

# PROFICIENT STUDENTS

## Performance Level Descriptors

### PHYSICS



A student who is **PROFICIENT** *consistently* exhibits competency in the scientific method, the scientific process, quantitative analysis, and science content. Proficient students are able to demonstrate their knowledge and skills in the following eight areas of physics as indicated below.

#### SCIENTIFIC THINKING

**Proficient students are able to accomplish the following:**

1. Identify and apply the steps of the scientific method
2. Interpret graphs, identify patterns, and use math to express and establish scientific relationships
3. Use vectors, dimensional analysis, and scientific notation to make calculations and establish scientific relationships
4. Distinguish between dependent and independent variables
5. Solve simple problems and use the results to determine the validity of different statements
6. Solve multi-step, non-routine problems

#### NEWTON'S LAWS OF MOTION/ MOMENTUM AND GRAVITY

**Proficient students are able to accomplish the following:**

1. Explain and calculate the motion of two-dimensional projectile motion
2. Calculate the displacement, velocity, and acceleration of a moving object
3. Calculate force, mass, and acceleration based on Newton's Second Law
4. Summarize and calculate impulse, and understand its relationship to momentum
5. Predict the motion of objects using the Law of Conservation of Momentum

## LINEAR MOTION/EQUILIBRIUM AND VECTORS

Proficient students are able to accomplish the following:

1. Describe relative motion using frames of reference
2. Apply Newton's Laws to motion problems involving frictional forces
3. Explain and calculate motion in two dimensions

## ATOMIC STRUCTURE

Proficient students are able to accomplish the following:

1. Recall New Mexico's role in nuclear science (e.g., Manhattan Project, WIPP, national laboratories)
2. Distinguish between natural and man-made forms of radiation and their applications
3. Summarize atomic structure, including the properties and relative sizes of protons, neutrons, electrons, and the structure of isotopes

## ENERGY AND WORK

Proficient students are able to accomplish the following:

1. Identify the different forms of energy
2. Describe the relationship between energy, work, and power

## HEAT TRANSFER

Proficient students are able to accomplish the following:

1. Describe equilibrium in thermal, mechanical, and chemical energy transformations
2. Recognize that energy can change from one form to another and that energy is conserved in these changes
3. Explain basic kinetic theory
4. Explain the direction of heat flow between objects

## WAVES

Proficient students are able to accomplish the following:

1. Calculate and describe wave properties including wavelength, frequency, amplitude, and speed
2. Apply the concepts of conservation of energy to simple harmonic motion

## ELECTROMAGNETIC SPECTRUM

Proficient students are able to accomplish the following:

1. Describe how waves interact with matter i.e., reflection, refraction, absorption
2. Calculate and describe wave properties including wavelength, frequency, amplitude, and speed.
3. Recall the parts of longitudinal and transverse waves

# BOREDERLINE PROFICIENT STUDENTS

## Performance Level Descriptors

### PHYSICS



A student who is **BORDERLINE PROFICIENT** *sporadically* exhibits competency in the scientific method, the scientific process, quantitative analysis, and science content. Borderline proficient students are able to demonstrate their knowledge and skills in the following eight areas of physics as indicated below.

#### SCIENTIFIC THINKING

**Borderline proficient students are able to accomplish the following:**

1. Identify the steps of the scientific method
2. Interpret graphs, identify patterns, and use math to express and establish scientific relationships
3. Use vectors, dimensional analysis, and scientific notation to make calculations and establish scientific relationships
4. Distinguish between dependent and independent variables
5. Solve simple problems and use the results to determine the validity of different statements
6. Solve multi-step, routine problems

#### NEWTON'S LAWS OF MOTION/ MOMENTUM AND GRAVITY

**Borderline proficient students are able to accomplish the following:**

1. Explain two-dimensional, projectile motion
2. Calculate the displacement, velocity, and acceleration of a moving object
3. Calculate force, mass, and acceleration based on Newton's Second Law
4. Summarize the importance of impulse in a variety of real-world situations
5. Predict the linear motion of objects using the Law of Conservation of Momentum in both elastic and inelastic collisions

## LINEAR MOTION/ EQUILIBRIUM AND VECTORS

**Borderline proficient students are able to accomplish the following:**

1. Describe relative motion using frames of reference in linear applications
2. Apply Newton's Laws to linear motion problems
3. Explain and calculate motion in two dimensions
4. Predict how frictional forces affect the motion of an object

## ATOMIC STRUCTURE

**Borderline proficient students are able to accomplish the following:**

1. Recall New Mexico's role in nuclear science (e.g., Manhattan Project, WIPP, national laboratories)
2. Distinguish between natural and man-made forms of radiation
3. Summarize atomic structure, including the properties and relative sizes of protons, neutrons, electrons, and the structure of isotopes

## ENERGY AND WORK

**Borderline proficient students are able to accomplish the following:**

1. Identify the different forms of energy
2. Describe the relationship between energy, work, and power and be able to calculate the conversions between them

## HEAT TRANSFER

**Borderline proficient students are able to accomplish the following:**

1. Describe the following concepts: equilibrium, thermal, mechanical, and chemical
2. Recognize that energy can change from one form to another and that energy is conserved in these changes
3. Explain and describe wave properties including wavelength, frequency, and speed
4. Apply the concepts of conservation of energy to simple harmonic motion

## ELECTROMAGNETIC SPECTRUM

**Borderline proficient students are able to accomplish the following:**

1. Describe how waves interact with matter (i.e., reflection, refraction, absorption)
2. Calculate and describe wave properties, including wavelength, frequency, and speed
3. Identify the parts of longitudinal and transverse waves

