



# High School Science Proficiency Review #11

## Physical Science: Energy

High School Science Proficiency Exam-Style Items from [http://rpd.net/sciencetips\\_v3/](http://rpd.net/sciencetips_v3/)

### Critical Information to focus on while reviewing Physical Science Energy

**P.12.C.1 Students know waves (i.e. sound, seismic, electromagnetic) have energy that can be transferred when the waves interact with matter. E/S**

- Identify transverse waves and longitudinal waves.
- Explain that waves transfer energy without transferring matter.
- Describe how waves behave when they meet an obstacle, pass into another medium, or encounter another wave.

**P.12.C.2 Students know energy forms can be converted. E/S**

- Explain that heat is often produced as a byproduct when one form of energy is converted to another form (e.g., when machines and living organisms convert stored energy to motion).
- From an example, identify that energy cannot be created or destroyed, but only changed from one form to another.

**P.12.C.3 Students know nuclear reactions convert a relatively small amount of material into a large amount of energy. I/S**

- Identify fission and fusion.
- Recognize that a large amount of energy is produced from a relatively small amount of material in a nuclear reaction.

**P.12.C.4 Students know characteristics, applications and impacts of radioactivity. E/S**

- Identify the difference between ionizing and non-ionizing radiation.
- Identify characteristics of radioactivity, including alpha, beta, gamma rays.
- Recognize applications of radioactivity from examples

**P.12.C.5 Students know the relationship between heat and temperature. I/S**

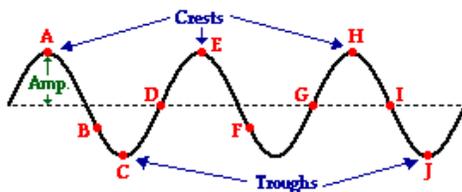
- Describe heat and temperature using the kinetic energy of particles.

**P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses. I/S**

- Describe various methods for generating electricity.
- Identify the processes by which various forms of energy (e.g., chemical, mechanical, and electromagnetic) are converted to electricity.
- Use a diagram to trace the transfer of electricity from generating sources to end uses by consumers.

### Sample Proficiency-Style Questions Related to Energy

1. The diagram below represents a transverse wave traveling in a string. The wave is transferring energy from left to right. Use the diagram to answer the following question.



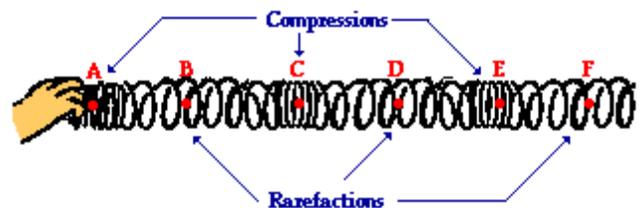
Predict the direction that a particle at position D will immediately move.

- A. Down
- B. Up
- C. Left
- D. Right

2. Wave motion in a medium transfers

- A. energy, but the matter vibrates around a fixed point.
- B. both mass and energy, in the direction of the wave's motion.
- C. neither mass nor energy, both just vibrate.
- D. mass, but the energy vibrates around a fixed point.

3. The diagram below represents a longitudinal wave traveling in a spring. The wave is transferring energy from left to right. Use the diagram to answer the following question.



Of the following, which is the **BEST** prediction of the direction that a particle at position C would immediately move?

- A. Diagonally
- B. In a circle
- C. Up
- D. Right



4. Which wave requires a medium for transmission?
  - A. Light
  - B. Infrared
  - C. Radio
  - D. Sound
5. A toy car with initial kinetic energy rolls to a stop along a flat track. Because of friction, some of kinetic energy was transferred to
  - A. thermal energy.
  - B. gravitational potential energy.
  - C. elastic energy.
  - D. chemical energy.
6. Energy is created as the result which activity?
  - A. Burning gasoline in an internal combustion engine.
  - B. Damming a river for hydroelectric power.
  - C. Rolling a marble down an incline plane.
  - D. Energy can only be transformed, not created.
7. Nuclear fission reactions are
  - A. responsible for the formation of most elements.
  - B. commonly used in nuclear power plants.
  - C. the reactions that power the stars.
  - D. when neutrons decay into electrons and protons.
8. The difference between ionizing and non-ionizing radiation is that ionizing radiation is located in which range of the electromagnetic spectrum?
  - A. Visible and lesser frequencies
  - B. Microwave frequencies only
  - C. Ultraviolet and greater frequencies
  - D. Radio frequencies only
9. Carbon -14 is used to date artifacts. The half-life of Carbon-14 is about 6,000 years. After 12,000 years, about how much Carbon -14 would remain in a sample?
  - A. None
  - B. One quarter
  - C. One half
  - D. Three quarters
10. A thermometer is a device that measures
  - A. average heat transferred.
  - B. average internal energy.
  - C. average kinetic motion.
  - D. average molecular volume.
11. Which of the following is **NOT** a method for generating electricity?
  - A. Creating a chemical reaction.
  - B. Wires moving relative to a magnetic field.
  - C. Sunlight on a photovoltaic cell.
  - D. Pumping water from a reservoir to a field.
12. Which of the following describes how a dam creates electricity?
  - A. Water is heated up and creates steam to turn the generator to create electricity.
  - B. Gravitational potential energy transfers to kinetic energy which turns a generator.
  - C. Electrons are removed from the water as it passes and creates electricity.
  - D. Water flows over wires in the dam which creates current from the water.
13. What role do electrical generators or batteries have in circuits?
  - A. They are the source of potential energy in a circuit.
  - B. They are the source of electrons that moves through the circuit.
  - C. They control how hard it is for the electricity to pass through a circuit.
  - D. They regulate the electrical current by storing then releasing charge.
14. In an alternating current (AC) circuit,
  - A. voltages can be easily increased and decreased within the circuit allowing for lower energy losses during transmission.
  - B. voltages change direction several times a second to generate electrical charge more rapidly.
  - C. rapid current changes regulate the ease at which electricity passes through the circuit.
  - D. current most often is high to prevent energy losses during transmission, but can be low to decrease the voltage in the circuit.
15. In nuclear reactions, some mass is converted into
  - A. protons.
  - B. electrons.
  - C. matter.
  - D. energy.



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### **Sample Proficiency-Style Questions Related to Energy**

1. A, DOK Level 2
2. A, DOK Level 1
3. D, DOK Level 2
4. D, DOK Level 1
5. A, DOK Level 1
6. D, DOK Level 1
7. B, DOK Level 1
8. C, DOK Level 1
9. B, DOK Level 2
10. C, DOK Level 1
11. D, DOK Level 1
12. B, DOK Level 2
13. A, DOK Level 1
14. A, DOK Level 2
15. D, DOK Level 1