

# **AAAS Project 2061**

## **Assessing Students' Progress on the Energy Concept**

### **Basic Test**

**Test Code = 01-01-B**

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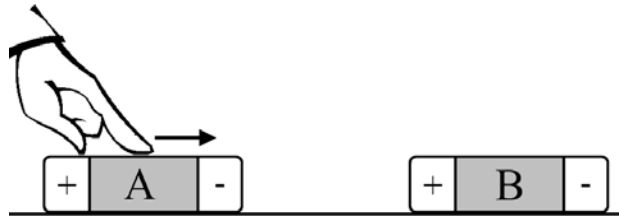
**For each question, fill in one circle on the answer sheet.**

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NG53-3

1. A student places a battery into a flashlight. When the student switches the flashlight on, a complete circuit is made, and the light bulb lights up. When the student switches the flashlight off, the circuit is no longer complete, and the light bulb goes out. Is energy being transferred electrically from the battery to the light bulb in the flashlight? Why or why not?
- A. No, because energy cannot be transferred electrically from one place to another
  - B. No, because even though energy can be transferred electrically, it cannot be transferred from a battery
  - C. Yes, but only when the flashlight is switched on because energy can be transferred electrically only when there is a complete circuit
  - D. Yes, as long as the battery is in the flashlight because electrical sources, such as batteries, transfer energy to electrical devices, such as flashlights, all the time
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RG120-2



2. A girl moves Magnet A close to Magnet B as shown above. When Magnet A is a certain distance from Magnet B, Magnet B begins to move toward Magnet A. The speed of Magnet B increases as it moves toward Magnet A. Is energy transferred while Magnet B moves toward Magnet A?
- A. No, energy is not transferred because magnets do not transfer energy unless they touch.
  - B. No, energy is not transferred because magnets do not have any energy.
  - C. Yes, energy is transferred because there is a change in speed.
  - D. Yes, energy is transferred, but the transfer of energy is not related to the change in speed.

**For each question, fill in one circle on the answer sheet.**

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NG59-3

3. Consider the following situations:

Situation 1: A battery is used to power a cell phone.

Situation 2: The sun shines on a plant.

Is energy being transferred in either of these situations?

- A. Energy is transferred in both situations.
  - B. Energy is NOT transferred in either situation.
  - C. Energy is transferred in Situation 1, but energy is NOT transferred in Situation 2.
  - D. Energy is transferred in Situation 2, but energy is NOT transferred in Situation 1.
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RG40-3

4. A repairman uses a tuning fork, like the one shown below, to tune a piano. He hits the tuning fork against the edge of a table. The tuning fork begins to vibrate. The vibrating tuning fork makes a specific sound, and the repairman adjusts the piano until it makes the same sound when played. After a while, the tuning fork stops vibrating, and the sound stops.



Photo by Helihark (CC-BY-SA-3.0)

What happens to the energy of the tuning fork as the vibrations of the tuning fork slow down and eventually stop?

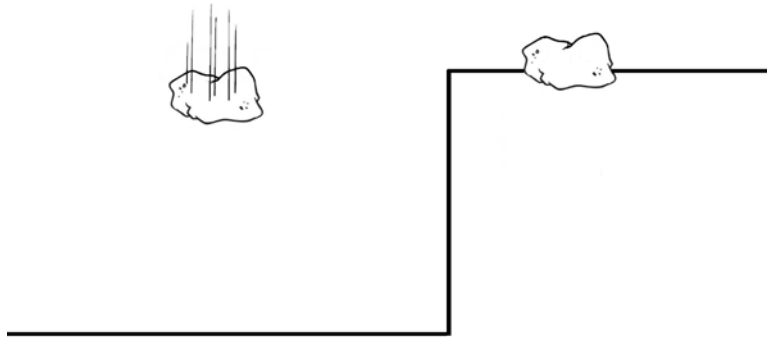
- A. Some of the energy is destroyed by the sound.
- B. Some of the energy is transferred to the surrounding air.
- C. Nothing happens to the energy because sound is not related to energy.
- D. The energy runs out because the force that was given to the tuning fork runs out.

**For each question, fill in one circle on the answer sheet.**

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RG161-2

5. The figure below shows two identical rocks. The rock on the left is falling, while the rock on the right is sitting on a cliff.



Does either rock have energy?

- A. The falling rock has energy because it is moving, and things that move have energy. The rock on the cliff does not have energy because it is not moving.
- B. The rock on the cliff has energy because it has energy stored inside of it. The falling rock does not have energy because it gave off its energy when it started to fall.
- C. Neither rock has energy because rocks are not alive, and only living things have energy.
- D. Both rocks have energy because all things have energy.

**For each question, fill in one circle on the answer sheet.**

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RG69-3

6. A person hits a musical instrument called a triangle. When it is hit, the triangle starts to vibrate, and a sound is produced. After a while, the vibration and sound stop.



How does the energy of the triangle change and why?

- A. The energy of the triangle decreases the entire time. Some energy is destroyed as the person hits the triangle, and some energy is transferred away from the triangle by sound.
- B. The energy of the triangle increases the entire time. Energy is transferred to the triangle as the person hits the triangle, and no energy is transferred away from the triangle by sound.
- C. The energy of the triangle increases when it is hit, and then the energy decreases. Energy is transferred from the person to the triangle as the person hits it, and then energy is transferred away from the triangle by sound after the person stops hitting it.
- D. The energy of the triangle does not change during this process. Energy is not transferred to the triangle when the person hits it, and energy is not transferred away from the triangle by sound.

**For each question, fill in one circle on the answer sheet.**

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RG62-3

7. Two girls are playing with two paper airplanes that are exactly the same. The girls stand the same distance from a wall and throw the airplanes toward the wall at different speeds. The first girl throws her airplane faster than the second girl. As the airplanes are flying, which one has more energy and why?
- A. The faster airplane has more energy because if two things are exactly the same, the faster one will always have more energy.
  - B. The slower airplane has more energy because it takes longer to hit the wall, and the amount of energy a thing has increases as it is moving.
  - C. The airplanes have the same amount of energy because they are exactly the same type of airplane.
  - D. The airplanes have the same amount of energy because they are flying the same distance.
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NG58-3

8. Consider the following situations:
- Situation 1: A person comes in contact with cold air.
- Situation 2: An electric generator is used to run a motor.
- Is energy being transferred in either of these situations?
- A. Energy is transferred in both situations.
  - B. Energy is NOT transferred in either situation.
  - C. Energy is transferred in Situation 1, but energy is NOT transferred in Situation 2.
  - D. Energy is transferred in Situation 2, but energy is NOT transferred in Situation 1.

**For each question, fill in one circle on the answer sheet.**

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RG13-3

9. A woman picks up a laptop computer and notices that the bottom of it feels cool. She turns on the laptop and works on it for an hour. Then she turns it off and picks it up again.



Will the bottom of the laptop be warmer or cooler after being on for an hour?

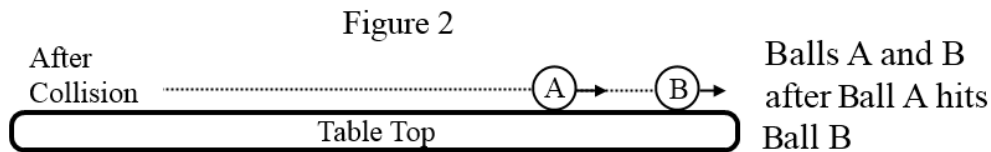
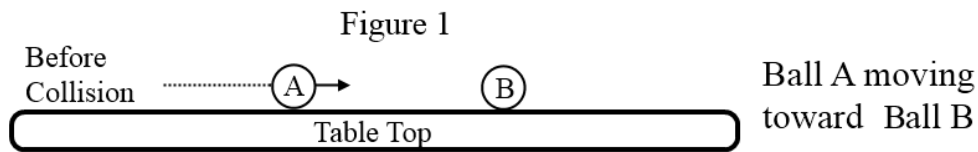
- A. The bottom of the laptop will be a little cooler after being on for an hour.
- B. The bottom of the laptop will be the same after being on for an hour.
- C. The bottom of the laptop will be a little warmer after being on for an hour.
- D. Whether the bottom of the laptop will be warmer or cooler depends on how much she used it during that hour.



For each question, fill in one circle on the answer sheet.

RG97-2

10. A player rolls Ball A toward Ball B as pictured in Figure 1. Then Ball A hits Ball B. Both balls continue to roll after the collision as shown in Figure 2.



Which of the following statements correctly describes Ball A's speed in Figure 2 compared to its speed in Figure 1?

- A. Ball A is moving faster in Figure 2 because it gained energy from hitting Ball B.
- B. Ball A is moving slower in Figure 2 because it transferred energy to Ball B when the balls hit each other.
- C. Ball A is moving slower in Figure 2 because some energy was destroyed when the balls hit each other.
- D. Ball A is moving at the same speed because no energy was transferred when the balls hit each other.

**For each question, fill in one circle on the answer sheet.**

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RG84-2

11. Two classes put plants in clay pots. The pots and plants are exactly the same, and they each have the same amount of dirt and water. One class hangs its pot outside the window on the first floor of the school. The other class hangs its pot outside the window on the second floor of the school.



Does the clay pot that is hanging outside the second floor window have more energy than the clay pot that is hanging outside the first floor window? Why or why not?

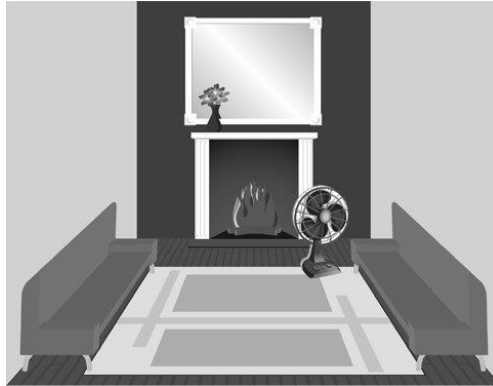
- A. Yes, the pot that is hanging outside the second floor window has more energy because it is higher above the ground.
- B. Yes, the pot that is hanging outside the second floor window has more energy because it is more likely to fall.
- C. No, both pots have the same amount of energy because they are exactly the same.
- D. No, both pots have no energy because they are not moving.

**For each question, fill in one circle on the answer sheet.**

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RG19-4

12. The air in the room pictured is cool. A fire is warming the air near the fireplace. There is a fan next to the fireplace.



If a person turns on the fan to blow the warmer air across the room, will the air at the other end of the room get any warmer? Why or why not?

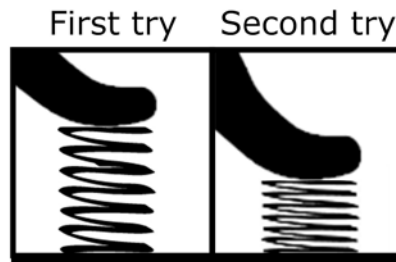
- A. No, because fans are only used to cool a room, they cannot be used to warm a room.
- B. No, because all of the air in a room is the same temperature, a blowing fan will not change the air temperature.
- C. Yes, because a fan can blow warmer air across a room, which makes the other end of the room warmer.
- D. It depends on the temperature of the air being blown by the fan. The air at the other end of a room will get warmer only if the air near the fire is a lot warmer than the air at the other end of the room.

For each question, fill in one circle on the answer sheet.

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RG53-3

13. A child has a spring. She wants to see how high she can make the spring jump into the air. First she pushes the spring down just a little bit and lets it go. Then she pushes the spring down as far as she can and lets it go. For each try, she watches the spring jump and measures how high the spring went.



Did the spring jump higher on the first or second try? Why?

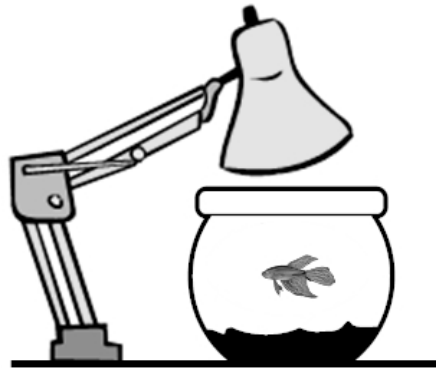
- A. The spring jumped higher on the first try because it was only pushed down a little bit.
- B. The spring jumped higher on the second try because it was pushed down more than on the first try.
- C. The spring jumped the same height on both tries because it is the same spring.
- D. More information is needed because how high a spring jumps does not depend on how much it is pushed down.

**For each question, fill in one circle on the answer sheet.**

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RG63-3

14. A person shines a light directly on to a fish bowl so that he can see the fish better. The fish bowl and the water start out at the same temperature as the air in the room.



What will happen to the temperature of the water in the fish bowl as the light shines on it?

- A. The water in the fish bowl will get a little warmer although it may be hard to notice.
- B. The water in the fish bowl will get a little cooler although it may be hard to notice.
- C. The water in the fish bowl will stay the same. It will not get warmer or cooler.
- D. Whether the water gets a little warmer, a little cooler, or stays the same depends on how cold the water is before the lamp is turned on.

**For each question, fill in one circle on the answer sheet.**

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RG80-3

15. A man takes a cookie out of a hot oven. He places the hot cookie on a cool plate. What will happen to the temperature of the plate and the cookie?

- A. The plate will get warmer, and the cookie will get cooler until they are both the same temperature.
  - B. The plate will get warmer, and the cookie will get cooler, but they will never be the same temperature.
  - C. The plate will stay the same temperature, and the cookie will get cooler until it is the same temperature as the plate.
  - D. The plate will stay the same temperature, and the cookie will get cooler, but they will never be the same temperature.
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RG59-3

16. A student flattens out an area of sand at the playground and then he drops a ball into the sand. He notices that the ball makes a dent in the sand. Next, he wants to see if throwing the ball from the same height into a new spot in the sand will make a deeper dent. When will the ball make the deeper dent and why?

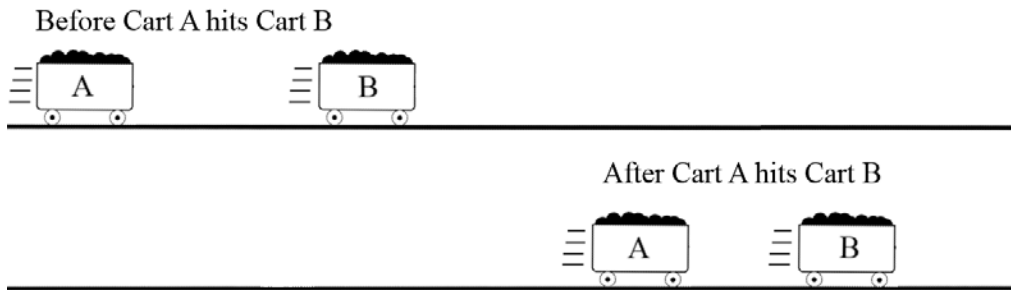
- A. The ball will make a deeper dent when it is dropped because it takes longer to fall.
- B. The ball will make a deeper dent when it is thrown because it is moving faster.
- C. The dent will be the same if the ball is dropped or thrown because it is the same ball each time.
- D. The dent will be the same if the ball is dropped or thrown because it is traveling the same distance each time.

For each question, fill in one circle on the answer sheet.

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RG159-2

17. Two carts are rolling on a smooth flat surface. Cart A is rolling faster than Cart B and hits the back of Cart B.



After Cart A hits Cart B, both carts continue rolling forward. Each cart is going a different speed than it was before. Was energy transferred from Cart A to Cart B?

- A. No, Cart A does not have any energy to transfer.
  - B. No, energy is not transferred when two objects hit each other.
  - C. Yes, the change in speed is a sign that energy was transferred.
  - D. Yes, energy was transferred, but the change in speed is not related to the transfer of energy.
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NG57-3

18. Consider the following situations:

Situation 1: A person touches a cold piece of metal.

Situation 2: A lamp shines light on a table.

Is energy being transferred in either of these situations?

- A. Energy is transferred in both situations.
- B. Energy is NOT transferred in either situation.
- C. Energy is transferred in Situation 1, but energy is NOT transferred in Situation 2.
- D. Energy is transferred in Situation 2, but energy is NOT transferred in Situation 1.

**For each question, fill in one circle on the answer sheet.**

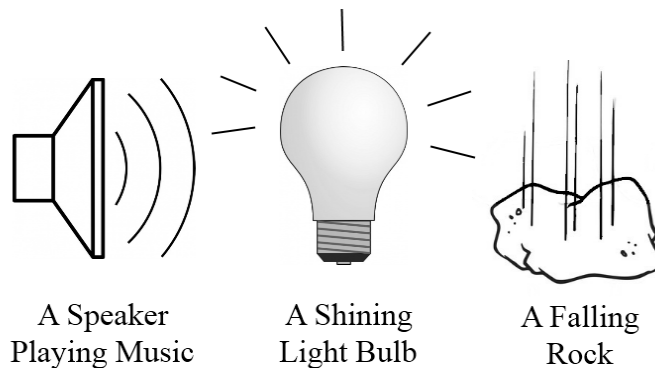
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RG166-1

19. A student has two blocks. One block is warmer than the other block. If the student stacks the warmer block on top of the cooler block, what will happen to the temperature of the blocks?

- A. The cooler block will stay the same temperature, and the warmer block will get cooler until it is the same temperature as the cooler block.
  - B. The warmer block will stay the same temperature, and the cooler block will get warmer until it is the same temperature as the warmer block.
  - C. The warmer block will get cooler and the cooler block will get warmer until both blocks are at the same temperature.
  - D. The warmer block will get cooler and the cooler block will get warmer, but they will never be the same temperature.
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RG148-2



20. Which of the objects in the figure above has energy?

- A. Only the rock, because the rock is moving
- B. Only the light bulb, because it is giving off light
- C. Only the speaker and light bulb, because they are using electricity
- D. All three objects, because all objects have energy



**For each question, fill in one circle on the answer sheet.**

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RG86-2

21. A river flows into a lake. The river water is warm, and the lake water is cold. What happens to the temperature of the lake water when the warm river water flows into the lake?
- A. The lake water will get cooler.
  - B. The lake water will get warmer.
  - C. The lake water will not change temperature.
  - D. The lake water will only change temperature if the river water is much warmer than the lake water.
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RG52-3

22. A girl and a boy find two rubber bands that are exactly the same. They each stretch a rubber band between their fingers. The girl stretches her rubber band as far as she can without breaking it. The boy stretches his rubber band a little less than the girl.



After the rubber bands are stretched, which one has more energy and why?

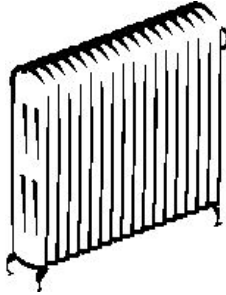
- A. The girl's rubber band has more energy because it is stretched more than the boy's rubber band.
- B. The boy's rubber band has more energy because it can still be stretched farther, but the girl's rubber band is stretched as far as it can go.
- C. Both rubber bands have the same amount of energy because the amount of energy a rubber band has is not related to how much it is stretched.
- D. Neither one of the rubber bands has any energy because the rubber bands are not moving.

**For each question, fill in one circle on the answer sheet.**

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NG39-3

23. A radiator is a device used to heat up a room. When a student stands close to the radiator, he feels warm even though he is not touching the radiator.



What will happen if the student holds a blanket up so that the blanket is between himself and the radiator but not touching him?

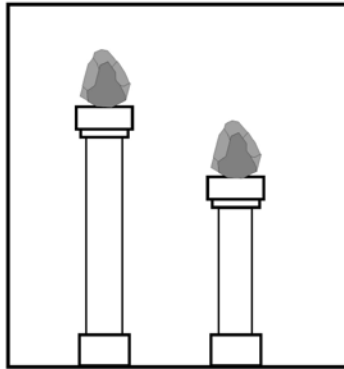
- A. He will feel warmer because blankets keep people warm.
- B. He will feel cooler because the blanket is blocking the energy being given off by the radiator.
- C. He will feel the same because holding the blanket up will not change the temperature of the air in the room.
- D. He will feel the same because he will still receive the same amount of energy from the radiator even if the blanket is between himself and the radiator.

**For each question, fill in one circle on the answer sheet.**

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RG49-3

24. A person has two rocks that are exactly the same. She puts the rocks on top of two different posts as shown in the picture below. Then she pushes the rocks off the posts and they fall to the ground.



Which rock is more likely to break when it hits the ground and why?

- A. The rock that is on the higher post is more likely to break because it is farther from the ground.
- B. The rock that is on the lower post is more likely to break because it is closer to the ground.
- C. Both rocks are equally likely to break because they are the same shape.
- D. Both rocks are equally likely to break because they weigh the same.

**For each question, fill in one circle on the answer sheet.**

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RG17-3

25. A man stops at a gas station on a sunny day and fills his car up with gasoline. Then he drives the car home.



How does the car get the energy it needs to move?

- A. The car gets the energy it needs to move by burning the gasoline.
- B. The car gets the energy it needs to move by absorbing light from the sun.
- C. The car gets the energy it needs to move from the man, not from burning gasoline or absorbing light from the sun.
- D. As the car moves, the car's motion makes the energy needed to keep the car moving.

**For each question, fill in one circle on the answer sheet.**

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RG29-4

26. A boy puts batteries in a remote control so that he can play with a remote controlled car. He plays with the car for an hour. As the car moves around, the wheels of the car rub against the floor. After he is finished playing, he picks up the car.



Will the wheels and the remote control be warmer after the boy plays with them for an hour? Why or why not?

- A. The remote control will be a little warmer because things that use batteries get warmer when you use them. The temperature of the wheels will not change.
- B. The wheels will be a little warmer because things that move get warmer as parts of them rub against each other. The temperature of the remote control will not change.
- C. The remote control will be a little warmer because it uses a battery, and the wheels will be a little warmer because they rubbed against the floor.
- D. Neither the remote control nor the wheels will be warmer because things do not get warmer just by using batteries or by rubbing together.

**For each question, fill in one circle on the answer sheet.**

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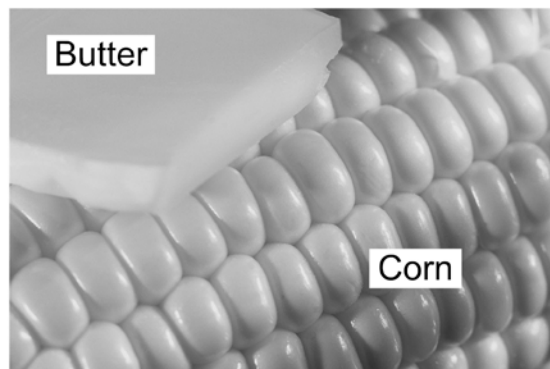
RG14-4

27. A person watches a candle burn. As the candle burns, the person sees the light of the flame. The person also notices that the air around the flame is warmer. Is energy given off or is energy taken in by the candle while it burns?

- A. Energy is taken in because the flame removes coldness from the air.
  - B. Energy is given off because the flame gives off light and heats the air.
  - C. Energy is not given off and not taken in because candles are not living things, and only living things give off or take in energy.
  - D. Energy is not given off and not taken in because the candle is not moving, and only things that are moving give off or take in energy.
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RG79-2

28. A cook heats up some corn. Then she cuts a piece of cold butter and places it on top of the hot corn.



What will happen to the temperature of the corn and the butter as soon as she puts the butter on top of the corn?

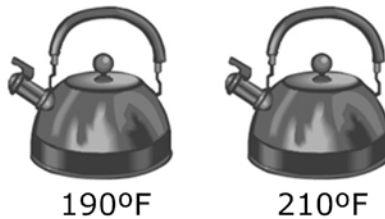
- A. Both the corn and the butter will get cooler.
- B. Both the corn and the butter will get warmer.
- C. The corn will get cooler, and the butter will get warmer.
- D. The corn will stay the same temperature, but the butter will get warmer.

**For each question, fill in one circle on the answer sheet.**

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RG56-3

29. An adult wants to heat up some water to make hot tea. He fills two tea kettles that are exactly the same with water and places them on the stove. While the kettles are on the stove, the temperature of the kettles and the water increases. When the kettles are very hot, the adult measures the temperature of each kettle. He finds that one kettle is hotter than the other.



Which tea kettle has more energy?

- A. The hotter kettle has more energy because it has a higher temperature.
  - B. The cooler kettle has more energy because it hasn't used up as much energy as the hotter kettle.
  - C. The kettles have the same amount of energy because they are both very hot.
  - D. The kettles have the same amount of energy because how much energy something has is not related to how hot it is.
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RG103-2

30. Can the amount of energy a rock has change?

- A. Yes, but the amount of energy something has can only change if a person moves it
- B. Yes, there are a number of different ways the amount of energy something has can change, for example, by changing its motion or heating it.
- C. No, because the amount of energy something has always stays the same no matter what is done to it
- D. No, because non-living things do not have any energy

**For each question, fill in one circle on the answer sheet.**

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RG180-1

31. A person puts a bottle of juice in a refrigerator. The juice gets cooler while it is in the refrigerator. As the juice gets cooler, what happens to the amount of energy the juice has?

- A. The amount of energy the juice has decreases as it gets cooler.
  - B. The amount of energy the juice has increases as it gets cooler.
  - C. Juice has the same amount of energy no matter what temperature it is.
  - D. Juice does not have energy.
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RG24-3

32. A musician is playing a guitar. The musician plucks one of the guitar strings, and it begins to vibrate back and forth. The vibration produces a sound.



Which of the following describes the transfer of energy from the guitar to the musician's ear while the sound is being produced?

- A. Energy is transferred from the guitar to the ear only if the sound is loud because only loud sounds can cause the air in the room to vibrate, and it is these vibrations that transfer energy.
- B. Any sound can cause the air in the room to vibrate, and these vibrations transfer energy from the guitar to the ear.
- C. The energy from the sound travels from the guitar to the ear independent of the air in the room. The air does not play a role in the transfer of energy.
- D. Energy is not transferred from the guitar to the ear because sound has nothing to do with energy.



**For each question, fill in one circle on the answer sheet.**

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RG12-2

33. A boy is drawing a picture with a crayon. He colors in a big part of the drawing by rubbing the end of the crayon back and forth on the paper.



Will the end of the crayon get warmer or cooler after the boy rubs it on the paper?

- A. The end of the crayon will get a little warmer.
- B. The end of the crayon will get a little cooler.
- C. The end of the crayon will not get warmer or cooler.
- D. Whether it gets warmer or cooler depends on what color the crayon is.

**For each question, fill in one circle on the answer sheet.**

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RG216-1

34. Inside a wall clock, a battery is connected in a complete circuit to a motor that turns the hands of the clock.



When a person puts a new battery in a clock, the hands of the clock start to turn. The hour and minute hands turn slowly while the second hand turns quickly. While the hands on the clock are turning, is energy being transferred? Why or why not?

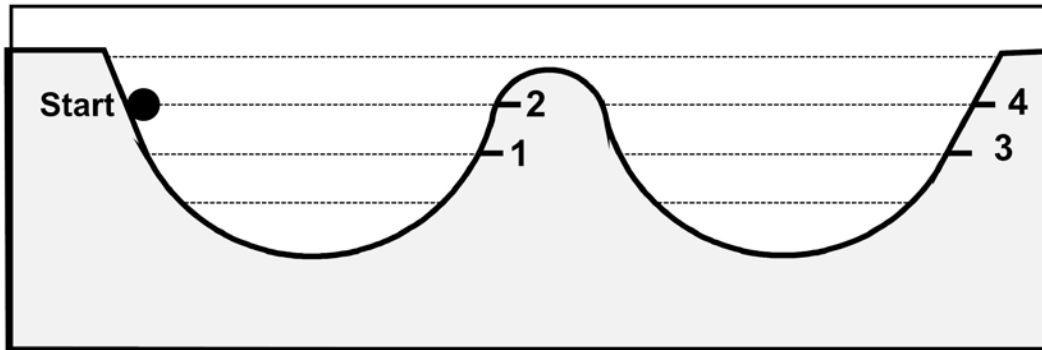
- A. Yes, energy is transferred from the battery but only to the second hand because it is moving the fastest.
- B. Yes, energy is transferred from the battery to all of the hands because all the hands are moving.
- C. Yes, energy is transferred from the battery to all of the hands because batteries transfer energy all the time even when they are not connected in a complete circuit to a device.
- D. No, energy is not transferred from the battery to the hands because energy cannot be transferred by a battery.

For each question, fill in one circle on the answer sheet.

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NG84-2

35. Imagine a ball on a track where no energy is transferred between the ball and the track or between the ball and the air around it. The ball starts from rest at the position labeled Start and moves along the track toward Positions 1, 2, 3, and 4.



What is the highest position the ball will reach before stopping and going back down the track? (Remember that no energy is transferred between the ball and the track or between the ball and the air around it.)

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

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**End of Test**