# PHYSICS: CONTENT FOR TEST PREP
# Grades 6-12
# 60 points per certificate

**7/12**
**#1-015-002**

**General Objective**

The purpose of this component is to increase the knowledge and skills of participants in the Physics competencies and skills. Upon successful completion of the component, all participants will have a basic knowledge of curriculum, and material covered on the teacher certification test.

**Specific Objectives**

Upon successful completion of this course, participants will be able to:

- Identify the characteristics and processes of scientific inquiry.
- Identify potentially hazardous situations in a physics laboratory and classroom, methods of prevention, and corrective actions.
- Select the appropriate laboratory equipment for specific scientific investigations.
- Relate the historical development of the major concepts, models, and investigations in physics to current knowledge (e.g., force and motion, conservation principles, fields, quantum theory).
- Distinguish between scientific theories and laws in terms of their specific roles and functions.
- Identify elements of guided inquiry (e.g., engaging through questioning, eliciting prior knowledge, engaging in thoughtful discussion, engaging in exploration, fostering data-based argumentation, providing for application) in the physics classroom and laboratory.
- Identify the areas of teacher liability and responsibility in science-related activities, including accommodations for diverse student populations.
- Determine the validity of a formula based on dimensional analysis.
- Combine vectors using graphic and trigonometric methods.
- Determine the dot product and cross product of two vectors.
- Convert between units of a given quantity (e.g., length, area, volume, mass, time, temperature).
- Identify prefixes in the metric system and standard units of measure (e.g., Newtons, meters, kilowatt-hours, teslas, electron volts, calories, and horsepower.)
- Estimate the order of magnitude of a physical quantity.
- Interpret the slope of a graph or area under the curve in relation to physical concepts.
- Apply the concepts of accuracy, precision, uncertainty, and significant figures to measurements and calculations.
- Relate changes in length, area, or volume of a system to changes in temperature.
- Distinguish between the three methods of heat transfer (i.e., conduction, convection, and radiation).
- Determine the amount of heat transferred by conduction or radiation.
- Interpret segments of graphs of temperature vs. heat added or removed (e.g., latent heats, specific heats).
- Analyze pressure, volume, and temperature relationships using the ideal gas law.
- Apply the first law of thermodynamics (i.e., energy conservation) to physical systems.
- Calculate work done by or on a gas from pressure vs. volume diagrams.
- Interpret pressure vs. volume diagrams (e.g., identify isobaric, isothermal, and adiabatic processes).
- Determine the specific heat, latent heat, or temperatures of a substance, given appropriate calorimetric data.
- Apply the second law of thermodynamics (i.e., entropy increase) to physical processes.
- Relate temperature or pressure to kinetic molecular theory.
- Analyze the motion of an object moving in one dimension, given a graph (e.g., displacement/time, velocity/time, and acceleration/time).
- Determine distance traveled displacement, speed, velocity, acceleration, or time of travel for objects moving in one dimension.
- Determine distance traveled displacement, speed, velocity, acceleration, or time of travel for objects moving in two dimensions (e.g., projectile motion).
- Apply Newton's laws of motion to problems involving linear motion of a body.
- Apply Newton's laws of motion to problems involving circular motion of a body.
- Identify action-reaction pairs of forces between two bodies.

- Apply conservation of momentum to problems in one or two dimensions.
- Analyze problems using the impulse-momentum theorem.
- Analyze problems using Newton's universal law of gravitation (e.g., orbital motion).
- Analyze problems involving static or kinetic frictional forces.
- Apply conservation of mechanical energy.
- Use Newton's second law to analyze problems involving two connected masses (e.g., Atwood machine, Atwood machine on inclined plane, blocks, massless pulley).
- Analyze problems involving work done on mechanical systems (e.g., power, work-energy theorem).
- Analyze problems involving center of mass.
- Use free-body diagrams to analyze static or dynamic problems in two or three dimensions.

**Description of Activities**

Activities held under this component will be designed to accomplish the specific objectives outlined above. They may include, but will not be limited to, such things as lectures, discussions, demonstrations, observations, online activities and hands-on activities.

**Evaluation of Participants**

Evaluation of the specific objectives will be determined by the activity leader or designee through analysis of student performance data affected by training activities, portfolios maintained by the training participant, documented observation by administrators, rubrics developed for special area curriculum, teacher-provided test results/grade books, or curriculum alignment data.

**Evaluation of Activity**

An online evaluation for this activity will be conducted through the Santa Rosa Professional Growth System (PGS).