DEPARTMENT OF NATURAL SCIENCES

WINDWARD COMMUNITY COLLEGE

2006-2007

Annual Department Report

Submitted by

David A. Krupp, Chair

Draft

June 4, 2007
Table of Contents

Windward Community College Mission Statement ................................................................. 3
Windward Community College Associate in Arts Degree Student Learning Outcomes ........ 3
Natural Sciences Department Mission Statement ................................................................. 3
Natural Sciences Student Learning Outcomes ...................................................................... 3
Certificates and Other Programs Offered by the Department ............................................. 4
Quantitative Indicators for Annual Review ........................................................................... 5
Demand ............................................................................................................................... 5
Efficiency ........................................................................................................................... 7
Effectiveness ...................................................................................................................... 9
Assessment Results for Department/Course Student Learning Outcomes ......................... 11
Curriculum Revision ......................................................................................................... 18
Analysis of Data ................................................................................................................ 19
Evidence of Quality and Evidence of Student Learning ..................................................... 19
Strengths and Weaknesses Based on Analysis of Data ...................................................... 20
Recommendations for Improving Student Learning and Departmental Outcomes Based On Analysis Of Data and Resource Sufficiency to Accomplish Recommendations ........... 21
Summary Action Plan and Budget Implications ................................................................. 24
Appendices ....................................................................................................................... 27
Appendix A. 2007-08 Action Plan Item Details ................................................................... 28
Appendix B. Action Plan Items for 2006-07 as Presented in the 2005-06 Natural Sciences Annual Report ........................................................................................................... 52
Appendix C. Course Student Learning Outcome Reports ................................................ 61
Appendix D. Individual Accomplishments and Goals ....................................................... 148
Windward Community College Mission Statement

Windward Community College is committed to excellence in the liberal arts and career development; we support and challenge individuals to develop skills, fulfill their potential, enrich their lives, and become contributing culturally aware members of our community.

Windward Community College Associate of Arts Degree Student Learning Outcomes

The student will:
1. Draw on knowledge from the liberal arts to succeed in upper division courses.
2. Recognize and respond to the wonders and challenges of the natural environment, both biological and physical.
3. Use research and technology skills to access information from multiple sources; use critical thinking and problem-solving skills to evaluate and synthesize information to form conclusions, ideas, and opinions.
4. Express ideas clearly and creatively in diverse ways through the fine and performing arts, speech and writing.
5. Recognize one’s role in community and global issues with a respect for diverse cultures and differing views while embracing one’s own cultural values and heritage.
6. Engage in civic activities with a sense of personal empowerment.
7. Enter and perform effectively in the work force.
8. Develop skills that improve personal well-being and enhance professional potential.
9. Use knowledge and skills to maintain and improve mental and physical well-being.

Natural Sciences Department Mission Statement

The mission of the Natural Sciences Department is to provide opportunities for students to further their development as scientifically literate citizens, develop skills in problem solving based on scientific inquiry, and explore careers in science and technology.

Natural Sciences Department Student Learning Outcomes

The student will:
1. Demonstrate a functional literacy and understanding of scientific laws, theories and concepts from the biological and physical sciences.
2. Demonstrate an understanding of the scientific method through specific applications of scientific laws, theories and concepts.
3. Demonstrate an understanding of the philosophy and history of science and the relationships between science and society.
4. Apply the knowledge base and tools of science gained through hands-on laboratory experience.
Certificates and Other Programs offered in the Natural Sciences Department

Certificate of Completion

Agricultural Technology
  Plant Landscaping (with area of specialization in either Landscape Maintenance or Turfgrass Maintenance)

Academic Subject Certificate (ASC)

Bio-Resources and Technology (with area of specialization in either Plant Biotechnology or Bio-Resource Development and Management)

Other Programs

  Marine Option Program (MOP)
  Hawai‘i Space Grant Consortium (HSGC)
Quantitative Indicators for Annual Review

**Demand**

<table>
<thead>
<tr>
<th></th>
<th>BIO-LAB</th>
<th>BIO-LEC</th>
<th>BIO-LL</th>
<th>PS-LAB</th>
<th>PS-LEC</th>
<th>OVERALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of registrations</td>
<td>254</td>
<td>573</td>
<td>114</td>
<td>271</td>
<td>703</td>
<td>1,915</td>
</tr>
<tr>
<td>Student semester hours for departmental classes</td>
<td>303</td>
<td>1,691</td>
<td>341</td>
<td>271</td>
<td>2,109</td>
<td>4,715</td>
</tr>
<tr>
<td>FTE program enrollment</td>
<td>16.93</td>
<td>38.2</td>
<td>7.6</td>
<td>18.07</td>
<td>46.87</td>
<td>127.67</td>
</tr>
<tr>
<td>Number of classes taught</td>
<td>18</td>
<td>25</td>
<td>12</td>
<td>18</td>
<td>29</td>
<td>102</td>
</tr>
</tbody>
</table>

![Quantitative Indicators: Demand (1)](image_url)
**Department Chair’s Statement: Determination of Department’s health, based on measures of Demand (Healthy, Cautionary, or Unhealthy).**

Healthy overall.

With the exception of BIO-LL classes (BIO-LL = Biological Science Lecture-Lab; i.e., classes that combine lecture and lab into a single registration), demand appears to be healthy. See comments regarding efficiency below.

The physical sciences tend to exhibit higher overall enrollment than the biological science (974 for physical sciences compared to 941 for biological sciences). But if the BIO-LL classes were split into separate lecture and lab classes, making these equivalent to the separated lecture and lab components of other natural science classes, then the number of enrollments for biological sciences would actually be 1055 (assuming students would still register for both the lecture and the lab if separated).

Registration into the physical sciences is dominated by the number of students enrolling into ASTR 110 (202 total for 2006-07), which is largely a function of the number of ASTR 110 sections offered (7 for 2006-07). ASTR 110 functions primarily in satisfying natural science core requirements. Registration into the biological sciences is dominated by the number of students enrolling into MICR 130 (157 for 2006-07). The total number of MICR 130 sections offered during 2006-07 was six. MICR 130 not only satisfies natural science core requirements but is also required for nursing and allied health disciplines at other institutions.
**Efficiency**

<table>
<thead>
<tr>
<th></th>
<th>BIO-LAB</th>
<th>BIO-LEC</th>
<th>BIO-LL</th>
<th>PS-LAB</th>
<th>PS-LEC</th>
<th>OVERALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average class size</td>
<td>14.11</td>
<td>22.92</td>
<td>9.5</td>
<td>15.06</td>
<td>24.24</td>
<td>18.77</td>
</tr>
<tr>
<td>Class fill rate</td>
<td>81.2</td>
<td>68.2</td>
<td>40.9</td>
<td>73.7</td>
<td>82.9</td>
<td>72.4</td>
</tr>
<tr>
<td>FTE of BOR appointed program faculty</td>
<td>0.67</td>
<td>1.97</td>
<td>0.43</td>
<td>0.50</td>
<td>2.3</td>
<td>5.87</td>
</tr>
<tr>
<td>Student/faculty ratio</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Program budget allocation (personnel, supplies and services, equipment)</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Cost per student semester hour</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Number of classes that enroll less than 10 students*</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

* Apparently determined for Fall 2006 only at the time data were generated. Actual number are higher if data from Spring 2007 were included. Please see "Department Chair's Statement" (next page).

For number of classes that enrolled less than 10, this graph only illustrates Fall 2006 data.
Department Chair’s Statement: Determination of Department’s health based on measures of Efficiency. (Healthy, Cautionary, or Unhealthy).

Healthy overall.

With the exception of BIO-LL classes, efficiency appears to be healthy. For example, the average class size for BIO-LL is 9.5, which is about 50% of the number of registrations per class (ca. 18.8) overall for natural science classes. This trend has been fairly consistent during the last several years (8.6 in 2005-06 & 9.5 in 2004-05).

Several possible explanations may account for this trend:

1. Students may prefer to enroll in those classes that offer the possibility of separate registrations for lecture and laboratory rather than into lecture-lab combined classes.
2. Registrations into lecture-lab classes are limited by the number of available seats in natural science laboratory classrooms (generally no more than 20, except for agriculture classes, which are typically “capped” at 25 – still lower than the “cap” of 35 for science lecture classes).
3. These BIO-LL classes are dominated by Agriculture classes (8 out of the 12 BIO-LL offered in 2006-07), which tend to enroll lower than other classes.
4. The data don’t appear to distinguish between “piggyback” and non-“piggyback” Agriculture classes. For example, during 2006-07, “piggy-back” classes AG 80/180 and AG 82/182 were treated as separate classes (four classes instead of two) in the data compilation and summarization. Taking this fact into account the number of BIO-LL classes should be 10 instead of 12 for 2006-07 and the average class size should be 11.4, which is still relative low, but not quite as severe as 9.5.

Average class size in the biological sciences was highest for ZOOL 141 (33.7 in 2006-07). CHEM 100 exhibited the highest average class size (29 in 2006-07) for the physical sciences. ZOOL 141 is a required course for nursing and allied health disciplines at other institutions. CHEM 100 satisfies natural science core requirements. Other classes exhibiting high average class sizes included BIOL 100 (33.3) and ASTR 110 (28.9), both of which function primarily in satisfying natural science core requirements.

Average class sizes for science labs tend to be lower (14.1 for BIO-LAB and 15.1 for PS-LAB) than for lecture-only classes (22.9 for BIO-LEC and 24.2 for PS-LEC). The difference is undoubtedly a consequence of the fact that the maximum enrollment for science labs is lower (usually 20) than for science lectures (usually 35; however, some science lecture classes have lab prerequisites, limiting the enrollment in these classes as well).

The lowest average class sizes (below 10) were observed in the following classes: AG 100, AG 40, AG 80/180 (combined enrollment), AG 82/182 (combined enrollment), BIOL 172L, BOT 210, CHEM 151L, GG 210, OCN 101. The values for AG classes were consistent with values observed in previous years. BIOL 172L is the second semester of a year two-semester sequence (similar declines in second-semester enrollments were observed in other two-semester lab classes). BOT 210 is a lecture-lab course whose enrollment may be limited by is pre-requisites. CHEM 151L is the companion laboratory class to CHEM 151. During the Fall 2006, two sections of CHEM 151L were offered. GG 210 is a Saturday fieldtrip/lab class with an enrollment cap of 15 because safety concerns in the field. OCN 101 is a one-credit seminar-style class whose audience is limited to Marine Option Program students interested in developing their skill projects.
**Effectiveness**

<table>
<thead>
<tr>
<th></th>
<th>BIO-LAB</th>
<th>BIO-LEC</th>
<th>BIO-LL</th>
<th>PS-LAB</th>
<th>PS-LEC</th>
<th>OVERALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention rates average (within courses)*</td>
<td>81.3</td>
<td>79.7</td>
<td>98.1</td>
<td>87.1</td>
<td>86.8</td>
<td>84.9</td>
</tr>
<tr>
<td>Success at next level of discipline, if applicable</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Persistence of majors Fall to Spring</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
</tbody>
</table>

* Calculated for Fall 2006 only.

**Quantitative Indicators - Effectiveness**

![Quantitative Indicators - Effectiveness](image-url)

- Retention rates average (within courses)
Determination of department's health based on measures of Effectiveness. (Healthy, Cautionary, Unhealthy.)

Healthy overall.

Given retention rates* of about 80% or higher, effectiveness appears to be high. The very high retention in BIO-LL classes (98.1%) appears anomalous, given the low enrollments in these classes. A high retention rate may imply high student satisfaction. And high student satisfaction should translate into high demand and efficiency. However, in this situation the classes with the highest retention appear to exhibit the lowest demand and efficiency.

Note, it should be pointed out that high retention rates do necessarily imply high effectiveness. While a high retention rate could be a reflection of high quality teaching that encourages students to remain in a class, it could also indicate that the class is very easy.

*Apparently only computed for Fall 2006.
Assessment Results for Department/Course Student Learning Outcomes

Course Alignment With Associate in Arts Degree Student Learning Outcomes

With the exception of most of the Agriculture classes (AG), ASTR 130, OCN 260, OCN 260L, PHRM 203, and SCI 123, the Natural Science Department has aligned its courses with the College’s Associate in Arts Degree Student Learning Outcomes (SLOs).

Course Alignment With Natural Science Department Student Learning Outcomes

The Department engaged in this process several years ago, but there does not seem to be a record of which classes have been aligned with the Natural Science Department Student Learning Outcomes. Completion of this task will be a goal for 2007-08. However, first the Department will need to re-evaluate its Student Learning Outcomes.

Completion of Defining Student Learning Outcomes for Natural Science Classes

Considerable progress was made in defining Student Learning Outcomes for Natural Science classes. However, there are still 14 Natural Science courses needing to have their Student Learning Outcomes articulated: AQUA 106, 201, 201L, BIOL 200L, IS 261, NREM 250, OCN 201L, 220, SCI 123, ZOOL 101, 105, 106, 107, 200. SLOs for these classes will be completed during 2007-08.

Assessment of Individual Course Student Learning Outcomes

Student Learning Outcomes (SLOs) were assessed in 18 courses during 2006-07. The results of these assessments are presented below. Full reports are attached in Appendix C.

<table>
<thead>
<tr>
<th>Course SLOs Assessed 06-07</th>
<th>Criteria for Success</th>
<th>Results of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIOL 100 Human Biology</strong> (Fall 2006)</td>
<td>Assessment Tools: • Imbedded questions for SLO items in Final Exam Criteria for Success: • Average of 65% percent of students answering questions correctly</td>
<td>65% criterion achieved for all SLOs assessed except SLO #3. Students apparently have great difficulty in understanding cell structure and function, especially those aspects dealing with cell metabolism. Most of the lower-scoring questions for this SLO relate to cell biochemistry and metabolism. I will likely include a required web-based tutorial (class is taught using distance learning technologies) on cell metabolism to enhance student learning in this regard.</td>
</tr>
<tr>
<td>1. Explain the process and philosophical basis of scientific inquiry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Distinguish between living things and inanimate objects.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Describe the parts, their structure and functions, of cells, diversity of cell types, cell metabolism, cell communication, and cell division processes (mitosis and meiosis).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Describe the interrelationships between humans and their environments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BIOL 171 General Biology I</strong> (Fall 2006)</td>
<td>Assessment Tools: • Imbedded questions for SLO items in Final Exam Criteria for Success: • Average of 65% percent of students answering questions correctly</td>
<td>65% criterion exceeded by a solid margin for all SLOs assessed.</td>
</tr>
<tr>
<td>1. Explain the process and philosophical basis of scientific inquiry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Distinguish between living things and inanimate objects.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Describe the parts, their structure and functions, of cells, diversity of cell types, cell metabolism, cell communication, and cell division processes (mitosis and meiosis).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Describe evolution as the unifying principle of biological science; and present the evidence supporting evolution and natural selection.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Course SLOs Assessed 06-07

**BIOL 172 General Biology II**  
(Spring 2007)  
1. Describe the biology of higher plants, including the following concepts: basic plant characteristics, plant adaptations to terrestrial versus aquatic life styles, and vascular plant reproduction, growth, anatomy, nutrition, transport mechanisms, and hormonal integration.  
2. Describe the biology of animals, including the following concepts: adaptations to terrestrial versus aquatic life styles, embryology, behavior, and the anatomy and physiology of animal organ systems (i.e., digestion, respiration, circulation, osmoregulation, thermoregulation, immunity, reproduction, nervous, and endocrine system).  
3. Describe the basic principles of ecology, including population ecology, community ecology, and ecosystem function.

**BOT 160 Identification of Tropical Plants**  
(Fall 2006)  
1. Operate dissecting microscopes  
2. Recognize unique vegetative and generative characteristics of plant families  
3. Use manuals, flora and monographs to identify plants  
4. Prepare herbaria

**BOT 210 Phytobiotechnology**  
(Spring 2007)  
1. Apply the principles of genetics  
2. Discuss and perform experiments including plant/bacterial/human  
3. DNA/protein electrophoresis, Southern and Western blots, plant genetic engineering using biolistic bombardment and bacterial gene transformation  
4. Apply bioinformatics and DNA sequencing  
5. Discuss bioethical issues, risks and benefits of biotechnology  
6. Produce lab reports using the standard scientific format

### Criteria for Success

**BIOL 172 General Biology II**  
Assessment Tools:  
- Imbedded questions for SLO items in Final Exam  
Criteria for Success:  
- Average of 65% percent of students answering questions correctly

**BOT 160 Identification of Tropical Plants**  
Assessment Tools:  
- Embedded assessment evaluating students achievement as stated in the student learning outcomes  
- Exams  
- Field trip reports  
- Lab practicum (plant identification exercises)  
- Class project presentations  
- Herbarium preparations  
Criteria for Success:  
- 92% of students received final grade point average higher than 88% of total possible points (550 points)  
- 92% of students achieved embedded assessment ratings between the score of 2 – 3 (achieves – exceeds “skills or competencies”)

**BOT 210 Phytobiotechnology**  
Assessment Tools:  
- Embedded assessment evaluating students achievement as stated in the student learning outcomes  
- Lecture and lab participations  
- Exams  
- Field trip reports  
- Lab reports (scientific format)  
- In vitro culture maintenance  
Criteria for Success:  
- 88% of students received final grade point average higher than 90% of total possible points (900 points)  
- 88% of students achieved embedded assessment ratings between the score of 2 – 3 (achieves – exceeds “skills or competencies”)

### Results of Assessment

65% criterion exceeded by a solid margin for all SLOs assessed.

The average embedded assessment rating was 2.5 (between achieves – exceeds the "skills and competencies"). This number was greater than the expected benchmark of 2.

The average embedded assessment rating was 2.57 (see table). This number was greater than the expected benchmark of 2.

---

Natural Sciences Annual Department Report for 2006-2007
<table>
<thead>
<tr>
<th>Course SLOs Assessed 06-07</th>
<th>Criteria for Success</th>
<th>Results of Assessment</th>
</tr>
</thead>
</table>
| CHEM 151 Elementary Survey of Chemistry (Spring 2007) | **Criteria for Success:**  
- At least 80% of the items should have an increase in the post semester mean value | Students demonstrated increases in confidence in chemistry knowledge for all items tested throughout the course. However, a few items did not exhibit a large increase from pre-course to post-course evaluations. Some of the pre-course evaluations were high because the topic had been covered before the administration of the test. For other items not meeting the expected increase, greater emphasis will be invested in these topics in future semesters. |
| 1. Predict properties of chemical elements based on their atomic structure and their location in the Periodic Table.  
2. Name chemical compounds, balance chemical and nuclear reactions.  
3. Predict properties of chemical compounds based on chemical bonding, molecular shapes, and polarity.  
4. Calculate mass relationships in chemical reactions and the quantity of matter in gaseous chemicals and chemical solutions.  
5. Predict the products of chemical reactions.  
6. Apply knowledge of chemical concepts to a current environmental, health, industrial, or technological issue or condition by writing a short research paper. | **Assessment Tools:**  
- Knowledge survey consisting of 110 items covering the SLO's  
- Conducted pre-course and post-course  
- Students evaluate the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | Passed. The class instructor rated all formal lab reports submitted with a grade of 70% or higher. Validation. Peer faculty member rated thirteen randomly selected formal reports (one from each student in a class of seventeen) using the same grade rubrics. All thirteen received a rating of 75% or higher, with an average rating of 88%. These same reports received an average rating of 89% from the class instructor. |
| CHEM 151L Elementary Survey of Chemistry Laboratory (Fall 2006) | **Criteria for Success:**  
- At least 70% of students will meet or exceed performance standards of 70% | | | **Assessment Tools:**  
- All CHEM 131L students prepared a minimum of three (3) lab reports using the standard scientific format.  
- Chemistry faculty peers evaluated randomly selected lab reports using a rating form developed by the faculty. | **Assessment Tools:**  
- Knowledge survey consisting of 136 items covering the SLO's  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | For improvement: Only a few items have less than 1.75 post course mean values should be given much greater emphasis in subsequent semesters. |
| 1. Apply and articulate the scientific method by preparing a lab report using the standard scientific format. | **Criteria for Success:**  
- At least 80% of the items should increase in the post course evaluation | | | **Assessment Tools:**  
- Knowledge survey consisting of 94 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | Pre-course survey: Except for one item, the students' self-evaluation ratings are low (all mean values below 1.5). Post-course survey: The post-course mean values vary from 1.47 to 3.0. The knowledge survey items are arranged in order they are covered in class. It is noticeable that items at the beginning of the semester have higher mean values than those that were taken towards the end of the semester. There was not adequate time to cover all the items with the desired depth. For improvement: Only a few items have less than 1.75 post course mean values should be given much greater emphasis in subsequent semesters. |
| CHEM 152 Survey of Organic and Bioorganic Chemistry (Spring 2007) | **Criteria for Success:**  
- At least 80% of the items should increase in the post course evaluation | | | **Assessment Tools:**  
- Knowledge survey consisting of 136 items covering the SLO's  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | Evidence of learning is revealed in 93 of the 94 items. With respect to the one item in which no evidence of learning topic place, all students self-evaluated that they have strong confidence in their knowledge of this particular topic at the beginning of the course. The 99% result surpasses the 80% benchmark. For those few items not meeting the expected increase, greater emphasis will be invested in these topics in future semesters. |
| 1. Construct molecular models and use these to describe chemical structure and geometry and physical properties.  
2. Identify, classify and name organic and biochemical compounds.  
3. Use the vocabulary of organic chemicals and reactions in metabolism and other biochemical applications.  
4. Explain the role of enzymes in metabolism.  
5. Apply knowledge of biochemistry concepts to discuss the genetic cause of a metabolic disorder in a short research paper. | **Assessment Tools:**  
- Knowledge survey consisting of 136 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | | | **Assessment Tools:**  
- Knowledge survey consisting of 94 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | | |
| CHEM 161 General Chemistry I (Fall 2006) | **Criteria for Success:**  
- At least 80% of the items should increase in the post course evaluation | | | **Assessment Tools:**  
- Knowledge survey consisting of 136 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | | |
| 1. Use the mole concept in solving stoichiometry problems involving solids, liquids, gases and solutions.  
2. Balance chemical equations, classify reactions, identify and analyze the role of the chemicals involved in chemical reactions.  
3. Predict the behavior of gases while undergoing changes in volume, pressure, temperature and quantity.  
4. Manipulate thermochemical equations and calculate the amount of energy involved in chemical reactions.  
5. Predict physical and chemical properties of elements based on electronic structure and location in the Periodic Table.  
6. Predict physical and chemical properties of compounds based on chemical bonding, geometry and intermolecular interactions. | **Assessment Tools:**  
- Knowledge survey consisting of 136 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | | | **Assessment Tools:**  
- Knowledge survey consisting of 94 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | | |

Natural Sciences Annual Department Report for 2006-2007
<table>
<thead>
<tr>
<th>Course SLOs Assessed 06-07</th>
<th>Criteria for Success</th>
<th>Results of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHEM 161L General Chemistry Laboratory II (Fall 2006)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. Apply and articulate the scientific method by preparing lab reports using the standard scientific format. | Assessment Tools:  
- All CHEM 161L students prepared a minimum of three (3) lab reports using the standard scientific format  
- Chemistry faculty peer evaluated randomly selected lab reports using a rating form developed by the faculty | Passed, exceed performance standard. All seventeen students got 70% or higher in their formal laboratory report grades graded by their instructor. For validation, fourteen randomly selected formal reports (no duplicates from a single student) were independently evaluated by chemistry faculty member peer. All fourteen received a rating of 70% or higher with an average rating of 88%. These same reports evaluated by instructor received an average rating of 91%. |
| 2. Express in writing core chemistry principles, results of experiments and do critical thinking by synthesizing conclusions based on observations and data. | Criteria for Success:  
- At least 70% of students will meet or exceed performance standards of 70% | |
| **CHEM 162 General Chemistry II (Spring 2007)** | | |
| 1. Predict properties (boiling point, melting point, osmotic pressure, vapor pressure) of solutions based on concentrations. | Assessment Tools:  
- Knowledge survey consisting of 74 items covering the SLO’s  
- Conducted pre-course and post-course  
- Students evaluated the degree of their knowledge to answer the questions  
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely | Students demonstrated increases in confidence in chemistry knowledge for all items tested throughout the course, surpassing the 80% benchmark. However, a few items did not exhibit a large increase from pre-course to post-course evaluations. Some of the pre-course evaluations were high because the topic had been covered before the administration of the test (in CHEM 161). For other items not meeting the expected increase, greater emphasis will be invested in these topics in future semesters. |
| 2. Determine reaction rate law and calculate rate constants and half-life based on experimental data. | | |
| 3. Calculate the equilibrium concentration of chemicals in solution involved in precipitation, acid-base and redox reactions. | | |
| 4. Predict spontaneous reactions based on enthalpy and entropy considerations. | | |
| 5. Determine the electrochemical potential of redox reactions. | | |
| **CHEM 162L General Chemistry Laboratory II (Spring 2007)** | | |
| 1. Apply and articulate the scientific method by preparing lab reports using the standard scientific format. | Assessment Tools:  
- All CHEM 162L students prepared a minimum of five (5) lab reports using the standard scientific format  
- Chemistry faculty peer evaluated randomly selected lab reports using a rating form developed by the faculty | Passed. Class instructor rated all formal lab reports with a grade of at least 70% based on the grading rubrics. To validate the assessment tool, seven randomly selected formal reports (one from each student in a class of nine) were evaluated by chemistry peer faculty, Ms. Vilma Fennin. All seven received a rating of 70% and higher, and the average was 90%. This agrees well with the instructor’s average rating of 91%. |
| 2. Express in writing core chemistry principles, results of experiments and do critical thinking by synthesizing conclusions based on observations and data. | Criteria for Success:  
- At least 80% of the items should show an increase in post course mean value | |
| **GEOG 101 The Natural Environment (Fall 2006)** | | |
| 1. Describe the components (inputs), principles (actions) and resulting spatial patterns (outputs) of the physical environment (atmosphere, hydrosphere, lithosphere and biosphere) as a system. (Understand facts; assessed by multiple choice/essay exams) | Assessment Tools:  
- Multiple choice exams, essay exams and learning logs were used to assess the SLOs  
- The results of the exams and learning logs were evaluated using a standard grading scale | While factual knowledge is well achieved (SLO #1), the application and evaluation of these facts (SLOs #2 & 3) were not. Next semester, the instructor will shift the emphasis of each class period more to application of materials covered, than to mere facts. |
| 2. Apply the scientific method, and theories and concepts of geography to explain a physical environment. (Use learned skills to interpret facts; assessed by multiple choice/essay exams) | Criteria for Success:  
- At least 70% of students will meet or exceed performance standards of 70% | |
| 3. Explain critically the interaction of humans and the physical environment. (Evaluate a total system; assessed by a long essay exam in the final) | | |
| 4. Illustrate how his/her views of the physical environment have (or have not) changed. (Communicate opinion; assessed by a short paper and/or class discussion) | | |

Natural Sciences Annual Department Report for 2006-2007
<table>
<thead>
<tr>
<th>Course SLOs Assessed 06-07</th>
<th>Criteria for Success</th>
<th>Results of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 101L The Natural Environment Laboratory (Fall 2006)</td>
<td><strong>Assessment Tools:</strong>&lt;br&gt;• Lab exercises and the semester project (capstone project) were used to assess the SLOs</td>
<td>Overall achievement was excellent. However, in some lab exercises, that some students were confused because of deteriorating equipment. To improve student learning, we need to replace those as soon as possible.</td>
</tr>
<tr>
<td><strong>1.</strong> Apply the scientific method to study a physical environment: Define a problem for a study, gather and record data, analyze the data, arrive at appropriate conclusions, and report the findings in written form. (Demonstrate knowledge of the scientific method including communication of ideas; assessed by lab exercises and a capstone project)</td>
<td><strong>Criteria for Success:</strong>&lt;br&gt;• The results of the lab exercises and the semester project were evaluated using a standard grading scale</td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong> Use various instruments, such as a compass, GPS unit and thermometer, to gather environmental data. (Demonstrate knowledge of how to use instruments; assessed by lab exercises and a capstone project)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Use the metric system, scientific notation, graphs, and geographic and basic statistical measurements. (Demonstrate quantitative skills in science; assessed by lab exercises and a capstone project)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.</strong> Write a lab report using the standard scientific format. (Demonstrate scientific writing skills; assessed by lab reports and a capstone project)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS 201 The Ahupua'a (Spring 2007)</td>
<td><strong>Assessment Tools:</strong>&lt;br&gt;• 40% of a students grade is determined by two written exams where questions (n= 4-5 per exam) are provided one week in advance. The actual exam question is randomly chosen on the day of the test. Grade is based on the basis of content and quality of writing&lt;br&gt;• 20% of their grade is dependent on a group presentation on a topic covered during the course period. It is made at the end of the semester and equivalent to a midterm exam. One grade is assigned to the entire group that is based on the quality and quantity of their presentation made to the class and instructors&lt;br&gt;• 20% of their grade is dependent on the construction of a implement used in ancient times, a written report and an oral presentation. The presentation of the implement and how it is used takes place at the end of the class and is a culminating event for the class. Quality of the implement, the written report and the oral presentation are used as criteria for success&lt;br&gt;• 20% of their grade is based on attendance to lectures and field trips. Field trips are designed to expose students to the various components of an ahupua'a but also involves a service/learning component at each site visited. Active student participation is the main criteria for success</td>
<td>Written and verbal skills were easily assessed as there were many opportunities provided. In general there was a relative improvement in both skills for the majority of students as the course progresses. The largest change (differs with each class) was usually with interactions of the class as a whole when the class began to actively start working as team(s) rather than individuals. When it did happen it was also apparent that the students understanding of the relationships/interdependence with each other and with the environment had started to take place (i.e., can be used as a measure of the instructors success). A numerical score was provided for each of the assessment tools and used to calculate their overall grade for the class. Bringing in additional speakers with varied backgrounds but still pertinent to the ahupua'a can certainly improve student learning. Likewise, the field sites visited and service learning activities can be changed.</td>
</tr>
<tr>
<td><strong>1.</strong> Understanding the value of land and water (fresh and marine) both past present and future</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong> Demonstrate a sensitivity and appreciation for the diversity of a community and perform effectively as a team</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Demonstrate an understanding of the relationship/responsibility between oneself and the environment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Course SLOs Assessed 06-07

<table>
<thead>
<tr>
<th>Course</th>
<th>Criteria for Success</th>
<th>Results of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MICR 130 General Microbiology</strong></td>
<td>Assessment Tools:</td>
<td></td>
</tr>
<tr>
<td>(Fall 2006)</td>
<td>• Embedded assessment evaluating student achievements as stated in student learning outcomes</td>
<td>The average embedded assessment rating was 2.16 (see table). This number exceeded the expected benchmark of 2.</td>
</tr>
<tr>
<td>1. Describe the main morphological characteristics, growth, reproduction and classification of algae, bacteria, fungi, protozoa, viruses and helminthes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Discuss etiologies, reservoirs of infection, modes of transmission, signs, symptoms, and treatments and/or methods of prevention of common infectious diseases of humans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Describe the basic principles of molecular genetics as they relate to cell division, mutation, genetic engineering, protein synthesis, bacterial virulence, and antibiotic resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Describe pathogenicity, immunity and allergies</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MICR 140 General Microbiology Laboratory</strong></td>
<td>Assessment Tools:</td>
<td></td>
</tr>
<tr>
<td>(Fall 2006)</td>
<td>• Embedded assessment evaluating students achievements as stated in the student learning outcomes</td>
<td>The average embedded assessment rating was 2.9. This number was far greater than the average benchmark of 2, and it almost reached the highest score of 3.</td>
</tr>
<tr>
<td>1. Operate equipment used in microbiology laboratory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Prepare growth media</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perform aseptic transfer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Identify microorganisms using morphological and physiological tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Follow biosafety procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Produce lab reports using the standard scientific format</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 151 College Physics I</strong></td>
<td>Assessment Tools:</td>
<td></td>
</tr>
<tr>
<td>(Fall 2006)</td>
<td>• Pre/post test instrument based on material drawn from course SLOs</td>
<td></td>
</tr>
<tr>
<td>1. Demonstrate a general understanding of the underlying philosophy of the physics, including the scientific method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Apply the basic concepts of physics, including mechanics, energy, simple oscillatory systems, gas laws and fluid dynamics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Apply the concept of conservation laws in problem solving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Apply basic algebraic and graphical analysis techniques to physics problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Compare and contrast macroscopic and microscopic systems in physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Define quantitatively and qualitatively the common terms used in physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Assess the limitations of the scientific method and apply error analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Determine when to apply physics principles to everyday situations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course SLOs Assessed 06-07</td>
<td>Criteria for Success</td>
<td>Results of Assessment</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------</td>
<td>-----------------------</td>
</tr>
</tbody>
</table>
| ZOOL 142 Human Anatomy and Physiology II (Spring 2007) | **Assessment Tools:**  
  - End of semester Knowledge Survey with scoring rubric  
  - Questions embedded in lecture exams  
  **Criteria for Success:**  
  - Score average ≥ 3 on Knowledge Survey questions  
  - Score average ≥ 70% on embedded questions | Students generally achieved outcomes satisfactorily, except for SLO #3. Instructor plans to institute the following changes in the Fall 2007 and Spring 2008 semesters:  
  1. Follow a spiral curriculum; revisit body systems and core topics several times throughout the semester to increase retention.  
  2. Increase lecture coverage for endocrine system and lipid digestion.  
  3. Devise interactive activities to teach hormone functions.  
  4. Include a patient “case-study” with each lecture topic to show how illness disrupts homeostasis of the body systems. Have students research medical treatments for each illness and discuss how the treatment restores homeostasis.  
  5. Hold wrap-up quiz sessions at the end of each lecture utilizing Smart-Room student remotes. This will allow both instructor and students to assess learning on a day-to-day basis and adjust teaching style/study habits accordingly.  
  6. Construct a more-detailed Knowledge Survey that can be given to students at the beginning and end of course. |
Curriculum Revision

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Action</th>
<th>Archive</th>
<th>Addition</th>
<th>Editorial Modification</th>
<th>Prerequisite Modification</th>
<th>Credit Modification</th>
<th>Other Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG 47</td>
<td>Orchid Culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AQUA 201L</td>
<td>Hawaiian Fishpond Lab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 100</td>
<td>Human Biology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOT 181</td>
<td>Plant Sea Life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOT 210</td>
<td>Phytobiotechnology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 151</td>
<td>Elementary Survey of Chemistry</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 161</td>
<td>General Chemistry I</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MET 101L</td>
<td>Introduction to Meteorology Lab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS1 999</td>
<td>NSC: Biol Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS1 999A</td>
<td>NSC: Biol Sciences (L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS2 999</td>
<td>NSC: Physical Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS2 999A</td>
<td>NSC: Phys Sciences (L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS3 999</td>
<td>NSC: Other Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS3 999A</td>
<td>NSC: Other Sciences (L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHRM 203</td>
<td>General Pharmacology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>PHYS 170</td>
<td>General Physics I</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 272L</td>
<td>General Physics II Laboratory</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI 121</td>
<td>Intro Sci Biol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI 122</td>
<td>Intro Sci Phys</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI 124</td>
<td>Tech, Ecol Man</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZOOL 254</td>
<td>Exercise Therapy &amp; Wellness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Additional Curriculum Actions Initiated, But Not Completed

**IS 201 The Ahupua‘a.** Curriculum action was initiated to qualify IS 201 as biological science (DB) and science laboratory class (DY) for the College’s general education core requirements. This action was approved by the Natural Sciences Department, but has not yet been submitted to the CCAAC.

**ASC-Bio-Resources and Technology.** Curriculum action was begun to split the two tracks (Plant Biotechnology and Bio-Resources Development and Management) of the Academic Subject Certificate (ASC) in Bio-Resources and Technology into separate ASCs: This action has not yet been presented to the Natural Sciences Department.

**Veterinary Technician Program.** A committee was established to research the feasibility of offering a curriculum designed to provide training to veterinary technicians. While the concept was presented to the Department, no action was taken as considerable work remains in the development of this program.

**Ocean Recreation Associate in Arts Degree.** After several years of hiatus, work was restarted on the establishment of an ocean recreation and safety program.
## Analysis of Data

### Evidence of Quality and Evidence of Student Learning

<table>
<thead>
<tr>
<th>Evidence of Quality</th>
<th>Evidence of Student Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Awards Received by Faculty</td>
<td>• SLO assessments conducted for 18 Natural Science classes overwhelmingly met established criteria for success.</td>
</tr>
<tr>
<td>o Letty Colmenares, Outreach Researcher, INBRE (IDeA Network For Biomedical Research Excellence)</td>
<td>• 66.7% of ASC Plant Biotechnology graduates (also AA graduates) transferred to four-year institutions majoring in biosciences.</td>
</tr>
<tr>
<td>o Letty Colmenares, Who’s Who of American Women</td>
<td>• Five students planning on majoring in geology at UHM</td>
</tr>
<tr>
<td>o Floyd McCoy, Senior Fulbright Scholar 2007-08</td>
<td>• Three students planning on majoring in oceanography at UHM</td>
</tr>
<tr>
<td>o Floyd McCoy, Visiting Research Professor 2007-08, Weiner Laboratory, American School Classical Studies, Athens</td>
<td></td>
</tr>
<tr>
<td>• Grants Received by Faculty</td>
<td></td>
</tr>
<tr>
<td>o $34,000, HSGC, Joe Ciotti</td>
<td></td>
</tr>
<tr>
<td>o $57,000. Friends of Lanihuli, Joe Ciotti</td>
<td></td>
</tr>
<tr>
<td>o $20,000, PCATT, Joe Ciotti</td>
<td></td>
</tr>
<tr>
<td>o $2,000, Ifuku Family Foundation, Letty Colmenares</td>
<td></td>
</tr>
<tr>
<td>o $500, American Chemical Society, Letty Colmenares</td>
<td></td>
</tr>
<tr>
<td>o $113,951, USDA-CSREES, Inge White</td>
<td></td>
</tr>
<tr>
<td>o $1,000, Garden Club of Honolulu Student Scholarship in Plant Biotechnology, Inge White</td>
<td></td>
</tr>
<tr>
<td>o $3,043, NSF (UHM-CTAHR: ABE Workshop), Inge White</td>
<td></td>
</tr>
<tr>
<td>o $99,929, NOAA BWET (through HlMB), Dave Krup and Jo-Ann Leong</td>
<td></td>
</tr>
<tr>
<td>o $75,000, Castle Foundation (3rd Year), Floyd McCoy &amp; Dave Krupp</td>
<td></td>
</tr>
<tr>
<td>o $1,000, Garden Club of Honolulu Student Scholarship in Environmental Studies, Floyd McCoy and Dave Krupp</td>
<td></td>
</tr>
<tr>
<td>o $43,000, HCRI, Ross Langston</td>
<td></td>
</tr>
<tr>
<td>o $10,000, Private Donor, Ed Bernauer and Ross Langston</td>
<td></td>
</tr>
<tr>
<td>o $18,000, INBRE, Letty Colmenares</td>
<td></td>
</tr>
<tr>
<td>• Grants Received by Current and Former WCC Students</td>
<td></td>
</tr>
<tr>
<td>o $700, NSF (UHM-CTAHR: ABE Workshop), Kimberley Chinen</td>
<td></td>
</tr>
<tr>
<td>o $120,000, NSF Graduate Fellowship (3 years), Lea Hollingsworth</td>
<td></td>
</tr>
<tr>
<td>• Special Student Achievement</td>
<td></td>
</tr>
<tr>
<td>o Six WCC Marine Option Program students made presentations at the University of Hawai’i Marine Option Program Student Skill Project Symposium. One of these received the “Best Poster Presentation” award.</td>
<td></td>
</tr>
<tr>
<td>o Two WCC Hawai’i Space Grant Consortium students presented their results at the Fall 2006 HSGC Fellowship Symposium.</td>
<td></td>
</tr>
<tr>
<td>o Six WCC Hawai’i Space Grant Consortium students presented their results at Spring 2007 HSGC Fellowship Conference and Undergraduate Research Symposium in Spring 2007.</td>
<td></td>
</tr>
<tr>
<td>o Four students and one mentor participating in the PaCES summer program made a presentation at the Coastal America Second Summit on the Environment in Washington D.C.</td>
<td></td>
</tr>
<tr>
<td>o Six students received the ASC in Bio-Resources – Plant Biotechnology (ASC-BRTPB).</td>
<td></td>
</tr>
<tr>
<td>o Two ASC-BRTPB graduates co-authored in two separate scientific publications.</td>
<td></td>
</tr>
<tr>
<td>o Three students from Chem 152 Spring 2006 transferred to UHM Nursing in Fall 2006 (one of them qualified to the Accelerated Program). Another one transferred to UHM Dental Hygiene.</td>
<td></td>
</tr>
<tr>
<td>o From Chem 152 Spring 2005 class, four students got in UHM Nursing program in Fall 2005.</td>
<td></td>
</tr>
<tr>
<td>• Additional Evidence</td>
<td></td>
</tr>
<tr>
<td>o Letter of Recommendation from Pioneer Hi-Bred International Inc., 2007</td>
<td></td>
</tr>
<tr>
<td>o Letter from ASC PB student, 2007</td>
<td></td>
</tr>
<tr>
<td>o Letter from ASC PB graduate, 2007</td>
<td></td>
</tr>
</tbody>
</table>
**Strengths and Weaknesses Based on Analysis of Data**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highly Qualified and Dedicated Faculty</strong></td>
<td><strong>Academic Program Weaknesses</strong></td>
</tr>
<tr>
<td>- Five of the seven Natural Science faculty members have received the UH Regents’ Excellence in Teaching Award.</td>
<td>1. Classes targeting students intending to major in conventional natural science disciplines at the baccalaureate level tend not to fill well. The reasons for this situation include inadequate marketing, premature cancellation of low-enrolled classes consistently.</td>
</tr>
<tr>
<td>- Six hold Ph.D.’s and engage in scientific research involving their students.</td>
<td>2. Many students still struggle with complex scientific content knowledge and concepts, especially when dealing with quantitative problem solving activities.</td>
</tr>
<tr>
<td>- Five of these routinely publish scholarly research papers and make formal research presentations at scientific meetings.</td>
<td>3. Classes in vocational agriculture also exhibit less than optimal enrollment.</td>
</tr>
<tr>
<td>- All are committed to teaching excellence and effective student learning in their respective disciplines.</td>
<td>4. ASC in Bio-Resources and Technology, Bio-Resources Development and Management track has not yet graduated a single student.</td>
</tr>
<tr>
<td>- All engage in efforts to support Departmental goals through soliciting extramural funds.</td>
<td>5. Departmental Student Learning Outcomes were originally articulated as goals rather than outcomes. It is not clear how various Natural Science classes align with these outcomes, nor how they should be assessed.</td>
</tr>
<tr>
<td>- All provide substantial service to the College and the University.</td>
<td><strong>Academic Support</strong></td>
</tr>
<tr>
<td>- All work closely with the Windward O’ahu community and beyond, providing their respective expertise for the good of these communities.</td>
<td>1. In general, the Natural Sciences Department faculty is overwhelmed with instructional and institutional expectations and responsibilities.</td>
</tr>
<tr>
<td>- Two Natural Sciences faculty members have appointments as graduate faculty at UH Manoa.</td>
<td>2. The inflexible bureaucracy regarding purchasing needed supplies represents an additional drain on faculty time.</td>
</tr>
<tr>
<td><strong>Academic Program Strengths</strong></td>
<td>3. Insufficient laboratory technician support to address growing department needs and increased regulations.</td>
</tr>
<tr>
<td>- Classes targeting non-science majors needing to satisfy WCC general education core requirements fill very well.</td>
<td><strong>Physical Resources</strong></td>
</tr>
<tr>
<td>- Classes targeting students interested in nursing and allied health areas fill very well.</td>
<td>1. Since the construction of Hale 'Imiloa, the physics program has not been able to acquire the equipment needed to adequately teach physics concepts in physics laboratory classes.</td>
</tr>
<tr>
<td>- ASC in Bio-Resources and Technology, Plant Biotechnology track exhibits healthy enrollment and participation by students.</td>
<td>2. No plan in place for replacement of major equipment supporting the Natural Science instructional program. This equipment was either supplied with the furniture and equipment allocation with the construction of Hale 'Imiloa or through grants secured by Natural Science faculty. Some of this equipment is beginning to reach the end of its useful lifetime.</td>
</tr>
<tr>
<td>- The Marine Option Program continues to support students with interests in the ocean with the only interdisciplinary, inter-campus academic certificate program in the University system.</td>
<td>3. Basic operating funds for consumable supplies (mainly for laboratory classes) insufficient to meet needs.</td>
</tr>
<tr>
<td>- 2+2 Cooperative Agreement with UH Hilo in Geology established.</td>
<td>4. The Natural Science facilities (mainly Hale 'Imiloa and Hale Hokulani) still exhibit the following structural problems: (1) roof degradation and leakage; and (2) noisy and unbalanced air conditioning.</td>
</tr>
<tr>
<td>- Student retention program: through Peer Tutoring program in Chemistry</td>
<td>5. The steam generator (autoclave) that was built into Hale ‘Imiloa room 105 at the time of construction needs to be serviced annually to ensure safe operations.</td>
</tr>
<tr>
<td>- Community Outreach thru “Community Forum in Chemistry” and high school students mentoring.</td>
<td><strong>Experiential Opportunities Beyond the Classroom for Students</strong></td>
</tr>
<tr>
<td><strong>Experiential Opportunities Beyond the Classroom for Students</strong></td>
<td><strong>Physical Resources</strong></td>
</tr>
<tr>
<td>- Plant Biotechnology</td>
<td>1. Classes targeting students intending to major in conventional natural science disciplines at the baccalaureate level tend not to fill well. The reasons for this situation include inadequate marketing, premature cancellation of low-enrolled classes consistently.</td>
</tr>
<tr>
<td>- Hawai'i Space Grant Consortium</td>
<td>2. Many students still struggle with complex scientific content knowledge and concepts, especially when dealing with quantitative problem solving activities.</td>
</tr>
<tr>
<td>- Pacific Center for Environmental Studies (PaCES)</td>
<td>3. Classes in vocational agriculture also exhibit less than optimal enrollment.</td>
</tr>
<tr>
<td>- Marine Option Program</td>
<td>4. ASC in Bio-Resources and Technology, Bio-Resources Development and Management track has not yet graduated a single student.</td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td>5. Departmental Student Learning Outcomes were originally articulated as goals rather than outcomes. It is not clear how various Natural Science classes align with these outcomes, nor how they should be assessed.</td>
</tr>
<tr>
<td>- Mainly as a consequence of grants secured by the Natural Science faculty and the original Hale ‘Imiloa furniture and equipment allocation, the WCC Natural Science Department has excellent equipment resources for instruction.</td>
<td>1. Since the construction of Hale ‘Imiloa, the physics program has not been able to acquire the equipment needed to adequately teach physics concepts in physics laboratory classes.</td>
</tr>
</tbody>
</table>

---

Natural Sciences Annual Department Report for 2006-2007

20
Recommendations for Improving Student Learning and Departmental Outcomes Based On Analysis Of Data and Resource Sufficiency to Accomplish Recommendations

Note, item numbers correspond to item numbers listed in “Weaknesses.”

<table>
<thead>
<tr>
<th>Recommendations For Improvement</th>
<th>Resource Sufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic Program Weaknesses</strong></td>
<td><strong>Academic Program Weaknesses</strong></td>
</tr>
<tr>
<td>1.a. Enhance marketing of WCC undergraduate preparation for success in natural science baccalaureate programs through improved outreach (e.g., high school visitations by natural science faculty, website, brochures, etc.) and conducting special academic programs for high school students that make them aware of what we have to offer.</td>
<td>1.a. Need website/brochure developer; faculty need assigned time to conduct outreach activities and to conduct programs for high school students.</td>
</tr>
<tr>
<td>1.b. Allow low enrolled classes to be offered for a period of several years to establish trust and credibility in our programs.</td>
<td>1.b. Use existing faculty; no additional funds needed.</td>
</tr>
<tr>
<td>1.c. Complete course offerings in mainstream freshman and sophomore courses needed for baccalaureate degrees in natural science disciplines.</td>
<td>1.c. Need faculty assigned time for additional course development.</td>
</tr>
<tr>
<td>1.d. Establish a full-time, tenure-track position in physics and astronomy.</td>
<td>1.d. Recently established full-time position needs to be converted to tenure-track</td>
</tr>
<tr>
<td>2.a. Enhance tutoring and mentoring opportunities in mathematics, chemistry, physics, and biological sciences.</td>
<td>2.a. Partly funded for chemistry with existing grants. Need to increase student help hours for this function.</td>
</tr>
<tr>
<td>2.b. Plan and establish learning community classes.</td>
<td>2.b. Need faculty assigned time for planning.</td>
</tr>
<tr>
<td>3. Explore additional agricultural industry needs, such as urban forestry.</td>
<td>3. Grant funds provide funds for faculty assigned time, but funds for additional equipment are being requested.</td>
</tr>
<tr>
<td>4.a. Offer required classes (e.g., IS 201) more consistently.</td>
<td>4.a. No additional funds needed.</td>
</tr>
<tr>
<td>4.b. Improve strategies for encouraging students to enroll in this ASC program through marketing and counseling.</td>
<td>4.b. No additional funds needed.</td>
</tr>
<tr>
<td>5. The Department needs to re-evaluate Departmental Learning Outcomes, align courses with these outcomes, and develop an instrument for assessing them.</td>
<td>5. No additional funds needed.</td>
</tr>
<tr>
<td>6. Complete SLOs for Natural Science classes.</td>
<td>6. No additional funds needed.</td>
</tr>
<tr>
<td><strong>Academic Support</strong></td>
<td><strong>Academic Support</strong></td>
</tr>
<tr>
<td>1.a. Provide regular consistent G-funded assigned time to support time invested in special academic support functions by Natural Sciences faculty (e.g., Chemistry forums, supervising tutors/mentors, biotechnology, Space Grant, MOP, PaCES, etc.).</td>
<td>1.a. Additional faculty assigned time needed to support these activities.</td>
</tr>
<tr>
<td>1.b. Increase student help hours in support of these activities.</td>
<td>1.b. Need additional student help hours (perhaps 20 hours per week).</td>
</tr>
<tr>
<td>2. Hire a regular part-time (20 hours/week) secretary or administrative assistant to facilitate purchasing within the Department. This individual should be trained in P-card use.</td>
<td>2. Should be able to use indirect costs from grants to pay for this position.</td>
</tr>
<tr>
<td>3. Hire a full-time laboratory technician with specific expertise in biotechnology, molecular biology, microbiology, and human anatomy and physiology lab set up.</td>
<td>3. Funds are needed to support this position.</td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td><strong>Physical Resources</strong></td>
</tr>
<tr>
<td>1. Purchase physics instructional equipment.</td>
<td>1. Additional funds needed.</td>
</tr>
<tr>
<td>2. Have the Natural Sciences Lab Technician coordinate an inventory of the operating status of all Departmental laboratory equipment and develop, in coordination with Department faculty, a replacement plan that anticipates future equipment needs.</td>
<td>2. No additional funds needed. Inventory work and planning draft would be conducted in the summer.</td>
</tr>
<tr>
<td>3. Bring the Natural Sciences annual operating budget for consumable supplies and programmatic support to $40,000.</td>
<td>3. Additional funds needed.</td>
</tr>
<tr>
<td>4. Complete scheduled repairs on air conditioning and roof.</td>
<td>4. Funds already allocated.</td>
</tr>
<tr>
<td>5. Establish service contract with vendor to maintain steam generator (autoclave).</td>
<td>5. Since the steam generator (autoclave) is part of the physical plant of the building, the funds should come from Administrative Services regular operating funds.</td>
</tr>
</tbody>
</table>

The following items were established by the Natural Science Department in 2005-06 and prioritized in December 2006. See Appendix B for details as presented in the 2005-06 Annual Report.

<table>
<thead>
<tr>
<th>Department Priority</th>
<th>Action Plan Number</th>
<th>Brief Description</th>
<th>Dollar Request</th>
<th>Strategic Direction Correlation</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>'Imiloa Repairs</td>
<td>R&amp;M</td>
<td>5B</td>
<td>Out for bid; repairs expected to be completed by Fall 2007</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>Community Forum in Chemistry</td>
<td>$500</td>
<td>7B, 7G</td>
<td>Completed for 2006-07; additional allocation received from INBRE for 2007-08</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>Chemistry Student Assistant</td>
<td>$238.50</td>
<td>1A, 7G</td>
<td>Completed for 2006-07; additional allocation to be requested for 2007-08</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>Polynesian Voyaging</td>
<td>$1,800</td>
<td>7G</td>
<td>Some repairs completed; storage area set up; core requirement correction not implemented; IS 201 approved by department as biological science (CCAC approval needed)</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Full-Time Physics Instructor</td>
<td>$38,640 + fringe</td>
<td>7G</td>
<td>Was planned for 2006-07, but classes were cancelled and hired individual with work visa issues</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>Natural Science Operating Funds</td>
<td>$18,500</td>
<td>3D, 6.0, 7G</td>
<td>An additional $5,700 was allocated (special allocation) for MOP during 2006-07 to purchase chemical supplies for water quality projects; will request again</td>
</tr>
<tr>
<td>7</td>
<td>19</td>
<td>Secure Footing for PaCES</td>
<td>$29,319</td>
<td>3B, 6A, 7G</td>
<td>Not implemented; a revised request to be included in 2006-07 annual report</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>Urban Forestry Program</td>
<td>$9,000 + fringe</td>
<td>3D, 7A</td>
<td>Not implemented; Dave Ringuette on sabbatical during 2006-07 to put together curriculum; equipment &amp; maintenance costs TBD</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>New Lab APT</td>
<td>$26,000 + fringe</td>
<td>7G</td>
<td>Not implemented</td>
</tr>
<tr>
<td>*</td>
<td>21</td>
<td>Electrical Power Supplied to Bioprocessor Lab</td>
<td>$2,000 to $7,000</td>
<td>5</td>
<td>Scheduled for summer 2007</td>
</tr>
<tr>
<td>**</td>
<td>20</td>
<td>PC Laptop for Fluorescent Scope</td>
<td>$3,000</td>
<td>7G</td>
<td>Completed for 2006-07</td>
</tr>
<tr>
<td>**</td>
<td>10</td>
<td>Lecturer to Teach PHRM 203</td>
<td>$9,000 + fringe</td>
<td>3D</td>
<td>Completed for 2006-07</td>
</tr>
<tr>
<td>***</td>
<td>4</td>
<td>SLO completion</td>
<td>$0</td>
<td>1C</td>
<td>Most of the Natural Science course SLOs completed; 14 courses remain</td>
</tr>
<tr>
<td>***</td>
<td>7</td>
<td>Lanihuli Observatory Completion</td>
<td>external funds</td>
<td>5A</td>
<td>Completed for 2006-07</td>
</tr>
<tr>
<td>Department Priority</td>
<td>Action Plan Number</td>
<td>Brief Description</td>
<td>Dollar Request</td>
<td>Strategic Direction Correlation</td>
<td>Status</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------</td>
<td>------------------------------------</td>
<td>----------------</td>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>***</td>
<td>8</td>
<td>Astronomy Business Plan</td>
<td>$0</td>
<td>7G</td>
<td>Completed for 2006-07; submitted to Dean of Instruction</td>
</tr>
<tr>
<td>***</td>
<td>11</td>
<td>Peer Tutoring in Chemistry</td>
<td>external funds</td>
<td>1A; 7G</td>
<td>Completed for 2006-07 &amp; funds for 2007-08 approved (extramural funds from Ifuku family)</td>
</tr>
<tr>
<td>***</td>
<td>14</td>
<td>Plant Medicinal Garden</td>
<td>external funds</td>
<td>3.0</td>
<td>Ongoing; mostly completed using existing USDA-CREES Grant; grant to cover completion &amp; implementation for 2007-08</td>
</tr>
<tr>
<td>***</td>
<td>15</td>
<td>USDA-CREES FY 2006 Proposal Submittal</td>
<td>external funds</td>
<td>3.0</td>
<td>Already submitted and funded</td>
</tr>
<tr>
<td>***</td>
<td>16</td>
<td>Promote ASC in Bio-Resources &amp; Technology</td>
<td>external funds</td>
<td>3.0</td>
<td>Ongoing; existing USDA-CREES Grant</td>
</tr>
<tr>
<td>***</td>
<td>17</td>
<td>Strengthen Natural Science Transfer Courses</td>
<td>$0</td>
<td>7A; 7G</td>
<td>Partly completed with successful offerings during 2006-07 and partnerships established with four-year institutions</td>
</tr>
<tr>
<td>***</td>
<td>18</td>
<td>Separate ASC Bio-Resources &amp; Tech Tracks</td>
<td>$0</td>
<td>3B</td>
<td>no cost item</td>
</tr>
</tbody>
</table>

1 See Appendix B for details.
* We did not assign a priority to this item because it was not certain whether or not funds were already allocated.
** These items were originally funded for 2006-07.
*** These items do not require WCC funds because they are funded via grants or are no cost items.
## Summary Action Plan and Budget Implications

Please refer to Appendix A for detailed explanations and justifications. Strategic plan references refer to both the 2002-2010 plan and the strategic plan update.

### Action Plan

<table>
<thead>
<tr>
<th>Action Plan</th>
<th>Criteria for measuring success</th>
<th>Implem Date</th>
<th>Bud Rqst Prty</th>
<th>Dept Pry</th>
<th>Strat Plan Ref</th>
<th>New Strat Rqst?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complete Hale 'Imiloa Building Repairs</td>
<td>• No more roof leaks.&lt;br&gt;• Mold removed and end to moisture-supported mold growth between walls and in cabinets and drawers.&lt;br&gt;• AC renovations completed&lt;br&gt;• Missing and damaged ceiling tiles replaced.&lt;br&gt;• Velcro display walls in Hale 'Imiloa hallway repaired.&lt;br&gt;• Floor tiles no longer ooze glue.</td>
<td>Summer or Fall 2007</td>
<td>R&amp;M funds</td>
<td>5B</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2. Purchase Annual Service Contract for Steam Generator (Autoclave)</td>
<td>• Continued safe operation of the autoclave from year-to-year</td>
<td>Fall 2007</td>
<td>$2,500 per year</td>
<td>5B</td>
<td>3D; 6; 7G; X</td>
<td></td>
</tr>
<tr>
<td>3. Increase the Natural Sciences Department Operating Funds to $40,000 Per Year</td>
<td>• Adequate supplies are available to teach science laboratory courses&lt;br&gt;• Improved SLO assessment results for science laboratory courses</td>
<td>Fall 2007</td>
<td>$18,500 per year</td>
<td>3D; 6; 7G; X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Natural Science Department Student Learning Outcomes</td>
<td>• Natural Science Department SLOs reviewed and accepted&lt;br&gt;• Alignment between courses and these departmental SLOs</td>
<td>Fall 2007</td>
<td>$0</td>
<td>1C</td>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>5. Complete Student Learning Outcomes (SLOs) for Natural Science Courses</td>
<td>• All Natural Science course SLOs completed</td>
<td>Fall 2007</td>
<td>$0</td>
<td>1C</td>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>6. Strengthen Enrollment in Natural Science STEM Transfer Courses</td>
<td>• Outreach materials prepared&lt;br&gt;• Visits and presentations made to all Windward O'ahu high schools</td>
<td>Spring 2008</td>
<td>$5,924</td>
<td>1Q; 7G; X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Hire Another APT Laboratory Technician</td>
<td>• All natural science labs receive the support needed</td>
<td>Fall 2007</td>
<td>$29,000 plus fringe per year</td>
<td>1R; 1T; 5G; 7G; X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Hire an Additional Clerical Assistance for the Natural Sciences Department</td>
<td>• Faculty spend much less time researching prices and processing requisitions&lt;br&gt;• Improved tracking of Department expenditures for grants and regular expenditures&lt;br&gt;• Improved morale by the faculty and staff involved in purchasing</td>
<td>Fall 2007</td>
<td>$14,000 plus fringe per year, use returned grant indirect funds</td>
<td>1R; 1T; 5G; 7G; X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Establish Operating Budget and Maintenance Schedule for Hoa‘aina Large Format Printer</td>
<td>• Posters are made when needed and in high quality color print</td>
<td>Fall 2007</td>
<td>$1,500 per year</td>
<td>7G</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>10. Laboratory Equipment Status Inventory</td>
<td>• Production of a realistic plan for replacement of existing instructional equipment</td>
<td>Summer &amp; Fall 2008</td>
<td>$0</td>
<td>5D</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>11. Open the Bioprocessing Medicinal Garden Complex (BMGC) for Operation</td>
<td>• Healthy plants are produced from the medicinal garden and the aquaponic system for use by students in making bioproducts (i.e. herbal teas, medicinal soaps, lotions, plant/flower extracts, wine, perfume etc.)</td>
<td>Fall 2007</td>
<td>$4,000 for generator</td>
<td>1S; 3B; 5N; 7G; X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Aggressive Promotion and Marketing of ASC in Plant Biotechnology</td>
<td>• Increase number of ASC graduates in Plant Biotechnology entering biotech workforce, transferring to higher institutions majoring in biosciences, and/or becoming bioprocessing entrepreneurs</td>
<td>Spring 2008</td>
<td>USDA Consortium Grant</td>
<td>1F; 3B; 7G</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>13. Support Conference Travel for ASC-Plant Biotechnology Student</td>
<td>• Research article will be published in the conference proceedings.</td>
<td>Fall 2007</td>
<td>$2,750</td>
<td>1S; 3B; 7G; X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Natural Sciences Annual Department Report for 2006-2007
14. Establish a Veterinary Certificate Program at WCC
   • Curriculum and infrastructure for introductory vet tech classes developed
   • Initial curriculum, supplies, and training materials for introductory classes purchased
   • Memorandum of Articulation with at least one existing mainland AVMA certified program established
   • Completed progress towards full AVMA accreditation
   • Solve issues regarding lab space, lab support, animal use, and a coordinator
   - Implem Criteria for measuring success
   - Date
   - Curricular and infrastructure for Fall 2007 introductory vet tech classes developed
   - Initial curriculum, supplies, and training materials for introductory classes purchased
   - Memorandum of Articulation with at least one existing mainland AVMA certified program established
   - Completed progress towards full AVMA accreditation
   - Solve issues regarding lab space, lab support, animal use, and a coordinator
   - Implement Bud Rqst
   - Date
   - Fall 2007
   - Dept Ref
   - Perkins grant
   - Strat Plan Ref
   - 1F; 3B; 3D; 7G
   - New Strat Rqst?
     X

15. Peer Tutoring in Chemistry
   • Increase in the number of students availing of the tutorial service.
   - Implem Criteria for measuring success
   - Date
   - Spring 2008
   - Dept Ref
   - Bud Rqst
   - $1,300
   - Strat Plan Ref
   - 1A; 7G

16. Community Forum in Chemistry
   - Implem Criteria for measuring success
   - Date
   - Fall 2007
   - Dept Ref
   - Bud Rqst
   - $1,100
   - Strat Plan Ref
   - 3G; 5K; 6A

17. Additional Student Help Hours for Chemistry Projects
   - Implem Criteria for measuring success
   - Date
   - Fall 2007
   - Bud Rqst
   - $1,636.50
   - Strat Plan Ref
   - 1B; 7G

18. Chemistry Mentoring
   • Students present work in symposium
   - Implem Criteria for measuring success
   - Date
   - Fall 2007
   - Bud Rqst
   - Externa, Funds (INBRE)
   - Strat Plan Ref
   - 1A; 1S; 7G

19. Learning Communities in Math and Chemistry
   • Higher proportion of students succeeding in Math and Chemistry
   • Higher proportion of students remaining in STEM disciplines
   - Implem Criteria for measuring success
   - Date
   - Fall 2007
   - Bud Rqst
   - $4,446 overload
   - Strat Plan Ref
   - 1B; 7G

20. Provide a Firm and Secure footing for the Pacific Center for Environmental Studies (PaCES)
   • Secure at least $75,000 to support the PaCES/BWET Summer Program in Environmental Science for High School Students in 2008
   • Grant proposal to establish a teacher training program in environmental science submitted
   • Grant proposal submitted to support environmental projects for WCC students
   • Increase the number of WCC undergraduate students engaging in environmental internships and research projects
   • Increase the number of WCC undergraduate students engaging in environmentally-related programs at WCC: Marine Option Program & ASC in BRT-BRDM
   • Increase the number of students receiving certificates in environmentally-related programs at WCC: Marine Option Program & ASC in BRT-BRDM
   • Increase the number of environmentally-related courses offered
   • Increase the number of students enrolled in environmentally-related courses
   • Continue existing relationships with community partners
   - Implem Criteria for measuring success
   - Date
   - Fall 2007
   - Bud Rqst
   - $15,492
   - Strat Plan Ref
   - 1B; 1S; 3B; 3G; 6A; 7G
   - New Strat Rqst?
<table>
<thead>
<tr>
<th>Action Plan</th>
<th>Criteria for measuring success</th>
<th>Implement Date</th>
<th>Bud Rqst</th>
<th>Dept Pfrty</th>
<th>Strat Plan Ref</th>
<th>New Strat Rqst?</th>
</tr>
</thead>
</table>
| 21. Purchase Equipment For Physics/Astronomy Labs | - Reduce the number of students per station to the accepted value of 2 in at least one-third of Physics labs offered during the spring semester  
- Increase the number of optics lab experiments by at least two for PHYS 122L and at least three for PHYS 152L and ASTR 110L. These would also be used in a future ASTR 250L (Observational Astronomy Lab)  
- Double the inventory for PHYS 151L and PHYS 122L (and eventually PHYS 170L) for at least 2 labs in the fall semester. This would also reduce the number of students per station to 2 for these lab exercises | Spring 2008 | $49,940 | 1Q; 7G |  |
| 22. Establish An Endowment for the Center for Aerospace Education (CAE) | - Target amount of $25,000 for first year | Fall 2007 | External Funds | 1B; 3B; 6A |  |
| 23. Hire A Full-Time, Tenure-Track Astronomy/Physics Instructor | - Class enrollment in astronomy for new instructor attains at least 90% capacity  
- New instructor acquires certification in the use of the Lanikuhani Observatory, Imaginarium and other Center for Aerospace facilities and incorporates these resources in his/her astronomy and/or physics classes  
- Increased enrollment in Physics as a result of such programs as Forensic Science | Fall 2008 | $50,902 | 1Q; 1R; 7G | X |
| 24. Establish an Ocean Recreation Associate in Arts Degree Program | - New ocean recreation courses approved  
- AA Degree in Ocean Recreation approved  
- Logistical details and funding worked out for Fall 2008 startup | Fall 2007 | $11,274 | 1F; 1S; 3B | X |
| 25. Urban Forestry Program | | Spring 2008 | $10,242 | 1F; 3B; 7G |  |
| 26. Split ASC-Bio-Resources and Technology Tracks | - Split achieved, establishing separate ASCs | Fall 2007 | $0 | 7G |  |
| 27. Curriculum Request for IS 201 to Satisfy College General Education Core Requirements | - IS 201 approved as a biological science (DB) and science laboratory (DY) course | Fall 2007 | $0 | 7G |  |
| 28. Strengthen the Polynesian Voyaging Program | - Canoes maintained in excellent, safe operating condition during off-year cycle (2007-08)  
- Adequate resources available for safe and effective instruction during on-year cycle (2008-09)  
- IS 160A, 160B, 260A, and 260B qualify as physical science (DP) for the College’s general education core requirements  
- IS 160L and 260L qualify as science laboratories (DY) for the College’s general education core requirements | Fall 2007 | $1,800 per year | 1Q; 1R; 7G |  |
| 29. Promote the ASC in Bio-Resources Development and Management | - Graduate five students with this certificate during the 2007-08 academic year | Fall 2007 | $0 | 1F; 3B; 7G |  |

Natural Sciences Annual Department Report for 2006-2007
# TABLE I

Department of Natural Sciences Priorities for Action Plan Items Listed in the 2006-07 Annual Report

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
<th>Budget Request</th>
<th>Strategic Plan Reference</th>
<th>Average Priority**</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Increase the Natural Sciences Department Operating Funds to $40,000 Per Year</td>
<td>$18,500 per year</td>
<td>3D; 6.0; 7G</td>
<td>3.8</td>
</tr>
<tr>
<td>21</td>
<td>Purchase Equipment For Physics/Astronomy Labs*</td>
<td>$49,940</td>
<td>1Q; 7G</td>
<td>6.0</td>
</tr>
<tr>
<td>15</td>
<td>Peer Tutoring in Chemistry</td>
<td>$1,300 per year</td>
<td>1A; 7G</td>
<td>6.1</td>
</tr>
<tr>
<td>19</td>
<td>Faculty Overload for Developing Learning Communities in Math and Chemistry</td>
<td>$4,446</td>
<td>1B; 7G</td>
<td>6.6</td>
</tr>
<tr>
<td>6</td>
<td>Strengthen Enrollment in Natural Science STEM Transfer Courses (Overload for Faculty)</td>
<td>$5,924</td>
<td>1Q; 7G</td>
<td>6.7</td>
</tr>
<tr>
<td>9</td>
<td>Establish Operating Budget and Maintenance Schedule for Hoa'aina Large Format Printer</td>
<td>$1,500 per year</td>
<td>7G</td>
<td>6.7</td>
</tr>
<tr>
<td>25</td>
<td>Urban Forestry Program Lecturers</td>
<td>$10,242 per year</td>
<td>3B; 7A</td>
<td>6.8</td>
</tr>
<tr>
<td>11</td>
<td>Generator for Bioprocessing Medicinal Garden Complex for Operation</td>
<td>$4,000</td>
<td>1S; 3B; 5N; 7G</td>
<td>7.6</td>
</tr>
<tr>
<td>13</td>
<td>Support Conference Travel for ASC-Plant Biotechnology Student to Make Formal Presentation</td>
<td>$2,750</td>
<td>1S; 3B; 7G</td>
<td>8.4</td>
</tr>
<tr>
<td>16</td>
<td>Community Forum in Chemistry</td>
<td>$1,100 per year</td>
<td>3G; 5K; 6A</td>
<td>8.6</td>
</tr>
<tr>
<td>20</td>
<td>Provide a Firm and Secure Footing for PaCES</td>
<td>$15,492 per year</td>
<td>1B; 1S; 3B; 3G; 6A; 7G</td>
<td>8.6</td>
</tr>
<tr>
<td>8</td>
<td>Hire an Additional Clerical Assistance for the Natural Sciences Department</td>
<td>$14,000</td>
<td>1R; 1T; 5G; 7G</td>
<td>8.8</td>
</tr>
<tr>
<td>17</td>
<td>Additional Student Help Hours for Chemistry Projects</td>
<td>$1,637 per year</td>
<td>1B; 7G</td>
<td>8.9</td>
</tr>
<tr>
<td>23</td>
<td>Hire A Full-Time, Tenure-Track Astronomy/Physics Instructor</td>
<td>$50,902 per year</td>
<td>1Q; 1R; 7G</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* Allocation could be split over two years.

** Items were ranked 1 to 14 by Natural Science faculty and staff members; then these values were averaged.
Appendices

Appendix A. 2007-08 Action Plan Item Details
Appendix C. Course Student Learning Outcome Reports
Appendix D. Individual Accomplishments and Goals
Appendix A. 2007-08 Action Plan Item Details

( The order of action plan items does NOT imply departmental priorities.

1. Complete Hale ‘Imiloa Building Repairs

Action:

Completion of the long-outstanding repairs and maintenance facing Hale ‘Imiloa, especially those involving health and safety issues. These include roof leaks, inadequate operation of the air conditioning system, and mold/mildew problems. Additional repairs include eliminating the recurrent oozing of glue from floor tiles, replacing missing and damaged ceiling tiles, and replacing the Velcro display boards in the central foyer, and fixing the plumbing problems in the men’s bathroom.

Rationale:

These problems were identified from the opening of the building in Summer 1997. Test of a new monolithic repair process has successfully eliminated the leaks associated with one tower of ‘Imiloa. Leaks still occur around and near the remaining towers adjoining the main hallways as well as the patina-painted metal roof. Such leaks continue to pose serious health and safety hazards, as well as pose potential damage to the equipment, supplies and other property.

Inspection of the building’s AC system has already indicated a need for a retrofit. Consultants have already completed the investigation phase to determine what problems need to be addressed. Corrections to these design flaws were estimated to start this summer.

Budget:

R&M funds required

Implementation Date:

Summer/Fall 2007

Criteria for Measuring Success:

- No more roof leaks.
- Mold removed and end to moisture-supported mold growth between walls and in cabinets and drawers.
- AC renovations completed
- Missing and damaged ceiling tiles replaced.
- Velcro display walls in Hale ‘Imiloa hallway repaired.
- Floor tiles no longer ooze glue.
Appendix A

2. Purchase Annual Service Contract for Steam Generator (Autoclave)

Action:

Purchase annual service contract for the built-in steam generator (autoclave) in Hale 'Imiloa 105.

Rationale:

The steam generator (autoclave) supports instruction in the biological sciences by allowing the preparation of sterile glassware and culture media needed for the culture of microorganisms. In addition, this equipment is used to destroy potential pathogens from contaminated media and cultureware. Thus the effective operation of the steam generator is not only essential for biological science lab function, but also to ensure human safety by reducing exposure to potential pathogens.

The steam generator (autoclave) was built in as part of the construction of Hale 'Imiloa in 1997. Its safe operation requires regular maintenance which it has never received since the building was occupied in 1997.

Budget:

ca. $2,500 per year (should be drawn from Administrative Services funds).

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Continued safe operation of the autoclave from year-to-year.

3. Increase the Natural Sciences Department Operating Funds to $40,000 Per Year

Action:

Increase the Natural Sciences Department operating funds for purchasing supplies to levels that reflect the following parameters: (1) previous levels of support prior to the major budget cuts beginning more than a decade ago; (2) growth of the department during the past decade; (3) inflationary increase in costs; and (4) the higher costs associated with modern technology.

Rationale:

The purchasing power of the Natural Science Department’s supply budget has diminished over the past 15 years due to fiscal cuts and inflation. During 2006-07 the total annual allocation was increased from $10,500 to $21,500 and was distributed as follows (see next page):
Appendix A

2006-07 Natural Sciences Department Supplies Budget

<table>
<thead>
<tr>
<th>Natural Science Discipline</th>
<th>Allocation (2006-07)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy &amp; Physiology (A&amp;P)</td>
<td>$2,300</td>
</tr>
<tr>
<td>Biology &amp; Zoology (other than A&amp;P)</td>
<td>$2,300</td>
</tr>
<tr>
<td>Microbiology &amp; Botany</td>
<td>$2,300</td>
</tr>
<tr>
<td>Chemistry</td>
<td>$3,300</td>
</tr>
<tr>
<td>Agriculture</td>
<td>$2,300</td>
</tr>
<tr>
<td>Oceanography &amp; Geology</td>
<td>$2,300</td>
</tr>
<tr>
<td>Physics &amp; Astronomy</td>
<td>$2,300</td>
</tr>
<tr>
<td>General Science</td>
<td>$600</td>
</tr>
<tr>
<td>Marine Option Program (MOP)</td>
<td>$3,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$21,500</strong></td>
</tr>
</tbody>
</table>

In addition to these amounts, an additional special allocation of $3,000 was provided to purchase a laptop computer to support image grabbing and processing from the fluorescent microscope used for Microbiology and Biotechnology. There was also an additional allocation for MOP of $4,000, an amount that was increased to $5,700. In the end, the Department’s overall purchases totaled about $31,000 (excluding funds used for microscope maintenance and Geology field trip costs, which involve funds not normally included in the Department’s allocation).

In the early 1990’s, the Natural Sciences Department’s annual supplies budget was about $33,500. Since then, the department has grown considerably. In the summer of 1997, the department relocated to a new building and experienced greater demands upon its supplies budget. This situation has been compounded by new university regulations regarding the handling and disposal of chemicals. We have increased both the diversity and number of courses offered. We have also added new programs (e.g., HSGC, a turf-grass management program, and the ASC in Bio-Resources and Technology). We added two full-time, tenure track positions in the biological sciences; and we are currently adding a full-time, non-tenural position in Physics and Astronomy. The cost of supplies has risen due to inflation. Finally, the expectation of incorporating additional instructional computers and new technologies (e.g., small-scale chemistry labs, GIS, remote sensing, astronomical instrumentation, and molecular biology) will further increase the baseline costs.

The total Natural Sciences annual supplies budget for 2005-06 was only $10,500, less than a one-third of what was allocated over a decade ago. In response to the Department’s action plan and budget request for 2006-07, the basic allocation for 2006-07 was increased to $21,500. At the time of this report generation, it was understood the the Department’s allocation for 2007-08 would be the same as the amount allocated for 2006-2007 (i.e., $21,500). While this increase, along with the special allocations mentioned (see above) was greatly appreciated, it was still less than the amounts that were allocated in the early 1990’s.

It is the ultimate goal of the Natural Sciences Department to develop a budget request that reflects a return to previous levels of support and as well as supports the growth experienced during the last decade. Currently, the best estimate that can be offered is a total operating budget of $40,000.

Thus the Natural Science Department is requesting an additional amount of $18,500 ($40,000 - $21,500 = 18,500) be added to its operating budget.
Appendix A
Budget:

$18,500 (increase from regular 2006-07 levels needed to provide $40,000 per year)

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Adequate supplies are available to teach science laboratory courses
• Improved SLO assessment results for science laboratory courses

4. Natural Science Department Student Learning Outcomes

Action:

The Natural Science Department needs to review its departmental student learning outcomes. Once this review is completed, and revisions adopted (if necessary), the Department will need to align courses with these Departmental SLOs.

Rationale:

Departmental Student Learning Outcomes were originally articulated as goals rather than outcomes. It is not clear how various Natural Science classes align with these outcomes, nor how they should be assessed.

Budget:

$0

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Natural Science Department SLOs reviewed and accepted
• Alignment between courses and these departmental SLOs
Appendix A

5. Complete Student Learning Outcomes (SLOs) for Natural Science Courses

Action:

Complete SLOs for the remainder of the natural science courses. There are 14 courses needing to have the SLOs articulated.

Rationale:

Based on the established accreditation timeline, each department was expected to have submitted 100% of its SLOs by the end of Spring 2006. By the end of Spring 2007 only 14 Natural Science classes remained to have their SLOs articulated.

Budget:

$0

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• All Natural Science course SLOs completed

6. Strengthen Enrollment in Natural Science STEM Transfer Courses

Action:

Promote and strengthen our natural science courses that support students intending to major in a natural science discipline at a baccalaureate-granting institution. Specifically, encourage enrollment into the following existing courses: BIOL 172/172L, BIOL 265/265L, BIOL 275/275L, CHEM 161/161L, CHEM 162/162L, PHYS 151/151L, PHYS 152/152L, and PHYS 170/170L, PHYS 272/272L. Establish an effective strategy for offering these courses consistently from year to year.

Rationale:

Windward Community College’s Natural Sciences facilities offer tremendous opportunity to teach the freshman –level and sophomore-level transfer courses needed for baccalaureate degrees in mainstream science disciplines. Unfortunately, these courses tend to be poorly enrolled and are often subject to cancellation. Consequently, the Department of Natural Sciences needs to determine and implement strategies for improving enrollment in these courses.
Appendix A

Budget:

$5,924 Total

$5,424 (Three credits assigned time for a Nat Sci faculty member to develop materials and conduct outreach)
$500 for publication of materials for distribution

Implementation Date:

Spring 2008

Criteria for Measuring Success:

- Outreach materials prepared
- Visits and presentations made to all Windward O‘ahu high schools

7. Hire Another APT Laboratory Technician

Action:

Hire another APT lab technician to meet the demands of our growing biological and physical science offering.

Rationale:

Our current lab technician was hired in 1993 when the Natural Sciences offered 5 labs per semester. Since then the number of lab sections offered per semester has doubled. In addition, the variety of lab preps has also increased. Ten years or more ago, a typical semester of labs included: BIOL 101, CHEM 100L, CHEM 151L, CHEM 161L and ZOOL 101. Currently, the lab technician is involved with a wider variety of preps, inventory and restocking. This Spring, for example, the following preps were required: ASTR 110L (two sections), BIOL 100L, BIOL 172L, BOT 101, BOT 210, CHEM 151L, CHEM 162L, GEOG 101L, IS 201, MICR140, OCN 201L, PHYS 152L and ZOOL 142L (three sections).

In addition, since the lab technician position was created, the rules and regulations governing the handling of biological and chemical materials, including waste disposal, have gotten much more stringent. Additional lab technician support is needed to maintain compliance with these regulations, as well as to ensure safe operations in our natural science labs.

Budget:

$29,000 salary plus fringe

Implementation Date:

Fall 2007
Appendix A
Criteria for Measuring Success:

• All natural science labs receive the support needed.

8. Clerical Assistance for the Natural Sciences Department

Action:

Establish a regular, part-time position (20 hours per week; regular position, not student employment) clerical assistant position to support natural science department purchasing and other appropriate logistical tasks.

Rational:

The University’s bureaucracy regarding purchasing requires natural science faculty to spend an inordinate amount of time researching prices and processing requisitions for both grant purchases and regular departmental purchases. In addition, the large amount of fiscal activity initiated by the Department places a large burden on the clerical and administrative staff in the Dean of Instruction office. The situation has not only led to frustration and anger among faculty, staff and administrators, but has also made timely essential purchase difficult.

This situation would be greatly improved by the hiring of a regular part-time (20 hours per week) clerical assistant. Since a significant amount of time expended by this person would involved dealing with grant fiscal issues, some of the indirect cost returned to the College could be used to support this position.

Budget:

$14,000 salary plus fringe

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Faculty spend much less time researching prices and processing requisitions.
• Improved tracking of Department expenditures for grants and regular expenditures.
• Improved morale by the faculty and staff involved in purchasing.

9. Establish Operating Budget and Maintenance Schedule for Hoa‘aina Large Format Printer

Action:

Secure operating funds to ensure that Hoa ‘aina large format printer remains in operating condition. Also establish a maintenance schedule and protocol to keep printer operating optimally.
Appendix A

Rationale:

Attractive and informative display posters are a great marketing tool for the Natural Sciences Department and the College. They are also used to display the results of professional work by faculty and students at professional meetings. In this respect, the large format printer in the Hoa ‘aina lab is used extensively, not only by Natural Science faculty and students, but also by others through the campus for special media productions (e.g., Palanakila Theatre productions and Ho‘olaule‘a).

The costs for maintaining this printer (printer head replacements, ink cartridges, ink delivery system, paper, etc.) run about $1,500 per years. To date, most of these costs have been covered either by PaCES or MOP funds.

Budget:

$1,500 per year

Implementation Date:

Fall 2007

Criteria for Measuring Success:

- Posters are made when needed and in high quality color print

10. Laboratory Equipment Status Inventory

Action:

Assign the Natural Sciences Lab Technician to coordinate an inventory of the operating status of all Departmental laboratory equipment and develop, in coordination with Department faculty, a replacement plan that anticipates future equipment needs.

Rationale:

No plan in place for replacement of major equipment supporting the Natural Science instructional program. This equipment was either supplied with the furniture and equipment allocation with the construction of Hale ‘Imiloa or through grants secured by Natural Science faculty. Some of this equipment is beginning to reach the end of its useful lifetime. In order to be able to continue integrating the use of this equipment with instruction, as well as to provide students with training in using the latest technologies, the Department needs to develop a plan for replacement of equipment.

Budget:

$0

Implementation Date:

Summer/Fall 2008
Appendix A
Criteria for Measuring Success:

• Production of a realistic plan for replacement of existing instructional equipment

11. Open the Bioprocessing Medicinal Garden Complex (BMGC) for Operation

Action:

Open the Bioprocessing Medicinal Garden Complex (BMGC) for operation.

Rationale:

The BMGC consists of 3 facilities: the medicinal garden, the aquaponic system, and the bioprocessing facility. Both the aquaponic system and the bioprocessing facility require a steady source of electricity. An electrical transformer will be installed in Summer 2007 (no budget is requested since it will be tapped into the campus electrical grid and maintenance fee). However, in the case of a power outage, one or two generators will be required to sustain the life of fish in the aquaculture tank and/or to maintain a cool temperature in the culture chamber in the bioprocessing facility.

Budget:

$4,000 for one or two generators

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Healthy plants are produced from the medicinal garden and the aquaponic system for use by students in making bioproducts (i.e. herbal teas, medicinal soaps, lotions, plant/flower extracts, wine, perfume etc.)

12. Aggressive Promotion and Marketing of ASC in Plant Biotechnology

Action:

Aggressive promotion and marketing of ASC in Plant Biotechnology to encourage and increase student participation.

Rationale:

Active marketing is necessary to attract students to the program. Marketing tools include websites, flyers, posters, Power Point presentations, special student activities and exhibitions and class/school visitations. A person(s) will be hired to accomplish this task.
Appendix A

Budget:

USDA consortium grant FY 07

Implementation Date:

Spring 2008

Criteria for Measuring Success:

- Increase number of ASC graduates in Plant Biotechnology entering biotech workforce, transferring to higher institutions majoring in biosciences, and/or becoming bioprocessing entrepreneurs.

13. Support Conference Travel for ASC-Plant Biotechnology Student

Action:

One ASC graduate in Plant Biotechnology will attend and present a PowerPoint presentation on her research project at the Second Scientific Conference on Andean Orchids in Ecuador, November 14–17, 2007, or at the 19th World Orchid Conference in Miami, Florida, January 23–27, 2008.

Rationale:

Kimberley Chinen has recently completed her independent study/research (BOT 199 and BOT 299) collaboratively done with the Hawaii Agriculture Research Center (HARC) titled “Agrobacterium-mediated transformation of Blc. Raye Holmes ‘Mendenhall’ protocom-like bodies to confer resistance to CyMV”.

Budget:

$2,750 for student travel allowance (round trip airfares, accommodation, meals and ground transportations).

Implementation Date:

Fall 2007

Criteria for Measuring Success:

- Research article will be published in the conference proceedings.

14. Establish a Veterinary Technician Certificate Program at WCC

Action:

Establish a Veterinary Technician training program at WCC to serve industry needs. Students participating in this program will be certified as veterinary technicians.
Appendix A

Rationale:

While some states require veterinary technicians to undergo specific training and certification, Hawai‘i does not. However, based upon research conducted by the ad hoc Veterinary Technician Committee, veterinary clinics in Hawai‘i would like to establish a formal veterinary technician training program in Hawai‘i. In addition, existing veterinary technicians are interested in participating in such a program, especially if it would lead to higher pay. Participating veterinarians on the committee feel that, eventually, the state of Hawai‘i will establish legal requirements for veterinary technician certification. By establishing such a program at WCC, WCC would establish itself as a leader in this area.

The program being investigated would involve distance learning classes taken from a mainland school as well as classes developed at WCC.

The Natural Sciences Department is requesting funding for the following:
• develop curriculum and infrastructure for introductory vet tech classes;
• purchase initial curriculum, supplies, and training materials for introductory classes;
• establish a Memorandum of Articulation with at least one existing mainland AVMA certified program; and
• work towards full AVMA accreditation.

Budget:

$64,752 has been awarded as a Perkins grant

Implementation Date:

Fall 2008

Criteria for Success:

• Curriculum and infrastructure for introductory vet tech classes developed
• Initial curriculum, supplies, and training materials for introductory classes purchased
• Memorandum of Articulation with at least one existing mainland AVMA certified program established
• Completed progress towards full AVMA accreditation
• Solve issues regarding lab space, lab support, animal use, and a coordinator

15. Peer Tutoring in Chemistry

Action:

Continue the implementation of the Peer Tutoring in Chemistry Project.

Rationale:

The Peer Tutoring in Chemistry project started in January 2006. Its purpose is to promote student retention and engagement for college success in chemistry. There is a need to continue the project inasmuch as the number of students who avail free tutoring is increasing. The Ifuku Family Foundation has funded the project since inception and the current funding is available until December 2007. In
Appendix A

case the third year funding request is denied, the College is requested to provide funds from January to May 2008.

Budget:

$1,300.00 to pay student tutors for the period January-May 2008.

Implementation Date:

Spring 2008

Criteria for Measuring Success:

- Increase in the number of students availing of the tutorial service.

16. Community Forum in Chemistry

Action:

Continue the implementation of the Community Forum in Chemistry Project.

Rationale:

The Community Forum in Chemistry project started in January 2006. It provides exposure of students to a wide range of applications of chemistry and interaction with science professionals in the community. This project promotes scientific understanding and science-based careers among students.

A total of eight forums were held during the AY 2006-07: Pandemic Influenza, Can Dogs See Ghosts, Waste-to-Energy, Chemical Safety at Home, Chemistry in Energy, Food and Health, The Mystery of Poisons and Trace Metals in the Ocean and Climate Change. A combined total of 230 attended the forums.

Funds for refreshments in Fall 2006 were provided by the Chancellor’s Office. Subsequently, funding ($500) was secured from the American Chemical Society-Hawaii Section through UH Foundation. Currently, funding is still being solicited to continue the implementation of the project. In case external funding is not secured, the College is requested to provide funds.

Budget:

$1,100 ($500.00 for refreshments and $600 for speakers’ honoraria) for AY 2007-08.

Implementation Date:

Fall 2007
Appendix A

17. Additional Student Help Hours for Chemistry Projects

Action:

Increase student help hours to assist in the planning and coordination of the Community Forum in Chemistry and in the Peer Tutoring in Chemistry projects.

Rationale:

The Peer Tutoring in Chemistry and the Community Forum in Chemistry projects require intensive, time-consuming organizational work. For the Peer Tutoring in Chemistry project, this involves writing request proposals for funding, writing biannual (and financial) reports, recruiting of 8-12 student tutors in a year, tutor training, tutoring hours scheduling, advertising tutorial services, matching tutees with tutors, evaluating tutors, keeping timesheets, recording hours and monitoring finances. For the Community Forum in Chemistry project, work involves recruiting speakers, developing forum topics, scheduling, publicity, arrangement of venues and equipment, purchasing and providing refreshments, taking attendance, conducting evaluation of speakers, expense reimbursements, funding solicitation and report writing. The Coordinator does not receive honorarium nor release time for these activities however, needs strong support and assistance from student help.

The current level of student help of 5 hours a week at $7.95/hr is not sufficient. An increase of another 5 hours a week and 15 hours during the winter break is needed. Also, assistance in the aforementioned duties necessitates a more experienced student worker at $8.85/hr or higher.

<table>
<thead>
<tr>
<th>Student help needed:</th>
<th>Budget:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hrs x $ 8.85 x 30 weeks (Fall 07-Sp 08) = $ 2,655</td>
<td>$1,636.50 ($2,832 – $1,195.50 = $1,636.50)</td>
</tr>
<tr>
<td>20 hrs x $ 8.85 (winter break) = $ 177</td>
<td></td>
</tr>
<tr>
<td>Total = $ 2,832</td>
<td></td>
</tr>
<tr>
<td>Current student help: 5 hrs x $7.97 x 30 weeks = $ 1195.50</td>
<td></td>
</tr>
</tbody>
</table>

Budget:

$1,636.50 ($2,832 – $1,195.50 = $1,636.50)

Implementation Date:

Fall 2007

18. Chemistry Mentoring

Action:

Provide mentoring to students in chemistry.

Rationale:

This is in line with the College strategic direction “S”, to promote education opportunities outside the conventional classroom through experiential or hands-on education.
Appendix A

Budget:

External Funds (INBRE).

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Students present work in symposium

19. Learning Communities in Math and Chemistry

Action:

Plan a learning community (LC) course for Chem 161-Chem 161L-Math 103 in Fall, 2007 and offer this in Spring 2008.

Rationale:

This is in line with the College strategic direction “B2”. Experiment with different learning approaches such as: Learning communities... to promote learning and teaching for student success. Students who will enroll in this LC course will have the benefit of learning all three courses in an integrated way.

Budget:

$4,446 (Three credits overload)

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• Higher proportion of students succeeding in Math and Chemistry
• Higher proportion of students remaining in STEM disciplines

20. Provide a Firm and Secure Footing for the Pacific Center for Environmental Studies (PaCES)

Action:

Obtain the funds and resources to provide a firm and secure footing for the Pacific Center for Environmental Studies (PaCES).

Natural Sciences Annual Department Report for 2006-2007

41
Appendix A

Rationale:

Housed within the Department of Natural Sciences, the Pacific Center for Environmental Studies (PaCES) encourages and supports environmental science education, research and stewardship at Windward Community College through the following activities: undergraduate environmental science enrichment through classroom instruction (mainly credit programs) and research; workforce training; K-12 environmental science enrichment; teacher training; and community environmental science awareness.

In addition to supporting credit classes with significant environmental content (e.g., AQUA 106, AQUA 201/201L, BIOL 124/124L, BIOL 171/171L, BIOL 172/172L, BIOL 199/299, BIOL 200/200L, BIOL 265/265L, GIS 150, GEOG 101/101L, GG 103, GG 210, GG 211, GG 212, GG 213, GG 214, IS 201, IS 261, MET 101/101L, NREM 250, OCN 101, OCN 199/299, OCN 201/201L, OCN 220, ZOOL 105, ZOOL 200; boldface-italic type indicates those courses taught during 2006-07 that were directly impacted by PaCES), PaCES supports the Marine Option Program (MOP), the Hoā‘aina RS/GIS Center, and the college's academic subject certificate (ASC) in Bio-Resources and Technology, Bio-Resources Development and Management (BRT-BRDM) track.

Through fundraising activities (grants, donations and other solicitations), PaCES has contributed materially, since its inception in 2004, in the following ways to the Natural Science Department and the College:

- Purchased six new high-end workstations for the Hoā‘aina RS/GIS Center
- Purchased a new Trimble GPS datalogger for the Trimble ProXR GPS
- Purchase a steel utility cart to allow lab-to-lab transportation of the Cole-Parmer UV/Visible dual beam spectrophotometer
- Purchased eight Garmin Geko201 GPS units
- Purchased an IDEXX Sealer
- Purchased an incubator
- Purchased a -20°C freezer
- Purchased several environmeters
- Purchased a YSI 556 Multiparameter Meter
- Purchased a HACH 2100P Turbidimeter
- Purchased a dredge
- Purchased a sediment corer
- Purchased six handheld field pH meters
- Purchased six VanDorn water collecting bottles
- Purchased six plankton nets
- Purchased six Secchi disks
- Purchased equipment (minifuges, vortexors, electrophoresis boxes, etc.) to support molecular applications to environmental science
- Purchased ESRI ArcGIS 9 software (and renewals) for the Noeau Computer Lab and the Hoā‘aina RS/GIS
- Purchased Trimble Pathfinder Office upgrades for the Hoā‘aina RS/GIS Center
- Purchased tens of thousands of dollars in supplies to support credit instruction and student research projects and internships
- Provided stipends to MOP students engaged in environmental research projects and internships (four students received $1000 scholarships during 2006-07)
- Provided funds for the repair and maintenance of the Hoā‘aina large format printer
Appendix A

- Provided funds for the repair, maintenance and upgrade of the SMART spectrophotometer for doing water quality assessment
- Received scholarships funds from the Garden Club
- Received a water flow meter
- Received 12 sets of snorkel gear
- Received 8 iPac systems for GIS work
- Received a new digitizer for Hoa ‘aina RS/GIS Center (will pick up soon)

PaCES also supports the nationally-recognized PaCES/BWET Summer Environmental Science Program for High School students, an important college recruiting tool (involves collaboration with the Hawai‘i Institute of Marine Biology). High school students enrolled in this program receive college credit (as BIOL 124/124L). To date, 52 students have participated in the program. This summer another 24 students will participate. Twelve of the students have returned to the program to participate as student mentors. This summer, four high school teachers have been invited to participate to assist in the establishment of a teacher training program that will run side-by-side with the high school program. Because of the success of this program and its partnership with HIMB, HIMB, received a grant (Jo-Ann Leong, PI, and David Krupp, Co-PI) of about $100,000, to support this summer’s program.

Finally, PaCES provides scientific expertise and outreach in environmental issues for various government agencies (e.g., DLNR) and not-for-profit community organizations (e.g., Kailua Bay Advisory Council, Waikulua Loko Fishpond Preservation Society, Reef Check Hawai‘i, and others).

PaCES was established through the receipt of a $225,000 grant from the Castle Foundation. Unfortunately, this grant will end in June 2007 and additional funds (from both college and extramural sources) will be needed to sustain the program beyond the lifetime of this grant. These funds are needed to support a PaCES coordinator and to purchase equipment and supplies for various PaCES activities and projects. Included in the PaCES coordinator’s responsibilities would be the following activities: (1) coordinate and facilitate the purchasing of equipment and supplies to support the Department’s various environmental programs and projects; (2) disseminate information to advertise and promote the various PaCES-sponsored programs and activities; (3) seeking extramural funds to support WCC undergraduates engaged in environmentally-related internships and research projects; (4) develop contacts and partnerships to facilitate student internships and research projects; (5) counseling and mentoring students engaged in projects; (6) seek extramural funds to provide continued support for the summer high school program; (7) seek extramural funds to develop and implement teacher training workshops in environmental science; (9) develop and conduct assessments of all of the programs, projects and activities that specifically fall under the PaCES.

Budget:

Six credits additional assigned time per year for the PaCES coordinator ($10,242). About $1,000 in general supply funds is needed for PaCES-supported projects and activities. Finally, 10 additional hours per week of student help wages is needed during the academic year and summer ($4,250).

Total Request = $15,492

Implementation Date:

Fall 2007
Appendix A
Criteria for Measuring Success

- Secure at least $75,000 to support the PaCES/BWET Summer Program in Environmental Science for High School Students in 2008
- Grant proposal to establish a teacher training program in environmental science submitted
- Grant proposal submitted to support environmental projects for WCC students
- Increase the number of WCC undergraduate students engaging in environmental internships and research projects
- Increase the number of WCC undergraduate students engaging in environmentally-related programs at WCC: Marine Option Program & ASC in BRT-BRDM
- Increase the number of students receiving certificates in environmentally-related programs at WCC: Marine Option Program & ASC in BRT-BRDM
- Increase the number of environmentally-related courses offered
- Increase the number of students enrolled in environmentally-related courses
- Continue existing relationships with community partners

21. Purchase Equipment For Physics/Astronomy Labs

Action:

Purchase equipment need to support instruction in Physics and Astronomy laboratory classes.

Rationale:

WCC’s Physics labs continue to be inadequately supplied. While science labs traditionally assign one or two students per lab station, the lack of sufficient equipment frequently forces 3 to 4 students to team up at each station in WCC’s Physics labs. During the second semester, when equipment is even scarcer, stations of 5 and 6 Physics students are common. One lab session, in fact, requires all 20 students to work as a team with the single apparatus available in the Physics inventory for that particular experiment.

This situation was intended to be alleviated over ten years ago with the Furniture & Equipment (F&E) funds that accompanied the construction of the Science Building. The approximately $1.4 million of F&E monies that was originally allocated was to be divided among the various science disciplines. Unfortunately, these funds quickly dwindled due to overruns in the building’s construction cost (which tapped $366,000 from the F&E account) and to a $200,000 payment to DAGS for consultation work. This drastic reduction in F&E funds resulted in a purchase strategy that sought to lower the impact on the overall science program. Rather than evenly distributing the funding loss, the Physics F&E was selected to absorb the largest portion of the necessary reduction.

This strategy also envisioned the recovery of the lost F&E funds and eventual purchase of the cut Physics equip during a subsequent phase, when additional CIP funds would hopefully be appropriated. This unfortunately never materialized. The past decade has seen legislative cuts rather than supplements. This budgetary shortfall, coupled with inflation, has stymied any attempt at correcting the deficiencies in the Physics inventory.

The recent addition of Astronomy labs and the anticipated increase in Physics enrollment as a result of requirements in such programs as Forensic Science has further exacerbated this situation.

This action plan represents the first phase in rectifying this instructional problem. The following list was compiled from a larger list of needed Physics equipment. The equipment included in this list was selected based on its ability to accommodate two or more different labs (for example, PHYS 152L...
Appendix A

and ASTR 110L). Heavier weight was assigned to equipment used in the spring semester Physics course, since the inventory for the second semester is less than that for the fall semester. Lastly, this list was limited to a maximum of $50,000.

Budget:

$49,940

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Description</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer-Based Optics System II</td>
<td>$2,700</td>
<td>10</td>
<td>$27,000</td>
</tr>
<tr>
<td>2</td>
<td>Power Amplifier II</td>
<td>350</td>
<td>10</td>
<td>3,500</td>
</tr>
<tr>
<td>3</td>
<td>Aperture Bracket</td>
<td>90</td>
<td>10</td>
<td>900</td>
</tr>
<tr>
<td>4</td>
<td>Diffraction Optics Kit</td>
<td>290</td>
<td>10</td>
<td>2,900</td>
</tr>
<tr>
<td>5</td>
<td>Steam Generator</td>
<td>390</td>
<td>5</td>
<td>1,950</td>
</tr>
<tr>
<td>6</td>
<td>Thermal Expansion Apparatus</td>
<td>440</td>
<td>5</td>
<td>2,200</td>
</tr>
<tr>
<td>7</td>
<td>Variable Output Air Supply</td>
<td>300</td>
<td>5</td>
<td>1,500</td>
</tr>
<tr>
<td>10</td>
<td>Basic Electronics Laboratory</td>
<td>500</td>
<td>10</td>
<td>5,000</td>
</tr>
<tr>
<td>11</td>
<td>Digital Multimeter</td>
<td>45</td>
<td>10</td>
<td>450</td>
</tr>
</tbody>
</table>

Sub-Total $45,400

Estimated Shipping (10%) 4,540

Total $49,940

Implementation Date:

Spring 2008

Criteria for Measuring Success:

- Reduce the number of students per station to the accepted value of 2 in at least one-third of Physics labs offered during the spring semester
- Increase the number of optics lab experiments by at least two for PHYS 122L and at least three for PHYS 152L and ASTR 110L (and eventually PHYS 170L). These would also be used in a future ASTR 250L (Observational Astronomy Lab)
- Double the inventory for PHYS 151L and PHYS 122L (and eventually PHYS 170L) for at least 2 labs in the fall semester. This would also reduce the number of students per station to 2 for these lab exercises

22. Establish An Endowment for the Center for Aerospace Education (CAE)

Action:

Establish an endowment for the Center for Aerospace Education (CAE).
Appendix A

Rationale:

This Fall 2007, the Center for Aerospace Education will enter its 21st year of operation at WCC. Besides assisting several hundred undergraduate students enrolled in WCC’s astronomy and physics courses and engaged in Hawai‘i Space Grant projects, the CAE serves over 10,000 K-12 students and teachers annually. Over the past two decades, the CAE has established and currently operates four major educational facilities: the Hokulani Imaginarium, the Aerospace Exploration Laboratory, the NASA Flight Training Aerospace Education Laboratory and the Lanihuli Observatory. The endowment will ensure the continued operation of these facilities.

Budget:

No college funds are involved.

Implementation Date:

Fall 2007

Criteria for Measuring Success

• Target amount of $25,000 for first year

23. Hire A Full-Time, Tenure-Track Astronomy/Physics Instructor

Action:

Hire a full-time, tenure-track astronomy/physics instructor to support the expansion of the Astronomy curriculum and rejuvenation of the Physics curriculum.

Rationale:

Each year, lecturers have been hired to teach the growing number of Astronomy classes. For at least the past four semesters, the ASTR 110 classes have drawn the largest number of students in the Natural Sciences department.

In addition, WCC’s involvement in the HSGC program has significantly increased since its inception 15 years ago. This year, WCC received $34,000 from HSGC for operations, travel, salaries and its fellowships—with stipends ranging from $500 to $1,000 for the 10 students engaged in Space Grant projects. More qualified instructors are needed to guide the growing number of students engaging in such workforce study project in space science.

New courses (including ASTR 180 and ASTR 250L) will be developed in the near future to align with UH-Hilo’s undergraduate program in Astronomy. These new courses along with the existing curriculum will take advantage of WCC’s strong involvement in HSGC as well as the extensive resource facilities operated through the college’s Center for Aerospace Education (especially the research equipment available in the Lanihuli Observatory and NASA Flight Training AEL). The Imaginarium also offers a unique resource for training in the use of astronomical observations.

This full-time instructor should possess a strong background in Astronomy and Physics. Experience in Physics is essential to support the anticipated increase in Physics enrollment as a result of Physics requirements in such programs as Forensic Science and the 2+2 in Geology with UH-Hilo.
Appendix A

Budget:

$50,902 (anticipating 9% & 11% increases before Fall 2008)

Implementation Date:

Fall 2008

Criteria for Measuring Success:

- Class enrollment in astronomy for new instructor attains at least 90% capacity
- New instructor acquires certification in the use of the Lanihuli Observatory, Imaginarium and other Center for Aerospace facilities and incorporates these resources in his/her astronomy and/or physics classes
- Increased enrollment in Physics as a result of such programs as Forensic Science

24. Establish an Ocean Recreation Associate in Arts Degree Program

Action:

Establish an Ocean Recreation Associate in Arts Degree Program.

Rationale:

In recognition of the fact that the ocean recreation industry is an important economic engine for the state of Hawai‘i and that the people of Hawai‘i benefit from this industry because it enhances the quality of their lives by providing recreational activities and employment opportunities, the Ocean Recreation and Safety Associate in Arts degree program seeks to support this industry by providing trained graduates with specific knowledge and experience in the field of ocean recreation. Students graduating from this program will have knowledge and understanding of the ocean environment (with emphasis on the Hawaiian ocean environment), best environmental practices, ocean safety skills, principles, and practices, social and cultural aspects of ocean recreation, legal and management issues related to the ocean recreation industry, and experience in specific ocean recreation industry activities.

In addition to completing Windward Community College core requirements for the Associate in Arts Degree, the students will complete a prescribed program of study involving 24 credit hours of ocean recreation and safety courses. The minimum number of credits required for the Associate of Arts degree is 60 credits. With their AA degree classes articulated, graduates from this program will be able to transfer into baccalaureate programs at UH Manoa.

With an established relationship already developed between the University of Hawai‘i and the US Affiliated Pacific Islands, this program may well attract students from other regions in the Pacific, such as the Northern Mariana Islands, Marshall Islands, Guam, American Samoa, and Palau.

Currently, disparate and individual agencies and companies around the state conduct training for ocean recreation industry employment. The competencies of these training programs may vary. Windward Community College was approached by members of the City and County of Honolulu, Ocean Safety and Lifeguard Services Division, and asked to consider offering both an Associate in Arts degree and short-term training in ocean recreation related fields.

The following data was shared with the planning committee and is the most current information available:

Natural Sciences Annual Department Report for 2006-2007
Appendix A

- Forecasted income for 1998 was $797 million with 7,000 people employed in the industry.
- From 1992-1998, the Ocean Recreation Industry was projected to grow 6% annually.
- The Recreation Industry of Hawai‘i generates approximately $560 million annually and employs approximately 5,850 residents (1992).
- Ocean Recreation is comprised of a wide variety of business activities that include both passive and active ocean use.
- Ocean Recreation includes boating activities, paddle sports, surf sports, wind sports, dive/snorkel activities, and ocean safety activities.
- Hawai‘i has an international reputation for ocean recreation and safety excellence.
- Educational opportunities in Hawai‘i and internationally are limited.

Both Windward Community College’s physical setting and existing curricular offerings lend themselves to developing an Ocean Recreation and Safety degree and certificates. The college enjoys proximity to a unique set of ocean related resources: Kane‘ohe Bay and environs, Kailua Beach and environs, O‘ahu’s North Shore surf beaches, Hanauma Bay National Marine Preserve and Education center, and organizational ties to Honolulu Community College’s Marine Education and Training Center, and the University of Hawai‘i’s Institute of Marine Biology on Coconut Island.

Much of the planning (e.g., basic curriculum) for this program has been completed. What remains is to seek College approval for the new courses developed, complete the paperwork needed to establish an Associate in Arts Degree, and secure the necessary approvals to establish the degree. Finally, considerable planning will be needed to actually implement the program (goal for implementation is Fall 2008) and secure the funds needed to operate it.

Budget:

$11,274 (equivalent to six credits of assigned time or overload for Range 5 faculty)

Implementation Date:

Fall 2007

Criteria for Measuring Success:

- New ocean recreation courses approved
- AA Degree in Ocean Recreation approved
- Logistical details and funding worked out for Fall 2008 startup

25. Urban Forestry Program

Action:

Develop an Urban Forestry program.

Rationale:

Meet a community need by teaching appropriate tree care techniques leading to International Society of Arboriculture Certification. There are no formal educational opportunities available to individuals. There are no formal education opportunities available to individuals. The Hawaii department of labor and industrial relations projects 22 new openings per year for the next ten years in
Appendix A

Tree care. The new program will give the agriculture program a more rounded and encompassing educational experience for students.

Budget:

$10,242 (Step C lecturers 6 credits)
Equipment purchase/maintenance (TBD)

Implementation Date:

Spring 2008

26. Split ASC-Bio-Resources and Technology Tracks

Action:

Separate the Bio-Resources Development and Management track of the Academic Subject Certificate (ASC) in Bio-Resources and Technology from the Plant Biotechnology track. This process was begun during Spring 2007, but needs to be presented to the Department and CCAAC for approvals.

Rationale:

The Plant Biotechnology and Bio-Resources Development and Management tracks of the ASC in Bio-Resources and Technology have very different learning outcomes and assessment requirements. They really should be established as separate ASC’s.

Budget:

$0

Implementation Date:

Fall 2007

Criteria for Measuring Success:

- Split achieved, establishing separate ASCs

27. Curriculum Request for IS 201 to Satisfy College General Education Core Requirements

Action:

Establish IS 201 The Ahupua‘a as a class that satisfies both biological science (DB) and science laboratory (DY) requirements for WCC’s AA degree general education requirements. This curriculum modification was formally approved by the Natural Science Department during Spring 2007. The request still needs to be presented to the CCAAC for approval.
Appendix A
Rationale:

In the 2005-06 Natural Science Annual Report, it was suggested that IS 201 should be promoted as the biological component of Polynesian Voyaging and Stewardship.

In addition, having IS 201 fulfill DB & DY requirements will strengthen this course by encouraging more students to enroll in it.

Budget:

$0

Implementation Date:

Fall 2007

Criteria for Measuring Success:

• IS 201 approved as a biological science (DB) and science laboratory (DY) course

28. Strengthen the Polynesian Voyaging Program

Action:

Secure funds to operate the college’s Polynesian Voyaging program effectively.

Change the designation of IS 160A & B from the other sciences designation to the physical sciences (DP) designation for the College’s general education core requirements. Keep the lab component (IS 160L and 260L) as science laboratory (DY) courses.

Rationale:

Currently, the Polynesian Voyaging program has been relying on funds raised through donations, rentals and Title III. The later two sources no longer are available. For safety reasons, it is imperative that the canoes be seaworthy at all times.

For the past 6 years, the lecture courses have been primarily physical science in content. The designation for these two courses needs to be aligned with this content.

Budget:

$1,800 annually. This program is run on an alternate year basis. The On-Year cycle refers to the year when the courses are offered. The Off-Year cycle refers to the following year during which the canoes are in dry dock and no classes are offered.
## Appendix A

### On-Year Cycle

**Staffing**

<table>
<thead>
<tr>
<th>Position</th>
<th>Hours</th>
<th>Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat Captain 1</td>
<td>45</td>
<td>$15/hr</td>
<td>$675</td>
</tr>
<tr>
<td>Boat Captain 2 (if lab enrollment is over 12)</td>
<td>45</td>
<td>$15/hr</td>
<td>$675</td>
</tr>
<tr>
<td>Guest Lecturers</td>
<td></td>
<td>$200</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous supplies</td>
<td></td>
<td>$250</td>
<td></td>
</tr>
</tbody>
</table>

Total: $1,800

### Off-Year Cycle

**Canoe Related Costs (per semester)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance supplies</td>
<td>$600</td>
</tr>
<tr>
<td>Maintenance labor ($20/hr x 30 hrs)</td>
<td>$600</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$600</td>
</tr>
</tbody>
</table>

Implementation Date: Fall 2007

**Criteria for Measuring Success:**

- Canoes maintained in excellent, safe operating condition during off-year cycle (2007-08)
- Adequate resources available for safe and effective instruction during on-year cycle (2008-09)
- IS 160A, 160B, 260A, and 260B qualify as physical science (DP) for the College’s general education core requirements
- IS 160L and 260L qualify as science laboratories (DY) for the College’s general education core

---

### 29. Promote the ASC in Bio-Resources Development and Management

**Action:**

Aggressively promote and market the ASC in Bio-Resources Development and Management to encourage and increase student participation. Marketing tools will include websites, flyers, posters, PowerPoint presentations, special student activities and exhibitions and class/school visitations.

**Rationale:**

Active marketing is necessary to attract students to the program.

**Budget:**

$0

**Implementation Date:**

Fall 2007

**Criteria for Measuring Success:**

- Graduate five students with this certificate during the 2007-08 academic year

The natural Sciences Department proposes the following action plan. No priority ranking is implied.

1. **Action:** Hire another APT lab technician to meet the demands of our growing biological and physical science offering.

**Rationale:** Our current lab technician was hired in 1993 when the Natural Sciences offered 5 labs per semester. In Spring 2006, the number of labs has doubled to 10. In addition, the variety of lab preps has also increased. Ten years ago, a typical semester of labs included: BIO 101, CHEM 100, CHEM 151, CHEM 161 and ZOOL 200. Currently, the lab technician is involved with a wider variety of preps, inventory and restocking. This Spring, for example, the following preps were required: BIO 100, BIO 101, BIOL 124, BIOL 172, BIOL 275, CHEM 151, CHEM 162, MICR140, OCN 2021 and ZOOL 142. In addition, new demands will be made with the offering of a new ASTR110 lab and the re-introduction of PHYS 122 and 151 labs. Neither of the physics labs has ever been assigned to the lab technician. This situation is expected to change, further increasing the demand on the current lab technician’s time.

**Implementation Date:** Fall 2007

**Budget:** $26,000 APT salary plus fringe

2. **Action:** completion of the long-outstanding repairs and maintenance facing Hale ‘Imiloa, especially those involving health and safety issues. These include roof leaks, inadequate operation of the air conditioning system, and mold/mildew problems. Additional repairs include eliminating the recurrent oozing of glue from floor tiles, replacing missing and damaged ceiling tiles, and replacing the Velcro display boards in the central foyer, and fixing the plumbing problems in the men’s bathroom.

**Rationale:** These problems were identified from the opening of the building in Summer 1997. Test of a new monolithic repair process has successfully eliminated the leaks associated with one tower of ‘Imiloa. Leaks still occur around and near the remaining towers adjoining the main hallways as well as the patina-painted metal roof. Such leaks continue to pose serious health and safety hazards, as well as pose potential damage to the equipment, supplies and other property.

Inspection of the building’s A/C system has already indicated a need for a retrofit. Consultants have already completed the investigation phase to determine what problems need to be addressed. Corrections to these design flaws were estimated to start this summer.

**Implementation Date:** Summer 2006

**Budget:** R&M funds required

3. **Action:** Secure funds to operate the college’s Polynesian Voyaging program and change the designation of IS 160A & B from the other sciences designation to the physical sciences designation. Keep the lab component (IS 160L and 260L) under the other (that is, both biological and physical) sciences designation and promote IS 201 (The Ahupua’a) as the biological component of Polynesian Voyaging and Stewardship.
Appendix B

Rationale: Currently, the Polynesian Voyaging program has been relying on funds raised through donations, rentals and Title III. The later two sources no longer are available. For safety reasons, it is imperative that the canoes be seaworthy at all times.

For the past 6 years, the lecture courses have been solely physical science in content. The designation for these two courses needs to be aligned with this content.

Implementation Date: Fall 2006

Budget: $1,800 annually. This program is run on an alternate year basis. The On-Year cycle refers to the year when the courses are offered. The Off-Year cycle refers to the following year during which the canoes are in dry dock and no classes are offered.

\[
\begin{array}{ll}
\text{On-Year Cycle} & \\
\text{Staffing} & \\
\text{Boat Captain 1} & \$15/hr \times 45 \text{ hrs} = \$675 \\
\text{Boat Captain 2 (if lab enrollment is over 12)} & \$15/hr \times 45 \text{ hrs} = \$675 \\
\text{Guest Lecturers} & \$200 \\
\text{Miscellaneous supplies} & \$250 \\
& \text{Total: } \$1,800 \\

d \\
\text{Off-Year Cycle} & \\
\text{Canoe Related Costs (per semester)} & \\
\text{Maintenance supplies} & \$600 \\
\text{Maintenance labor} & \$600 \\
\text{Miscellaneous} & \$600 \\
& \text{Total: } \$1,800 \\
\end{array}
\]

4. Action: Complete SLOs for the remainder of the natural science courses.

Rationale: Based on the established accreditation timeline, each department is expected to have submitted 100% of its SLOs by the end of Spring 2006. Of the 109 total courses currently on the books for the Natural Sciences Department, 76 courses have also been submitted, but require further modified. SLOs for the remaining 26 courses have not yet been submitted to the IEC for review.

Implementation Date: Fall 2006

Budget: $0

5. Action: Increase the Natural Sciences Department operating funds for purchasing supplies to levels that reflect the following parameters: (1) previous levels of support prior to the major budget cuts beginning more than a decade ago; (2) growth of the department during the past decade; (3) inflationary increase in costs; and (4) the higher costs associated with modern technology.

Rationale: The purchasing power of the Natural Science Department’s supply budget has diminished over the past 15 years due to fiscal cuts and inflation. The annual total allocation of $10,500 is currently distributed as follows:
Appendix B

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Supply Budget (2005-06)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy &amp; Physiology (A&amp;P):ZOOL 141/142</td>
<td>$ 1,000</td>
</tr>
<tr>
<td>Biology &amp; Zoology (other than A&amp;P)</td>
<td>$ 1,000</td>
</tr>
<tr>
<td>Microbiology/Botany</td>
<td>$ 1,000</td>
</tr>
<tr>
<td>Chemistry</td>
<td>$ 2,000</td>
</tr>
<tr>
<td>Agriculture</td>
<td>$ 500</td>
</tr>
<tr>
<td>Oceanography &amp; Geology</td>
<td>$ 1,000</td>
</tr>
<tr>
<td>Physics &amp; Astronomy</td>
<td>$ 1,000</td>
</tr>
<tr>
<td>General Science</td>
<td>$ 500</td>
</tr>
<tr>
<td>Polynesian Voyaging</td>
<td>$ 0</td>
</tr>
<tr>
<td>Hawai'i Space Grant Consortium (HSGC)</td>
<td>$ 0</td>
</tr>
<tr>
<td>MOP (Marine Option Program)</td>
<td>$ 2,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$10,500</strong></td>
</tr>
</tbody>
</table>

In the early 1990’s, the Natural Sciences Department’s annual supplies budget was about $33,500. Since then, the department has grown considerably. In the summer of 1997, the department relocated to a new building and experienced greater demands upon its supplies budget. This has been compounded by new university regulations regarding the handling and disposal of chemicals. We have increased both the diversity and number of courses offered. We have also added new programs (e.g., HSGC, a turf-grass management program, and the ASC in Bio-Resources and Technology). We added two full-time, tenure track positions in the biological sciences; and we are currently adding a full-time non-tenurial position in physics and astronomy. The cost of supplies has risen due to inflation. Finally, the expectation of incorporating additional instructional computers and new technologies (e.g., small-scale chemistry labs, GIS, remote sensing, astronomical instrumentation, and molecular biology) will further increase the baseline costs. The total Natural Sciences annual supplies budget for 2005-06 was only $10,500, less than a one-third of what was allocated over a decade ago.

It is the ultimate goal of the Natural Sciences Department to develop a budget request that reflects the amounts needed to sustain this expected growth. However, since there is insufficient time to develop such a request before budgetary decision-making resumes this summer, the Natural Sciences Department requests the following total amount for purchasing of supplies for the 2006-07 academic year: $40,000. We believe that this amount is reasonable considering the amount that was allocated in the early 1990’s (ca. $33,500).

At the beginning of Fall 2006, the department will collectively develop plans for allocating these funds to its various functions for AY 2006-07 as well as for subsequent years.

Implementation Date: Fall 2006

Budget: $29,500 (increase from 2005-06 levels)

6. Action: Hire by Fall 2006 a full-time temporary physics instructor to re-vitalize the physics program. Re-offer PHYS 151/152 and PHYS 122 along with their accompanying labs (PHYS 151L/152L and 122L) beginning AY 2006-07.

Rationale: Each year, different lecturers have been hired to teach these classes, preventing continuity in expanding the curriculum. Several sections have been canceled throughout the intervening years due to the minimum enrollment required for lecturer positions. Such cancellation has had major

Natural Sciences Annual Department Report for 2006-2007

54
Appendix B

impacted on the Spring semester course PHYS 152, which is essential for students to complete in the PHYS 151/152 series. In order to overcome the negative reputation that these courses have received over the past years as a result of these repeated cancellations, an agreement is needed between the administration and department to offer these physics course regardless of enrollment figures for at least two consecutive academic years.

Implementation Date: Fall 2006

Budget: $3,220/month minimum plus fringe = $38,640 annual + fringe

7. Action: Complete the construction of the Lanihuli Observatory, which will support the ASTRO 110L courses and WCC’s HSGC undergraduate students, as well as various outreach efforts.

Rationale: Construction of the observatory is 95% complete. Fundraising is currently underway to purchase the 16-foot dome, which once installed will complete the construction phase. Half of that cost has already been raised this year from various private donors. A grant proposal has recently been sent to the Estate of James Campbell for the balance. The heliostat (solar telescope), which was purchased on a PCATT grant, arrived April 2006. Its installation is tentatively set for summer 2006. The radio telescope receiver and controls along with the NOAA weather satellite tracking earth station are also planned to be relocated to this facility during the summer.

Implementation Date: Fall 2006

Budget: no college funds are involved

8. Action: Design and implement an academic business plan to support a full-time astronomy faculty position dedicated to expand the astronomy curriculum, direct and enhance WCC’s HSGC program, produce Imaginarium programs for the astronomy and Polynesian voyaging curriculum as well as other disciplines such as GPS and remote sensing, oversee the undergraduate research projects conducted at the Lanihuli Observatory, design and implement an Astronomy Academic Subject Certificate and direct the college’s Center for Aerospace Education (which includes directing and overseeing the operations of Aerospace Exploration Lab, Hokulani Imaginarium, Lanihuli Observatory and NASA Flight Training Aerospace Education Laboratory).

Rationale: Interest and enrollment in astronomy has been consistently high for the past 15 years as supported by the data in Part IV. In addition, WCC’s involvement in the HSGC program has significantly increased during this same period. This year WCC received $41,500 from HSGC for its fellowships, operations, travel and salaries. This year, 221 students were engaged in HSGC projects, with six receiving Space Grant stipends. WCC’s HSGC program is also acting as a venue for mentorship of science teachers in the Windward DOE complex.

WCC has acted as the lead community college on HSGC’s Can/Sat program. WCC students on fellowships are involved in the design, development and deployment of rocket-launched data sensors and transmitters, and have presented their findings at symposia during the Fall and Spring semesters. They have already conducted successful launches at the WCC campus, Schofield and PMRF (Barking Sands) on Kaua‘i. Our goal is to participate in the ARLISS project and competition (initiated by Stanford University), scheduled for this coming Fall 2006 on the mainland.
Appendix B

WCC Space Grant students also are using the college’s zero-g tower and some have flown aboard NASA’s KC 135 aircraft, where they conducted research experiments under micro-gravity conditions.

And astronomy ASC would take advantage of WCC’s strong involvement in HSGC as well as the extensive resource facilities operated through the College’s Center for Aerospace Education (especially the research equipment available in the Lanihuli Observatory and NASA Flight Training AEL). The Imaginarium will also offer a unique resource for training in the use of astronomical observations.

Over the past 19 year, coordination of theses growing programs has been assigned to the college’s Director of the Center for Aerospace Education. With the near completion of the college observatory, the expansion of its HSGC involvement and the increased interest in the college’s astronomy courses, time has come to formalize this position. This will also provide a stable position upon which to develop and implement an astronomy ASC program and eventually explore the feasibility of a 2+2 program in astronomy at UH-Hilo.

Implementation Date: Fall 2006

Budget: $0 (involves permanent reassignment of duties to current position).

9. Action: Develop an Urban Forestry Program

Rationale: Meet a community need by teaching appropriate tree care techniques leading to International Society of Arboriculture Certification. There are no formal educational opportunities available to individuals. The Hawaii department of labor and industrial relations projects 22 new openings per year for the next ten years in tree care. The new program will give the agriculture program a more rounded and encompassing educational experience for students.

Implementation Date: Spring 2008

Budget: Lecturers 6 credits (approximately $9,000)

Equipment purchase/maintenance (TBD)

10. Action: Hire a Lecturer to teach PHRM 203- General Pharmacology.

Rationale: The Curriculum Committee has approved the new course, PHRM 203. This course supports the 2006 Updated Strategic Plan 3D. Explore the possibility of providing some of the general education requirements for transfer into nursing, allied health, and other vocational programs. PHRM 203 is a pre-admission requirement to the RN-BS program at UHM SONDH as well as to the Nursing program at UH-Hilo. The Natural Science Department is already offering all the other pre-admission courses except PHRM 203. This course will complete the WCC Pre-Nursing Program and will be offered starting Spring 2007.

Implementation Date: January 2007

Budget: Lecturer fee: approx $4,500 per semester = $9,000 annually
Appendix B

11. Action: Secure funding for the continuing implementation of the Peer Tutoring in Chemistry Project.

Rationale: The goal of the Peer Tutoring in Chemistry is to promote student retention and success in chemistry as they pursue the Liberal Arts Programs or science-related careers. All chemistry students who need help get free tutoring while outstanding students enrich their educational experience by becoming peer tutors. The Ifuku Family Foundation is currently funding this project, which started in January 2006. Its present funding is expected to last until the end of Spring 2006. Continued funding will be sought.

Budget: $2,000 per year (from external funding)


Rationale: The Community Forum in Chemistry Project features speakers on topics related to chemistry. This forum provides exposure of students to a variety of chemistry topics and chemistry-related careers. It also provides a forum for students to interact with chemistry professionals in the community. This project is geared towards retention of students and in promotion science as a career. Last Fall two speakers were featured. This year funds will be secured to expand the project.

Budget: $500 per year (from external funding).


Rationale: In Fall 2005 available student help hours in chemistry totaled three hours per week. In Spring 2006 this was trimmed down to two hours per week due to the hiring of a temporary laboratory technician who promised to do all laboratory equipment inventory and maintenance. This turned out to be a mistake and severe workload resulted in scrapping the Community Forum in Chemistry Project this Spring. In order to restore and improve the aforementioned projects, the number of student help work hours should at least be restored to three hours per week as in Fall 2005 and Spring 2006.

Budget: Additional $238.50 annually (for additional student help hours, based on re-allocation of the lost 1 hr per week at $7.95/hr/week for 30 weeks during AY 2005-06)


Budget: Funds through grant. This project is supported through a USDA-CSREES grant FY 2005 (Nov 2005-Sep 2006).

15. Action: Submit a USDA-CSREES FY 2006 proposal to establish a Bioprocessing-Medicinal Garden Complex. This complex will be the fourth facility required to support the Plant Biotechnology Program.

Budget: pending through grant
Appendix B

16. Action: Continue to promote ASC graduates in Bio-Resources and Technology (Plant Biotechnology).

Budget: USDA grant funded

17. Action: Promote and strengthen our natural science courses that support students intending to major in a natural science discipline at a baccalaureate-granting institution. Specifically, encourage enrollment into the following existing courses: BIOL 172/172L, BIOL 265/265L, BIOL 275/275L, CHEM 161/161L, CHEM 162/162L, PHYS 151/151L, PHYS 152/152L, and PHYS 170/170L, PHYS 272/272L. Establish an effective strategy for offering these courses consistently from year to year.

Rationale: Windward Community College's Natural Sciences facilities offer tremendous opportunity to teach the freshman-level and sophomore-level transfer courses needed for baccalaureate degrees in mainstream science disciplines. Unfortunately, these courses tend to be poorly enrolled and are often subject to cancellation. Consequently, the Department of Natural Sciences needs to determine and implement strategies for improving enrollment in these courses.

Implementation Date: Fall 2007

Budget: $0 (should be part of the department's assessment and planning process).

18. Action: Separate the Bio-Resources Development and Management track of the Academic Subject Certificate (ASC) in Bio-Resources and Technology from the Plant Biotechnology track.

Rationale: The Plant Biotechnology and Bio-Resources Development and Management tracks of the ASC in Bio-Resources and Technology have very different learning outcomes and assessment requirements. They really should be established as separate ASC's.

Implementation Date: Spring 2007

Budget: $0

19. Action: Obtain the funds and resources to provide a firm and secure footing for the Pacific Center for Environmental Studies (PaCES).

Rationale: PaCES is the Department of Natural Sciences administrative umbrella for environmental studies at Windward Community College. In addition to supporting credit classes with significant environmental content (e.g., AQUA 201/201L, BIOL 124/124L, BIOL 172/172L, BIOL 200/200L, BIOL 265/265L, GIS 150, GEOG 101/101L, GG 103, GG 210, GG211, GG212, GG213, GG214, IS 201, IS 160L, IS 260L, IS 261, MET 101, NREM 250, OCN 101, OCN 201/201L, OCN 220, ZOOL 105, ZOOL 200), PaCES supports the Marine Option Program (MOP) and the college's academic subject certificate (ASC) in Bio-Resources and Technology, Bio-Resources Development and Management (BRT-BRDM) track. PaCES also supports the nationally-recognized PaCES/BWET Summer Environmental Science Program for High School students, an important college recruiting tool (involves collaboration with the Hawai'i Institute of Marine Biology and is funded through the summer of 2007). Finally, PaCES provides scientific expertise in environmental issues for various government agencies and not-for-profit community organizations.
Appendix B
PaCES was established through the receipt of a $225,000 grant from the Castle Foundation. Unfortunately, this grant will end in June 2007 and additional funds (from both college and extramural sources) will be needed to sustain the program beyond the lifetime of this grant. These funds are needed to support a PaCES coordinator and to purchase equipment and supplies for various PaCES activities: (1) coordination of MOP (thus the current MOP faculty coordinator responsibilities including the existing assigned time allocation of three credits per semester, would fall under the PaCES coordinator); (2) coordination of the ASC in BRT-BRDM; (3) information dissemination to advertise and promote the various PaCES-sponsored programs and activities; (4) seeking extramural funds to support WCC undergraduates engaged in environmentally related internships and research projects; (5) developing contacts and partnerships to facilitate student internships and research projects; (6) counseling and mentoring students engaged in projects; (7) seeking extramural funds to provide continued support for the summer high school program; (8) seeking extramural funds to develop and implement teacher training workshops in environmental science; (9) developing and conducting assessments of all of the programs, projects and activities that fall under the PaCES umbrella.

Implementation Date: Fall 2007

Budget: Six credits additional assigned time per year (in addition to the six credits per year assigned to the MOP coordinator) for a total of twelve credits assigned time per year (six credits per semester) plus three credits of summer overload (similar to what has been available, through inconsistently, for the MOP faculty coordinator in the past). In addition to the current annual allocation of $2,500 to MOP (for the purchase of supplies and the costs of travel to neighbor islands for meetings, MOP symposia, and projects), at least $7,500 is needed to sustain the current level of expenditures used for PaCES-supported projects and activities.

Additional Faculty Assigned Time and Overload: $13,500

Extra Supplies & Travel: $7,500

Finally, 10 additional hours per week (current level is about 10 hours per week for the MOP student coordinator) of student help wages is needed during the academic year. Forty hours per week of student help wages is requested for the non-academic periods (winter and summer break). [Note, these requested levels of student work hours would actually represent a return to former levels provided to the MOP student coordinator over a decade ago.]

Student Help Funds:
- 10 additional hrs/week for AY @ $8.85/hr/week for 30 weeks = $2,655
- 40 hrs/week for Winter Break @ $8.85/hr/week for 2 weeks = $ 708
- 40 hrs/week for Summer Break @ $8.85/hr/week for 14 weeks = $4,956

Total Extra Student Help: $8,319

Total: $13,500 + $7,500 + $8,319 = $29,319

20. Purchase a PC laptop with accessories to interface with our existing fluorescent microscope.

Rationale: A PC laptop computer is necessary to control the required software for producing quality images with our fluorescent microscope. The Macintosh computer currently used does not provide the required imaging for this laboratory exercise. This computerized microscope system will enable our students to capture and examine specimens which fluoresce for a very brief period of time. A laptop is...
Appendix B
necessary due to the limited space available for connecting with and using the microscope. This instrument will be used by MICRO 140, BOT 205, BOT 210, BIOL 275L and BIOL 171L.

Implementation Date: Fall 2006

Budget: $3,000

21. Action: Installation of electrical power into the bioprocessing facility for operating bioprocessing equipment, aquaponic systems and air conditioning.

Rationale: Electrical power is required to operate the bioprocessing equipment, aquaponic systems and air conditioning that will be installed in the Bioprocessing-Medicinal Garden Complex. This facility is supported through the USDA-CSREES grants for FY 2006. The cost for electrical installation is estimated to be between $5,000 and $10,000. The USDA-CSREES grants, however, only covers $3,000 of this cost. A matching fund of $2,000 to $7,000 from the college is requested to cover the remaining cost of this installation.

Implementation Date: Summer 2006

Budget: $2,000 to $7,000
Appendix C. Course Student Learning Outcome Reports
Appendix C

Assessment of Course Student Learning Outcomes

COURSE ALPHA/NUMBER: BIOL 100  
Semester/Year: Fall 2006

Instructor: Krupp, David  
Date Submitted to Department Chair: May 22, 2007

Identify the Course Student Learning Outcomes assessed this semester.

1. Explain the process and philosophical basis of scientific inquiry.
2. Distinguish between living things and inanimate objects.
3. Describe the parts, their structure and functions, of cells, diversity of cell types, cell metabolism, cell communication, and cell division processes (mitosis and meiosis).
4. Describe the interrelationships between humans and their environments.

How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

All four SLOs being assessed align with the Associate of Arts SLO Two.

Course SLO One aligns with Natural Science Department SLO One, Two & Three

What skills or competencies are necessary for the student to perform the selected SLOs?

Students must be able to comprehend concepts and vocabulary relevant to the SLOs being evaluated. These are summarized in lecture outlines that include lists of relevant vocabulary terms and study questions.

What instructional methods or materials are used to prepare the students?

This course is taught via distance learning technologies.
Conventional lecture presentations delivered through Cable television.
Downloadable PowerPoint files.
Reading assignments.
Instructor provides lecture outlines with list of relevant vocabulary terms and study questions.
Students take regular (weekly) quizzes.

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Specific objective questions imbedded in the midterm and final examinations. Criteria for success: average percent of students getting question correct equals 65% or greater. Note, in my scheme criteria, 65% of total points is the minimum level of achievement for passing the class.

What are the results of the assessment?

<table>
<thead>
<tr>
<th>COURSE SLO</th>
<th>NUMBER OF QUESTIONS</th>
<th>PERCENT OF STUDENTS GETTING QUESTION CORRECT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AVERAGE</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>89.7</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>74.6</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>59.5</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>65.8</td>
</tr>
</tbody>
</table>
### Appendix C

**How will you use the results? What changes do you propose to improve student learning? When?**

This class was taught using distance learning technologies (television broadcast of lectures and WebCT administration of the course). In general, student comprehension of the material meets the criteria for success and is fair to good. Student understanding of cells (Course SLO Three) did not meet the criteria for success. Most of the lower-scoring questions for this SLO relate to cell biochemistry and metabolism. I will likely include a required web-based tutorial on cell metabolism to enhance student learning in this regard.

**Will the changes require funding? How much will the changes cost?**

I need to investigate what options are available to provide a web-based tutorial on cell metabolism for students.

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports and send a copy to Ellen Ishida-Babineau, IEC.

---

*The results of the assessment are not used for promotion or tenure.*

IEC, March 2006
Revised April 7, 2006
Revised April 12, 2005
Appendix C

Assessment of Course Student Learning Outcomes

COURSE ALPHA/NUMBER: BIOL 171  
Semester/Year: Fall 2006
Instructor: Krupp, David  
Date Submitted to Department Chair: May 22, 2007

Identify the Course Student Learning Outcomes assessed this semester.

1. Explain the process and philosophical basis of scientific inquiry.
2. Distinguish between living things and inanimate objects.
3. Describe the parts, their structure and functions, of cells, diversity of cell types, cell metabolism, cell communication, and cell division processes (mitosis and meiosis).
4. Describe evolution as the unifying principle of biological science; and present the evidence supporting evolution and natural selection.

How do the above course SLOs align with the Associate of Arts or certificate program

All four SLOs being assessed align with the Associate of Arts SLO Two.

Course SLO One aligns with Natural Science Department SLO One, Two & Three

Course SLOs Two, Three & Four align with Natural Science Department SLO Four.

What skills or competencies are necessary for the student to perform the selected SLOs?

Students must be able to comprehend concepts and vocabulary relevant to the SLOs being evaluated. These are summarized in a lecture outline that includes lists of relevant vocabulary terms and study questions.

What instructional methods or materials are used to prepare the students?

This course is taught via distance learning technologies.
Conventional lecture presentations delivered through Cable television.
Downloadable PowerPoint files.
Reading assignments.
Instructor provides lecture outlines with list of relevant vocabulary terms and study questions.
Students take regular (weekly) quizzes.

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Specific objective questions imbedded in the final examination. Criteria for success: average percent of students getting question correct equals 65% or greater. Note, in my grading scheme, 65% of total points is the minimum level of achievement for passing the class.

What are the results of the assessment?

<table>
<thead>
<tr>
<th>COURSE SLO</th>
<th>NUMBER OF QUESTIONS</th>
<th>PERCENT OF STUDENTS GETTING QUESTION CORRECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>90.8</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>81.5</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>79.0</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>76.0</td>
</tr>
</tbody>
</table>
**Appendix C**

<table>
<thead>
<tr>
<th>How will you use the results? What changes do you propose to improve student learning? When?</th>
</tr>
</thead>
<tbody>
<tr>
<td>This class was taught using distance learning technologies (television broadcast of lectures and WebCT administration of the course). In general, the students who take this class are highly motivated because they plan to major in the biological sciences. In the future, I would like to improve student understanding of evolutionary theory. Consequently, I may incorporate a homework assignment that helps student comprehension of evolutionary theory.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Will the changes require funding? How much will the changes cost?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No additional cost required.</td>
</tr>
</tbody>
</table>

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports and send a copy to Ellen Ishida-Babineau, IEC.

*The results of the assessment are not used for promotion or tenure.*
Appendix C

Assessment of Course Student Learning Outcomes

COURSE ALPHA/NUMBER: BIOL 172  |  Semester/Year: Spring 2007
Instructor: Krupp, David  |  Date Submitted to Department Chair: May 22, 2007

Identify the Course Student Learning Outcomes assessed this semester.

1. Describe the biology of higher plants, including the following concepts: basic plant characteristics, plant adaptations to terrestrial versus aquatic life styles, and vascular plant reproduction, growth, anatomy, nutrition, transport mechanisms, and hormonal integration.

2. Describe the biology of animals, including the following concepts: adaptations to terrestrial versus aquatic life styles, embryology, behavior, and the anatomy and physiology of animal organ systems (i.e., digestion, respiration, circulation, osmoregulation, thermoregulation, immunity, reproduction, nervous, and endocrine system).

3. Describe the basic principles of ecology, including population ecology, community ecology, and ecosystem function.

How do the above Course SLOs align with the level outcomes?

All three SLOs being assessed align with the Associate of Arts SLO Two.

All three SLOs align with Natural Science Department SLO Four.

What skills or competencies are necessary for the student to perform the selected SLOs?

Students must be able to comprehend concepts and vocabulary relevant to the SLOs being evaluated. These are summarized in lecture outlines that include lists of relevant vocabulary terms and study questions.

What instructional methods or materials are used to prepare the students?

This course is taught via distance learning technologies.

- Conventional lecture presentations delivered through Cable television.
- Downloadable PowerPoint files.
- Reading assignments.
- Instructor provides lecture outlines with list of relevant vocabulary terms and study questions.
- Students take regular (weekly) quizzes.

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Specific objective questions imbedded in the final examination. Criteria for success: average percent of students getting question correct equals 65% or greater. Note, in my grading scheme, 65% of total points is the minimum level of achievement for passing the class.

What are the results of the assessment?

<table>
<thead>
<tr>
<th>COURSE SLO</th>
<th>NUMBER OF QUESTIONS</th>
<th>PERCENT OF STUDENTS GETTING QUESTION CORRECT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AVERAGE</td>
</tr>
<tr>
<td>1</td>
<td>16</td>
<td>80.6</td>
</tr>
<tr>
<td>2</td>
<td>82</td>
<td>78.4</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>83.0</td>
</tr>
</tbody>
</table>
Appendix C

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How will you use the results? What changes do you propose to improve student learning? When?</td>
<td>This class was taught using distance learning technologies (television broadcast of lectures and WebCT administration of the course). In general, the students who take this class are highly motivated because they plan to major in the biological sciences. I plan to look at some of the lower-scoring question to evaluate possible hidden trends.</td>
</tr>
<tr>
<td>Will the changes require funding? How much will the changes cost?</td>
<td>No additional costs required.</td>
</tr>
<tr>
<td>Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports and send a copy to Ellen Ishida-Babineau, IEC.</td>
<td>The results of the assessment are not used for promotion or tenure.</td>
</tr>
</tbody>
</table>

IEC, March 2006
Revised April 7, 2006
Revised April 12, 2005
Appendix C

Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: BOT 160</th>
<th>Semester/Year: Fall, 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Ingelia White</td>
<td>Date Submitted to Department Chair: Jan. 2, 2007</td>
</tr>
</tbody>
</table>

Identify the Course Student Learning Outcomes assessed this semester.
1. Operate dissecting microscopes
2. Recognize unique vegetative and generative characteristics of plant families
3. Use manuals, flora and monographs to identify plants
4. Prepare herbaria

How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?
The above SLOs align with the AA-Liberal Arts and ASC in Bio-Resources and Technology (Plant Biotechnology) learning outcomes.

What skills or competencies are necessary for the student to perform the selected SLOs?
1. Using dissecting microscopes to observe the structure of flowers, fruits and leaves to identify plants
2. Mastering botanical terms (vegetative and generative parts of the plants) in order proficiently using manuals, flora and monographs to identify plants
3. Collecting plant specimens and preparing herbaria

What instructional methods, materials, or courses are used to prepare the students?

Instructional methods:
- Lectures
- Class discussions
- Field trips
- Class practicum/study groups
- Research/class presentations
- Herbarium preparations

Materials:
- Text books
- Manuals, floras, monographs
- Hand-outs

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Assessment tools:
- Embedded assessment evaluating students achievement as stated in the student learning outcomes
- Exams
- Field trip reports
- Lab practicum (plant identification exercises)
- Class project presentations
- Herbarium preparations

Criteria for success:
- 92% of students received final grade point average higher than 88% of total possible points (550 points)
- 92% of students achieved embedded assessment ratings between the score of 2 – 3 (achieves – exceeds “skills or competencies”).

What are the results of the assessment?
The average embedded assessment rating is 2.5 (between achieves – exceeds the “skills and competencies”). This number is greater than the expected benchmark of 2. The assessment helps to clarify specific skills and competencies that need to be fulfilled by the students. Students’ performance and their progress are monitored very closely.
How will you use the results? What changes do you propose to improve student learning? When?
Assessment results are shared and discussed with students to enable them to know what the status of their performance and to encourage them to achieve higher skills and competencies. Students are monitor individually to reach these goals. The table and chart below show a great improvement made toward the end of the semester.

<table>
<thead>
<tr>
<th>SLO</th>
<th>S &amp; C</th>
<th>1st</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a)</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>c)</td>
<td>1.5</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>a)</td>
<td>.5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>.5</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>a)</td>
<td>.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>c)</td>
<td>.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>d)</td>
<td>.75</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>a)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>.2</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>c)</td>
<td>.2</td>
<td>2.75</td>
</tr>
<tr>
<td>5</td>
<td>a)</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>1</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td>c)</td>
<td>.5</td>
<td>1.75</td>
</tr>
</tbody>
</table>

Botany 160, Fall 2006 Chart
<table>
<thead>
<tr>
<th>Will the changes require funding? How much will the changes cost?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Submit this form to:
- Your department chair for inclusion in End-of-the-Year (EOY) department reports.

Modified from IEC Course- Natural Sciences Department Annual Report for 2006-07

December 2006
# Assessment of course SLO for BOT 160

<table>
<thead>
<tr>
<th>Student Learning Outcome</th>
<th>Skills &amp; Competencies</th>
<th>0 No Evidence</th>
<th>1 Developing</th>
<th>2 Achieves</th>
<th>3 Exceeds</th>
<th>Average SLO Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Operate dissecting</td>
<td>a) Observe/observe flowers/leaves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>microscope</td>
<td>b) Turn on/off light and focus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Care of microscope</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Master botanical terms</td>
<td>a) Vegetative parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Generative parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Prepare herbaria</td>
<td>a) Collect specimens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Dry specimens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Mount specimens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Label specimens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Proficiently use of</td>
<td>a) Use manuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>manuals, floras and</td>
<td>b) Use floras</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>monographs to identify</td>
<td>c) Use monographs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plants</td>
<td>a) 5 - 10 plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) 10 - 30 plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) 30 - 60 plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average: ____________________  
Standard: ____________________
## Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: BOT 210</th>
<th>Semester/Year: Spring 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Ingelia White</td>
<td>Date Submitted to Department Chair: May 17, 2007</td>
</tr>
</tbody>
</table>

### Identify the Course Student Learning Outcomes assessed this semester.

1. Apply the principles of genetics
2. Discuss and perform experiments including plant/bacterial/human DNA/protein electrophoresis, Southern and Western blots, plant genetic engineering using biolistic bombardment and bacterial gene transformation
3. Apply bioinformatics and DNA sequencing
4. Discuss bioethical issues, risks and benefits of biotechnology
5. Produce lab reports using the standard scientific format

### How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?
The above SLOs align with the AA-Liberal Arts and ASC in Bio-Resources and Technology (Plant Biotechnology) learning outcomes.

### What skills or competencies are necessary for the student to perform the selected SLOs?
Students are required to know how to perform aseptic transfer, and perform lab protocols, to do keen observations, to collect data and use of computer to transfer them to spreadsheet and to create graphs and utilize the internet. They also are required to participate in class discussions.

### What instructional methods or materials are used to prepare the students?

**Instructional methods:**
- Lectures
- Class discussions
- Field trips
- Lab works
- Computer data base analysis

**Materials:**
- Text books
- Hand-outs

### What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

**Assessment tools:**
- Embedded assessment evaluating students achievement as stated in the student learning outcomes
- Lecture and lab participations
- Exams
- Field trip reports
- Scientific format
- In vitro culture maintenance

**Criteria for success:**
- 88% of students received final grade point average higher than 90% of total possible points (900 points)
- 88% of students achieved embedded assessment ratings between the score of 2 – 3 (achieves – exceeds “skills or competencies”).

### What are the results of the assessment?
The average embedded assessment rating is 2.57 (see table). This number is greater than the expected benchmark of 2. The assessment helps to clarify specific skills and competencies that need to be fulfilled by the students. Students’ performance and their progress are monitored very closely.

---

Natural Sciences Department Annual Report for 2006-07
How will you use the results? What changes do you propose to improve student learning? When?
Assessment results are shared and discussed with students to enable them to know what the status of their performance and to encourage them to achieve higher skills and competencies. Students are monitor individually to reach these goals. The table and chart below show a great improvement made toward the end of the semester.

<table>
<thead>
<tr>
<th>SLO</th>
<th>S&amp;C</th>
<th>1st</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a)</td>
<td>0.125</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>0</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>c)</td>
<td>0.125</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>d)</td>
<td>0.25</td>
<td>1.88</td>
</tr>
<tr>
<td></td>
<td>e)</td>
<td>0.125</td>
<td>2.37</td>
</tr>
<tr>
<td>2</td>
<td>a)</td>
<td>0.25</td>
<td>2.63</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>0.125</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>c)</td>
<td>0</td>
<td>2.75</td>
</tr>
<tr>
<td>3</td>
<td>a)</td>
<td>0.125</td>
<td>2.375</td>
</tr>
<tr>
<td>4</td>
<td>a)</td>
<td>1.125</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>a)</td>
<td>1.25</td>
<td>3</td>
</tr>
</tbody>
</table>

Will the changes require funding? How much will the changes cost?

NO.

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports and send a copy to Ellen Ishida-Babineau, IEC.

The results of the assessment are not used for promotion or tenure.
### Assessment of Course SLO for BOT 210

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Skills and Competencies</th>
<th>0 Evidence</th>
<th>1 Developing</th>
<th>2 Achieves</th>
<th>3 Exceeds</th>
<th>Average SLO Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Molecular genetics - application</td>
<td>a) DNA/protein extraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Isolation of chloroplast/mitochondria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gel electrophoresis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Southern/Western blots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) PCR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Biotechnology - application</td>
<td>a) Tissue culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Bacterial gene transformation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Biolistic gene bombardments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Bioinformatics</td>
<td>a) Interpretation of DNA chromatograms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Bioethics</td>
<td>a) Biosafety, risks benefits of biotechnology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Scientific lab reports</td>
<td>a) Well prepared sections: Introduction, Methods, Results, Conclusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average: 
Standard: 2
# Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: Chern 151</th>
<th>Semester/Year: Spring 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructors: Leticia U. Colmenares and Cynthia Rajani</td>
<td>Date Submitted to Department Chair: May 20, 2007</td>
</tr>
</tbody>
</table>

**Identify the Course Student Learning Outcomes assessed this semester.**

1. Predict properties of chemical elements based on their atomic structure and their location in the Periodic Table.
2. Name chemical compounds, balance chemical and nuclear reactions.
3. Predict properties of chemical compounds based on chemical bonding, molecular shapes, and polarity.
4. Calculate mass relationships in chemical reactions and the quantity of matter in gaseous chemicals and chemical solutions.
5. Predict the products of chemical reactions.
6. Apply knowledge of chemical concepts to a current environmental, health, industrial, or technological issue or condition by writing a short research paper.

**How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?**

The SLO’s align with the Natural Science Department and the AA Program outcomes.

**What skills or competencies are necessary for the student to perform the selected SLOs?**

- Concept recognition
- Knowledge competency

**What instructional methods or material are used to prepare the students?**

- Lectures
- Process-oriented inquiry based activities
- Demonstrations
- Modeling

**What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?**

Tool: Knowledge survey consisting of 110 items covering the SLO’s

Conducted pre-course and post-course

Students evaluate the degree of their knowledge to answer the questions

On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely

Criteria for success:

At least 80% of the items should have an increase in the post semester mean value.

**What are the results of the assessment?**

The following chart shows the mean score (y-axis) for each item (x-axis) in the knowledge survey. Students self-evaluated an increase in knowledge in each of the items (pre-semester versus post-semester). A 100% increase in mean value (with 80% benchmark) implies success.
What are the results of the assessment?

The following chart shows the mean score (y-axis) for each item (x-axis) in the knowledge survey. Students self-evaluated an increase in knowledge in each of the items (pre-semester versus post-semester). A 100% increase in mean value (with 80% benchmark) implies success.

How will you use the results? What changes do you propose to improve student learning? When?

The item numbers 1, 2, 3, 8, 9, 10, 11, 35, 48, 82, 87 and 100 showed a mean value increase of less than 1.

Explanation: The topic items 1, 2, 3, 8, 9, 10 and 11 were covered in the first week of class together with the conduct of the pre-course survey. Students self-rated high in the pre-course, and this caused a small rise in the mean values.

More time and emphasis will be given to topics of items 35, 48, 82, 87 and 100 next semester to improve learning.

Will the changes require funding? How much will the changes cost?

No
Knowledge Survey in Chem 151

INSTRUCTIONS: Please read carefully and completely.

This is a knowledge survey rather than a test. In a knowledge survey, you don't actually answer the questions or solve the problems provided, but you instead provide a very honest self assessment of your present knowledge. This survey will be given again at the end of the semester. Save/print the survey and use this as a guide by referring to the questions as we proceed through the semester.

Read each question and then mark either a "3", "2", or "1". If you mark a "3", it means you have significant background to answer the question, you should be confident that if your professor asks you to demonstrate that ability by actually answering the designated question, that you could actually respond completely for graded test purposes. Mark a "2" as response to the question if you can truly answer at least 50% of it or know precisely where you could quickly get the information. Mark a "1" as response to the question if you don't know the answer or are not confident you could find the information to answer it completely.

Use the survey answer sheet provided. Be sure to fill in your name on the answer form. You may use pen or pencil to mark your responses.

1. Distinguish between a hypothesis and a theory. Give examples.

2. What are the steps in using the scientific method?

3. What do the prefixes milli-, centi-, and kilo- mean?

4. Round the number 0.032040 to 3 significant figures and express it in exponential notation.

5. Calculate the density of a metal whose weight of 46.6 grams occupies a volume of 5.2 cm$^3$. Express answer in correct significant digits.

6. What is the volume of 1.0 gram of air (density = 0.00129 g/mL)?

7. A 150-lb adult has about 9 pints of blood. Using unit factor method, show how to convert the volume of blood to liters (2 pints = 1 quart; 1 quart = 0.946 liters). Set up the unit factors.

8. Provide examples of physical change and chemical change.

9. What is a pure substance?

10. Distinguish elements, compounds and mixtures.

11. Name the 3 major subatomic particles.

12. What is the charge and mass of each major subatomic particle?

13. What happens when an electron in an atom jumps to a shell closer to the nucleus?
14. How many protons are in the nucleus of the isotope Rn-220?

15. What is the correct symbol for a species with 79 protons, 118 neutrons and 78 electrons?

16. Naturally occurring argon consists of three isotopes, the atoms of which occur in the following abundances: 0.34% 36Ar (35.9676 u), 0.07% 38Ar (37.9627 u), and 99.59% 40Ar (39.9624 u). Calculate the atomic weight of argon.

17. Given a blank periodic table, identify which part of the periodic table are the representative metals.

18. Based on its location on the periodic Table, classify any given element as a metal (M), a non-metal (NM), or a semi-metal/metalloid (SM).

19. What are the properties of metals, nonmetals and semimetals?

20. What are transition metals?

21. Which elements have the last electron/s go to the f orbital/subshell.

22. How many electrons can be accommodated in a d (not s, p or f) subshell?

23. Write the electronic configuration for K.

24. What element matches the following electron configuration: 1s²2s²2p⁶3s²3p⁶4s¹

25. Write the abbreviated electron configuration of P?

26. Why are O²⁻ and Ne isoelectronic?

27. What is the total number and valence electrons in S (sulfur)?

28. Which of the following atoms, N, O, F, is the largest?

29. Distinguish ionic compounds from covalent compounds.

30. Predict the most probable (stable) ion formed from each of the following: Li, Ca, O, Br

31. Write the chemical formula for the binary compound of barium and fluoride?

32. Write the chemical formula of the reaction between Mg and Cl.

33. What is the correct name of Na⁺?

34. What is the charge of Cu in CuSO₄

35. What is electronegativity?

36. Give the complete name of this compound: CuO

37. Which elements exist as diatomic covalent molecules? Name them.
38. Predict the most polar bond based on electronegativity trend: 
   C – B, C – F, C – O, C – N, C – C

39. Give the name of the covalent compound P₂O₅.

40. Write the formula for calcium carbonate (known as limestone).

41. Given CuCrO₄. Give its name.

42. Write the Lewis structure of carbonate, CO₃²⁻ and predict its shape.

43. Predict the shape of a molecule containing 2 single bonds and two lone pairs in the central atom.

44. Predict the bond angle in CO₂ molecule.

45. What is the shape (geometry) of NH₃?

46. Based on shape, predict the polarity of NH₃ and CO₂.

47. Distinguish dipole-dipole intermolecular forces, hydrogen bonding and van der Waals forces.

48. Predict whether following pairs will mix with each other and form a solution? 
   KCl in H₂O, H₂O in CCl₄, CH₃OH in H₂O, Cl₂ in CCl₄

49. How does intermolecular force of attraction affect melting point and boiling point?

50. Rank the following in order of increasing polarity? 
   a. C-F  b. N-O  c. C-O from least polar to most polar.

51. True or False. Hydrogen-bonding occurs anytime a hydrogen-containing molecule is present in a liquid. Why?

52. Based on polarity predict relative boiling points of HF and O₂.

53. Substances A and B are identical in size, but substance A (bent shape) boils at 150 C, while substance B (linear) boils at 70 C. Which is more likely to be polar?

54. How many Cu atoms are there in a 0.03 moles of Cu sample?

55. Calculate the formula (molar) mass of Ba₃(PO₄)₂.

56. Convert 25.0 g of CO₂ to moles.

57. Convert 1.5 moles of silver (Ag) to mass (grams)?

58. Balance the following reaction  Au₂S₃ + H₂ ----> Au + H₂S

59. Determine the coefficient in front of O₂ needed to balance the equation? 
   ₄H₁₀ + ___ O₂ → 8 CO₂ + 10 H₂O
60. Sodium carbonate, upon heating, produces sodium oxide and carbon dioxide. Write a balanced equation for the reaction.

61. How many moles of $O_2$ are needed to form one (1) mole of MgO in the following reaction? $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ (balanced)

62. Suppose you react 10 moles of Mg and 8 moles of $O_2$, how many moles of MgO will be formed in the following reaction? $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

63. Calculate the mass (grams) of $O_2$ that must react with 1.000 mole of Mg to form MgO in the following reaction. $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ (balanced)

64. How many grams of product (MgO) can be produced from 243.1 g of Mg in the following reaction? $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ (balanced)

65. How many grams of NaCl will be formed from 7.0 g of Na in the following reaction? Fill in all the blanks to solve.

$$2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$$

<table>
<thead>
<tr>
<th>7.0 g Na</th>
<th>1 mole Na</th>
<th>2 mole NaCl</th>
<th>g NaCl</th>
</tr>
</thead>
<tbody>
<tr>
<td>g Na</td>
<td>mole Na</td>
<td>1 mole NaCl</td>
<td></td>
</tr>
</tbody>
</table>

= g NaCl

66. You have reacted 32.8 g of LiOH and 32.8 g of $CO_2$ for the following reaction. $2\text{LiOH} + \text{CO}_2 \rightarrow \text{Li}_2\text{CO}_3 + \text{H}_2\text{O}$ Which is the LR (limiting reagent)?

67. What is the percent yield of $PI_3$, if 58.62 g of $I_2$ are reacted with an excess of phosphorus according to the following equation and 60.75 g are actually obtained?

$$2\text{P(s)} + 3\text{I}_2\text{(s)} \rightarrow 2\text{PI}_3\text{(s)}$$

68. When the temperature (Kelvin) is doubled on a sample of gas occupying 6.8 L, what will be the new volume (holding pressure constant)?

69. Which variables ($P$, $V$, $n$, $T$) are directly related and which are inversely related?

70. How many moles of an ideal gas are there in a 5.0 L flask at 27°C and 3.5 atm? ($R = 0.0821 \text{ L.atm/mol.K}$)

71. What is the pressure exerted by 0.250 mole of a gas at 300 K in a 3.00 L container?

72. Classify the following reaction: $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ as Combination, decomposition, double replacement or single replacement

73. What is the precipitate formed when iron(III) nitrate reacts with sodium hydroxide?

74. Write the balanced equation showing the combustion of propane ($C_3H_8$).

75. Distinguish solute and solvent.
76. What is the concentration in mass % of a solution made by dissolving 31.72 g of potassium nitrate in 150.0 g solution?

77. A solution containing 9.5 g of MgCl2 in water has a volume of 400. mL. What is its molarity?

78. How many mL of concentrated (12 M) hydrochloric acid is required to prepare exactly 1.00 L of 0.100 M solution.

79. What is the concentration (in molarity) of a solution made by dissolving 5.00 g of NaNO3 in enough water to make 250.0 mL of solution?

80. Solid calcium carbonate decomposes on heating and releases carbon dioxide. How many Liters of carbon dioxide at STP can be formed from the decomposition of 200. g of calcium carbonate?

\[
\text{CaCO}_3 (s) \rightarrow \text{CO}_2 (g) + \text{CaO} (s)
\]

81. A 2% sucrose solution and an 8% sucrose solution are separated by a semipermeable membrane. Which solution will decrease in volume?

82. Which of these solutions (rubbing alcohol, sea water, tap water) conduct electricity the most?

83. What is the effect of adding a nonvolatile chemical to the melting and boiling points of solutions?

84. The boiling point of water is highest at
   a. top of Mt. Everest  b. in a pressure cooker  c. at sea level

85. Explain how attraction between solute and solvent (water) particles in a solution increases boiling point.

86. Distinguish between exothermic and endothermic reactions.

87. Which change of state (freezing, boiling, sublimation, melting) is not an endothermic process?

88. Which of the following (temperature, catalyst, concentration, surface area) influence/s the rate of a chemical reaction?

89. Draw a potential energy diagram representing an exothermic reaction.

90. Draw a potential energy diagram representing the effect of a catalyst.

91. Write the equilibrium constant \((K)\) expression for the reaction below:

\[
\text{N}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{NO}(g)
\]

92. The equilibrium constant for the reaction below is \(K = 0.0278\)

\[
\text{N}_2(g) + 3 \text{H}_2(g) \rightleftharpoons 2\text{NH}_3(g)
\]. What does this mean, in terms of which specie/s has the lowest concentration in the equilibrium mixture?
93. For the reaction below, initially at equilibrium, predict the equilibrium shift when NO(g) is added. \(2\text{NO}(g) \rightleftharpoons \text{N}_2(g) + \text{O}_2(g)\)

94. Classify the following reactions as (acid-base, precipitation, oxidation-reduction or decomposition) reactions.
- \(\text{KBr(aq)} + \text{AgNO}_3(aq) \rightarrow \text{AgBr(s)} + \text{KNO}_3(aq)\)
- \(\text{ZnBr}_2(aq) + 2\text{AgNO}_3 \rightarrow \text{Zn(NO}_3)_2(aq) + 2\text{AgBr(s)}\)

95. Which of the following body fluids (given with their pH values: saliva, 6.8, urine, 5.9, blood, 7.45, bile, 8.4) is the most acidic?

96. What is the pH of a .001 M \([H^+]\) solution?

97. How many more times acidic is a solution of pH 2 compared to one with pH 4?

98. What is the name of the aqueous solution, HF, used to etch glass?

99. Name the following acid \(\text{H}_3\text{PO}_4\).

100. Identify the acid in car batteries and in carbonated drinks.

101. Which salt is produced in the reaction of aluminum hydroxide with nitric acid?

102. Identify the salt produced between \(\text{Ca(OH)}_2\) and \(\text{H}_2\text{SO}_4\).

103. Identify whether \(\text{Ba(OH)}_2\) is an acid, base or salt.

104. What is the change in the oxidation number of Zn in the following reaction?
\(\text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\)

105. In the reaction below, which substance is oxidized?
\(\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2(aq) + \text{H}_2(g)\)

106. In the following reaction, identify the oxidizing agent.
\(\text{C}_2\text{H}_4 + \text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}\)

107. Which, if any, of the following is not a redox reaction?
- \(\text{CO}_3^{2-} + \text{HSO}_4 \rightarrow \text{HCO}_3^- + \text{SO}_4^{2-}\)
- \(2\text{Al(s)} + 3\text{H}_2\text{SO}_4(aq) \rightarrow 3\text{H}_2(g) + \text{Al}_2(\text{SO}_4)_3(aq)\)
- \(2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2\)
- \(2\text{NaI} + \text{Br}_2 \rightarrow 2\text{NaBr} + \text{I}_2\)
All of them are redox reactions.

108. When bismuth-210 undergoes beta decay, what is the product?

109. Which of the following (alpha, beta or gamma particles) has the greatest penetrating power?

110. A radioactive material has a halflife on 1 hr. If you start out with a 1-gram sample at noon, how much of it is left at 3:00 pm?
# Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: Chem 151L</th>
<th>Semester/Year: Fall 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Leticia U. Colmenares</td>
<td>Date Submitted to Department Chair: May 20, 2007</td>
</tr>
</tbody>
</table>

Identify the Course Student Learning Outcomes assessed this semester.

Apply and articulate the scientific method by preparing a lab report using the standard scientific format.

How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

The SLO aligns with the Natural Science Department and the AA Program outcomes.

What skills or competencies are necessary for the student to perform the selected SLOs?

- Writing in technical report format
- Use computer, word-processing, spreadsheet and graphing
- Develop methods and objectives
- Critically analyze data, discuss results and draw conclusions
- Effective communication

What instructional methods or material are used to prepare the students?

- Laboratory Manual and textbook
- Pre-Lab Discussion
- One-on-one Q & A
- Laboratory equipment and supplies
- Chemicals
- Computer and software

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Tool: All Chem 151L students will prepare a minimum of three (3) lab reports using the standard scientific format. Chemistry faculty peers will evaluate randomly selected lab reports using a rating form developed by the faculty.

Criteria for success:
At least 70% of students will meet or exceed performance standards of 70%.

What are the results of the assessment?

Passed. The class instructor rated all formal lab reports submitted with a grade of 70% or higher.

Validation. Peer faculty, Dr. Cynthia Rajani rated thirteen randomly selected formal reports (one from each student in a class of seventeen) using the same grade rubrics. All thirteen received a rating of 75% or higher, with an average rating of 88%. These same reports received an average rating of 89% from the class instructor.
Appendix C

How will you use the results? What changes do you propose to improve student learning? When?

Common errors incurred in formal report writing will be emphasized in Fall 2007 semester.

Will the changes require funding? How much will the changes cost?

No

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports. 

The results of the assessment are not used for promotion or tenure.

IEC, March 2006
Revised April 7, 2006
Revised April 12, 2005
**Chem 151L Learning Outcome Assessment Rubric**

**ne:** Chem 151L students will apply and articulate the scientific method by preparing lab reports using the standard scientific format. To be evaluated by peer faculty.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Rating = 4</th>
<th>Rating = 3</th>
<th>Rating = 2</th>
<th>Rating = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Follows prescribed format:</td>
<td>Contains the following:</td>
<td>Contains the following:</td>
<td>Contains the following:</td>
</tr>
<tr>
<td></td>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
</tr>
<tr>
<td></td>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
</tr>
<tr>
<td></td>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
</tr>
<tr>
<td></td>
<td>6. Results.</td>
<td>6. Results.</td>
<td>6. Results.</td>
<td>6. Results.</td>
</tr>
<tr>
<td></td>
<td>7. Discussion and Conclusion.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Written work has no major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization. Integrates proper word processing formatting of subscripts and superscripts.</td>
<td>Written work is relatively free of major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work has several major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work has serious and persistent errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
</tr>
<tr>
<td>c.</td>
<td>Correct interpretation of data and clear conclusion connecting data to general concept or principle.</td>
<td>Vague relationship expressed between data and general concept or principle.</td>
<td>Incorrect relationship expressed between data and general concept or principle.</td>
<td>No interpretation of data and relationship to general concept expressed.</td>
</tr>
</tbody>
</table>

**Natural Sciences Department Annual Report for 2006-07**
# Assessment of Course Student Learning Outcomes

**COURSE ALPHA/NUMBER:** Chem 152  
**Semester/Year:** Spring 2007

**Instructor:** Leticia U. Colmenares  
**Date Submitted to Department Chair:** May 17, 2007

<table>
<thead>
<tr>
<th>Identify the Course Student Learning Outcomes assessed this semester.</th>
</tr>
</thead>
</table>
| 1. Construct molecular models and use these to describe chemical structure and geometry and physical properties.  
2. Identify, classify and name organic and biochemical compounds.  
3. Use the vocabulary on organic chemicals and reactions in metabolism and other biochemical applications.  
4. Explain the role of enzymes in metabolism.  
5. Apply knowledge of biochemistry concepts to discuss the genetic cause of a metabolic disorder in a short research paper. |

**How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?**

The SLO's align with the Natural Science Department and the AA Program outcomes.

**What skills or competencies are necessary for the student to perform the selected SLOs?**

- Concept recognition  
- Knowledge competency  
- Apply the knowledge in problem solving

**What instructional methods or material are used to prepare the students?**

- Lectures  
- Process-oriented inquiry based activities  
- Demonstrations  
- Modeling

**What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?**

**Tool:** Knowledge survey consisting of 136 items covering the SLO's  
Conducted pre-course and post-course  
Students evaluate the degree of their knowledge to answer the questions  
On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely

**Criteria for success:**  
At least 80% of the items should increase in the post course evaluation.

**What are the results of the assessment?**

The following chart shows the mean score (y-axis) for each item (x-axis) in both the pre-course and post-course knowledge surveys. The students self-evaluated mean scores showed an increase in learning in 100% of the items. This surpasses the 80% benchmark.
The following chart shows the mean score (y-axis) for each item (x-axis) in both the pre-course and post-course knowledge surveys. The students self-evaluated mean scores showed an increase in learning in 100% of the items. This surpasses the 80% benchmark.

How will you use the results? What changes do you propose to improve student learning? When?

Pre-course survey: Except for item number 1, the students' self-evaluation ratings are low (all mean values below 1.5).

Post-course survey: The post-course mean values vary from 1.47 to 3.0. The knowledge survey items are arranged in order they are covered in class. It is noticeable that items at the beginning of the semester have higher mean values than those that were taken towards the end of the semester. There was not adequate time to cover all the items with the desired depth.

For improvement: Items that have less than 1.75 post course mean values (87, 89, 106, 109, 116, 131 and 132) should be given much greater emphasis in subsequent semesters.

Will the changes require funding? How much will the changes cost?

No
INSTRUCTIONS: Please read carefully and completely.

This is a knowledge survey rather than a test. In a knowledge survey, you don't actually answer the questions or solve the problems provided, but you instead provide a very honest self assessment of your present knowledge. This survey will be given again at the end of the semester. Save/print the survey and use this as a guide by referring to the questions as we proceed through the semester. Read each question and then mark either a "3", "2", or "1". If you mark a "3", it means you have significant background to answer the question, you should be confident that if your professor asks you to demonstrate that ability by actually answering the designated question, that you could actually respond completely for graded test purposes. Mark a "2" as response to the question if you can truly answer at least 50% of it or know precisely where you could quickly get the information. Mark a "1" as response to the question if you don't know the answer or are not confident you could find the information to answer it completely.

Use the survey answer sheet provided in your Lecture Notes. Be sure to fill in your name on the answer form. You may use pen or pencil to mark your responses.

1. What are the characteristics of organic compounds?
2. What happens to the melting and boiling points as the n in \( H(CH_2)_nH \) increases?
3. Draw the structure of an isomer to pentane.
4. Name this compound \( (CH_3)_3C(CH_2)_2CH(CH_3)_2 \)

   ![Diagram of isomers]

6. How is petroleum or crude oil refined?
7. Compare saturated vs. unsaturated hydrocarbons:
8. Give the correct general formula for alkane, alkenes and alkynes.
9. Bulky groups on cyclohexane are most likely to be found in which position?
10. Name the following: \( CH_3CH_2CH_2C=CH_2CH_3 \)
11. Name the following \( \text{CH}_3\text{CH}_2\text{CH}_2\text{C} = \text{CCH}_2\text{CH}_3 \)

12. What is the product of the reaction below?

\[ \text{H}_2 \quad / \quad \text{Cl}_2 \quad / \quad \text{H} \quad / \quad \text{C} = \text{C} \quad / \quad \text{H} \quad + \quad \text{H}_2 \quad / \quad \text{Cl}_2 \quad / \quad \text{H} \quad / \quad \text{C} = \text{C} \quad / \quad \text{H} \quad \rightarrow \]

13. Identify the product produced when 2-Butene is treated with \( \text{H}_2 \) in the presence of a metal catalyst.

14. Name \( \text{CH}_3\text{CH}_2\text{CH} = \text{CHCH}_2\text{CH}_3\text{Cl} \).

15. Following Markovnikov’s rule, predict what is the major product in the reaction of \( \text{HBr} \) with \( (\text{CH}_3)_2\text{C} = \text{CH}_2 \)?

16. Name the product of reaction between an alkene with water in the presence of an acid catalyst.

17. What does “HDPE” (what milk gallon containers are made of) stand for?

18. Teflon is essentially \( (\text{CF}_2)_n \). What monomer would you expect to be required to produce this addition polymer?

19. What is the \( \text{C} - \text{C} - \text{C} \) bond angle in 1-propyne?

20. What is the correct prefix for the following di-substituted benzene compounds?

\[
\begin{array}{c}
\text{G} & 1 & 2 & \text{G} \\
\text{G} & 1 & 3 & \text{G} \\
\text{G} & 1 & 4 & \text{G}
\end{array}
\]

21. Give the IUPAC name of \( \text{CH}_3(\text{CH}_2)_2\text{CH(OH)}(\text{CH}_2)_3\text{CH}_3 \).

22. The intermolecular force of attraction demonstrated below is ________.
23. Which of the following would you expect to be the least soluble in water?  
   Pentane, 1-Pentanol, Pentanal, 2-Pentanone, Pentane-2,3-diol

24. Which of the following would you expect to be the most soluble in water?  
   Pentane, 1-Pentanol, Pentanal, 2-Pentanone, Pentane-2,3-diol

25. When 1-Pentanol is exposed to acid and heat, what does it produce?

26. What is the product of oxidation of 2-Pentanol?

27. What is the product of oxidation of 2-Methyl-2-pentanol?

28. Which of the following is an oxidizing reagent?  
   \( \text{H}_2/\text{Ni} \) catalyst, \( \text{H}_2\text{O}/\text{H}^+ \), \( \text{CrO}_3 \)

29. Why are alcohols with less than 4 C atoms miscible with water?

30. Name \( \text{CH}_3\text{CH}_2\text{OCH}_3 \).

31. Which functional group is known for its stinky odor?

32. Give the best IUPAC name of \( \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{SH} \).

33. Which of the following pairs are NOT structural isomers?
   a. Dimethyl ether and ethanol
   b. Butane and 2-methylpropane
   c. Benzene and cyclohexene
   d. Hexene and cyclohexane

34. Give one general application or use of phenols and its derivatives.

35. Draw the structure of the following: 2,4,6-trinitrotoluene, propanethiol, trans-1,4-diethylcyclohexane, phenol, 1,5-pentanediol

36. Explain the metabolic changes of ethanol in the body.
37. Complete each of the following by supplying the missing reactant or product indicated by the question mark. Draw the structure, if needed.

   a. \( \text{CH}_3-\text{C-C-CH}_3 \) + ? \( \rightarrow \) \( \text{CH}_3-\text{CH-CH}_3 \)

   \[
   \begin{array}{c}
   \text{CH}_2 \\
   \text{OH}
   \end{array}
   \]

   b. ? + \( \text{H}_2\text{O}, \text{H}^+ \) \( \rightarrow \) ethanol

   c. \( 2\text{C}_2\text{H}_2 + \_\_\_\_\_\_\text{O}_2 \rightarrow ? + ? \) complete combustion

   d. \( \text{CH}_3\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \) \( \_\_\_\_\_\_\_\_\_\rightarrow ? \)

   \[
   \begin{array}{c}
   \text{OH}
   \end{array}
   \]

38. Name this compound. \( \text{CH}_3\text{CH}_2\text{CCH}_2\text{CH}_3 \) is

39. What is the product formed when the compound, \( \text{CH}_3\text{CH}_2\text{CH}_{2}\text{CH}_2\text{CHO} \) is reduced by addition of \( \text{H}_2 \)?

40. What class of compounds is \( \text{RCHO} \) or structural formula \( \text{RC}=\text{O} \)?

41. Name the conversion reaction of 2-methyl hexanal into 2-methyl hexanoic acid.

42. What do you call the conversion of 2-pentanone to 2-pentanol?

43. What are produced from oxidation of \( 1^0 \) alcohols and aldehydes?

44. What class of compounds is represented by the general formula \( \text{RCOR} \)?

45. Name this compound \( (\text{CH}_3)_2\text{CHCH}_2\text{CO}_2\text{H} \) is

46. The following have molecular weights near 75. Which has the highest boiling point? Propanoic acid, 2-Butanone, Pentane, Butanal

47. What is the ester formed by reaction between methyl alcohol and propanoic acid?

48. What is produced when a ethyl propanoate is heated with water and acid?

49. Name the following functional groups: Circle one letter only.
50. Which carboxylic acid is produced in muscles during strenuous exercise?
51. What is produced from the hydrolysis of an ester under basic conditions?
52. Which functional group is mostly responsible for the pleasant smell of many fruits.
53. Write the general structure of an acid anhydride?
54. What is a suitable name for the sodium salt of a long-chain fatty acid?
55. Describe the structure of soap.
56. Use arrow to point the ester Functional group in aspirin.
57. Use arrow to point the amide functional a. (active ingredient in Tylenol).

58. Give the name of the reaction, (i.e. oxidation, reduction, addition, substitution, esterification, neutralization, dissociation, hydrolysis).

\[
\begin{align*}
&\text{O} \\
&\text{O-H} \\
&\text{a. CH}_3\text{-C-H} + \text{methanol} \rightarrow \text{CH}_3\text{-C-H} \\
&\quad \downarrow \quad \uparrow \\
&\quad \text{OCH}_3
\end{align*}
\]
b. Methanal -> Methanoic acid

c. Amide + strong base -> carboxylate salt + amine

d. CH₃COOH + NaOH -> CH₃COONa⁺ + H₂O

59. Write the structure of methyl butanoate (in apples)

60. How are Soaps made?

61. Explain why drinking fruit punch (wine mixed with fruit juice and not the fast food punch drink) tastes very mellow results in a hangover. Note that fruit juice contains citric acid.

62. What is produced in the hydrolysis of amides by strong acids?

63. For compounds of similar molecular weight, which of the following types would have the highest boiling point? Alkane, primary amine, secondary amine, tertiary amine

64. What are amide bonds? In which biomolecules are they found: carbohydrates, proteins, lipids or nucleic acids?

65. Cite the difference in structure of Mylar and Dacron versus Nylon.

66. Name this CH₃CH₂NHCH₂CH₂CH₃.

67. Write the structure of cadaverine, 1,5-diaminopentane

68. Name CH₃CH₂-C-NHCH₂CH₃ is

69. Identify the functional groups:

70. What 2 functional groups do monosaccharides, such as glucose and fructose,
Appendix C

71. Differentiate the structure of maltose v. sucrose.
72. What is a chiral carbon?
73. Given the open-chain structure of D-glucose, draw the Haworth structure.
74. What type of bond holds the two monosaccharides in a polysaccharide?
75. What two monosaccharides combine to form lactose?
76. What is the most abundant carbohydrate on earth?
77. What do the structures of amylose (in starch) and cellulose have in common and how do they differ?
78. What is the difference between D-ribose and L-ribose?
79. What polysaccharide in animals has a structure very similar to amylopectin (in starch/plants)?
80. Name the fatty acid that has the formula C_{17}H_{35}COOH.
81. Name the product of the following reaction: Oleic acid + H_2 -> ?
82. Cite function of bile salts in the digestion of dietary fats.
83. Which type of biological compound is a hormone such as testosterone, and progesterone?
84. What functional group characterizes the phospholipids?
85. What are the products of complete hydrogenation of glyceryl trioleate?
86. What compound is the precursor of the steroids found in the human body?
87. Which class of human plasma lipoproteins carries cholesterol from peripheral tissues to the liver?
88. Explain why and how the percent unsaturated fats in membrane lipids affects the fluidity of the membrane.
89. What kind of eicosanoids is thought to promote certain aspects of the inflammatory response?
90. How does aspirin work to reduce inflammation?
91. Prostaglandins are derived from which acid?

92. What type of lipid is formed from a reaction between a long chain alcohol and a long chain fatty acid?

93. Which lipid hormones allow tissues to communicate with one another?

94. Which lipid is synthesized from isoprene units?

95. What is the key difference between diffusion and active transport?

96. What is the most abundant class of membrane lipids?

97. What two words summarize the structure and composition of biological membranes?

98. Which of the following types of substances is NOT a polymer? Protein, Triglyceride, Starch, Polyester

99. Differentiate hemoglobin v. keratin.

100. Predict the polarity and solubility of this amino acid \( H_2NCHCOOH \)

| CH₂OH

101. What is an essential amino acid?

102. The peptide bonds linking amino acids in proteins are the same as _______ bonds.

103. Draw the dipeptide produced when combining glycine and alanine amino acids.

\[
\text{H}_2\text{N-CH}_2\text{-C=O} + \text{H}_2\text{N-CH-C=O} \rightarrow \text{H}_3\text{C OH} \]

104. What structural protein is found in bone, tendon and skin?

105. Differentiate primary, secondary, tertiary and quarternary structure of protein.

106. How do the primary structure of normal hemoglobin and sickle cell hemoglobin differ?

107. Give three ways to denature a protein.

108. What is broken when a protein is hydrolysed?
109. What is a prosthetic group on a protein?

110. Describe the structure of the anticodon in transfer RNA.

111. Name and give the function of the six different classes of enzymes.

112. What is the first step in an enzyme catalyzed reaction?

113. Describe enzyme structure: active site v. allostERIC site v. co-enzyme.

114. Heavy metal cations such as Pb$^{2+}$ and Hg$^{2+}$ are irreversible inhibitors of enzyme activity, because they react with __________ of proteins.

115. What enzymes hydrolyse proteins?

116. How does penicillin work as antibiotic?

117. Describe the different pathways of enzyme regulation.


119. Describe detection of myocardial infarction by elevated levels of certain enzymes in the blood serum.

120. What is the main starting material in glycolysis pathway?

121. What is the first reaction in glycolysis, which traps glucose in the cell?

122. In glycolysis, glucose is converted to two _______ molecules, with a net yield of ____ (how many?) ATP and ____ (how many?) NADH.

123. Into what final product is glucose converted at the end of glycolysis?

124. When one molecule of glucose undergoes fermentation, what products, and how many of each are formed?

125. Starvation, low carbohydrate diet and diabetes can trigger the formation of ______ from excess acetyl CoA.

126. What hormone is responsible for stimulating glycogenesis?

127. What is Catabolism? The first stage of catabolism is the hydrolysis (digestion) of dietary macromolecules in the stomach and intestines. Polysaccharides are
converted to ________________; proteins are degraded to ________________, and triglycerides are broken down to ________________ and _________________. The small molecules produced in digestion are taken into the cells lining the intestine by active or passive transport. In the second stage of catabolism, the small molecules are converted into much more smaller molecules such as ________________, the direct fuel of the citric acid cycle, which get converted to carbon dioxide. The first oxidation step in the citric acid cycle is the conversion of isocitrate to ________________, in which an alcohol group is oxidized to a ketone group. This step is similar to the last oxidation step, where malate is oxidized to _________________. The electrons and hydrogen ions released in all of the oxidation steps are carried by coenzymes NADH and FADH₂ to the fourth stage, the electron transport chain and the oxidative phosphorylation. Here, the electrons and hydrogen ions are accepted by oxygen (from breathing) to produce ______ and ATP. At the same time, the oxidized coenzymes NAD⁺ and ______ are regenerated.

128. In beta-oxidation, capric acid (10 C atoms) is converted to ______ (how many?) acetyl CoA, ______ (how many?) NADH and ______ (how many?) FADH₂. The total ATP molecules that can be obtained from one molecule of capric acid is ______.

129. Which enzyme is responsible for oxidative phosphorylation in the mitochondria inner membrane is: Hexokinase, ATP synthase, Oxidase, Dehydrogenase?

130. What is oxidative phosphorylation?

131. Contrast electron transport chain v. substrate level phosphorylation

132. What is beta-oxidation?

133. Differentiate structure of RNA versus DNA molecule.

134. Describe the structure of DNA.

135. If a gene had a sequence, 5'-TACCTAGCT-3', the mRNA would have the sequence ________________.

136. If the parental DNA strand had the following sequence: 5'-ATGCGGCTA-3', the sequence of the complementary daughter strand would be ________________.
## Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: Chem 161</th>
<th>Semester/Year: Fall, 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Leticia U. Colmenares</td>
<td>Date Submitted to Department Chair: May 17, 2007</td>
</tr>
</tbody>
</table>

### Identify the Course Student Learning Outcomes assessed this semester.

1. Use the mole concept in solving stoichiometry problems involving solids, liquids, gases and solutions.
2. Balance chemical equations, classify reactions, identify and analyze the role of the chemicals involved in chemical reactions.
3. Predict the behavior of gases while undergoing changes in volume, pressure, temperature and quantity.
4. Manipulate thermochemical equations and calculate the amount of energy involved in chemical reactions.
5. Predict physical and chemical properties of elements based on electronic structure and location in the Periodic Table.
6. Predict physical and chemical properties of compounds based on chemical bonding, geometry and intermolecular interactions.

### How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

The SLO’s align with the Natural Science Department and the AA Program outcomes.

### What skills or competencies are necessary for the student to perform the selected SLOs?

- Concept recognition
- Knowledge competency
- Apply the knowledge in problem solving

- Lectures
- Demonstrations

### What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

**Tool:** Knowledge survey consisting of 94 items covering the SLO’s
- Conducted pre-course and post-course
- Students evaluate the degree of their knowledge to answer the questions
- On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely

**Criteria for success:**
- At least 80% of the items should show an increase in post course mean value.

### What are the results of the assessment?

The following chart shows the mean score (y-axis) for each item (x-axis) in both pre-course and post-course surveys. Evidence of learning is revealed in each of the 93 items, except in item number 1. The 99% result surpasses the 80% benchmark.
Appendix C

What are the results of the assessment?

The following chart shows the mean score (y-axis) for each item (x-axis) in both pre-course and post-course surveys. Evidence of learning is revealed in each of the 93 items, except in item number 1. The 99% result surpasses the 80% benchmark.

![Chart showing pre-post comparison of knowledge survey results.](image)

How will you use the results? What changes do you propose to improve student learning? When?

Explanation: All item numbers showed an increase in the post course survey except in item number 1. All students self-evaluated that they have strong confidence in their knowledge of this particular topic.

The plot shows that student self-evaluation of items at the beginning of the semester up to item #28 are already high, mean values of 2 and above. These students may already have taken these topics in Chem 151 or high school chemistry.

The plot also shows that at the end of the semester students have achieved a high level of confidence in their knowledge as most of the items have post-course items of 2.5 or better ratings.

The ones that received less than 2.5 rating are the following items: 34, 35, 36, 47, 48, 50, 60, 61, 76, 89, 93 and 94. These are the items that need greater emphasis in the future.

Will the changes require funding? How much will the changes cost?

No
Knowledge Survey in Chem 161

INSTRUCTIONS: Please read carefully and completely.

This is a knowledge survey rather than a test. In a knowledge survey, you don't actually answer the questions or solve the problems provided, but you instead provide a very honest self-assessment of your present knowledge. This survey will be given again at the end of the semester. Save/print the survey and use this as a guide by referring to the questions as we proceed through the semester.

Read each question and then mark either a "3", "2", or "1". If you mark a "3", it means you have significant background to answer the question, you should be confident that if your professor asks you to demonstrate that ability by actually answering the designated question, that you could actually respond completely for graded test purposes. Mark a "2" as response to the question if you can truly answer at least 50% of it or know precisely where you could quickly get the information. Mark a "1" as response to the question if you don't know the answer or are not confident you could find the information to answer it completely.

Use the survey answer sheet provided. Be sure to fill in your name on the answer form. You may use pen or pencil to mark your responses.

1. Differentiate the following: law, theory, observation, and hypothesis.

2. Given 0.005 L, how many mL is this? How many μL? how many dL?

3. Round off this number 1,050,000 to 2 significant figures and write it in exponential form.

4. Do the indicated arithmetic and give the answer to the correct number of significant figures. $(1.5 \times 10^{-4} \times 61.3) + 2.01 =$

5. Walking fast can consume 5.0 kcal per minute. Using unit factor method, show your solution to determine how many minutes of such exercise are required to consume 400 kcal, the energy in a milk shake? Circle the unit factor in your solution.

6. A pure yellow crystalline substance, when heated in a vacuum, releases a greenish gas and a red powder. The original yellow crystalline substance is a compound or an element?

7. Pick the sequence of answers that describes the change occurring in the following three processes. i. Steam condenses to water when cooled.
   ii. Hydrogen gas reacts with oxygen gas to form water.
   iii. The size of a Helium balloon increases as it is heated.

   i  ii  iii
   Physical  Physical  Physical
   Physical  Chemical  Physical
8. Give the number of protons (p), electrons (e), and neutrons (n) in one atom of chlorine-37.

9. Write the isotope symbol of chloride-37.

10. Which pair of elements would most likely form an ionic compound?
    P and Br  Cu and K  C and O  O and Zn

11. What is the formula for the simple ionic compound formed by magnesium and iodine?

12. What is the correct formula for copper(II) phosphate?

13. All of the following are in aqueous solution. Which is incorrectly named?
    HC₂H₃O₃, acetic acid
    HBr, bromic acid
    H₂SO₃, sulfurous acid
    HNO₂, nitrous acid
    HClO₃, chloric acid

14. What is the correct systematic name for Cr₂O₃?

15. Which one of the following does not represent the quantity of 1.00 mole?
    6.02 x 10²³ C atoms, 26.0 g Fe, 12.01 g C, 65.38 g Zn

17. How many atoms of H are there in 3 moles of H₂O?

18. What is the molar mass of acetaminophen, C₇H₉NO₂?

19. Boron obtained from borax deposits in Death Valley consists of two isotopes. They are boron-10 and boron-11 with atomic masses of 10.013 amu and 11.009 amu, respectively. The atomic mass of boron is 10.81 amu (see periodic table). Which isotope of boron is more abundant, boron-10 or boron-11?

20. The percentage composition of tartaric acid is: 32.01% C, 4.03% H, and 63.96% O. Given that the molecular mass of tartaric acid is 150 amu, determine its molecular formula.

21. Balance the following equation: __ C₂H₆ + __ O₂ -------> __ CO₂ + __ H₂O
22. Which of the following equations is NOT balanced?
   A. 2 Al + 3 H₂SO₄ ----> Al₂(SO₄)₃ + 3H₂
   B. (NH₄)₂Cr₂O₇ ---> Cr₂O₃ + N₂ + 4 H₂O
   C. P₄O₁₀ + 6 H₂O ---> 4 H₃PO₄
   D. 2 FeS₂ + 2 O₂ ---> 2FeO + 2 SO₂

23. Balance the following equation: CS₂ + CaO ----> CO₂ + CaS
   Based on the balanced equation, calculate how many moles of CaO are consumed if 1.5 mole CS₂ reacts?

24. Follow-up question from above: How many grams of CaO are required to react completely with 19 g of CS₂?

25. How many grams of Cl₂ can be maximally prepared when 15.0 g of MnO₂ and 30.0 g of HCl are allowed to react according to the following equation?
   MnO₂ + 4HCl ----> MnCl₂ + Cl₂ + 2H₂O

26. In the above conditions, which is the limiting reagent.
27. If only 10.0 g were actually formed in the reaction above, what is the % yield?

28. What is the molarity of a solution that contains 0.05 moles of solute in 200 mL of solution?

29. Describe the procedure used to make 3.0 liters of a 2.0 M KCl solution, starting with solid KCl. Show all your calculations.

30. What volume of concentrated nitric acid (15.0 M) is required to prepare 100 mL of a 3.0 M nitric acid solution?

31. What volume of 18.0 M sulfuric acid must be used to prepare 5.0 L of 0.195 M H₂SO₄?

32. Diabetics often need injections of insulin to help maintain the proper blood glucose levels in their bodies. How many moles of insulin are needed to make up 45 mL of 0.0052 M insulin solution?

33. Rust (Fe₂O₃) stains can be removed by washing a surface with a dilute solution of oxalic acid (H₂C₂O₄). The reaction is
   Fe₂O₃ (s) + 6 H₂C₂O₄ (aq) ----> 2Fe(C₂O₄)₃⁻ (aq) + 3 H₂O (l) + 6 H⁺ (aq)
   Question: What mass of Fe₂O₃ can be removed by 1.0 L of a 0.14 M H₂C₂O₄ solution?

34. You have a 3.00 L of a 3.00 M solution of NaCl(aq). You also have 2.00 L of a 2.00 M solution of AgNO₃(aq). After you mix the two solutions, what are the concentrations of [Na⁺], [Cl⁻], [Ag⁺] and [NO₃⁻]= 1.8 M
35. Which of the following is not an electrolyte when dissolved in water?
   table salt (NaCl) vinegar (acetic acid) ammonia (NH₃) sugar (C₁₂H₂₂O₁₁) hydrochloric acid (HCl)

36. Identify the major ionic species present in an aqueous solution of Na₂CO₃.

37. Which salt is NOT soluble in water?
   NaNO₃   KC₂H₃O₂   PbCl₂   AgNO₃BaCl₂

38. Which of the following is a precipitation reaction?
   A. 2H₂(g) + O₂(g) ------→ 2H₂O(l)
   B. CaBr₂(aq) + H₂SO₄(aq) ------→ CaSO₄(s) + 2HBr(g)
   C. 2KNO₃(s) ------→ 2KNO₃(s) + O₂(g)

39. Predict if a precipitate will form when solutions containing Pb(NO₃)₂(aq) and KI(aq) are mixed. If yes, give the chemical formula of the precipitate.

40. In the neutralization reaction between hydrochloric acid and calcium hydroxide, the products are water and a salt. What is the chemical formula of the salt?

41. What are the products of the neutralization reaction between sulfuric acid and potassium hydroxide?

42. During a titration the following data were collected. A 50 mL portion of an HCl solution was titrated with 0.50 M NaOH. It required 200 mL of NaOH to neutralize the sample. What is the molarity, M, of the HCl solution?

43. What is the oxidation number of Mn in potassium permanganate, KMnO₄.

44. Which one of the following is a redox reaction?
   A. H⁺(aq) + OH⁻(aq) ----→ H₂O(l)
   B. 2KBr(aq) + Pb(NO₃)₂(aq) ------→ 2KNO₃(aq) + PbBr₂(s)
   C. CaBr₂(aq) + H₂SO₄(aq) ------→ CaSO₄(s) + 2HBr(g)
   D. 2Al(s) + 3H₂SO₄(aq) ------→ Al₂(SO₄)₃(aq) + 3H₂(g)

45. Balance the following redox reaction in acidic medium.
   Br⁻(aq) + MnO₄⁻(aq) ------→ Br₂(l) + Mn²⁺(aq)

46. Which element is the reducing agent in the following reaction?
   Cu + 2H₂SO₄ ------→ CuSO₄ + SO₂ + 2H₂O

Natural Sciences Department Annual Report for 2006-07
47. For a particular process where \( q = -17 \text{ kJ} \) and \( w = 21 \text{ kJ} \). Which of the following statements is false?

A. heat flows from the system to the surroundings
B. the process is exothermic
C. the system is doing work (expansion job) on the surroundings
D. \( \Delta E = 4 \text{ kJ} \)

48. Which of the following substances does not have a standard enthalpy of formation \( (\Delta H^0_f) \) equal to zero at 25°C and 1.0 atm? \( \text{F}_2(g), \text{Al}(s), \text{H}_2\text{O}(l), \text{H}_2(g) \)

49. A sample of nitrogen gas has a volume of 32.4 L at 20°C. The gas is heated to 220°C at constant pressure. What is the new volume of nitrogen gas?

50. Nitrogen gas is being collected by water displacement at 30°C when the atmospheric pressure is 760 mm Hg. Given that the partial pressure of water at 30°C is 31.8 mm Hg, what is the partial pressure of the nitrogen gas?

51. The reaction between calcium oxide and water is represented below:
\[
\text{CaO (s) + H}_2\text{O (l)} \rightarrow \text{Ca(OH)}_2 (s) \quad \Delta H^0 = -64.8 \text{ kJ/mol}
\]
How much heat would be liberated when 7.15 g CaO is dropped into a beaker containing 152 g H\(_2\)O?

52. Gases are sold in large cylinders for laboratory use. What pressure in atmospheres will be exerted by 2,500 g of oxygen gas (O\(_2\)) when stored at 22°C in a 40.0 L cylinder?

53. Calcium hydride combines with water according to the equation
\[
\text{CaH}_2(s) + 2\text{H}_2\text{O(l)} \rightarrow 2\text{H}_2(g) + \text{Ca(OH)}_2(s)
\]
What volume (in L) of \( \text{H}_2 \) will be produced at 273 K and a pressure of 1520 torr beginning with 100.0 g of CaH\(_2\) and 36.0 g of \( \text{H}_2\text{O} \). Which is the limiting reagent?

54. Baking powder is made up of sodium bicarbonate (NaHCO\(_3\)) and calcium hydrogen phosphate (CaHPO\(_4\)). When baking powder is wet, this reaction produces carbon dioxide (CO\(_2\)). The equation for this reaction is given below.
\[
\text{NaHCO}_3 (aq) + \text{CaHPO}_4 (aq) \rightarrow \text{NaCaPO}_4 (aq) + \text{CO}_2 (g) + \text{H}_2\text{O (l)}
\]
If I use 4.0 grams of NaHCO\(_3\), how many liters of \( \text{CO}_2 \) are formed at room temperature (300 K) at sea level?
55. If 64.7 kJ of heat energy are applied to 300.0 g of water at an initial temperature of 36.0°C, what is the final temperature of the water? The specific heat capacity of water is 4.184 J/g°C.

56. In a coffee-cup calorimeter, 50.0 mL of 0.100 M AgNO₃ and 50.0 mL of 0.100 M HCl are mixed to yield the following reaction:

    \[ \text{Ag}^+ (aq) + \text{Cl}^- (aq) \rightarrow \text{AgCl (s)} \]

The two solutions were initially at 22.60°C, and the final temperature is 23.40°C. Calculate the heat that accompanies this reaction in kJ/mol of AgCl formed. Assume that the combined solution has a mass of 100.0 g and has a specific heat capacity of 4.18 J/°C·g.

57. A bomb calorimeter has a heat capacity of 2.47 kJ/K. When a 0.105-g sample of ethylene (C₂H₄) was burned in this calorimeter, the temperature increased by 2.14 K. Calculate the energy of combustion for one mole of ethylene.

58. Consider the following thermochemical equation:

    \[ 2\text{Al(s)} + 3\text{Cl}_2(g) \rightarrow 2\text{AlCl}_3(s) \quad \Delta H = -1390.81 \text{ kJ} \]

Calculate the heat produced when 10.0 g AlCl₃ forms.

59. Given: The reaction \( \text{N}_2 + 2\text{O}_2 \rightarrow 2\text{NO}_2 \) requires 67.7 kJ.

To carry out the reaction \( \text{N}_2 + 2\text{O}_2 \rightarrow \text{N}_2\text{O}_4 \) 9.7 kJ is required.

(a) Use Hess law to determine how much energy (absolute value) is involved in the reaction \( 2\text{NO}_2 \rightarrow \text{N}_2\text{O}_4 \).

(b) Is this reaction last mentioned, exothermic or endothermic?

60. Given the following data:

    \[ \text{S(s)} + \frac{3}{2}\text{O}_2(g) \rightarrow \text{SO}_3(g) \quad \Delta H = -395.2 \text{ kJ} \]

    \[ \text{O}_3(g) + \text{O}_2(g) \rightarrow 2\text{SO}_3(g) \quad \Delta H = -198.2 \text{ kJ} \]

Calculate \( \Delta H \) for the reaction

    \[ \text{S(s)} + \text{O}_2(g) \rightarrow \text{SO}_2(g) \]

61. Use the accompanying Table to calculate the standard enthalpy change for the reaction \( \Delta H^0_{\text{rxn}} \): \( \text{CaO (s)} + \text{CO}_2(g) \rightarrow \text{CaCO}_3 (s) \)

62. Arrange the following types of radiation in order of increasing wavelength, increasing energy, and increasing frequency?

- ultraviolet radiation
- infrared radiation
- visible light
- radio waves

63. Green light has a wavelength of 5.50 \( \times 10^2 \) nm. What is the energy of a photon of green light is (given: \( c = 3.0 \times 10^8 \) m/s \( h = 6.6 \times 10^{-34} \) Js)

64. How many d orbitals are there in the atomic energy level n=3? What is the maximum number of electrons in the 3rd level?
65. Write the electron configuration for the barium atom and barium ion.

66. Which of the following combinations of quantum numbers is not allowed?
   \[ n \quad m(l) \quad m(s) \]
   A. 1 1 0 1/2
   B. 3 0 0 -1/2
   C. 2 1 -1 1/2
   D. 4 3 -2 -1/2

67. Identify the atom that has the following electron configuration \([\text{Kr}]4d^{10}5s^25p^2\).

68. Differentiate the following: nonmetal, transition element, metal, inner transition element

69. Which of the following has the largest radius? \(S^2^-\) \(\text{Cl}^-\) \(\text{Ar}\) \(\text{K}^+\)

70. What is the number of valence electrons of halogen atoms?

71. \(\text{Mn}\) has how many unpaired electrons in its 3d orbitals?

72. Which of the following has the largest radius? \(\text{S}^2^-\) \(\text{Cl}^-\) \(\text{Ar}\) \(\text{K}^+\) \(\text{Ca}^{2+}\)

73. Order the elements \(\text{S}\), \(\text{Cl}\), and \(\text{F}\) in terms of increasing ionization energy.

74. What is the correct orders for atomic radius and ionization energy for \(\text{S}\), \(\text{O}\) and \(\text{F}\)?

75. For the elements \(\text{Rb}\), \(\text{F}\), and \(\text{O}\), what is the order of increasing electronegativity?

76. Atoms with very similar electronegativity values are expected to from what type of chemical bonds?

77. What type of chemical bond is generally formed between a metal reacts and a nonmetal?

78. What is the shape of the formaldehyde molecule, \(\text{H}_2\text{C}=\text{O}\)?

79. Follow up question: What is the bond angle?

80. Consider the following Lewis structure:
What is the hybridization of each N, C and O atom?
81. How many pi bonds are there in the above structure?
82. What is the bond angle formed by N-C-C in the above structure?
83. Draw the Lewis structure and the correct molecular geometry of BeF₃
84. Order the following from shortest to longest bond: C₂, B₂, H₂, N₂
85. In spite of larger electronegativity differences between bonded atoms, BeCl₂ has no dipole while SCl₂ does. Draw Lewis structure of each and explain fully.
86. Select the molecule(s) that are nonpolar (or have a zero net dipole moment) from the following molecules: BF₃ CHBr₃ (C is the central atom) Br₂ XeCl₂ CO
87. Draw the Lewis structure (and resonance structures, if needed to make true representation) and select the correct molecular structure for NO₃⁻
88. Give the molecular orbital electron configuration of the molecule CO molecule and calculate the bond order.
89. In which of the following groups of substances would dispersion forces be the only significant factors in determining boiling points? Cl₂ HF Ne KNO₂ CCl₄
90. In which of the following molecules have hydrogen bonding as the significant factor in boiling point? C₂H₅OH CCl₄ CH₃Cl HF
91. Arrange the following in the correct order of increasing boiling points: CH₃OH C₂H₆ Ne
92. The normal boiling point of liquid X is less than that of Y, which is less than that of Z. What is the correct order of increasing vapor pressure of the three liquids at STP?
93. Explain why a nonpolar liquid displays a convex meniscus.
94. Which salt would have the highest (most negative) lattice energy? Which one will have the highest melting point? CsI NaBr NaCl FeCl₃ FeI₂
Identify the Course Student Learning Outcomes assessed this semester.

Apply and articulate the scientific method by preparing lab reports using the standard scientific format. Express in writing core chemistry principles, results of experiments and do critical thinking by synthesizing conclusions based on observations and data.

How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

The SLO align with the Natural Science Department and the AA Program outcomes.

What skills or competencies are necessary for the student to perform the selected SLOs?

• Writing in technical report format
• -processing, spreadsheet and graphing
• Develop methods and objectives
• Critically analyze data, discuss results and draw conclusions
• Effective communication

What instructional methods or material are used to prepare the students?

• Laboratory Manual and textbook
• Pre-Lab Discussion
• One-on-one Q & A
• Laboratory equipment and supplies
• Chemicals
• Computer and software

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Tool: All Chem 161L students will prepare a minimum of three (3) lab reports using the standard scientific format. Chemistry faculty peer will evaluate randomly selected lab reports using a rating form developed by the faculty.

Criteria for success:
At least 70% of students will meet or exceed performance standards of 70%

What are the results of the assessment?

Passed, exceed performance standard. All seventeen students got 70% or higher in their formal laboratory report grades graded by their instructor.

For validation, fourteen randomly selected formal reports (no duplicates from a single student) were independently evaluated by chemistry faculty peer Dr. Cynthia Rajani. All fourteen received a rating of 70% or higher with an average rating of 88%. These same reports evaluated by instructor received an average rating of 91%.
What are the results of the assessment?

Passed, exceed performance standard. All seventeen students got 70% or higher in their formal laboratory report grades graded by their instructor.

For validation, fourteen randomly selected formal reports (no duplicates from a single student) were independently evaluated by chemistry faculty peer Dr. Cynthia Rajani. All fourteen received a rating of 70% or higher with an average rating of 88%. These same reports evaluated by instructor received an average rating of 91%.

How will you use the results? What changes do you propose to improve student learning? When?

Common errors incurred in writing formal reports will be emphasized at the beginning of the following semester.
Chem 161L Assessment Learning Outcome Rubric

Chem 161L students will apply and articulate the scientific method by preparing lab reports using the standard scientific format. Express in writing principles, results of experiments and do critical thinking by synthesizing conclusions based on observations and data. Use computer familiarity, word-processing, spreadsheet and graphing. Evaluated by peer faculty.

<table>
<thead>
<tr>
<th>mance nce</th>
<th>Rating = 4</th>
<th>Rating = 3</th>
<th>Rating = 2</th>
<th>Rating = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>Follows prescribed format: 1. Title &amp; Purpose. 2. Identify the problem. 3. Hypothesis. 4. Methods &amp; Procedures. 5. Observations &amp; Data. 6. Results. 7. Discussion and Conclusion.</td>
<td>Contains the following: 1. Title &amp; Purpose. 2. Identify the problem. 3. Hypothesis. 4. Methods &amp; Procedures. 5. Observations &amp; Data.</td>
<td>Contains the following: 1. Title &amp; Purpose. 2. Identify the problem. 3. Hypothesis.</td>
<td>Contains the following: 1. Title &amp; Purpose. 2. Identify the problem.</td>
</tr>
<tr>
<td>%</td>
<td>Written work has no major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work is relatively free of major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work has several major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work has serious and persistent errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
</tr>
<tr>
<td>%</td>
<td>Report integrates an accurate and organized spreadsheet (i.e. table/chart) appropriate for the data being analyzed. Contain relevant title, labels, legends and captions. Integrates proper word processing formatting of subscripts and superscripts.</td>
<td>Report integrates an accurate and organized spreadsheet (i.e. table or chart) appropriate for the data being analyzed. Contain relevant title, labels, legends and captions.</td>
<td>Report integrates an organized spreadsheet (i.e. table or chart) appropriate for the data being analyzed.</td>
<td>Report integrates a spreadsheet (i.e. table or chart) that lacks organization.</td>
</tr>
<tr>
<td>tent</td>
<td>Correct interpretation of data and clear conclusion connecting data to general concept or principle.</td>
<td>Vague relationship expressed between data and general concept or principle.</td>
<td>Incorrect relationship expressed between data and general concept or principle.</td>
<td>No interpretation of data and relationship to general concept expressed.</td>
</tr>
</tbody>
</table>

**Natural Sciences Department Annual Report for 2006-07**

110
**Assessment of Course Student Learning Outcomes**

**COURSE ALPHA/NUMBER:** Chem 162  
**Semester/Year:** Spring 2007

**Instructor:** Leticia U. Colmenares  
**Date Submitted to Department Chair:** May 17, 2007

Identify the Course Student Learning Outcomes assessed this semester.

1. Predict properties (boiling point, melting point, osmotic pressure, vapor pressure) of solutions based on concentrations.
2. Determine reaction rate law and calculate rate constants and half-life based on experimental data.
3. Calculate the equilibrium concentration of chemicals in solution involved in precipitation, acid-base and redox reactions.
4. Predict spontaneous reactions based on enthalpy and entropy considerations.
5. Determine the electrochemical potential of redox reactions.

How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

The SLO’s align with the Natural Science Department and the AA Program outcomes.

What skills or competencies are necessary for the student to perform the selected SLOs?

- Concept recognition
- Knowledge competency
- Apply the knowledge in problem solving

What instructional methods or material are used to prepare the students?

- Lectures
- Process-oriented inquiry based activities
- Demonstrations
- Modeling

What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

**Tool:** Knowledge survey consisting of 74 items covering the SLO’s  
**Conducted pre-course and post-course**  
Students evaluate the degree of their knowledge to answer the questions  
On a scale of 1 (least confident) to 3 (most confident) to answer the question precisely

**Criteria for success:**  
At least 80% of the items should show an increase in the post survey mean.

What are the results of the assessment?

The y-axis of the following chart shows the mean score for each item (x-axis) in the knowledge survey. Both pre-course and post-course mean scores are shown. Each of the items showed an increase in mean value indicating increase in learning. This surpasses the 80% benchmark.
The y-axis of the following chart shows the mean score for each item (x-axis) in the knowledge survey. Both pre-course and post-course mean scores are shown. Each of the items showed an increase in mean value indicating increase in learning. This surpasses the 80% benchmark.

How will you use the results? What changes do you propose to improve student learning? When?

The item numbers 1,2,6,8,9,10,37,53, 54, 55 and 72 showed the lowest mean increases.

Explanation: Topic items 1,2,6,8,9 and 10 were covered in the previous semester and were reviewed briefly in Chem 162. Students who were in the previous class rated themselves high in the pre-course, causing the rise in mean to be small.

Topic items 37, 53, 54, 55 and 72 should be given greater emphasis will be given the next time.

Will the changes require funding? How much will the changes cost?

No
Appendix C

Knowledge Survey in Chem 162

INSTRUCTIONS: Please read carefully and completely.

This is a knowledge survey rather than a test. In a knowledge survey, you don't actually answer the questions or solve the problems provided, but you instead provide a very honest self-assessment of your present knowledge. This survey will be given again at the end of the semester. Save/print the survey and use this as a guide by referring to the questions as we proceed through the semester.

Read each question and then mark either a "3", "2", or "1". If you mark a "3", it means you have significant background to answer the question, you should be confident that if your professor asks you to demonstrate that ability by actually answering the designated question, that you could actually respond completely for graded test purposes. Mark a "2" as response to the question if you can truly answer at least 50% of it or know precisely where you could quickly get the information. Mark a "1" as response to the question if you don't know the answer or are not confident you could find the information to answer it completely.

Use the survey answer sheet provided. Be sure to fill in your name on the answer form. You may use pen or pencil to mark your responses.

1. What are the different kinds of solids?

2. On the basis of your knowledge of bonding in liquids and solids, arrange the following substances in order of highest to lowest melting temperature: NaCl, Na, Cl₂, SiO₂

3. The unit cell in this two-dimensional crystal contains _______ Xs and _______ Os.

   X   X   X   X
   O   O   O   O
   X   X   X   X
   O   O   O   O
   X   X   X   X
   O   O   O   O

4. Which substance can be described as cations bonded together by mobile electrons?

5. The unit cell in a certain lattice consists of a cube formed by an anion at each corner, an anion in the center, and a cation at the center of each face. The unit cell contains how many cations and anions?
6. At normal atmospheric pressure and a temperature of 0°C, which phase(s) of H₂O can exist?

7. Chromium metal crystallizes as a body-centered cubic lattice. If the atomic radius of Cr is 1.25 angstroms, what is the density of Cr metal in g/cm³?

8. Below is a phase diagram for compound X. The normal boiling point of X is most likely:

![Phase Diagram](image)

9. A certain substance has the phase diagram shown below. At which of the following values of T and P is the substance a pure liquid?

![Phase Diagram](image)

10. The triple point of CO₂ is at 5.2 atm and −57°C. Under atmospheric conditions present in a typical Boulder, Colorado, laboratory (P = 630 torr, T = 23°C), solid CO₂ will: melt, boil, sublime, remain solid?

11. What are the different colligative properties?

12. A solution containing 292 g of Mg(NO₃)₂ per liter has a density of 1.108 g/mL. What is the molality of the solution?
13. Determine the change in boiling point for 300.0 g of carbon disulfide (K_b = 2.34°C kg/mol) if 35 g of a nonvolatile, nonionizing compound is dissolved in it. The molar mass of the compound is 70.0 g/mol and the boiling point of the pure carbon disulfide is 46.2°C.

14. A chemist is given a white solid that is suspected of being pure cocaine. When 1.22 g of the solid is dissolved in 15.60 g of benzene the freezing point is lowered by 1.32°C. Calculate the molar mass of the solid. The molal freezing point constant (K_f) for benzene is 5.12°C/m.

15. When 92.0 g of a compound is dissolved in 1000. g of water, the freezing point of the solution is lowered to —3.72°C. Determine the molar mass of the compound.

16. Calculate both the boiling point and the freezing point if 46.0 g of glycerol, C_3H_5(OH)_3, is dissolved in 500.0 g of H_2O.

17. The balanced equation for the reaction of bromate ion with bromide in acidic solution is given by:

\[
\text{BrO}_3^- + 5\text{Br}^- + 6\text{H}^+ \rightarrow 3\text{Br}_2 + 3\text{H}_2\text{O}
\]

At a particular instant in time, the value of \(-\Delta[\text{Br}^-]/\Delta t\) is 2.0 \times 10^{-3} M/s. What is the value of \(\Delta[\text{Br}_2]/\Delta t\) in the same units?

18. For the reaction: A + B \rightarrow C, the following initial rate data were obtained:

<table>
<thead>
<tr>
<th>[A] (M)</th>
<th>[B] (M)</th>
<th>Initial Rate of Formation of C (M/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>0.2</td>
<td>0.50</td>
</tr>
<tr>
<td>0.4</td>
<td>0.2</td>
<td>2.00</td>
</tr>
<tr>
<td>0.8</td>
<td>0.2</td>
<td>8.00</td>
</tr>
<tr>
<td>0.2</td>
<td>0.4</td>
<td>1.00</td>
</tr>
<tr>
<td>0.2</td>
<td>0.8</td>
<td>2.00</td>
</tr>
</tbody>
</table>

What is the rate law for the reaction?

19. A first-order reaction is 35% complete at the end of 55 minutes. What is the value of the rate constant?

20. For the reaction 2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g), the following data were collected:

<table>
<thead>
<tr>
<th>t (minutes)</th>
<th>[N_2O_5] (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.24 \times 10^{-2}</td>
</tr>
<tr>
<td>10</td>
<td>0.92 \times 10^{-2}</td>
</tr>
<tr>
<td>20</td>
<td>0.68 \times 10^{-2}</td>
</tr>
<tr>
<td>30</td>
<td>0.50 \times 10^{-2}</td>
</tr>
<tr>
<td>40</td>
<td>0.37 \times 10^{-2}</td>
</tr>
</tbody>
</table>
Appendix C

50. \( 0.28 \times 10^{-2} \)
70. \( 0.15 \times 10^{-2} \)

Plot the different possible straight-line options and determine the order of the reaction.

21. What is the half-life of the reaction above?

22. The following questions refer to the reaction \( 2A_2 + B_2 \rightarrow 2C \). The following mechanism has been proposed:
   
   \[
   \begin{align*}
   \text{step 1 (slow)} & : A_2 + B_2 \rightarrow R + C \\
   \text{step 2 (fast)} & : A_2 + R \rightarrow C
   \end{align*}
   \]
   
   What is the molecularity of step 2?

23. Which step above is "rate determining"?

24. According to the proposed mechanism, what should the overall rate law be?

25. Indicate the K (mass action) expression for the following reaction in equilibrium:
   \[ 2X(g) + Y(g) \leftrightharpoons 3W(g) + V(g) \]

26. The following reactions occur at 500 K. Arrange them in order of increasing tendency to proceed to completion (least \(
\rightarrow \) greatest tendency).
   
   1. \( 2\text{NOCl} \rightarrow 2\text{NO} + \text{Cl}_2 \) \( K_p = 1.7 \times 10^{-2} \)
   2. \( 2\text{SO}_3 \rightarrow 2\text{SO}_2 + \text{O}_2 \) \( K_p = 1.3 \times 10^{-5} \)
   3. \( 2\text{NO}_2 \rightarrow 2\text{NO} + \text{O}_2 \) \( K_p = 5.9 \times 10^{-5} \)

27. For a certain reaction at 25.0°C, the value of \( K \) is \( 1.2 \times 10^{-3} \). At 50.0°C the value of \( K \) is \( 3.4 \times 10^{-1} \). This means that the reaction is endothermic or exothermic?

28. The following questions refer to the equilibrium shown here:
   \[ 4\text{NH}_3(g) + 5\text{O}_2(g) \leftrightharpoons 4\text{NO}(g) + 6\text{H}_2\text{O}(g) \]
   
   What would happen to the system if oxygen were added?

29. What would happen to the system if the pressure were decreased?

30. For the following reaction at equilibrium, what condition/s give a change that will shift the position of equilibrium to favor more products?
   \[ 2\text{NOBr}(g) = 2\text{NO}(g) + \text{Br}_2(g) \quad \Delta H^{\circ\text{rxn}} = 30 \text{kJ} \]

31. Fill in the table below, which refers to the following reaction:
   \[ 2\text{NO}(g) + \text{Br}_2(g) \rightarrow 2\text{NOBr}(g) \]
<table>
<thead>
<tr>
<th>Concentration (M)</th>
<th>[NO]</th>
<th>[Br2]</th>
<th>[NOBr]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>2.5</td>
<td>5.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Change</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Equilibrium</td>
<td>2.0</td>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>

32. A 2-liter flask initially contains 1.2 mol of gas A and 0.60 mol of gas C. Gas A decomposes according to the following reaction:

\[ 2A \rightleftharpoons B + 3C \]

The equilibrium concentration of gas B is 0.20 mol/L. Determine the equilibrium concentration of gas A.

33. Determine the equilibrium concentration of gas C above.

34. An equilibrium mixture for the reaction

\[ 2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g) \]

on analysis, it was found to contain 1.0 mol H2S, 4.0 mol H2, and 0.80 mol S2 in a 4.0 L vessel. Calculate the equilibrium constant for this reaction.

35. The following reaction is investigated (assume an ideal gas mixture):

\[ 2N_2O(g) + N_2H_4(g) \rightleftharpoons 3N_2(g) + 2H_2O(g) \]

Initially there are 0.10 moles of N2O and 0.25 moles of N2H4, in a 10.0-L container. If there are 0.06 moles of N2O at equilibrium, how many moles of N2 are present at equilibrium?

36. Consider the following reaction:

\[ 2HF(g) \rightleftharpoons H_2(g) + F_2(g) \quad (K = 1.00 \times 10^{-2}) \]

Given 1.00 mole of HF(g), 0.500 mole of H2(g), and 0.750 mole of F2(g) are mixed in a 5.00-L flask, determine the reaction quotient, Q, and the net direction to achieve equilibrium.

37. Write chemical formulas for the following common inorganic laboratory acids.
   a. hydrochloric acid
   b. nitric acid
   c. sulfuric acid
   d. phosphoric acid

38. The pH of rain collected on a remote island in the Pacific is assumed to be unaffected by human pollution. The pH of the rainwater will be ________.

39. Solve for the OH⁻ concentration in 1.0 \times 10^{-3} M Ba(OH)₂ solution.

40. What is the H⁺ ion concentration in a 4.8 \times 10^{-2} M KOH solution?
41. Calculate the pH of beer in which the hydrogen ion concentration is 6.3 \times 10^{-5} \text{M}. Calculate the [H_3O^+] in a solution that has a pH of 2.30.

42. What is the pH of a solution at 25°C in which [OH^-] = 3.4 \times 10^{-5} \text{M}.

43. Calculate the pH of 0.250 M HNO_3 solution.

44. What is the [H^+] for a solution at 25°C that has a [OH^-] concentration of 2.5 \times 10^{-6} \text{M}?

45. Is this a conjugate acid/base pair? HCl/OCI^-

46. Identify the conjugate base of CH_3COOH in the following reaction:

\[ \text{CH}_3\text{COOH} + \text{HSO}_4^- \rightarrow \text{H}_2\text{SO}_4^+ + \text{CH}_3\text{COO}^- \]

47. For nitrous acid, HNO_2, Ka = 4.0 \times 10^{-4}. Calculate the pH of 0.25 M HNO_2.

48. Calculate the pH of a 0.05 \text{M} solution of ascorbic acid (diprotic) (Ka_1 = 7.9 \times 10^{-5}; Ka_2 = 1.6 \times 10^{-12}).

49. Solid calcium hydroxide is dissolved in water until the pH of the solution is 10.94. What is the hydroxide ion concentration [OH^-] of the solution?

50. The pain killer morphine is a weak base when added to water. The reaction produces one mole of hydroxide ions for every one mole of morphine that dissolves. The Kb is 1.60 \times 10^{-6}. What is the pH of a 5.00 \times 10^{-3} \text{M} solution of morphine?

51. Arrange the acids H_2Se, H_2Te, and H_2S in order of increasing acid strength.

52. Arrange the acids HOCI, HClO_3, and HClO_2 in order of increasing acid strength.

53. Which one of the following salts will form a basic solution on dissolving in water?
   A. NaCl
   B. KCN
   C. NaNO_3
   D. NH_4NO_3
   E. FeCl_3

54. Write the equation representing the hydrolysis of KF

55. Hydrosulfuric acid is a diprotic acid. Its two stages of ionization are

\[ \text{H}_2\text{S(aq)} \rightarrow \text{H}^+ + \text{HS}^- \quad \text{Ka}_1 = 5.7 \times 10^{-8} \]

\[ \text{HS}^- (\text{aq}) \rightarrow \text{H}^+ + \text{S}^{2-} \quad \text{Ka}_2 = 1 \times 10^{-19} \]
Appendix C

Calculate the concentration of HS⁻ ion in a 0.10 M H₂S solution.

56. Which one of the following is a buffer solution?
A. 0.40 M HCN and 0.10 KCN  
B. 0.20 M CH₃COOH  
C. 1.0 M HNO₃ and 1.0 M NaNO₃  
D. 0.10 M KCN  
E. 0.50 M HCl and 0.10 NaCl

57. What is the pH of a buffer solution that was initially 0.050 M acetic acid, CH₃COOH, and 0.050 M sodium acetate? $K_a = 1.8 \times 10^{-5}$

58. What will be the pH if 0.01 mol of HCl is added to solution above. Assume no volume change.

59. Describe how to prepare 500 mL of a cyanic acid (HCNO)/sodium cyanate (NaCNO) buffer, with a pH of 4.80. $K_a(\text{HCNO}) = 2.0 \times 10^{-4}$

60. Which is the net ionic equation for the reaction that occurs when small amounts of hydrochloric acid are added to a HOCl/NaOCl buffer solution?
A. $\text{H}^+ + \text{H}_2\text{O} \longrightarrow \text{H}_3\text{O}^+$  
B. $\text{H}^+ + \text{OCl}^- \longrightarrow \text{HOCl}$  
C. $\text{HOCl} \longrightarrow \text{H}^+ + \text{OCl}^-$  
D. $\text{H}^+ + \text{HOCl} \longrightarrow \text{H}_2\text{OCl}^+$  
E. $\text{HCl} + \text{HOCl} \longrightarrow \text{H}_2\text{O} + \text{Cl}_2$

61. The solubility of lead iodide is 0.064 g/100 mL at 20°C. What is the solubility product for PbI₂?

62. For PbCl₂ $K_{sp} = 2.4 \times 10^{-4}$, will a precipitate of PbCl₂ form when 0.10 L of 3.0 x $10^{-2}$ M Pb(NO₃)₂ is added to 400 mL of 9.0 x $10^{-2}$ M NaCl?

63. Arrange the following compounds in order of increasing standard molar entropy at 25°C: C₃H₇(g), C₂H₄(g), ZnS(s), and H₂O(l).

64. Determine $\Delta S^\circ$ for the following reaction.  
$\text{SO}_3(g) + \text{H}_2\text{O}(l) \longrightarrow \text{H}_2\text{SO}_4(l)$  
Given the following absolute entropies;  
$S^\circ(J/K\cdot\text{mol})$
65. What does a negative sign for $\Delta G$ of a reaction indicate?

66. For the reaction CuS(s) + H$_2$(g) $\rightarrow$ H$_2$S(g) + Cu(s)
$\Delta G^{\circ}$f (CuS) = -53.6 kJ/mol
$\Delta G^{\circ}$f (H$_2$S) = -33.6 kJ/mol
$\Delta H^{\circ}$f (CuS) = -53.1 kJ/mol
$\Delta H^{\circ}$f (H$_2$S) = -20.6 kJ/mol
calculate $\Delta G^\circ$ and $\Delta H^\circ$ at 298 K and 1 atm pressure

67. Will the reaction above proceed spontaneously?

68. Calculate the equilibrium constant for the reaction above

69. Calculate $\Delta S^\circ$ at 298 K and 1 atm pressure of reaction above

70. Sodium carbonate can be made by heating sodium bicarbonate.
2NaHCO$_3$(s) $\rightarrow$ Na$_2$CO$_3$(s) + CO$_2$(g) + H$_2$O(g)
Given that $\Delta H^\circ$ = 128.9 kJ and $\Delta G^\circ$ = 33.1 kJ at 25°C, above what minimum temperature will the reaction become spontaneous under standard state conditions?

71. HI has a normal boiling point of -35.4°C, and its $\Delta H_{\text{vap}}$ is 21.16 kJ/mol. Calculate the molar entropy of vaporization ($\Delta S_{\text{vap}}$).

72. Given the following standard reduction potentials in acid solution
$E^\circ$ (V)

<table>
<thead>
<tr>
<th>Reductant</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al$^{3+}$ + 3e$^-$ $\rightarrow$ Al(s)</td>
<td>-1.66</td>
</tr>
<tr>
<td>AgBr(s) + e$^-$ $\rightarrow$ Ag(s) + Br$^-$</td>
<td>+0.07</td>
</tr>
<tr>
<td>Sn$^{4+}$ + 2e$^-$ $\rightarrow$ Sn$^{2+}$</td>
<td>+0.14</td>
</tr>
<tr>
<td>Fe$^{3+}$ + e$^-$ $\rightarrow$ Fe$^{2+}$</td>
<td>+0.77</td>
</tr>
</tbody>
</table>

Which is the strongest oxidizing agent?

73. Given the following notation for an electrochemical cell
Pt(s) | H$_2$(g) | H$^+$(aq) || Ag$^+$ (aq) | Ag(s)
write the balanced overall (net) cell reaction.
74. Calculate the value of $E^{0}_{\text{cell}}$ for the following reaction:

$$2\text{Au}(s) + 3\text{Ca}^{2+}(\text{aq}) \rightarrow 2\text{Au}^{3+}(\text{aq}) + 3\text{Ca}(s)$$

Given:

- $\text{Au}^{3+}(\text{aq}) + 3\text{e}^{-} \rightarrow \text{Au}(s)$ \hspace{1cm} $E^{0}(\text{V}) = +1.50$
- $\text{Ca}^{2+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{Ca}(s)$ \hspace{1cm} $E^{0}(\text{V}) = -2.87$

Bone Pile:

$$\Delta G^0 = -nF E^{0}_{\text{cell}}$$

$$R = 8.314 \text{ J/K mol}$$

$$E^{0}_{\text{cell}} = \frac{RT}{nF} \ln K$$

$$F = 96,500 \text{ coul/mol}$$

$$\Delta G^0 = \Delta H^0 - T \Delta S^0$$
### Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: Chem 162L</th>
<th>Semester/Year: Spring 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Leticia U. Colmenares</td>
<td>Date Submitted to Department Chair: May 20, 2007</td>
</tr>
</tbody>
</table>

#### Identify the Course Student Learning Outcomes assessed this semester.

Apply and articulate the scientific method by preparing lab reports using the standard scientific format. Express in writing core chemistry principles, results of experiments and do critical thinking by synthesizing conclusions based on observations and data.

#### How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

The SLO aligns with the Natural Science Department and the AA Program outcomes.

#### What skills or competencies are necessary for the student to perform the selected SLOs?

- Writing in technical report format
- Use computer, word-processing, spreadsheet and graphing
- Develop methods and objectives
- Critically analyze data, discuss results and draw conclusions
- Effective communication

#### What instructional methods or material are used to prepare the students?

- Laboratory Manual and textbook
- Pre-Lab Discussion
- One-on-one Q & A
- Laboratory equipment and supplies
- Chemicals
- Computer and software

#### What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

**Tool:** All Chem 162L students prepare a minimum of five (5) lab reports using the standard scientific format. Chemistry faculty peers will evaluate randomly selected lab reports using a rating form developed by the faculty.

**Criteria for success:** At least 70% of students will meet or exceed performance standards of 70%.

#### What are the results of the assessment?

Passed. Class instructor rated all formal lab reports with a grade of at least 70% based on the grading rubrics.

To validate the assessment tool, seven randomly selected formal reports (one from each student in a class of nine) were evaluated by chemistry peer faculty, Ms. Vilma Fermin. All seven received a rating of 70% and higher, and the average was 90%. This compares well with the instructor's average rating of 91%.
Appendix C

How will you use the results? What changes do you propose to improve student learning? When?

Common errors incurred in formal reports will be emphasized right from the beginning of the following semester.

Will the changes require funding? How much will the changes cost?

No

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports.

The results of the assessment are not used for promotion or tenure.

IEC, March 2006
Revised April 7, 2006
Revised April 12, 2005
### Chem 162L Assessment Learning Outcome Rubric

Chem 162L students will apply and articulate the scientific method by preparing lab reports using the standard scientific format. Express in writing principles, results of experiments and do critical thinking by synthesizing conclusions based on observations and data. Use computer skills, word-processing, spreadsheet and graphing. Evaluated by course instructor and by peer faculty.

Rubric is based on Structure (20%), mechanics (20%), Word processing and Spreadsheet (20%), and Content (40%)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Rating = 4</th>
<th>Rating = 3</th>
<th>Rating = 2</th>
<th>Rating = 1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Follows prescribed format:</td>
<td>Contains the following:</td>
<td>Contains the following:</td>
<td>Contains the following:</td>
<td>Contains the following:</td>
<td></td>
</tr>
<tr>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
<td>1. Title &amp; Purpose.</td>
<td></td>
</tr>
<tr>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
<td>2. Identify the problem.</td>
<td></td>
</tr>
<tr>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
<td>3. Hypothesis.</td>
<td></td>
</tr>
<tr>
<td>6. Results.</td>
<td>6. Results.</td>
<td>6. Results.</td>
<td>6. Results.</td>
<td>6. Results.</td>
<td></td>
</tr>
<tr>
<td>7. Discussion and Conclusion.</td>
<td>7. Discussion and Conclusion.</td>
<td>7. Discussion and Conclusion.</td>
<td>7. Discussion and Conclusion.</td>
<td>7. Discussion and Conclusion.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanics</th>
<th>Rating = 4</th>
<th>Rating = 3</th>
<th>Rating = 2</th>
<th>Rating = 1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Written work has no major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work is relatively free of major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work has several major errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td>Written work has serious and persistent errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Word processing and Spreadsheet</th>
<th>Rating = 4</th>
<th>Rating = 3</th>
<th>Rating = 2</th>
<th>Rating = 1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Report integrates an accurate and organized spreadsheet (i.e. table/chart) appropriate for the data being analyzed. Contain relevant title, labels, legends and captions. Integrates proper word processing formatting of subscripts and superscripts.</td>
<td>Report integrates an accurate and organized spreadsheet (i.e. table or chart) appropriate for the data being analyzed. Contain relevant title, labels, legends and captions.</td>
<td>Report integrates an organized spreadsheet (i.e. table or chart) appropriate for the data being analyzed.</td>
<td>Report integrates a spreadsheet (i.e. table or chart) that lacks organization.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Content</th>
<th>Rating = 4</th>
<th>Rating = 3</th>
<th>Rating = 2</th>
<th>Rating = 1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Correct interpretation of data and clear conclusion connecting data to general concept or principle.</td>
<td>Vague relationship expressed between data and general concept or principle.</td>
<td>Incorrect relationship expressed between data and general concept or principle.</td>
<td>No interpretation of data and relationship to general concept expressed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Natural Sciences Department Annual Report for 2006-07

124
Appendix C

Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER:</th>
<th>GEOG 101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor:</td>
<td>Toshi Ikagawa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester/Year:</th>
<th>Fall 2006</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Date Submitted to Department Chair:</th>
</tr>
</thead>
</table>

Identify the Course Student Learning Outcomes assessed this semester.

1. Describe the components (inputs), processes (actions) and resulting spatial patterns (outputs) of the physical environment (atmosphere, hydrosphere, lithosphere and biosphere) as a system. (Understand facts; assessed by multiple choice/essay exams)

2. Apply the scientific method, and theories and concepts of geography to explain a physical environment. (Use learned skills to interpret facts; assessed by essay exams)

3. Explain critically the interaction of humans and the physical environment. (Evaluate a total system; assessed by a long essay exam in the final)

4. Illustrate how his/her views of the physical environment have (or have not) changed. (Communicate opinion; assessed by a short paper and/or class discussion)

How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

SLO 1 is strongly tied to the AA2, and also tied to AA1.
SLOs 2 and 3 are strongly tied to AA3 and 4, and also tied to AA7 and 8.
SLO 4 is strongly tied to AA3, 4 and 10, and also tied to AA5.

AA1: Draw on knowledge from the liberal arts to succeed in upper division courses.
AA2*: Recognize and respond to the wonders and challenges of the natural environment, both biologi
AA3: Use research and technology skills to access information from multiple sources; use critical thinking and problem-solving skills to evaluate and synthesize information to form conclusions, ideas, and opinions.
AA4: Express ideas clearly and creatively in diverse ways through the fine and performing arts, speech and writing.
AA5: Recognize one’s role in community and global issues with a respect for diverse cultures and differing views while embracing one’s own cultural values and heritage
AA7: Enter and perform effectively in the work force.
AA8: Develop skills that improve personal well-being and enhance professional potential.
AA10: Pursue lifelong learning.

*Bold indicates the strong tie with GEOG 101 SLOs.

What skills or competencies are necessary for the student to perform the

Natural Sciences Department Annual Report for 2006-07
125
### What skills or competencies are necessary for the student to perform the selected SLOs?

College level reading and writing, and elementary math.

### What instructional methods or materials are used to prepare the students?

- Reading questions for the textbook (to prepare for classes)
- Lectures to describe basic facts and processes (with everyday examples)
- Hands-on activities for tangible experiences
- Visual aids (overhead transparencies, actual samples)
- PowerPoint presentations
- Video/DVD programs to support lectures
- Review questions for exams to enhance learning

### What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Multiple choice exams, essay exams and learning logs are used to assess the SLOs.

The results of the exams and learning logs are evaluated using a standard grading scale.

### What are the results of the assessment?

See attached.

### How will you use the results? What changes do you propose to improve student learning? When?

While factual knowledge is well achieved (SLO #1), the application and evaluation of these facts (SLOs # 2 & 3) were not. Next semester, I will shift the emphasis of each class period more to application of materials covered, than to mere facts.

### Will the changes require funding? How much will the changes cost?

Possibly some copying cost for assignment materials.

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports.

---

**IEC, March 2006**
**Revised April 7, 2006**
**Revised April 12, 2005**

*Natural Sciences Department Annual Report for 2006-07*
Assessment of Course Student Learning Outcomes

COURSE ALPHANUMBER: GEOG 101L
Semester/Year: Fall 2006
Instructor: Toshi Ikagawa
Date Submitted to Department Chair:

Identify the Course Student Learning Outcomes assessed this semester.

1. Apply the **scientific method** to study a physical environment: Define a problem for a study, gather and record data, analyze the data, arrive at appropriate conclusions, and report the findings in written form. (Demonstrate knowledge of the scientific method including communication of ideas; assessed by lab exercises and a capstone project)

2. Use various **instruments**, such as a compass, GPS unit and thermometer, to gather environmental data. (Demonstrate knowledge of how to use instruments; assessed by lab exercises and a capstone project)

3. Use the metric system, scientific notation, graphs, and geographic and basic statistical measurements. (Demonstrate quantitative skills in science; assessed by lab exercises and a capstone project)

4. Write a **lab report** using the standard scientific format. (Demonstrate scientific writing skills; assessed by lab reports and a capstone project)

How do the above course SLOs align with the Associate of Arts or certificate program?

SLO 1 is strongly tied to the AA2, and also tied to AA1.
SLOs 2 and 3 are strongly tied to AA3 and 4, and also tied to AA7 and 8.
SLO 4 is strongly tied to AA3 and 4, and also tied to AA10.

**AA1:** Draw on knowledge from the liberal arts to succeed in upper division courses.

**AA2:** Recognize and respond to the wonders and challenges of the natural environment, both biological and physical.

**AA3:** Use research and technology skills to access information from multiple sources; use critical thinking and problem-solving skills to evaluate and synthesize information to form conclusions, ideas, and opinions.

**AA4:** Express ideas clearly and creatively in diverse ways through the fine and performing arts, speech and writing.

**AA7:** Enter and perform effectively in the work force.

**AA8:** Develop skills that improve personal well-being and enhance professional potential.

**AA10:** Pursue lifelong learning.

*Bold indicates the strong tie with GEOG 101L SLOs.

What skills or competencies are necessary for the student to perform the selected SLOs?
<table>
<thead>
<tr>
<th>What skills or competencies are necessary for the student to perform the selected SLOs?</th>
</tr>
</thead>
<tbody>
<tr>
<td>College level reading and writing, and elementary math.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What instructional methods or materials are used to prepare the students?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hands-on exercises in the lab</td>
</tr>
<tr>
<td>Many scientific equipment such as a digital thermometer, GPS unit and GIS software</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What assessment task(s) or tools are being used to assess the outcomes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the criteria for success?</td>
</tr>
<tr>
<td>Lab exercises and the semester project (capstone project) are used to assess the SLOs.</td>
</tr>
<tr>
<td>The results of the lab exercises and the semester project are evaluated using a standard grading scale.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What are the results of the assessment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>See attached.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How will you use the results? What changes do you propose to improve student learning? When?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall achievement was excellent. However, I noticed, in some lab exercises, that some students were confused because of deteriorating equipment. To improve student learning, we need to replace those as soon as possible.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Will the changes require funding? How much will the changes cost?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, we need new equipment. Probably about $100.</td>
</tr>
</tbody>
</table>

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) report.

IEC, March 2006
Revised April 7, 2006
Revised April 12, 2006
## Assessment of Course Student Learning Outcomes

**COURSE ALPHA/NUMBER: IS 201**

**Semester/Year:** Spring 2007

**Instructor:** Clyde Tamarul/Winston Kong

**Date Submitted to Department Chair:** May 12, 2007

### Identify the Course Student Learning Outcomes assessed this semester.
- Understanding the value of land and water (fresh and marine) both past present and future
- Demonstrate a sensitivity and appreciation for the diversity of a community and perform effectively as a team
- Demonstrate an understanding of the relationship/responsibility between oneself and the environment

### How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

**Academic Subject Certificate (ASC) in Bio-Resources and Technology (Bio-Resource Development and Management)**
- prepares students for careers in biotechnology and environmental science/studies
- qualifies them to transfer to bachelor of science degree programs.
- Prepares students to become productive and efficient users of natural resources and promote sustainable practices.

### What skills or competencies are necessary for the student to perform the selected SLOs?
- Creativity
- Ability to conduct research
- Demonstrate competency in writing
- Verbal communication
- Social Interactions

### What instructional methods or materials are used to prepare the students?

**IS 201** uses a combination of lectures from various experts and a hands on/experiential approach in the laboratory to align the SLO of the course with the program level outcomes of the ASC. In addition, the entire class are placed in situations (e.g., group projects; community service projects) where their outcome is assessed as a unit.

### What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

- **40%** of a student's grade is determined by two written exams where questions (n=4-5 per exam) are provided one week in advance. The actual exam question is randomly chosen on the day of the test. Grade is based on the basis of content and quality of writing.

- **20%** of their grade is dependent on a group presentation on a topic covered during the course period. It is made at the end of the semester and equivalent to a midterm exam. One grade is assigned to the entire group that is based on the quality and quantity of their presentation made to the class and instructors.

- **20%** of their grade is dependent on the construction of an implement used in ancient times, a written report and an oral presentation. The presentation of the implement and how it is used takes place at the end of the class and is a culminating event for the class. Quality of the implement, the written report and the oral presentation are used as criteria for success.

- **20%** of their grade is based on attendance to lectures and field trips. Field trips are designed to expose students to the various components of an ahupuaa but also involves a service/learning component at each site visited. Active student participation is the main criteria for success.

### What are the results of the assessment?

Written and verbal skills are easily assessed as there are many opportunities provided. In general there is a relative
Appendix C

**What are the results of the assessment?**
Written and verbal skills are easily assessed as there are many opportunities provided. In general there is a relative improvement in both skills for the majority of students as the course progresses. The largest change, and differs with each class, is usually with interactions of the class as a whole. When the class begin to actively start working as team(s) rather than individuals becomes very clear but can differ between the dynamics of the class. When it does happen it is also apparent that understanding of the relationships/interdependence with each other and with the environment has started to take place (i.e., can be used as a measure of the instructors success).

**How will you use the results? What changes do you propose to improve student learning? When?**

A numerical score is provided for each of the assessment tools and used to calculate their overall grade for the class. Bringing in additional speakers with varied backgrounds but still pertinent to the ahupuaa can certainly improve student learning. Likewise, the field sites visited and service learning activities can be changed.

Changes made during the onset of the next time the class is held.

**Will the changes require funding? How much will the changes cost?**

NO external funding required.

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports and

IEC, March 2006
Revised April 7, 2006
Revised April 12, 2005
### Assessment of course Student Learning Outcomes

**COURSE ALPHA/NUMBER:** MICRO 130  
**Semester/Year:** Fall 2006  
**Instructor:** Ingelia White  
**Date Submitted to Department Chair:** Jan. 2, 2007

#### Identify the Course Student Learning Outcomes assessed this semester.

1. Describe the main morphological characteristics, growth, reproduction and classification of algae, bacteria, fungi, protozoa, viruses and helminthes
2. Discuss etiologies, reservoirs of infection, modes of transmission, signs, symptoms, and treatments and/or methods of prevention of common infectious diseases of humans
3. Describe the basic principles of molecular genetics as they relate to cell division, mutation, genetic engineering, protein synthesis, bacterial virulence, and antibiotic resistance
4. Describe pathogenicity, immunity and allergies

#### How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?

The above SLOs align with the AA-Liberal Arts and ASC in Bio-Resources and Technology (Plant Biotechnology) learning outcomes.

#### What skills or competencies are necessary for the student to perform the selected SLOs?

1. Distinguish characteristics (morphology, growth, reproduction, classification of bacteria, fungi, viruses, protozoa, algae and helminthes
2. Discuss etiology, mechanisms of pathogenicity, modes of transmission, sign and symptoms of the diseases
3. Describe DNA multiplication and protein synthesis
4. Analyze specific and non-specific defense systems and immune system disorders

#### What instructional methods, materials, or courses are used to prepare the students?

Lectures, discussions, text-book, hand-outs, transparency papers, Power Point presentations, CD-Roms and DVDs.

#### What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

**Assessment tools:**
- Embedded assessment evaluating student achievements as stated in student learning outcomes
- Exams
- Homework assignments
- Students’ journals

**Criteria for success:**
- 73% of students received final grade point average higher than 86% of total possible points (550).
- 100% of students achieved embedded assessment ratings between 2 – 3 (achieves to exceeds the “skills or competencies”).

#### What are the results of the assessment?

The average embedded assessment rating is 2.16 (see table). This number exceeds the expected benchmark of 2.

---

Natural Sciences Department Annual Report for 2006-07

131
Appendix C

How will you use the results? What changes do you propose to improve student learning? When?
Assessment results are shared and discussed with students to enable them to know what the status of their performance and to encourage them to achieve higher skills and competencies. Students are monitor individually to reach these goals. The table and chart below show a great improvement made toward the end of the semester.
<table>
<thead>
<tr>
<th>Will the changes require funding? How much will the changes cost?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
</tbody>
</table>

Submit this form to:
- Your department chair for inclusion in End-of-the-Year (EOY) department reports.

Modified from IEC Course- Natural Sciences Department Annual Report for 2006-07 December 2006
<table>
<thead>
<tr>
<th>Student Learning Outcome</th>
<th>Skills &amp; Competencies</th>
<th>0 No Evidence</th>
<th>1 Developing</th>
<th>2 Achieves</th>
<th>3 Exceeds</th>
<th>Average SLO Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Characteristics of algae, bacteria, fungi, protozoa, viruses &amp; helminthes</td>
<td>a) Distinguish their growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) morphology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) reproduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) classification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Infectious diseases</td>
<td>a) Discuss etiology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) reservoir of infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) modes of transmission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) signs and symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) treatment/prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Principles of molecular genetics</td>
<td>a) cell division</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) cell mutation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) genetic engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) protein synthesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) bacterial virulence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>f) antibiotic resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Pathogenicity</td>
<td>a) describe mechanisms of pathogenicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Immunity</td>
<td>a) non-specific defence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Specific defence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) disorders of immune system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average: __________________

Standard: __________________
# Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER: MICRO 140</th>
<th>Semester/Year: Fall 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Ineglia White</td>
<td>Date Submitted to Department Chair: Jan. 2, 2007</td>
</tr>
</tbody>
</table>

## Identify the Course Student Learning Outcomes assessed this semester.
1. Operate equipment used in microbiology laboratory
2. Prepare growth media
3. Perform aseptic transfer
4. Identify microorganisms using morphological and physiological tests
5. Follow biosafety procedures
6. Produce lab reports using the standard scientific format

## How do the above SLOs align with the Associate of Arts or certificate program-level outcomes?
The above SLOs align with the AA-Liberal Arts and ASC in Bio-Resources and Technology (Plant Biotechnology) learning outcomes

## What skills or competencies are necessary for the student to perform the selected SLOs?
- Operate microscope, analytical balance, water bath, and autoclave
- Prepare culture media and reagents
- Perform microbial inoculations
- Adhere to biosafety codes
- Identify unknown microorganism cultures for diagnostic purpose
- Submit scientific lab reports

## What instructional methods, materials, or courses are used to prepare the students?
Lab manuals, hand-outs, dry runs, lab exercises

## What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?
**Assessment tools:**
- Embedded assessment evaluating students achievements as stated in the student learning outcomes
- Lab exams
- Lab reports
- Identification of unknown microorganism cultures

**Criteria for success:**
- 91% of students received final grade point average higher than 86% of total possible points (720)
- 100% of students achieved embedded assessment ratings between 2 – 3 (achieves – exceeds in “skills or competencies”)

## What are the results of the assessment?
The average embedded assessment rating is 2.9. This number is far greater than the average benchmark of 2, and it almost reaches the highest score of 3.
Appendix C

How will you use the results? What changes do you propose to improve student learning? When?
Assessment results are shared and discussed with students to enable them to know what the status of their performance and to encourage them to achieve higher skills and competencies. Students are monitor individually to reach these goals. The table and chart below show a great improvement made toward the end of the semester.

Micro 140, Fall 2006

<table>
<thead>
<tr>
<th>SLO</th>
<th>S &amp; C</th>
<th>1st</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 a)</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2 a)</td>
<td>1.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3 a)</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4 a)</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5 a)</td>
<td>1.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>1.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>6 a)</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Micro 140, Fall 2006 Chart

![Chart Showing Improvement](image-url)
Appendix C

Will the changes require funding? How much will the changes cost?
No changes will be necessary.

Submit this form to:
  • Your department chair for inclusion in End-of-the-Year (EOY) department reports.
### Student Learning Outcome

<table>
<thead>
<tr>
<th>Skills &amp; Competencies</th>
<th>0 No Evidence</th>
<th>1 Developing</th>
<th>2 Achieves</th>
<th>3 Exceeds</th>
<th>Average SLO Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Operate lab equipment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Microscope: focused specimens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b). Balance accurate measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c). Autoclave: tools and media</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Prepare growth media</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Measuring ingredients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b). Mixing &amp; pouring to glassware</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. Perform aseptic transfer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Sterilizing: work station, inoculating tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b). Inoculating: in liquid and solid media</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Identify microorganisms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Performing all lab modules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5. Follow biosafety procedures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Using lab attire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b). Washing hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c). Emergency kits/tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6. Produce scientific lab reports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Writing: Introduction, Methods, Results, Conclusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average: ______________________
Standard: _____________________
Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER:</th>
<th>PHYS 151</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester/Year:</td>
<td>Fall 2006</td>
</tr>
<tr>
<td>Instructor:</td>
<td>Joseph Ciotti</td>
</tr>
<tr>
<td>Date Submitted to Department Chair:</td>
<td>Apr 17, 2007</td>
</tr>
</tbody>
</table>

Identify the Course Student Learning Outcomes assessed this semester.

1. Demonstrate a general understanding of the underlying philosophy of the physics, including the scientific method
2. Apply the basic concepts of physics, including mechanics, energy, simple oscillatory systems, gas laws and fluid dynamics
3. Apply the concept of conservation laws in problem solving
4. Apply basic algebraic and graphical analysis techniques to physics problems.
5. Compare and contrast macroscopic and microscopic systems in physics
6. Define quantitatively and qualitatively the common terms used in physics
7. Assess the limitations of the scientific method and apply error analysis
8. Determine when to apply physics principles to everyday situations.

How does the above course SLOs align with the institution level, program level, and department level outcomes?

SLOs were evaluated during Fall 2006 using a pre/post test assessment and determined to align with the AA program and department outcomes.

1. ability to apply critical thinking skills, especially as related to quantitative problem solving
2. mathematics skills in algebra and basic trigonometry as well as geometry.
3. graphical analysis, including familiarity with software applications involving statistics and graphical curve fitting
4. skills using scientific hand calculators
5. ability to qualitatively articulate basic physical concepts

What instructional methods or material are used to prepare the students?

Lecture, demonstrations, computer tutorial, student workbooks, models and class discussion and problem solving sessions
What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?

Pre/post test instrument based on material drawn from course SLOs.

What are the results of the assessment?

The chart below shows consistent improvement between pre- and post-test for all students administered this instrument. A t-test for paired pre- and post-test scores yielded a highly significant p value < 0.0001. Mean of Pre-Test minus Post-Test = -8.13 (95% confidence interval of this difference ranges from -9.37 to -6.90.)

How will you use the results? What changes do you propose to improve student learning? When?

An item analysis will assist in determining which topics of discussion require revision. Implementation in Fall 2008.

Will the changes require funding? How much will the changes cost?

No

Submit this form to your department chair for inclusion in End-of-the-Year (EOY) department reports.

The results of the assessment are not used for promotion or tenure.

IEC, March 2006
Appendix C

Assessment of Course Student Learning Outcomes

<table>
<thead>
<tr>
<th>COURSE ALPHA/NUMBER:</th>
<th>ZOOL 142</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester/Year:</td>
<td>Spring, 2007</td>
</tr>
<tr>
<td>Instructor:</td>
<td>Ross Langston</td>
</tr>
<tr>
<td>Date Submitted to Department Chair:</td>
<td>5/16/16</td>
</tr>
</tbody>
</table>

**Identify the Course Student Learning Outcomes assessed this semester.**

1) Describe the anatomy and function of the circulatory, lymphatic, endocrine, digestive, urinary, and reproductive systems.

3) Describe how lipids, carbohydrates, proteins, and nucleic acids are digested, assimilated, and catabolized to obtain energy and raw materials.

4) Discuss how negative feedback maintains homeostasis in the human body.

5) Explain how disease and disorders disrupt the homeostasis of each of the above body systems and discuss how common medical treatments and drugs are used to restore homeostasis.

**How do the above course SLOs align with the Associate of Arts or certificate program-level outcomes?**

The above SLOs align well with the AA and Natural Sciences department outcomes.

**What skills or competencies are necessary for the student to perform the selected SLOs?**

- Knowledge of the major anatomical components of body systems
- Recognition of anatomical terms
- Detailed understanding of major biological concepts
- Familiarity with dietary macromolecules (proteins, carbohydrates, lipids, and nucleic acids) and their monomers

**What instructional methods or materials are used to prepare the students?**

1) Lectures
2) Demonstrations and models.
3) Complimentary WebCT site.
4) In-class discussions
5) Game
6) Detailed study guides.

**What assessment task(s) or tools are being used to assess the outcomes? What are the criteria for success?**

**Assessment Tools:**

1) End of semester Knowledge Survey (Attachment 1)
2) Knowledge Survey Scoring Rubric (Attachment 2)
3) Questions embedded in lecture exams

**Criteria for Success**

1) Score average $\geq 3$ on Knowledge Survey questions.
2) Score average $\geq 70\%$ on embedded questions.
What are the results of the assessment?

**Figure 1.** Ability of students to list major anatomical components and functions of body systems covered in ZOOL 142 (from Knowledge Survey question # 5; applies to SLO #1). Student comprehension was lowest for endocrine system (mean = 2.42) and highest for urinary system (mean= 3.56). All other averages were ≥ 3. Note that the endocrine system was the first topic covered in the semester whereas the urinary and reproductive systems were covered last.
Figure 2. Student comprehension of major concepts covered in ZOOL 142. Applies to SLOs #4 (Knowledge Survey questions 1 & 2) and #5 (questions 3 & 4). Students showed satisfactory comprehension of homeostasis and negative feedback but were less familiar with the effects of disease or injury on homeostatic balance. Likewise, many were unable to satisfactorily explain how common medical treatments restore homeostasis of a body system.
What are the results of the assessment?

Figure 3. Outcome of embedded assessment for SLO #3 (knowledge of mechanisms of fat, carbohydrate, protein and nucleic acid digestion). Students scored poorly (<50% of students responding correctly) on questions 61 (lipid transport) and 71 (lipid absorption) indicating more emphasis is needed for these topics. Students scored well (>80% correct responses) on questions 57 (major locations of nutrient absorption), 64 (rates of digestion), and 67 (functions of salivary glands) indicating coverage and emphasis of these topics are adequate. All other questions rated between 50-79% correct. Overall average was 65%.
Appendix C

Zoology 142 Exit Survey

Name__________________________ Date____

1) What is homeostasis?

2) Give a detailed example of how negative feedback maintains homeostasis in the human body. (A diagram will suffice).

3) Explain how disease/illness disrupts the homeostasis of a body system.

4) How are common medical treatments and drugs used to restore homeostasis?
5) possible

Circulatory System:

Respiratory System:

Reproductive System:

Urinary System:

Lymphatic/ Immune System:

Endocrine System:
### Appendix C

#### Scoring Rubric for ZOOL 142 Exit Survey: Questions 1-4

**SLOs Assessed:**
- #4: Discuss how negative feedback maintains homeostasis in the human body (Q's 1-2)
- #5: Explain how disease and disorder disrupt the homeostasis of body systems and discuss how common medical treatments and drugs are used to restore homeostasis.

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>5 - Reflects detailed and comprehensive understanding</th>
<th>4 - Above average understanding of concept</th>
<th>3 - Average understanding of concept</th>
<th>2 - Cursory/Incomplete understanding of concept</th>
<th>1 - Little or no understanding of concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is Homeostasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Give a detailed example of how negative feedback maintains homeostasis.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Explain how disease/illness disrupts homeostasis of a body system.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>How are common treatments and drugs used to restore homeostasis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total**

#### Scoring Rubric for ZOOL 142 Exit Survey: Question 5

**SLOs Assessed:**
- #1: Describe the anatomy and function of the circulatory, respiratory, endocrine, digestive, urinary and reproductive systems and discuss how these systems maintain homeostasis in the human body.

**Question #5:** List the components and functions of each of the following body systems. Be as detailed as possible.

<table>
<thead>
<tr>
<th>#</th>
<th>Body System</th>
<th>5 - Lists multiple components as well as major and minor functions</th>
<th>4 - Lists multiple functions and components</th>
<th>3 - Lists BOTH major function AND component(s)</th>
<th>2 - Lists at least one major function OR component</th>
<th>1 - Cannot list major components or functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Circulatory System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Respiratory System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Reproductive System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Urinary System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>Lymphatic &amp; Immune System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>Endocrine System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total**
Appendix D. Individual Accomplishments and Goals