

Modern Physics Objective Rubric

Course: _____

Date: _____

Assignment: _____

Instructor: _____

Objective: *Students will apply understanding and skill related to the principles and concepts of modern physics essential for graduate school and/or professional employment in the field.*

Measure: *Student knowledge for each student learning objective in every mastery level course will be assessed by embedded questions in exams and assignments.*

Target: *Physics majors on a 5 year rolling average will score an average of at least 3.0 out of 5.0 on all modern physics SLO's.*

Instruction: Assess each modern physics SLO on your exam or assignment and enter the average performance score for all physics majors using a scoring system of 0 (Lowest) through 5.0 (Highest). If SLO was not assessed, mark N/A.

#	Student Learning Outcome	Score
1.	Demonstrated ability to solve relativity of space and time problems.	
2.	Demonstrated ability to solve relativistic mass, energy, and momentum problems.	
3.	Demonstrated ability to solve problems involving the quantization of mass, charge, light, and energy including Avogadro's number, black-body radiation, photoelectric effect, and Compton scattering.	
4.	Described various models of the atom and explained why each was proposed and rejected except for the quantum model.	
5.	Demonstrated ability to apply wave-particle duality and uncertainty principle to solve physics problems.	
6.	Demonstrated ability to solve quantum mechanical eigenvalue equations for various operators and obtain expectation values of the corresponding observables.	
7.	Demonstrated ability to solve 1-D quantum problems including the quantum particle in a box, a well, the simple harmonic oscillator, and the transmission and reflection of waves.	
8.	Demonstrated ability to solve 3-D quantum problems including dealing with separation of variables, quantization of orbital angular momentum, electron spin, spin-orbit coupling, and total angular momentum.	
9.	Demonstrated ability to solve problems involving the wave functions of the hydrogen atom and explain the organization of the periodic table of the elements.	
10.	Demonstrated ability to apply the classical Maxwell-Boltzmann distribution and the equipartition theorem to solve physics problems.	
11.	Demonstrated ability to solve problems involving the determination of the commutation relation between two operators.	
12.	Demonstrated ability to apply perturbation theorem and variational principle to solve problems.	
13.	Demonstrated ability to apply nuclear energy level diagrams to solve problems involving alpha, gamma, and isobaric decay.	
14.	Demonstrated ability to solve problems involving photon attenuation through materials.	
15.	Demonstrated ability to solve problems involving the properties of the nucleus including radius, binding energy, etc.	