De Anza College **SLO ARCHIVE**

Student Learning Outcomes for PHYS 4D

Physics for Scientist and Engineers (Modern Physics)

Team Members:

Team Leader:
Eduardo Luna () in PHYS

Other members:

1. David Newton (x8668) PHYS

Additional team members/notes about team:

Ron Francis, David Newton,

Additional Notes:

Outcomes:

Outcome 1 Phase I: Statement

Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of modern physics.

Outcome 1 Phase II: Assessment Strategy Used:

Assessment Quarter: Spring 2011
Assessors: Eduardo Luna
Assessment Tools: *No tools assigned*.
Sections being assessed: 01

Outcome 1 Phase III: Reflect & Enhance

Number of people involved in Phase III: 1

Changes:

Methods:
As assessment tools we used selective new un-encountered problems on the lecture final. Assessment was then based on the scores obtained on these selective problems on an

individual and overall class basis. The following problem on the lecture final was used as an assessment:A particle of mass m moves in a 2-dimensional box of sides x = L and y = L. a.Starting with the Time-Independent Schrodinger Equation derive the wavefunctions (do not normalize). (Hint: Try using Separation of Variables)b.Determine the momentum of the particle.c.Determine the energy of the particle.d.Find the energy of the ground state and the first excited state and explain if any are degenerate.e.Write down the complete wavefunction(s) for the first excited state (do not normalize).

Findings and Conclusions:
a) 50% of the class was able to solve the problem correctly, 20% did acceptably well, and 30% did not perform well.b) 30% of the class needed to improve their analytical and problem solving skills.c)50% success was acceptable for the class, but not outstanding.d)Areas for improvement would be to further help students develop their analytical and problem solving skills using the principles/laws/theories of quantum mechanics.e) The results are typical in this type of class and reasonably acceptable considering the size and difficulty of the class.

Enhancement (Planned Actions)
Part I:
The assessment results suggested areas of student learning improvement. In order to improve student learning and success, the instructor should address the SLOs and the assessment results in an effective pedagogical approach.

Part II:
Supplementing our teaching methods with computer-based technology and traditional physics demonstrations would be ideal to help students understand physics principles from a conceptual and practical viewpoint.

Outcome 2 Phase I: Statement

Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories.

Outcome 2 Phase II: Assessment Strategy Used:

Assessment Quarter: Spring 2011
Assessors: Eduardo Luna
Assessment Tools: •
Sections being assessed: 01

Outcome 2 Phase III: Reflect & Enhance

Number of people involved in Phase III: 1

Changes:

Methods:
Proper knowledge of the Scientific Lab Report as accessed in the lab final including;

scientific measurements with uncertainties, error analysis, calculations, and hands-on experience with the experimental method. The following problem was used as an assessment in the lab:BOHR QUANTUM MODELA. HYDROGEN SPECTRUMThe following is a set of data for the hydrogen spectrum in the Bohr Quantum Model experiment:A.red emission line (first order) was observed at an angle of 11.360B.green emission line (first order) was observed at an angle of 8.390C.blue emission line (first order) was observed at an angle of 7.470D.The grating used had 300 lines/mmUse this data and EXCEL to obtain the equation of the best curve-fit such that the slope is related to the Rydberg constant. Obtain the Rydberg constant from the equation and calculate the percent error. From the equation calculate the final quantum number for the electronic transition of the electron for this given data. a)Explain why the Mercury light source was not used in this experiment.b)Measure the angle reading to the correct number of significant figures on the spectrometer provided.B. HELIUM SPECTRUMa)Based on your experimental data for Zeff = 1.34, Z= 1, and Z = 2 can you associate any of the spectral lines with the initial and final quantum numbers ni and nf ? Copy your experimental data from your lab notebook below to answer this question and explain clearly the logic/procedure you used to make your conclusion. b)For any of these Z values explain why or why not did the Bohr Quantum Model successfully describe the helium spectrum?c)If systematic and random errors could be neglected, would you expect the Bohr Model to successfully explain the He spectral lines? How about the spectral lines of other atoms? Give supporting evidence/argument to explain your answer.

Findings and Conclusions:
a) About 60% of the class was able to solve the problem correctly, 30% did acceptably well, and 10% did not know how to solve it.b) 60% success was partially acceptable for the class and thus there weren't any apparent student needs and issues revealed.c)60% success on error analysis was acceptable for the class, but not outstanding.d)Area for improvement would be to further help students develop a conceptual and practical understanding of the physics principles in the lab.e)Based on previous performances for such a class, the results are reasonably acceptable.

Enhancement (Planned Actions)
Part I:
The assessment results suggested areas of student learning improvement. In order to improve student learning and success, the instructor should address the SLOs and the assessment results in an effective pedagogical approach.

Part II:
Supplementing our teaching methods with computer-based technology and traditional physics demonstrations would be ideal to help students understand physics principles from a conceptual and practical viewpoint.

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