

Directions: Please choose the best answer choice for each of the following questions.

1. Jamie is making a list of different systems that can convert mechanical energy into electrical energy. Which system should he include in his list?
 - A. motor
 - B. windmill
 - C. battery charger
 - D. incandescent bulb

2. Which energy system changes chemical energy into electrical energy?
 - A. battery
 - B. generator
 - C. refrigerator
 - D. toaster

3. Ms. Joffe wants to replace the refrigerator in her house because it has stopped cooling well, and the sides of the refrigerator are very warm because of the increase in the total disorder in the refrigerator. What is the reason for the poor functioning of the refrigerator?
 - A. A part of the useful electrical energy is not converted into useful mechanical energy.
 - B. A part of the non-useful mechanical energy is converted into useful thermal energy.
 - C. A part of the non-useful thermal energy is converted into useful electrical energy.
 - D. A part of the useful electrical energy is converted into non-useful thermal energy.

Go on to the next page »

4. In an experiment, James recorded the temperature of boiling water at one-minute intervals. After ten minutes he observed that the temperature remained constant as water changed into steam. What can he conclude about the effect of heat and temperature on water?

- A. Temperature speeds up water particles, causing a loss of heat energy.
- B. Temperature slows down water particles, causing a gain in heat energy.
- C. Heat energy speeds up water particles, causing the temperature to reach boiling point.
- D. Heat energy slows down water particles, causing the temperature to reach boiling point.

5. A vacuum cleaner requires 650 watts of electrical energy when in use. However, some of the electrical energy is lost during the conversion of electrical energy into useful kinetic energy. Which option BEST explains the loss of electrical energy during this energy transformation?

- A. Some electrical energy is lost as electrical charges.
- B. Some electrical energy is lost due to electrical forces.
- C. Some electrical energy is lost as heat and sound energy.
- D. Some electrical energy is lost as potential and chemical energy.

6. Andre turns on a light to study with but notices quite a lot of heat coming from the light. What is causing the heat, and what is happening to entropy in this scenario?

- A. A part of the thermal energy is converted into non-useful electrical energy that results in an increase in entropy.
- B. A part of the electrical energy is converted to non-useful thermal energy that results in an increase in entropy.
- C. A part of the mechanical energy is converted into useful thermal energy that results in a decrease in entropy.
- D. A part of the thermal energy is converted into useful mechanical energy that results in a decrease in entropy.

7. Even when energy-efficient CFL light bulbs are used, there is some loss of electrical energy during conversion to light energy. What explains the reason behind this loss of electrical energy?

- A. Some electrical energy is lost as heat.
- B. Some electrical energy is lost as microwaves.
- C. Some electrical energy is lost as charged particles.
- D. Some electrical energy is lost as electromagnetic radiations.

Go on to the next page »

8. In a lab experiment, Pablo boils 20 mL of water in beaker A and 40 mL of water in beaker B. Which of these is the BEST comparison of the water in beakers A and B?

- A. Heat energy in B is greater than in A, while both temperatures are the same.
- B. Heat energy in A is greater than in B, while both temperatures are the same.
- C. Temperature in B is greater than in A, while both have the same amount of heat energy.
- D. Temperature in A is greater than in B, while both have the same amount of heat energy.

9. Mr. Williams is explaining the concept of heat and temperature of substances to his class. Which sentence BEST describes the heat and temperature of substances?

- A. Heat is the thermal energy of a substance, while temperature is the average kinetic energy of its particles.
- B. Heat is the thermal energy of a substance, while temperature is the average potential energy of its particles.
- C. Heat is the average kinetic energy of the particles of a substance, while temperature is the amount of thermal energy lost by the substance.
- D. Heat is the average potential energy of the particles of a substance, while temperature is the amount of thermal energy absorbed by the substance.

10. Henry's mother is cooking soup in a microwave oven. Which unit is a measure of the total energy that the microwave oven uses while cooking the soup?

- A. volts
- B. amperes
- C. kilowatt hours
- D. degrees Celsius

Go on to the next page »

11. The diagram below shows the motion of a skier going up and down a hill.



How does the motion of the skier illustrate the transformation between kinetic and potential energy?

- A. The skier gains both potential and kinetic energy while going up the hill.
- B. The skier loses potential energy and gains kinetic energy while going up the hill.
- C. The skier has equal amounts of potential and kinetic energy at the top of the hill.
- D. The skier loses potential energy and gains kinetic energy while going down the hill.

12. Laura throws a ball up in the air.



The ball travels upward to point A before coming back down. Which energy transformation occurs in the ball once it reaches point A?

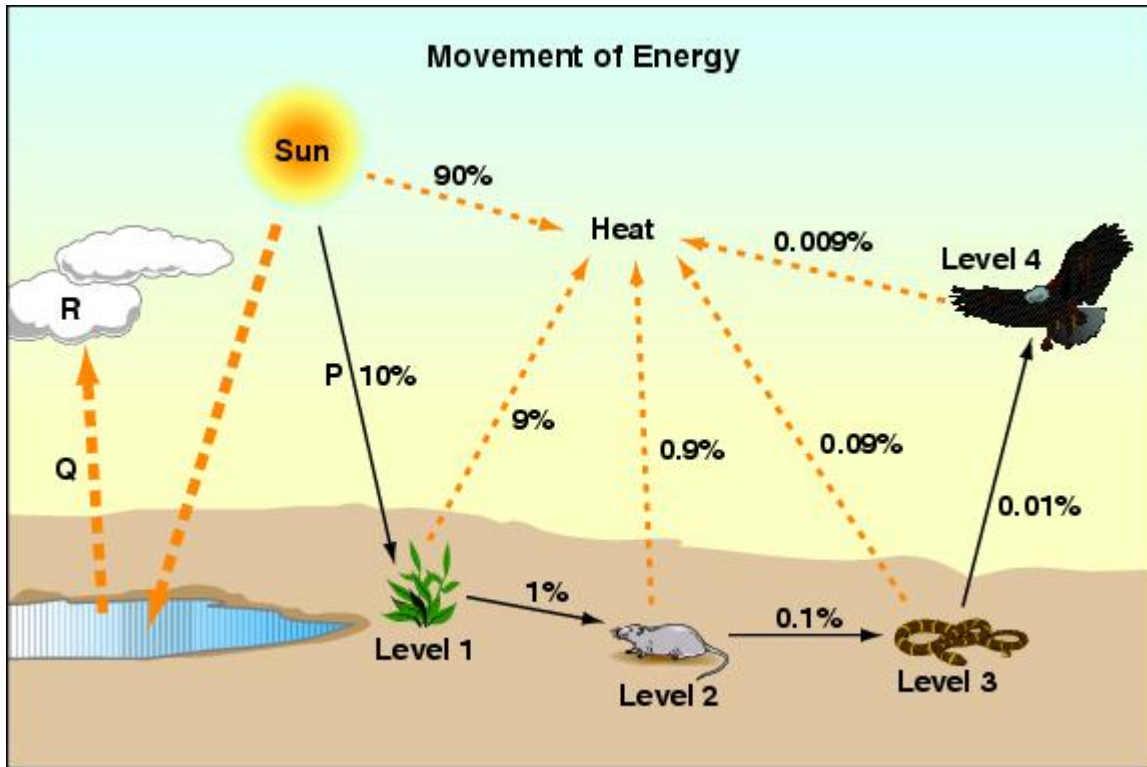
- A. heat energy to chemical energy
 - B. potential energy to kinetic energy
 - C. kinetic energy to chemical energy
 - D. muscular energy to mechanical energy
13. How does the energy of a rock change as it falls off a cliff?
- A. Potential energy changes into kinetic energy.
 - B. Kinetic energy changes into potential energy.
 - C. Kinetic energy changes into mechanical energy.
 - D. Mechanical energy changes into potential energy.

Go on to the next page »

14. Hydroelectric power can be generated from water that is stored in reservoirs. When this water is released from a certain height, the flowing water rotates the turbines of the power plant to generate electricity. Which energy transformation takes place when the water is released?
- A. potential energy to kinetic energy
 - B. chemical energy to kinetic energy
 - C. electrical energy to kinetic energy
 - D. mechanical energy to kinetic energy

Directions: Review the content below and answer the questions that follow

Energy from the Sun
The diagram below shows how energy moves through an ecosystem.



15. In the diagram, what happens to the total energy during the different energy transformations at levels 1, 2, 3, and 4?

- A. The total energy decreases at all levels.
- B. The total energy is conserved at all levels.
- C. The total energy decreases at level 1 and level 2, while it increases at level 3 and level 4.
- D. The total energy increases at level 1 and level 2, while it decreases at level 3 and level 4.

16. Which energy transfer takes place at level 1?

- A. heat energy \rightarrow light energy
- B. light energy \rightarrow chemical energy
- C. mechanical energy \rightarrow heat energy
- D. chemical energy \rightarrow mechanical energy

Go on to the next page »

17. Which process of energy transfer is identified by label P in the diagram?

- A. conduction
- B. convection
- C. expansion
- D. radiation

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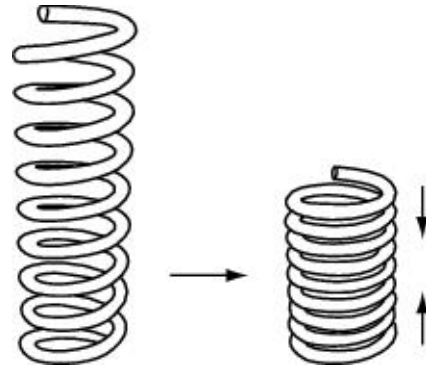
18. During the generation of electricity through coal, water is heated by burning coal to produce steam. The steam rotates the turbines of the power plant to generate electricity. Which of these BEST describes the energy transformation that takes place during this process?

- A. The energy transformation is 100% efficient because there is no loss of heat energy to the environment.
- B. The energy transformation is not 100% efficient because there is some loss of heat energy to the environment.
- C. The energy transformation is not 100% efficient because there is some loss of chemical energy to the environment.
- D. The energy transformation is 100% efficient because the total amount of steam produced is used to generate electricity.

19. Sally read in a science journal that the total electrical energy supplied to an air conditioner from an outlet does not get converted into useful energy. What is the BEST explanation for this difference in energy use?

- A. Some of the energy is wasted as light energy.
- B. Some of the energy is wasted as heat energy.
- C. Some of the energy is wasted as electrical energy.
- D. Some of the energy is wasted as chemical energy.

20. Identify the form of energy shown as a result of the process below.



- A. chemical energy
- B. kinetic energy
- C. stored gravitational energy
- D. stored mechanical energy

Go on to the next page »

21. The diagram below shows the direction of a common food chain.



Which set of energy transformations BEST represents the above process?

- A. heat energy \rightarrow chemical energy \rightarrow light energy
 - B. light energy \rightarrow heat energy \rightarrow chemical energy
 - C. radiant energy \rightarrow heat energy \rightarrow chemical energy
 - D. radiant energy \rightarrow chemical energy \rightarrow mechanical energy
22. Mr. Cheever writes the following energy transformation on the board.
- potential \rightarrow kinetic \rightarrow mechanical \rightarrow electrical
- Which system is an example of this transformation?
- A. a solar cooker heating food
 - B. a generator producing electricity
 - C. a voltmeter measuring voltage potential
 - D. a hydroelectric plant generating electricity

23. Which system transfers light energy into electrical energy?

- A. torch
- B. solar cell
- C. iron skillet
- D. roller coaster

24. Man-made systems can transform energy from one form to another as they perform functions. Which system transforms electric energy into kinetic and potential energy?

- A. toaster
- B. solar cell
- C. moving fan
- D. glowing bulb

25. A central heating system is used to keep houses warm. Which instrument is used as a sensor to help measure the heat energy produced by a central heating system?

- A. barometer
- B. calorimeter
- C. spectrometer
- D. thermometer

26. Josephine reads the nutrition facts written on a package of snacks.

Nutrition Facts						
Serving Size		2 tablespoons (28g)				
Amount Per Serving	Mix	Prepared with oil		Prepared oil free		
Calories	100	150		120		
Calories from Fat	10	70		10		
% Daily Values**						
Total Fat	1g*	6%	7g	13%	1.5g	2%
Saturated Fat	0.5g	3%	1g	6%	0.5g	3%
Cholesterol	0mg	1%	18mg	4%	15mg	4%
Sodium	125mg	16%	140mg	5%	160mg	5%
Total Carbohydrate	23g	8%	24g	8%	25g	8%
Dietary Fiber	1g	5%	1g	5%	1g	5%
Sugars	13g		13g		14g	
Protein	1g		2g		2g	

Which of these gives information about how much energy Josephine's body will get from the snack?

- A. sodium
- B. calories
- C. cholesterol
- D. serving size

27. A dozen steel marbles at 0°C are placed into an insulated beaker containing water at 30°C. Which of these explains what will happen in the next five minutes?

- A. Both the water and the marbles will become colder.
- B. Both the water and the marbles will become warmer.
- C. The water will become warmer and the marbles will become colder.
- D. The water will become colder and the marbles will become warmer.

28. Jerome placed an ice cube into his steaming bowl of soup and watched it quickly disappear. He knew the ice had changed from a solid state to a liquid state. How did heat affect the water molecules when the water changed from solid to liquid?

- A. Heat reduced the number of the water molecules.
- B. Heat increased the motion of the water molecules.
- C. Heat broke the chemical bonds in the water molecules.
- D. Heat increased the number of chemical bonds in the water molecules.

29. Scott puts a few ice cubes in a glass of warm water to make it cold. He observes that after some time, all ice cubes melt. Which description explains this phenomenon?

- A. Ice and water react to create cool water.
- B. Heat flows from hot water to the ice cubes.
- C. Cold flows from the ice cubes to the hot water.
- D. Ice cubes expand when placed in the warm water.

30. A camper is cold and wet. The camper lights a campfire and warms up by standing three feet to the side of the fire. Why is the camper warmed?

- A. The fire radiates heat in all directions, and the radiated heat directly warms the camper.
- B. The fire heats air next to it by conduction, and the warm air heats the camper by conduction.
- C. The fire heats air above it by conduction. The hot air rises and then sinks, warming the camper.
- D. The fire radiates heat upward only. Air above the fire absorbs heat and then sinks, warming the camper.

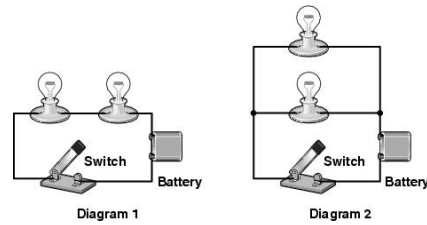
31. During winter, fireplaces can help keep houses warm. Which process transfers the heat from a fireplace into a room?

- A. conduction
- B. convection
- C. insulation
- D. radiation

32. How can two objects that are not touching transfer heat?

- A. radiation only
- B. conduction only
- C. convection and radiation
- D. convection and conduction

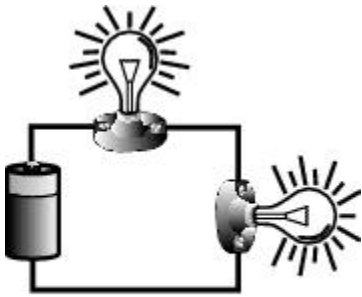
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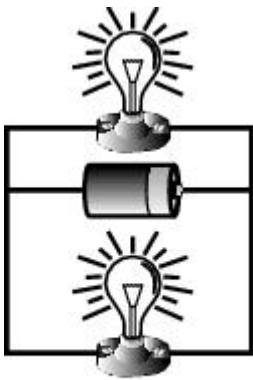
The diagrams above represent two types of circuits. Which types of circuits are these?

- A. Both diagrams 1 and 2 are series circuits.
- B. Both diagrams 1 and 2 are parallel circuits.
- C. Diagram 1 is a parallel circuit, and diagram 2 is a series circuit.
- D. Diagram 1 is a series circuit, and diagram 2 is a parallel circuit.

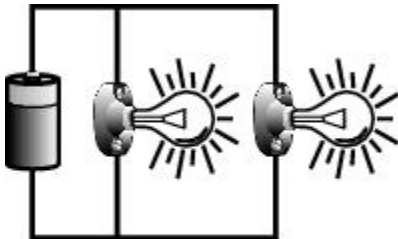
34. Shaun is drawing series and parallel circuits for his assignment.



A



B



C

Which of these choices correctly identifies the series and parallel circuits?

- A. Circuits A, B, and C are series circuits.
- B. Circuits A, B, and C are parallel circuits.
- C. Circuits A and B are series circuits, and circuit C is a parallel circuit.

35. Kendra noticed that one bulb in her string of holiday lights had gone out. However, the rest of the bulbs still glowed. Which type of circuit connected Kendra's holiday lights?

- A. contact
- B. magnetic
- C. parallel
- D. series

36. Jolene's father is going to install two light bulbs in her doll house. What would be an advantage of connecting the bulbs in a parallel circuit?

- A. Only one loop of wire will be required.
- B. One bulb will give off more light than the other.
- C. If one bulb burns out, the other bulb can still give off light.
- D. If more bulbs are added to the circuit, it cannot be overloaded.

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37. Hannah is conducting a lab experiment to study the properties of electromagnets.

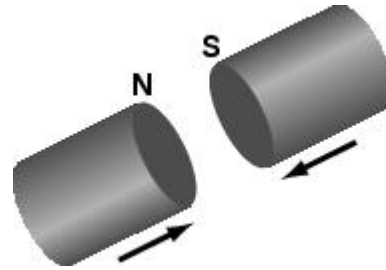
- She winds a copper wire around a soft iron bar.
- She places metal paper clips near the iron bar.
- She passes current through the coil.
- She notices that the soft iron bar becomes an electromagnet.
- She observes that the clips are attracted to this electromagnet.



Which conclusion can be drawn from this experiment?

- A. The soft iron bar is a natural magnet.
- B. The soft iron bar attracts the clips because of heat.
- C. The electromagnets are poor conductors of electricity.
- D. The electromagnets use both electrical and magnetic forces.

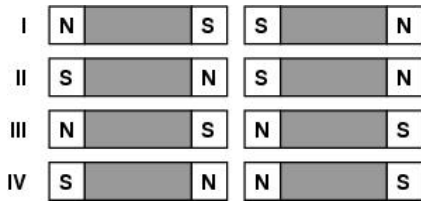
38. Sam observes the attraction between two magnets even when they are a few centimeters apart.



Which reason BEST explains this observation?

- A. Magnetic forces between two magnets increase as the distance between them increases.
- B. Magnetic forces acting from a distance cause magnets to exert a pull toward each other.
- C. Gravitational forces between two magnets increase as the distance between them increases.
- D. Gravitational forces acting from a distance cause magnets to exert a pull toward each other.

39. Shaun uses two bar magnets to study the forces of attraction and repulsion.



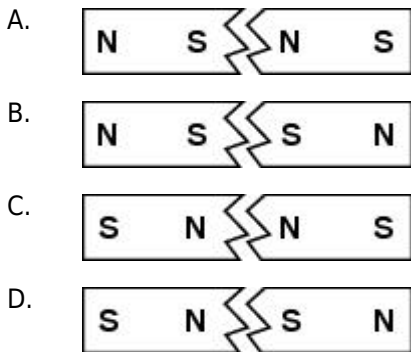
In which of these arrangements do the magnets attract each other?

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

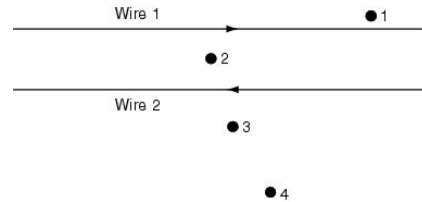
40. Daniel breaks a bar magnet into two pieces.



Which diagram correctly identifies the poles of the broken pieces of the magnet?



41. Each of two parallel wires has a current running through it. Wire 1 is above wire 2. Wire 1 has current flowing to the right. Wire 2 has current flowing to the left. Where is the induced magnetic field the strongest?



- A. 1
- B. 2
- C. 3
- D. 4

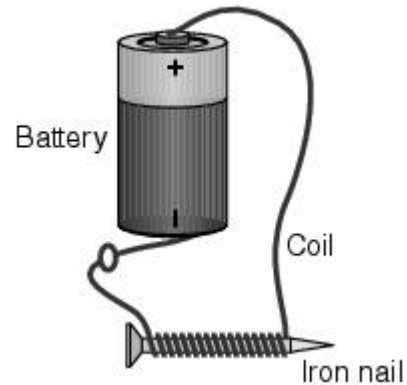
42. Which of these does a moving charge generate?

- A. thermal energy
- B. a magnetic field
- C. a chemical bond
- D. gravitational energy

43. A particle with a positive charge passes by a permanent magnet. Which BEST explains why the particle is deflected?
- A. The electric charge in the particle is repelled by the magnetic charges in the magnet.
 - B. Permanent magnets exert a force on a charge whether the charge is moving or stationary.
 - C. The permanent magnet contains positive and negative charges, which exert an electric force on the moving charge.
 - D. The moving charge produces a magnetic field. The permanent magnet exerts a force on the charge as if it were another magnet.

44. An electromagnet is shown below.

Electromagnet



Which BEST explains how an electromagnet produces a magnetic field?

- A. Each loop in the coil is a permanent magnet.
- B. When there is a current in the coil, the coil produces a magnetic field.
- C. Magnetic energy leaves the battery and becomes stronger by moving through the coil.
- D. The iron core is magnetic. The coil blocks the magnetic field except when the current is on.

45. In a power plant, how is a spinning turbine used to generate electricity?
- A. It turns a magnet inside a coil; the moving magnet causes a current in the coil.
 - B. It causes one coil to turn inside another coil, producing electric currents in opposite directions.
 - C. It turns a coil, which spins the free electrons inside the wires; the motion of the electrons is an electric current.
 - D. It causes a current in an electromagnet. The electromagnet pushes on another magnet, causing it to spin.

Stop! You have finished this exam.