



High School Science Proficiency Review #8

Physical Science: Matter (1 of 2)

High School Science Proficiency Exam-Style Items from <http://rpd.net/sciencetips v3/>

Critical Information to focus on while reviewing Physical Science Matter

P.12.A.1 Students know different molecular arrangements and motions account for the different physical properties of solids, liquids, and gases. E/S

- ◆ Given a diagram, choose the molecular arrangement that best describes a solid, liquid, or gas
- ◆ Recognize the differences between solids, liquids, and gases.
- ◆ Analyze the motion of particles in solids, liquids, and gases.
- ◆ Explain properties of the states of matter using kinetic-molecular theory.

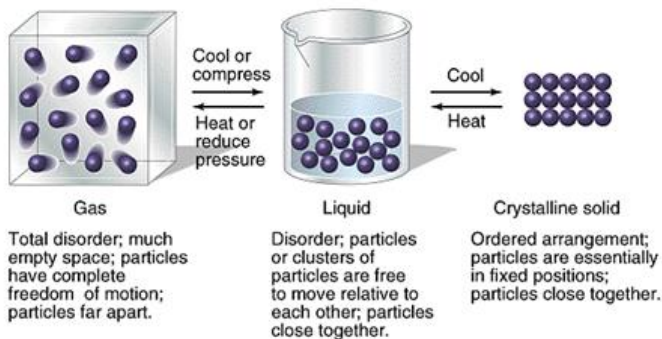
P.12.A.2 Students know elements in the periodic table are arranged into groups and periods by repeating patterns and relationships. E/S

- ◆ Explain why elements in the main groups (metals, nonmetals, alkali metals, alkaline earths, halogens, and noble [inert] gases) on the periodic table have similar properties.
- ◆ Identify the positions of metals and non-metals on the periodic table.
- ◆ Classify elements as metals and non-metals.
- ◆ Predict periodic trends in atomic mass and atomic number.
- ◆ Recognize the difference between the atomic number and the atomic mass of an element.
- ◆ Calculate the number of electrons, protons, and neutrons given the atomic number and atomic mass for a given isotope of any element in the periodic table. (See also P.12.A.8.)

P.12.A.3 Students know identifiable properties can be used to separate mixtures. E/S

- ◆ Identify mixtures and compounds.
- ◆ Identify heterogeneous and homogeneous mixtures.
- ◆ Design separation processes based on properties (e.g., magnetism, solubility, density, boiling point, and properties that lend themselves to mechanical sorting).

Sample Proficiency-Style Questions Related to Matter



1. Which of the following describes the differences between solids and liquids?
 - A. Both have a definite shape, but only solids have a definite volume.
 - B. Both have a definite volume, but only liquids have a definite shape.
 - C. Solids have definite volume and shape, but liquids only have a definite volume.
 - D. Liquids have a definite volume and shape, but solids only have a definite shape.

2. A student ran tests on a mystery substance and found that it has a definite volume, high density, and flows easily. Which state of matter is it and why?
 - A. It is a solid because it has a definite volume and high density.
 - B. It is a liquid because it has a definite volume and high density.
 - C. It is a solid because it has a definite volume and flows easily.
 - D. It is a liquid because it has a definite volume and flows easily.
3. Which of the following correctly describes the motion of particles in a solid?
 - A. They do not move at all.
 - B. They move rapidly around in random patterns.
 - C. They vibrate in a set pattern.
 - D. They flow easily, but slowly around each other.
4. What is happening to the particles of a gas as it changes phase into a liquid?
 - A. They slow down and spread apart because energy is being added.
 - B. They slow down and become closer because energy is being removed.
 - C. They speed up and spread apart because energy is being added.
 - D. They speed up and become closer because energy is being removed.



Physical Science Review

Matter (1 of 2)

5. Why do elements in the same families (groups) on the periodic table have the same properties?
- They have the same atomic number and mass number.
 - They have the same number of electrons.
 - They have the same number of valence electrons.
 - They have very similar mass and atomic numbers.
6. **Use the periodic table to answer the question below.**
Which of the following pairs share similar properties?
- Bromine (Br) and Iodine (I)
 - Oxygen (O) and Iodine (I)
 - Fluorine (F) and Neon (Ne)
 - Helium (He) and Hydrogen (H)
7. Which group of elements would be expected to have very similar properties?
- Oxygen, sulfur, selenium
 - Nitrogen, oxygen, fluorine
 - Sodium, magnesium, potassium
 - Neon, sodium, potassium
8. **Use the periodic table to answer the question below.**
Where are the metals located on the periodic table?
- On the far right of the periodic table.
 - On the far left of the periodic table.
 - To the right of the metalloids.
 - To the left of the metalloids.
9. Which of the following are properties of metals?
- Malleable, ductile, and good conductors of heat and electricity.
 - Malleable, dull, and good conductors of heat and electricity.
 - Ductile, shiny, and poor conductors of heat and electricity.
 - Ductile, malleable, and poor conductors of heat and electricity.
10. Atomic mass on the periodic table progressively changes left to right and top to bottom because
- a proton is being lost.
 - an electron is being lost.
 - a proton is being added.
 - an electron is being added.
11. The atomic mass of an element represents the
- average mass of all its known isotopes.
 - total mass of all its known isotopes.
 - the average mass of the protons and neutrons.
 - the total mass of the protons and neutrons.
12. How many electrons are in a neutral atom with an atomic number of 12?
- A. 4 B. 6 C. 12 D. 24
13. Which of the following explains the difference between atomic number and atomic mass?
- The atomic number is the number of protons and the atomic mass is the average mass of the element's known isotopes.
 - The atomic number is the number of protons and the atomic mass is the total mass of the protons and electrons.
 - The atomic number is the total number of protons and neutrons and the atomic mass is the average mass of the isotopes.
 - The atomic number is the total number of protons and neutrons and the atomic mass is the total mass of the protons and electrons.
14. Physical properties of a mixture
- vary with the amount of substance.
 - depend on the volume of the substance.
 - depend on the organization of the substance.
 - vary depending upon its components.
15. Which element is contained in all of the following chemical compounds?
Compounds: CO_2 , NaHCO_3 , $\text{C}_6\text{H}_{12}\text{O}_6$, and C_4H_{10}
- Hydrogen
 - Oxygen
 - Carbon
 - Sodium
16. When a pure solid substance was heated, it changed into another solid and a gas, each of which was a pure substance. Based on these observations, the original solid
- was a single element.
 - was a compound.
 - was the mixture of only two substances.
 - was a mixture of three or more substances.
17. Which of the following is an example of a heterogeneous substance?
- Bottled water
 - Table salt
 - Pieces of copper
 - Candle
18. Which of the following is an example of a homogeneous substance?
- Water
 - Sandwich
 - Chocolate Chip Cookie
 - Pine cone



Critical Information to focus on while reviewing Physical Science Matter

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Sample Proficiency-Style Questions Related to Matter

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



High School Science Proficiency Review #9

Physical Science: Matter (2 of 2)

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Physical Science Matter

P.12.A.4 Students know atoms bond with one another by transferring or sharing electrons. E/S

- ♦ Recognize that bonding electrons are outer electrons.
- ♦ Explain the difference between ionic and covalent bonding.
- ♦ Predict bond type based on relative positions in periodic table (e.g., alkali metal and halogen, and typical organic compounds).

P.12.A.5 Students know chemical reactions can take place at different rates, depending on a variety of factors (i.e. temperature, concentration, surface area, and agitation). E/S

- ♦ Describe factors affecting the rate at which a reaction proceeds.
- ♦ Predict the result of a given factor on the reaction rate.
- ♦ Identify the effect of catalysts on reaction rate.

P.12.A.6 Students know chemical reactions either release or absorb energy. E/S

- ♦ Identify the presence of energy as a component of every chemical reaction.

P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change. I/S

- ♦ Explain how a chemical reaction satisfies the law of conservation of mass.
- ♦ Balance simple chemical reaction equations using simple whole number ratios and the conservation of mass principle.
- ♦ Explain that the law of definite proportions allows for predictions of reaction amounts.

P.12.A.8 Students know most elements have two or more isotopes, some of which have practical applications. I/S

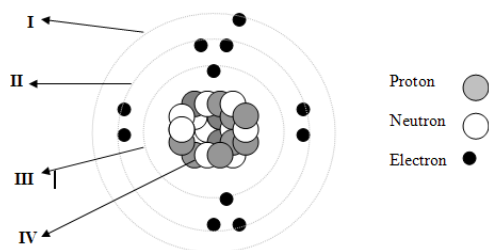
- ♦ Know that isotopes of an element have different numbers of neutrons and the same number of protons.
- ♦ Identify that practical applications of isotopes arise from the nature of radioactivity and that atoms are the building blocks of all things.
- ♦ Calculate the numbers of protons and neutrons given a nuclear symbol. (See also P.12.A.2 and P.12.C.4.)

P.12.A.9 Students know the number of electrons in an atom determines whether the atom is electrically neutral or an ion. I/S

- ♦ Calculate the number of protons and electrons to determine the electrical charge of an atom.

Sample Proficiency-Style Questions Related to Matter

1. Analyze the model of an atom below.



Which of the above numbers indicates the orbit of the electrons that could bond with electrons of other atoms to make molecules?

- A. I
- B. II
- C. III
- D. IV

2. Which of the following statements is true about ionic and covalent bonding?

- A. Ionic bonds are formed between nonmetals and covalent bonds are formed between metals.
- B. Ionic and covalent bonds can be formed between metals and between nonmetals.
- C. Ionic bonds form between metals and nonmetals, and covalent bonds form between nonmetals.
- D. Ionic bonds and covalent bonds always contain at least one metal and one nonmetal.

3. Which statement best describes the role of energy in all chemical reactions? All chemical reactions

- A. use energy to create matter.
- B. convert matter into energy.
- C. either release or absorb energy.
- D. either create or destroy energy.



4. Use the periodic table to answer to question below.

A sodium ion (Na⁺) can form an ionic bond with a chlorine ion (Cl). A carbon (C) atom can form a covalent bond with an oxygen (O) atom. Identify the true statement below.

- A. Carbon (C) and Oxygen (O) can ionize and form an ionic bond.
- B. Oxygen (O) and chlorine (Cl) can ionize and form an ionic bond.
- C. Lithium (Li) and Chlorine (Cl) can form a covalent bond.
- D. Lithium (Li) and Chlorine (Cl) can ionize and form an ionic bond.

5. Identify the combination of factors that will most likely increase the rate of a chemical reaction.

- A. Decreasing temperature, using a large block of the solid, and stirring.
- B. Decreasing temperature, chopping up the solid block, and stirring.
- C. Increasing temperature, using a large block of the solid, and stirring.
- D. Increasing temperature, chopping up the solid block, and stirring.

7. Which of the following is true about catalysts in chemical reactions?

- A. Catalysts are used up in chemical reactions.
- B. Catalysts slow down or stop chemical reactions.
- C. Catalysts are changed in chemical reactions.
- D. Catalysts increase chemical reaction rates.

8. Use the periodic table to answer to question below.

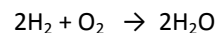
Metals often form ionic bonds with nonmetals. Nonmetals often form covalent bonds with each other. Identify the true statement below.

- A. Sodium (Na) can form a covalent bond with Fluorine (F).
- B. Magnesium (Mg) can form an ionic bond with chlorine (Cl).
- C. Lithium (Li) can form an ionic bond with Sodium (Na).
- D. Potassium (K) can form a covalent bond with Calcium (Ca)

9. The burning of gasoline is an example of a chemical reaction in which the chemical energy stored in the bonds between the molecules of gasoline is converted into other forms of energy during the burning process. Identify the true statement about the role of energy in the burning of gasoline.

- A. Chemical energy is converted into thermal energy which is released.
- B. Chemical energy is converted into thermal energy which is absorbed.
- C. Thermal energy is converted into chemical energy which is released.
- D. Thermal energy is converted into chemical energy which is absorbed.

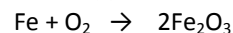
10. The formula below represents the chemical reaction between the elements hydrogen and oxygen when the compound water is formed.



This equation supports the law of conservation of mass because

- A. the total number of hydrogen and oxygen atoms in the reactants and products is twelve.
- B. the mass of hydrogen and oxygen in the reactants is equal to the mass of the water in the product.
- C. atoms of the elements hydrogen and oxygen are in the reactants and also in the products.
- D. atoms of the elements hydrogen and oxygen react to form molecules of the compound water.

11. The following equation for the rusting of iron is missing the coefficients representing the correct number of iron atoms and oxygen atoms in the reactants.



Identify the number of iron and oxygen atoms in the reactants that will balance the equation.

- A. Four iron atoms and four oxygen atoms.
- B. Four iron atoms and six oxygen atoms.
- C. Two iron atoms and two oxygen atoms.
- D. Two iron atoms and three oxygen atoms.

12. The nucleus of an atom consists of protons and neutrons. In an isotope the numbers of

- A. protons vary.
- B. neutrons vary.
- C. electrons vary.
- D. quarks vary.

13. Carbon-14 (¹⁴C) and carbon-12 (¹²C) are examples of carbon

- A. isotopes.
- B. ions.
- C. molecules.
- D. compounds.

14. If an isotope has 7 protons and a mass number of 15, how many neutrons does it have?

- A. 8
- B. 22
- C. 15
- D. 7

15. An oxygen atom has 8 protons, 8 neutrons and 8 electrons. If the oxygen atom gains two electrons to form an oxygen ion what will be the magnitude and sign of the charge?

- A. -2
- B. +2
- C. -8
- D. +8



High School Science Proficiency Review #9

Physical Science: Matter (2 of 2)

KEY

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- ♦ Calculate the number of protons and electrons to determine the electrical charge of an atom.

Sample Proficiency-Style Questions Related to Matter

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



High School Science Proficiency Review #10

Physical Science: Force and Motion

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Physical Science Force and Motion

P.12.B.1 Students know laws of motion can be used to determine the effects of forces on the motion of objects. E/S

- ♦ Apply Newton's three laws of motion to physical situations (knowing the number of each law is not core knowledge).
- ♦ Describe how the strength of the net force and mass of an object determine the amount of change in an object's motion (includes the effects of the force of gravity on objects).
- ♦ Explain how friction affects the motion of an object.
- ♦ Given distance vs. time and velocity vs. time plots, interpret and predict different types of motion. (See also N.12.A.1.)
- ♦ Identify how an example may illustrate a change and/or redirection of force where the amount of work remains unchanged.

P.12.B.2 Students know magnetic forces and electric forces can be thought of as different aspects of electromagnetic force. I/S

- ♦ Describe the relationship between electric currents and magnetic fields.

P.12.B.3 Students know the strength of the electric force between two objects increases with charge and decreases with distance. I/S

- ♦ Explain how electric forces change when the distance between the two charges changes and/or when the magnitude of the charges changes.

P.12.B.4 Students know the strength of the gravitational force between two objects increases with mass and decreases rapidly with distance. I/S

- ♦ Identify the components of gravitational force and gravitational potential energy.
- ♦ Explain that gravitational force becomes stronger as the masses increase and become weaker as the distance between the objects increases.

Sample Proficiency-Style Questions Related to Force and Motion

1. What is inertia?
 - A. The force required to change the motion of an object.
 - B. The energy required to change the motion of an object.
 - C. The resistance to changes in motion of an object.
 - D. The momentum of an object in motion.
 2. Which of the following would require the **LEAST** amount of force, if applied to the same ball?
 - A. Stopping the ball that is rolling on a flat and smooth surface.
 - B. Changing the direction of a ball that is rolling on a flat and smooth surface.
 - C. Starting the ball in motion on a flat and smooth surface.
 - D. Keeping the ball moving at a constant speed on a flat and smooth surface.
 3. A hammer strikes a nail and drives the nail into a block of wood. If the action force is the hammer striking the nail, the reaction force is
 - A. the nail striking the wood with an equal and opposite force.
 - B. the nail striking the hammer with an equal and opposite force.
 - C. the wood striking the hammer with an equal and opposite force.
 - D. the wood striking the nail with an equal and opposite force.
 4. Which of the following boxes would have the greatest acceleration?
 - A. A 10 kg box pushed with 5N of force.
 - B. A 10 kg box pushed with 10N of force.
 - C. A 20 kg box pushed with 5N of force.
 - D. A 20 kg box pushed with 10N of force.
 5. Use the diagram to answer the question below.

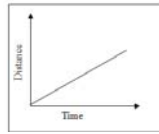
The diagram shows a rectangular box. Above the box is an upward-pointing arrow labeled 'N'. To the left of the box is the letter 'W', to the right is 'E', and below is 'S'.
- A cart is being pulled North across a carpeted floor. Which direction is the force of friction acting?
- A. North
 - B. South
 - C. East
 - D. West



Physical Science Review

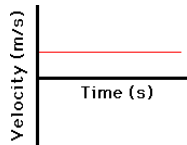
Force and Motion

6. Below is a **distance vs. time** graph showing the action of a person over time. Use this graph to answer the following question.



Which of the following statements is the **BEST** description of the person's action?

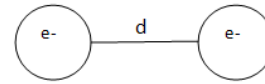
- A. The person is walking up a large hill.
 - B. The person is walking faster as time increases.
 - C. The person is walking at a slowing speed up a hill.
 - D. The person is walking at a constant speed.
7. Below is a **velocity vs. time** graph showing the movement of a train over time. Use this graph to answer the following question.



Which of the following statements is the **BEST** description of the train's motion?

- A. The train is not moving in any direction.
 - B. The train is continuously accelerating.
 - C. The train is moving with a constant velocity.
 - D. The train is accelerating slowly.
8. In which of the following situations is the **MOST** work done?
- A. Lifting a 50 N box up 2 meters.
 - B. Lifting a 50 N box up 2 meters and then down 2 meters.
 - C. Lifting a 75 N box up 1 meter.
 - D. Lifting a 75 N box up 1 meter and then down 1 meter.
9. A temporary magnet made by wrapping a current-carrying wire around an iron core is known as a(n)
- A. alkaline battery.
 - B. electromagnet.
 - C. magnetic pole.
 - D. magnetic compass.
10. Electromagnetic induction is the process by which an electric current is produced by moving a wire in a magnetic field. Which of the following devices works on the principle of electromagnetic induction?
- A. Light bulb
 - B. Compass
 - C. Battery
 - D. Generator

11. Analyze the diagram below, which shows two electrically charged objects. Use this diagram to answer the following question.



Which of the following would cause a decrease in the magnitude of the electrical force between the two objects?

- A. Decrease the temperature of the objects.
 - B. Increase the temperature of the objects.
 - C. Decrease the distance between the objects.
 - D. Increase the distance between the objects.
12. The magnitude of electric force between two electrically charged objects will
- A. increase as the level of charge on the objects increases and increase as distance between them increases.
 - B. increase as the level of charge on the objects increases and decrease as the distance between them increases.
 - C. decrease as the level of charge on the objects increases and increase as the distance between them increases.
 - D. increase as the level of charge on the objects increases but stay the same as the distance between them increases.
13. What is the cause of the gravitational force between the Earth and the Sun?
- A. Earth's magnetic field causes the gravitational force.
 - B. The Sun's rotation about its axis causes the gravitational force.
 - C. The masses of both the Earth and Sun cause the gravitational force.
 - D. The tangential velocity of the Earth causes the gravitational force.
14. If the height of an object, held above Earth's surface, were doubled the gravitational potential energy associated with the object would be
- A. $\frac{1}{4}$ as great
 - B. $\frac{1}{2}$ as great.
 - C. twice as great.
 - D. four times greater.
15. If Earth suddenly became twice its current mass but stayed its current size, what is one effect you would notice?
- A. Your weight would become twice as great.
 - B. Your mass would become twice as great.
 - C. Your weight would become half as much.
 - D. Your mass would become half as much.



High School Science Proficiency Review #10

Physical Science: Force and Motion

KEY

High School Science Proficiency Exam-Style Items from <http://rpd.net/sciencetips v3/>

Critical Information to focus on while reviewing Physical Science Force and Motion

P.12.B.1 Students know laws of motion can be used to determine the effects of forces on the motion of objects. E/S

- ♦ Apply Newton's three laws of motion to physical situations (knowing the number of each law is not core knowledge).
- ♦ Describe how the strength of the net force and mass of an object determine the amount of change in an object's motion (includes the effects of the force of gravity on objects).
- ♦ Explain how friction affects the motion of an object.
- ♦ Given distance vs. time and velocity vs. time plots, interpret and predict different types of motion. (See also N.12.A.1.)
- ♦ Identify how an example may illustrate a change and/or redirection of force where the amount of work remains unchanged.

P.12.B.2 Students know magnetic forces and electric forces can be thought of as different aspects of electromagnetic force. I/S

- ♦ Describe the relationship between electric currents and magnetic fields.

P.12.B.3 Students know the strength of the electric force between two objects increases with charge and decreases with distance. I/S

- ♦ Explain how electric forces change when the distance between the two charges changes and/or when the magnitude of the charges changes.

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Sample Proficiency-Style Questions Related to Force and Motion

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



High School Science Proficiency Review #11

Physical Science: Energy

High School Science Proficiency Exam-Style Items from 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

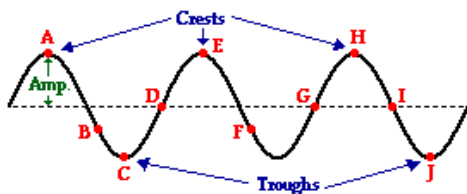
- Describe heat and temperature using the kinetic energy of particles.

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.



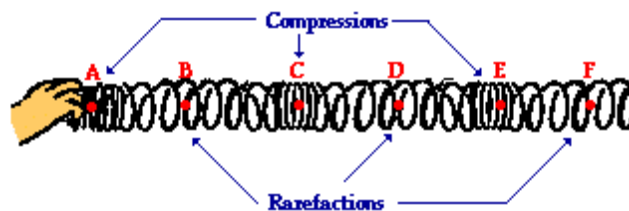
Predict the direction that a particle at position D will immediately move.

- 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.



High School Science Proficiency Review #11

Physical Science: Energy

KEY

High School Science Proficiency Exam-Style Items from 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. 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