



Pre-AP Physics

CareerTech Pre-AP Physics is the study of the nature of matter and energy and how they interrelate. It will provide the student with a foundation for understanding concepts and laws of modern physics, as well as providing a good foundation for AP Physics course curriculum. CareerTech Pre-AP Physics will align with Oklahoma *Priority Academic Student Skills (PASS)* and National Science Education Standards. Physics education is essential for those preparing for a career in science and those that will be touched by aspects of it through technology, medicine, engineering, architecture, biomechanics, and many other related fields. CareerTech Pre-AP Physics will give the student hands-on lab experience and will reinforce crucial math & critical thinking skills.

Pre-AP Physics will give the student a set of basic models in the core content of Physics. The student will collaboratively make and use these models to describe, explain, predict, design, and control physical phenomena. Technology will be an essential tool used throughout the course to collect, organize, analyze, visualize, and model real data which allows the student to conceptually understand the principles of Physics. Students will then be able to evaluate scientific models through comparisons with empirical data. This course will focus on the development of the student as a scientist through the study of physics. Being a scientist requires a broad set of tools, including theory, problem solving, written and oral communication, interpreting data and laboratory skills.

Course Description

This course will cover kinematics in one and two dimensions, as well as forces and vectors. Students will study work, energy, and power that will then lead into the study of momentum and the conservation of energy. Circular motion and gravitation, translational and rotational equilibrium, fluid mechanics and thermal physics will be covered. The students will study electricity and magnetism then look at waves and optics. A final subject area will be atomic and nuclear physics. Good math skills are critical to success in this course. Prerequisites: Biology I, Algebra I, Geometry, Algebra II or concurrently enrolled.

Requirements for College Admission Status (Title 70 O.S. § 11-103.6)

These courses are to be taught by a highly qualified teacher with an Oklahoma Physics teaching certification. The students should be in the eleventh or twelfth grade or if a sophomore, they should be in a Focused Field of Career Study program. The course should consist of 40% laboratory or fieldwork in order to be considered a lab science. The course will have at a minimum, but may exceed, a duration of 120 hours within a school year (72 hours theory/48 lab hours).



Pre-AP Physics

Objective	National Science Education Standards 9-12 Content Standard	Oklahoma PASS Physics Standards
I. Physics Skills		
A. Math Review: Algebra, equations, trig functions, scientific notation, significant figures	A	NA
B. Understand SI Units of Measurement	A	Process & Inquiry 1.3
C. Use common metric prefixes	A	Process & Inquiry 1.3
D. Practice unit conversions	A	NA
E. Recognize linear and direct relationships and interpret the slope of a curve	A	Process & Inquiry 2.3, 6.4
F. Recognize quadratic and inverse relationships	A	Process & Inquiry 2.3, 6.4
G. Be able to graph data points and interpret the graph	A	Process & Inquiry 2.3, 6.4
H. Be able to use dimensional analysis to test validity of an equation	A	NA

I. Define physics and explain its role and scope	A	NA
I. Activities/Labs		
a. Math exercises-worksheets, games, etc.	A	Process & Inquiry 1.3
b. Scientific Method/Inquiry Lab	A	Process & Inquiry 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
II. Kinematics in One & Two Dimensions		
A. Have an understanding of frame of reference	A	Content- 1.1
B. Understand the difference between distance and displacement and between speed and velocity	A, B	Content- 1.1
C. Be able to interpret and plot position-time graphs	A, B	Content- 1.1
D. Distinguish between average speed and average velocity	A, B	Content- 1.1
E. Understand the concept of instantaneous velocity.	A, B	Content- 1.1
F. Learn to use an organized strategy for solving motion problems	A, B	Content- 1.1
G. Calculate the	A, B	Content- 1.1

displacement of an object from the area under a velocity-versus-time curve.		
H. Understand what acceleration is and how to solve for it.	A, B	Content- 1.1
I. Be able to solve motion problems in which the acceleration is due to gravity.	A, B	Content- 1.1
J. Determine the acceleration from the curves on a velocity-time graph	A, B	Content- 1.1
K. Use the kinematics equations to solve problems for objects moving at a constant acceleration in a straight line	A, B	Content- 1.1
L. Differentiate between scalar and vector quantities	A, B	Content- 1.1
M. Determine the resultant of two or more vectors using the component method of vector addition	A, B	Content- 1.1
N. Determine the resultant of two or more vectors by graphical method	A, B	Content- 1.1
O. Solve problems involving projectile motion for projectiles fired horizontally and projectiles fired at	A, B	Content- 1.1

an angle		
P. Understand centripetal acceleration of objects and be able to apply Newton's laws to such motion	A, B	Content- 1.1
Q. Understand simple harmonic motion and it's components	A, B	Content- 1.1
II. Activities & Labs		
a. Create motion graphs	A, B, E	Content- 1.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 5.1, 5.2, 5.3, 6.4
b. Do activities utilizing constant velocity video analysis	A, B, E	Content- 1.1 Process & Inquiry 1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
c. Investigate situations with uniformly accelerated motion	A, B, E	Content- 1.1 Process & Inquiry 1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
d. Determine the range of projectiles	A, B, E	Content- 1.1 Process & Inquiry 1.1,

		1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
e. Investigate simple harmonic motion by use of a pendulum	A, B, E	Content- 1.1 Process & Inquiry 1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
III. Forces		
A. Know Newton's Three Laws of Motion and applications of each	A, B, G	Content- 1.1
B. Know what a force is and the four forces that physicists recognize	A, B, G	Content- 1.1, 1.2, 1.3, 1.4
C. Use Newton's Second Law to solve problems	A, B	Content- 1.1
D. Distinguish between weight and mass	A, B	Content- 1.1
E. Demonstrate an understanding of frictional forces and distinguish between static and kinetic	A, B	Content- 1.1
F. Understand net force and be able to calculate the acceleration that results	A, B	Content- 1.1
G. Understand	A, B	Content- 1.1

“free fall” and the causes of air resistance and terminal velocity		
III. Activities & Labs		
a. Atwood’s Machine Labs	A, B, E	Content- 1.1 Process & Inquiry1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
b. Friction Labs	A, B, E	Content- 1.1 Process & Inquiry1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
c. Labs demonstrating Newton’s 1 st Law	A, B, E	Content- 1.1 Process & Inquiry1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
d. Labs demonstrating Newton’s 2 nd Law	A, B, E	Content- 1.1 Process & Inquiry1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8,

		6.3, 6.4
e. Labs demonstrating Newton's 3 rd Law	A, B, E	Content- 1.1 Process & Inquiry 1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 6.3, 6.4
IV. Universal Gravitation		
A. List and understand Kepler's Laws	A, B, G	Content- 1.2
B. Be able to calculate periods and velocities of orbiting objects	A, B, D	Content- 1.2
C. Understand Newton's law of gravitational force is proportional to both masses and the inverse square of the distance between the centers of spherical bodies	A, B, G	Content- 1.2
D. Understand the concept of weightlessness	A, B, C	Content- 1.1, 1.2
IV. Activities & Labs		
a. Center of gravity experiments	A, B, C, E	Content- 1.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3,

		6.4
b. Plot a planetary orbit, applying Kepler's Laws	A, B, D, E	Content- 1.2 Process & Inquiry 1.3, 5.1, 5.2, 5.3
c. Lab that demonstrates centripetal acceleration and centripetal force of an object in circular motion	A, B, E	Content- 1.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
V. Momentum		
A. Understand the meaning of momentum and impulse	A, B	Content- 2.1
B. Apply conservation of momentum to a variety of problems	A, B	Content- 2.1
C. Distinguish between elastic and inelastic collisions	A, B	Content- 2.1
D. Solve conservation of momentum problems for elastic and inelastic collisions	A, B	Content- 2.1
V. Activities & Labs		
a. Conservation of momentum labs	A, B, E	Content- 2.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2,

		4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Design products to reduce momentum	A, B, E	Content- 2.1 Process & Inquiry1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
VI. Work, Energy, & Power		
A. Be able to use the mathematical formulas for work, potential energy, kinetic energy, and power to find the an unknown variable	A, B	Content- 2.1, 2.2
B. Understand the concept of mechanical advantage	A, B	Content- 2.2
C. Be able to calculate kinetic energy and apply the work-energy theorem	A, B	Content- 2.1, 2.2
D. Be able to calculate the gravitational potential energy of a system	A, B	Content- 1.2, 2.1, 2.2
E. Demonstrate an ability to solve problems using the law of conservation of energy	A, B	Content 2.1

VI. Activities & Labs		
a. Conservation of energy labs	A, B, E	Content- 2.1, 2.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Field trips to amusement parks/playgrounds	A, B, E	Content- 2.1, 2.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 4.2, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.2, 6.3, 6.4
c. Constructing models to demonstrate the conservation of energy in a system	A, B, E	Content- 2.1, 2.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 4.2, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.2, 6.3, 6.4
VII. Thermal Physics		
A. Understand the nature of thermal energy as explained by the kinetic theory	A, B, F	Content- 2.3
B. Know the difference between thermal energy and temperature	A, B	Content- 2.3

and/or heat		
C. Understand what specific heat is and be able to calculate heat transfer	A, B	Content- 2.3
D. Describe and use the Celsius and Kelvin temperature scales and be able to convert between them	A, B, G	Content- 2.3
E. Understand and be able to calculate the application of conservation of energy to heat transfers	A, B	Content- 2.1, 2.3
F. Explain the first and second laws of thermodynamics	A, B	Content- 2.3
G. Understand the three mechanisms of heat transfer: conduction, convection, and radiation	A, B	Content- 2.3
H. Understand and apply the relationship between pressure, volume, and temperature of an ideal gas.	A, B	Content- 2.3
I. Apply a relationship to determine the ideal efficiency of a heat engine	A, B	Content- 2.3
VII. Activities & Labs		

a. Labs that investigate thermal energy transfer	A, B, E	Content- 2.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Activity that allows observation of the disorder associated with temperature in liquids	A, B, E	Content- 2.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 4.2, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.2, 6.3, 6.4
VIII. States of Matter		
A. Understand the origin of Pascal's and Archimedes' principles and their applications	A, B, G	Content- 2.3
B. Explain Bernoulli's principle and its applications in producing lift	A, B, G	Content- 2.3
C. Be able to figure the rate of flow of a fluid	A, B	Content- 2.3
D. Have an understanding of the origin of thermal expansion and be able to solve problems using linear thermal expansion. Be able to state some examples of	A, B	Content- 2.3

applications and difficulties caused by thermal expansion		
E. Describe how cohesive and adhesive forces cause surface tension and capillary action	A, B	Content- 2.3
F. Discuss properties of solids such as elasticity	A, B	Content- 2.1, 2.2, 2.3
VIII. Activities & Labs		
a. Density determination labs	A, B, E	Content- 2.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Investigate the buoyancy of objects	A, B, E	Content- 2.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
c. Archimedes' principle Demo	A, B, E	Content- 2.3 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
IX. Electric Force, Potential,		

and Field		
A. Recognize the basic properties of the electrical interaction	A, B	Content-1.3, 1.4
B. Use Coulomb's law to solve problems related to electrical force	A, B	Content- 1.3
C. Describe the differences between conductors and insulators	A, B	Content- 1.3
D. Know the SI unit of charge and understand the vector nature of the electric force	A, B	Content- 1.3
E. Be able to solve problems related to charge, electric field, and forces	A, B	Content- 1.3
F. Define the electric potential difference in terms of work done moving a unit test charge and distinguish potential from potential difference	A, B	Content- 1.3
G. Know where charges reside on solid and hollow conductors and recognize the relationship between conductor shape and field strength	A, B	Content- 1.3
H. Define capacitance and solve parallel-plate capacitor problems	A, B	Content- 1.3

IX. Activities & Labs		
a. Investigation of static electricity	A, B, E	Content- 1.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Electroscope activities and demo	A, B, E	Content- 1.3 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
X. Electric Current		
A. Define electric current and the ampere and describe conditions that permit current flow	A, B	Content- 1.3
B. Understand resistance and state Ohm's law	A, B	Content- 1.3
C. Be able to draw circuits and understand energy transfer in them	A, B	Content- 1.3
D. Explain the definition of power in electric circuits and solve problems involving current, potential difference, and power	A, B	Content- 1.3
E. Diagram simple electric circuits and recognize the	A, B	Content- 1.3

correct use of ammeters and voltmeters		
F. Explain how electric energy is converted into thermal energy	A, B	Content- 1.3, 2.3
G. Describe the use of capacitors for energy storage in circuits	A, B	Content- 1.3
H. Describe series and parallel circuits and state the important characteristics of each	A, B	Content- 1.3
I. Define the kilowatt-hour and solve problems involving the use and cost of electrical energy	A, B	Content- 1.3
J. Calculate current, voltage, and equivalent resistance for devices connected in series and in parallel	A, B	Content- 1.3
X. Activities & Labs		
a. Making circuits in series and parallel	A, B, E	Content- 1.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Circuit analysis	A, B, E	Content- 1.3

		Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
c. Drawing electrical schematics	A, B, E	Content- 1.3 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
d. Design circuits to measure an unknown resistance	A, B, E	Content- 1.3 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
XI. Magnetism		
A. Learn the origin of magnetism in materials	A, B, G	Content- 1.4, 3.2
B. Describe the magnetic poles and the interactions between magnets	A, B	Content- 3.2
C. Learn the right hand rule to determine the direction of the magnetic field	A, B	Content- 3.2
D. Calculate the magnetic field of a current-carrying wire	A, B	Content- 3.2
E. Calculate the	A, B	Content- 3.2

magnetic force on a moving charge		
F. Explain the design and operation of an electric motor	A, B	Content- 3.2
XI. Activities & Labs		
a. Magnet exploration experiments	A, B, E	Content- 3.2 Process & Inquiry1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Magnetic field mapping	A, B, E	Content- 3.2 Process & Inquiry1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
c. Construct and modify an electric motor	A, B, E	Content- 3.2 Process & Inquiry1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
XII. Electromagnetic Induction		
A. Explain how a	A, B	Content-

changing magnetic field produces an electric current		1.4, 3.2
B. Describe how an EMF is produced when there is relative motion between a conductor and a magnetic field	A, B	Content- 3.2
C. Explain how an electric generator works and how it differs from a motor	A, B	Content- 3.2
D. Describe Faraday's experiments and his law of electromagnetic induction	A, B, G	Content- 3.2
E. Explain and apply Lenz's law	A, B, G	Content- 3.2
F. Describe a transformer and solve problems involving voltage, current, and turn ratios	A, B	Content- 3.2
G. Describe the generation of electromagnetic waves by accelerated charges and recognize the use of resonance	A, B	Content- 3.2
H. Know the frequency and wavelength of common electromagnetic waves	A, B	Content- 3.2
XII. Activities & Labs		

a. Build an electromagnet	A, B, E	Content- 3.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Investigate appliances that use electromagnetic waves	A, B, E, F, G	Content- 3.2 Process & Inquiry 1.1, 1.2, 3.1, 3.2, 3.4, 3.5, 4.1, 4.2, 4.4, 4.5, 4.7, 6.1, 6.2, 6.3, 6.4
c. Investigate the basic principles of electromagnetism	A, B, E	Content- 3.2 Process & Inquiry 1.1, 1.2, 3.1, 3.2, 3.4, 3.5, 4.1, 4.2, 4.4, 4.5, 4.7, 6.1, 6.2, 6.3, 6.4
XIII. Waves and Energy Transfer		
A. Distinguish between longitudinal and transverse waves and between a pulse and a continuous wave	A, B	Content- 3.1
B. Know the three terms to describe periodic waves: speed, wavelength, and frequency and solve problems using these	A, B	Content- 3.1

quantities		
C. Understand that wave speed is dependent on the medium	A, B	Content- 3.1
D. Understand how constructive and destructive interference results	A, B	Content- 3.1
E. Understand the law of reflection and be able to apply it to problem solving	A, B	Content- 3.1
F. Describe refraction and diffraction in term of behavior of a wave	A, B	Content- 3.1
XIII. Activities & Labs		
a. Labs demonstrating wave motion using a Slinky®, string, springs, etc.	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
B. Standing wave demonstrations	A, B, E	Content- 3.1 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
XIV. Sound		
A. Understand the nature of sound waves	A, B	Content- 3.1
B. Find the speed of sound at	A, B	Content- 3.1

different temperatures		
C. Apply the Doppler effect to problems involving moving sources of moving observers	A, B	Content- 3.1
D. Show an understanding of resonance as applied to an air column and describe a standing wave. This can be done by solving problems involving standing waves in resonating air columns	A, B	Content- 3.1
XIV. Activities & Labs		
a. Doppler Effect Demonstration Lab	A, B, E	Content- 3.1 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
b. Labs measuring the speed of sound	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
c. Making simple wind musical instruments	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 3.1, 3.2, 3.4, 3.5, 4.1,

		4.2, 4.4, 4.5, 4.7, 6.1, 6.2, 6.3, 6.4
d. Demonstration of the construction of a music amplifier	A, B, E	Content- 3.1 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
XV. Optics		
A. Be able to solve problems involving the speed of light	A, B	Content- 3.1
B. Have an understanding of the electromagnetic spectrum and the portion of visible spectrum	A, B	Content- 3.1
C. Define transparent, translucent, and opaque	A, B	Content- 3.1
D. Understand the formation of color in terms of light	A, B	Content- 3.1
E. Describe polarization of light	A, B	Content- 3.1
XV. Activities & Labs		
a. Make a pinhole camera	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Double-Slit Interference Lab	A, B, E	Content- 3.1

		Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
c. Chromatography Lab	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
XVI. Geometric Optics		
A. Explain the law of reflection	A, B	Content- 3.1
B. Understand and apply Snell's law	A, B	Content- 3.1
C. Calculate the index of refraction in a medium	A, B	Content- 3.1
D. Explain total internal reflection and define the critical angle	A, B	Content- 3.1
E. Explain how concave and convex mirrors form real and virtual images	A, B	Content- 3.1
F. Distinguish between converging and diverging lenses	A, B	Content- 3.1
G. Describe how real and virtual	A, B	Content- 3.1

images are formed by lenses		
H. Locate images using ray diagrams and calculate image location and size using equations	A, B	Content- 3.1
I. Calculate image height using the magnification equation	A, B	Content- 3.1
J. Describe Young's double-slit experiment	A, B	Content- 3.1
K. Understand the formation of interference patterns using diffraction gratings	A, B	Content- 3.1
XVI. Activities & Labs		
a. Investigate positions and characteristics of images produced by curved mirrors	A, B, E	Content- 3.1 Process & Inquiry1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
b. Lab that determines the index of refraction of glass using Snell's law	A, B, E	Content- 3.1 Process & Inquiry1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4

c. Lab that determines the wavelength of a laser light	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
d. Demonstrations of reflection and refraction	A, B, E	Content- 3.1 Process & Inquiry 2.1, 5.1, 5.2, 5.3, 6.4
e. Lab that demonstrates the bending of light	A, B, E	Content- 3.1 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
XVII. Atomic and Nuclear Physics		
A. Explain the photoelectric effect	A, B, G	Content- 3.2
B. Describe experiments that demonstrate three particle-like properties of electromagnetic radiation	A, B	Content- 3.2
C. Describe the forms of radioactive decay and solve nuclear equations	A, B	Content- 3.2
D. Define nuclear	A, B	Content- 3.2

fission and chain reaction		
E. Describe the fusion process	A, B	Content- 3.2
XVII. Activities & Labs		
a. Labs that simulate half-life	A, B, E	Content- 3.2 Process & Inquiry 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 5.1, 5.2, 5.3, 6.3, 6.4
b. Research on fusion and fission	A, B, E, F, G	Content- 3.2 Process & Inquiry 3.1, 3.5, 5.1, 5.2, 5.3, 6.4
c. Research on medical applications of radioactivity	A, B, E, F, G	Content- 3.2 Process & Inquiry 3.1, 3.5, 5.1, 5.2, 5.3, 6.4

NA—Not addressed in Oklahoma Physics PASS Objectives

Reference and Resources

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National Science Standards (5th ed). (1998). National Research Council, Washington, D.C., National Academy of Sciences

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