

The Heat is On – Answer Key

This test is worth 72 points. All questions are worth one point unless otherwise noted.

Station 1

1. Kinetic or Potential
2. Kinetic or Potential
3. Kinetic or Potential
4. Kinetic or Potential
5. Kinetic or Potential

Station 2

6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D

Station 3

11. Nuclear
12. Thermal
13. Electric
14. Chemical
15. Mechanical
16. Thermal
17. Chemical

Station 4

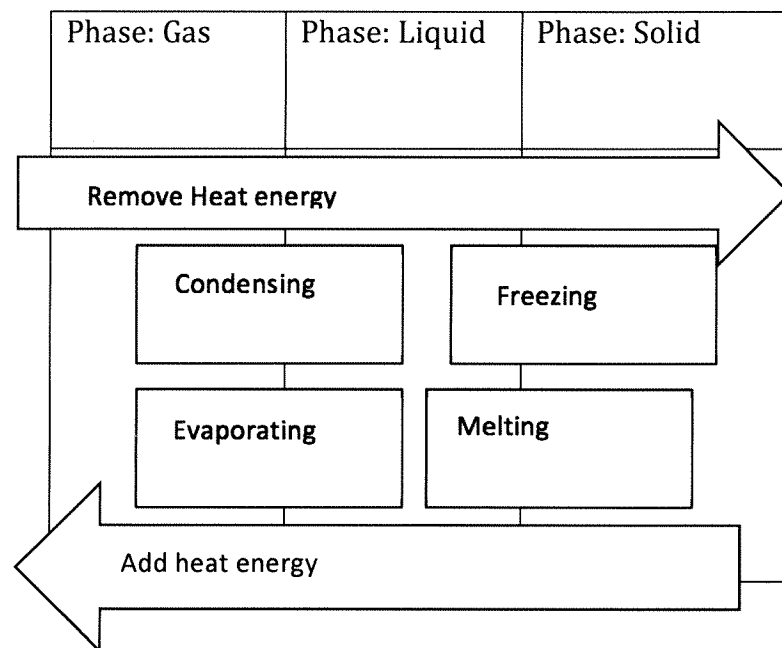
18. Conduction
19. Convection
20. Radiation
21. Radiation
22. Friction
23. Convection

Station 5

24. Wood
25. Styrofoam

Station 6

26.



Station 7

27. Yes
28. A B C D
29. A B C D

Station 8

30. Gas
31. Added
32. Radiation

Station 9

33. The balloon will wilt_____
34. As the molecules of gas in the balloon lose heat energy they get closer together_____
35. The lid will pop off_____
36. The air in the jug will warm up as it sits inside, the molecules will move farther away from each other

Station 10

37. FIT or NOT FIT
38. As molecules heat they get further apart
39. Low boiling point_____

Station 11

40. the temperature_____
41. INCREASE or DECREASE
42. A B
43. B_____

Station 12

44. A B C D
45. A B C D

Station 13

46. Mechanical to Electrical (2pts)
47. Thermal to Mechanical (2pts)
(would also accept Nuclear to Mech)
48. A B C D

Station 14

49. Yes or No
50. Yes or No
51. Yes or No
52. Yes or No
53. Yes or No

Station 15

54. Yes or No
55. Yes or No
56. Yes or No
57. Chemical to Electrical (2pts)

Station 16

58. Condensation_____
59. Evaporation_____
60. Precipitation_____
61. The sun_____
62. A B C D
63. TRUE or FALSE
64. Sublimation_____

Station 17

65. A B C D
66. A B C D
67. A B C

Station 18

68. A B C D
69. A B C D
70. A B C

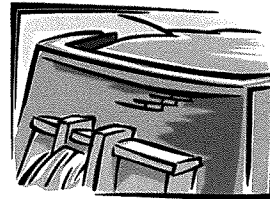
Station 1

Determine whether the following pictures are examples of **Kinetic Energy** or **Potential Energy**.

1. Stretching a rubber band and holding it before letting go.



2. The water behind the wall of a dam.



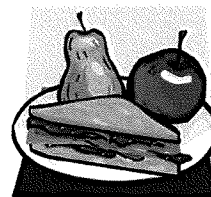
3. The water flowing through an opening in the wall of a dam.



4. A downhill skier racing down the slope.
(source: http://a.abcnews.com/images/International/winter-olympics-07-gty-jrl-171228_3x2_992.jpg)

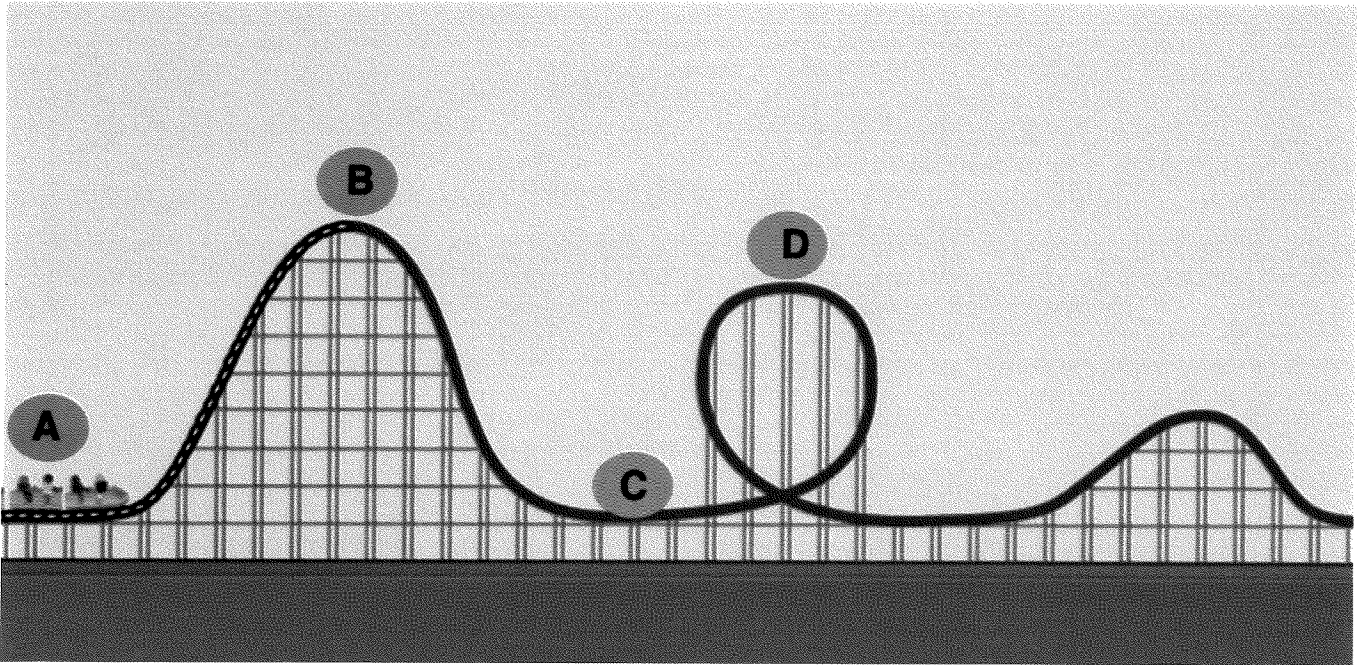


5. A plate of food sitting on a table.



Station 2

Look at this roller coaster diagram to answer the following questions. There may be more than one correct answer for some of these questions.



Source: <http://d3tt741pwxqwm0.cloudfront.net/WGBH/conv16/conv16-int-rollercoaster/index.html>

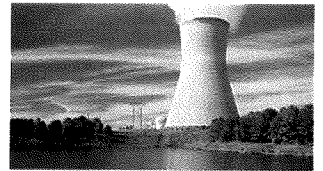
6. Where does the ball have the most kinetic energy? A B C D
7. Where does the ball have the least kinetic energy? A B C D
8. Where does the ball have the most potential energy? A B C D
9. Where does the ball have the least potential energy? A B C D
10. Where does the ball have some potential and some kinetic energy? A B C D

Station 3

Classify the pictures below according to the form of energy being illustrated. Use the word bank to help you.

Word Bank				
mechanical	chemical	electrical	thermal	nuclear

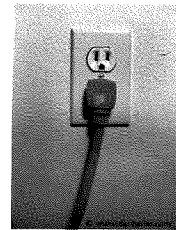
11. What type of energy is used to make electricity at this power plant in NC?



12. What type of energy is measured by a thermometer?



13. What type of energy do we get from a typical wall socket in our homes?



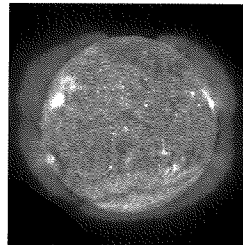
14. What type of energy is provided for cars at a gas station?



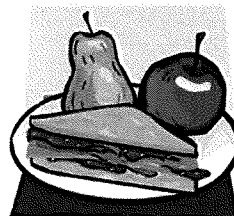
15. What type of energy does pedaling a bike create?



16. What type of energy in the sun produces heat?



17. What type of energy is found in food?



Station 4

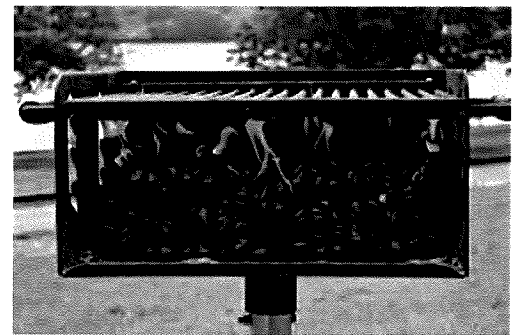
Classify the pictures below according to the way energy is being transferred. Use the word bank to help you.

Word Bank			
conduction	convection	radiation	friction

18. How does a hot stove burner transfer heat to a metal pot?
19. When a stove heats a metal pot, how does the pot heat the food inside it?



20. The flames in a grill heat the air, causing the hot air to rise. What type of energy transfer is this?
21. Your eyes can see the light from the flames in the grill. How does the light get to your eyes?



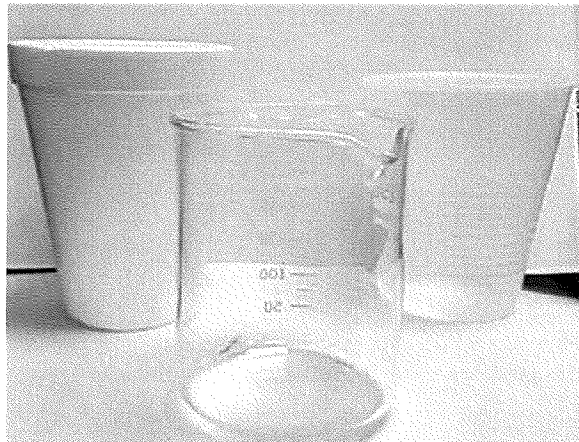
22. When you rub your cold hands together very quickly, how are you transferring heat?
23. You use your warm breath to blow on your cold hands to heat them. How are you transferring heat energy to your hands?



Station 5



24. You are making homemade taffy and the recipe says that you have to stir the candy continuously for 10 minutes while it heats up to 300 °F. Which of the spoons at this station would be the best insulator to protect your hand from the heat?
25. You are trying to keep a cup of ice from melting for your whole Science Olympiad practice session. Which of these cups is the best insulator? Styrofoam, glass, or plastic?



Station 6

26. Fill in all the blanks on your answer sheet to match the pictures below.

Phase:	Phase:	Phase:

Word Bank

Add heat energy	Condensating	Evaporating	Freezing	Gas
Liquid	Melting	Remove heat energy	Solid	

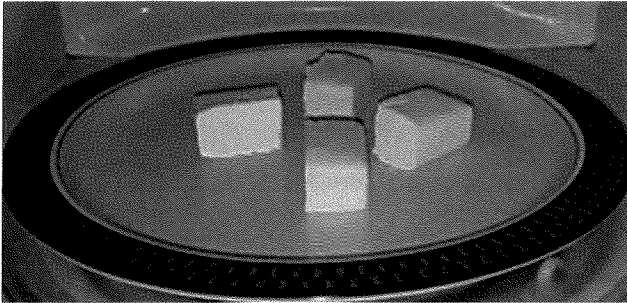
Station 7



Source: https://cdn.shopify.com/s/files/1/0232/3919/files/2_medium.jpg?1199

27. Rub the balloon with the cloth and then hold it near your partner's shirt. Does it stick?
28. Which of the following statements is true about this activity?
- A. Negatively charged particles are transferred from the cloth to the balloon
 - B. Negatively charged particles are transferred from the balloon to the cloth
 - C. Positively charged particles are transferred from the cloth to the balloon
 - D. Positively charged particles are transferred from the balloon to the cloth
29. What is the name of the subatomic particle being transferred?
- A. Proton
 - B. Neutron
 - C. Atom
 - D. Electron

Station 8



At this station is a bar of ivory soap before and after I cooked it in the microwave.

The pieces grew very large and filled up the entire microwave! After the microwave shut off, the soap shrank down and this is what is left.

30. What do you think is in the soap that expanded?

31. Was energy added or subtracted from the soap in the microwave?

32. What kind of energy does a microwave use to cook food?

Station 9

Read each situation. Circle the correct outcome and provide a short explanation.

33. You go to the store to buy a shiny helium balloon for your friend for her birthday. Inside the store, it is warm and toasty. Outside the store, it is frosty and cold. What will happen to the balloon when you take it outside?

The balloon will wilt.



OR

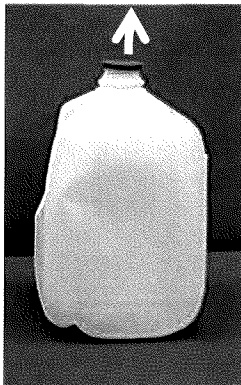
The balloon will pop.



34. Explain why!

35. An empty milk jug has been sitting outside in the freezing cold for a few days. You put the lid on, bring it inside where it is very warm and set it on the table. What will happen to the milk jug after it has been sitting on the table for a while?

The lid will pop off.



OR

The milk jug will crumple.

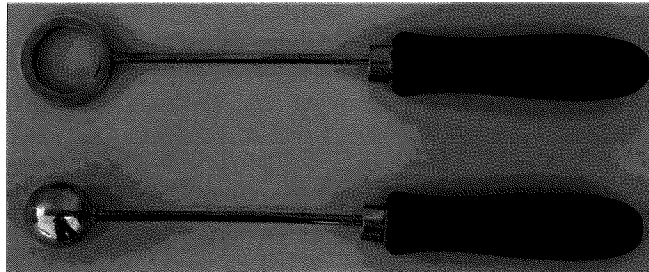


36. Explain why.

Station 10

Read each situation. Circle the correct outcome and provide a short explanation.

This ball and ring device is made out of metal. Test to be sure the ball will fit through the ring.

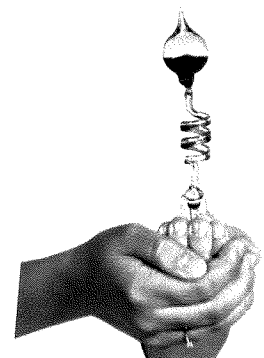


37. If you hold the ball in a very hot flame for 5 minutes, predict what will happen.

The ball will still fit through the ring. The ball will **not** fit through the ring.

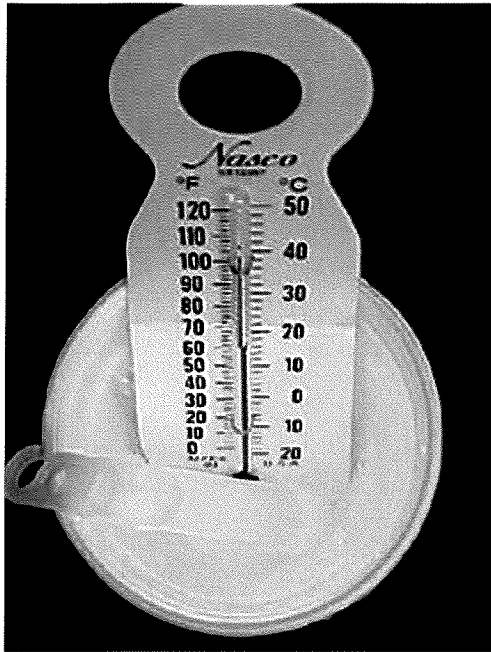
38. Explain why.

This is a picture of a hand boiler, which is made of glass with a liquid inside. When you hold the bulb in your hand like in the picture, the liquid moves from the bottom to the top of the bulb.



39. Does this liquid have a low boiling point or a high boiling point?

Station 11



A

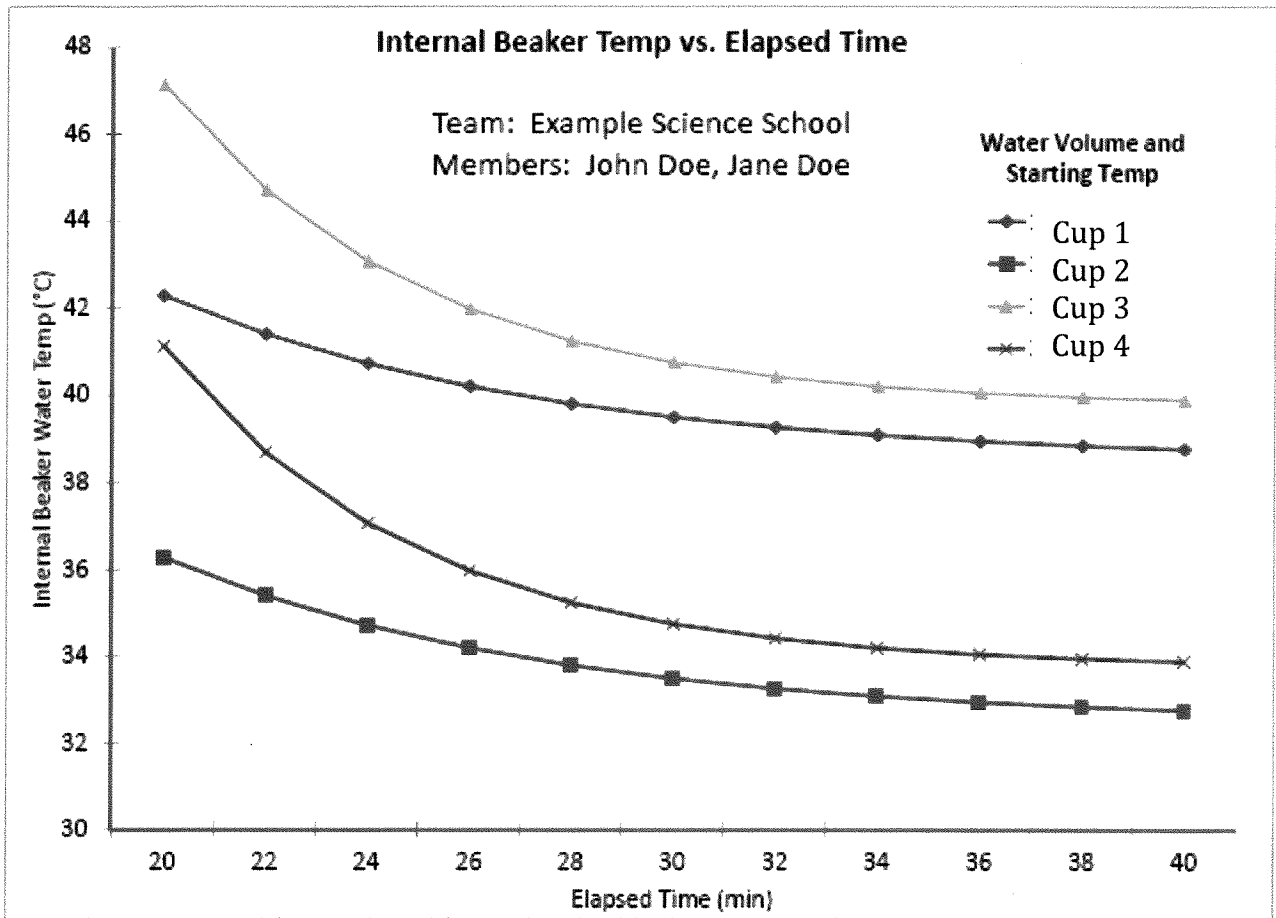


B

In picture A, the glow stick is glowing brighter than in picture B. Observe the pictures carefully and answer the questions below.

40. What factor is affecting the brightness of the glow stick?
41. If you were to take the glow stick from picture B out of its cup and leave it on the table for a while, would its brightness increase or decrease?
42. If you were to take the glow stick from picture A out of its cup and leave it on the table for a while, how would the heat transfer?
 - a. From the glow stick to the surrounding air and the table.
 - b. From the air and table to the glow stick.
43. Which glow stick has particles that are moving the slowest, the glow stick in picture A or picture B?

Station 12



44. Which of these containers was the best insulator?

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

45. Look at the data table below. Which line in the graph matches the data table?

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

Elapsed Time (min)	Temp (°C)
0	50.2
10	46.1
20	41.3
24	37.2
30	35.7
34	35.1
38	34.5

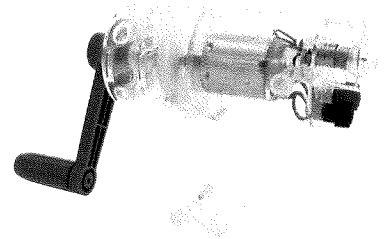
Station 13

Energy is usually transformed from one kind to another by the many different devices we use. Answer the questions below about how energy is transformed.

mechanical	chemical	Word Bank	thermal	nuclear
		electrical		

This is a hand generator. Turn the crank and watch what happens.

46. This device turns what energy into what other type of energy?

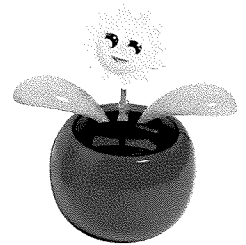


This toy gets its energy by collecting sun rays.

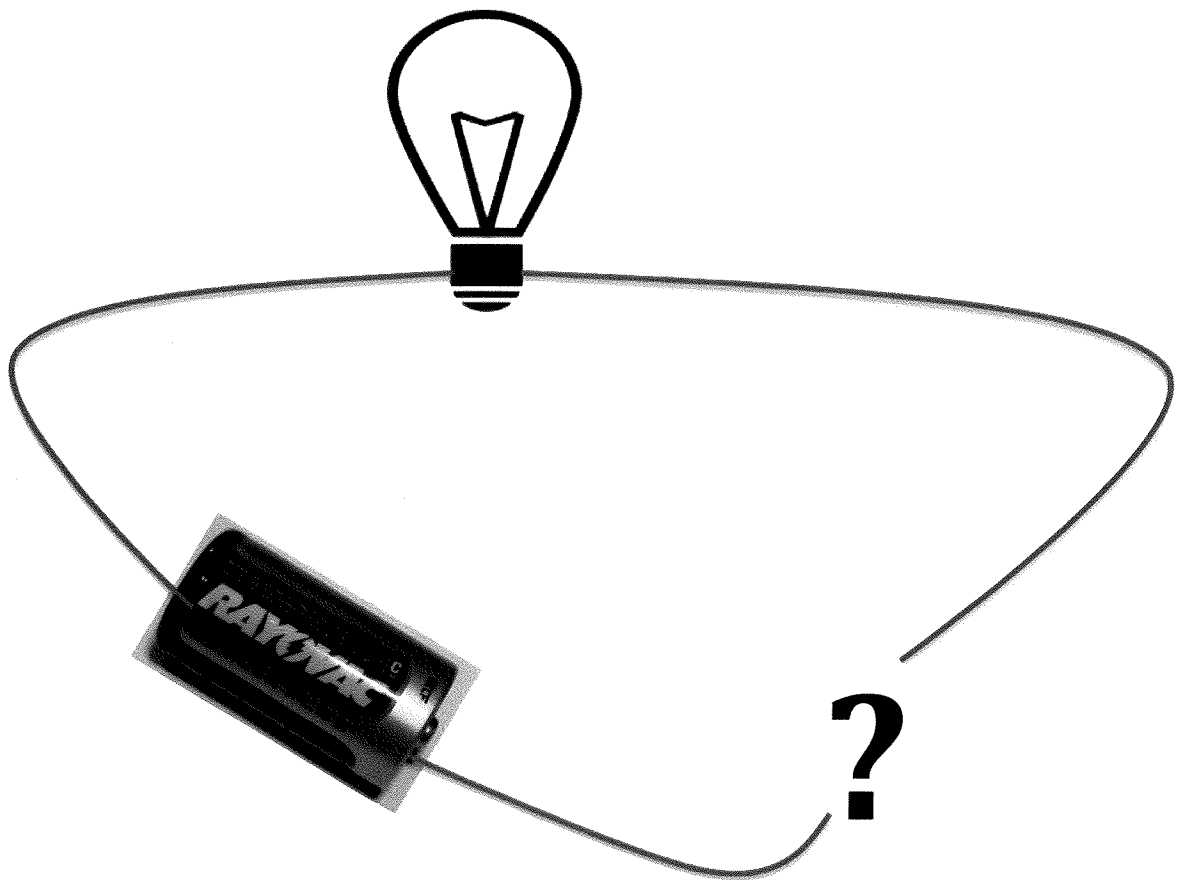
47. This device turns what energy into what other type of energy?

48. How does sunlight reach the earth?

- A. Conduction
- B. Convection
- C. Radiation
- D. Friction



Station 14



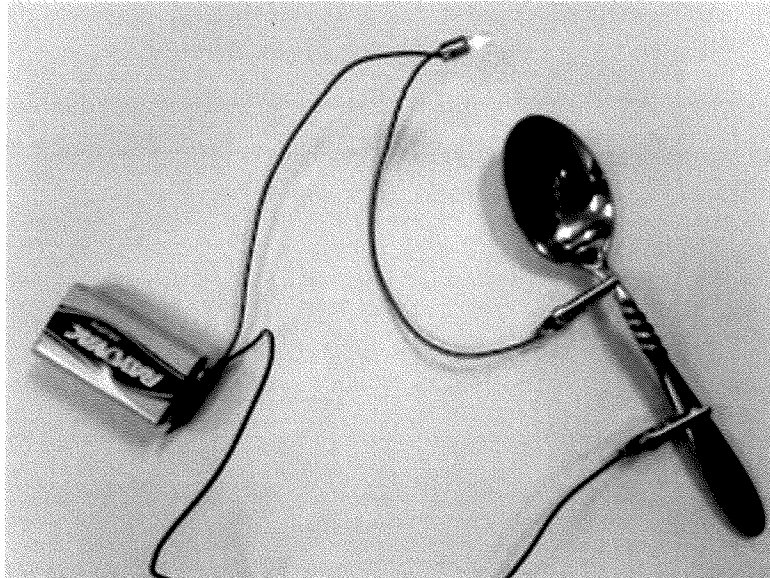
The light bulb on this circuit will light up when the circuit is complete. Which items at this station will complete the circuit?

- 49. Racquetball
- 50. Penny
- 51. Dowel rod
- 52. Fresh tree branch
- 53. Coffee cup

Station 15

There is a conductivity tester at this station. When the battery is plugged in and you touch both of the clips to something that conducts electricity, the light bulb will light up. Gently touch both clips on the items below to see whether they are conductors or not.

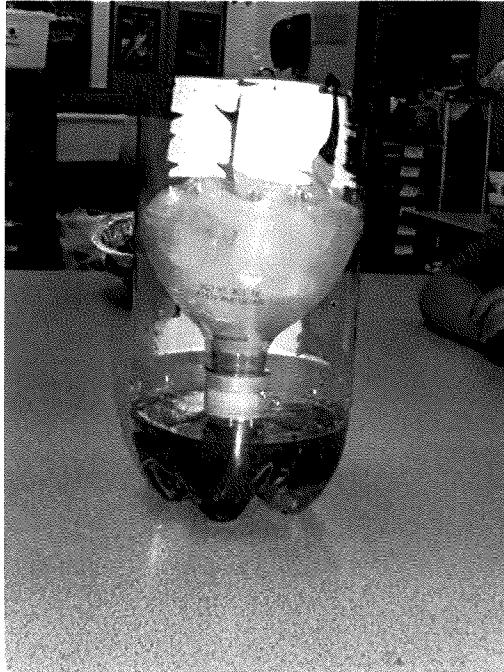
Pat the tester dry with a paper towel in between testing the liquids.



SAFETY ALERT: DO NOT drink any of the liquids at this station.

54. Touch the clips to the wooden block. Is the block a conductor?
55. Touch the clips to the distilled water. Is distilled water a conductor?
56. Touch the wire ends of the device to the salt water. Is salt water a conductor?
57. This tester is powered by a battery. It turns _____ energy into _____ energy.

Station 16



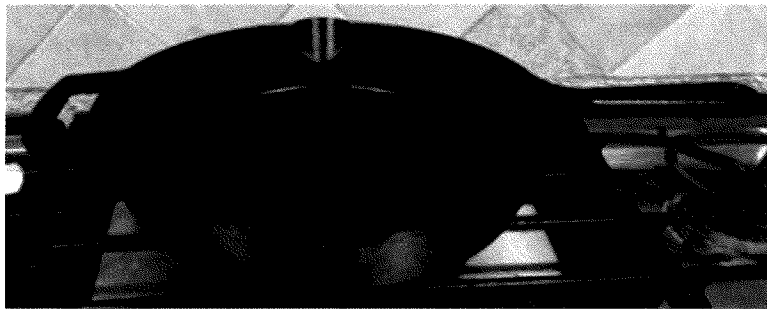
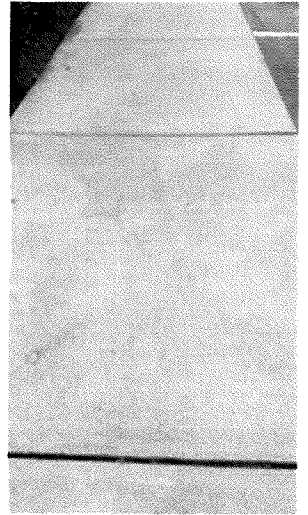
Imagine that the blue water at the bottom is the ocean and the top of the bottle is the atmosphere.

58. You should see some 'clouds' inside the container. Through what process are clouds formed in the sky?
59. Through what process does the water get from the 'ocean' to the sky?
60. After a few minutes, you may see water dripping down off of the inside bottle. What is it called in the water cycle when water comes back down to the ground?
61. What gives the earth's water cycle its energy?
62. When you hang clothes outside to dry, what process are you hoping for?
- A. evaporation
 - B. precipitation
 - C. condensation
 - D. accumulation
63. TRUE or FALSE: All water in the water cycle ends up in the same place it started.
64. Water gets to the atmosphere even at the South Pole, where ice turns directly into a gas. What is that process called?

Station 17

65. Most sidewalks are built with cracks in them like this one. What do you predict will happen to the sidewalk cracks on a hot North Carolina summer day?

- A. The spaces get wider because the concrete shrinks.
- B. The spaces get narrower because the concrete expands.
- C. The spaces stay the same because the concrete does not shrink or expand.
- D. Some spaces get narrower and some get wider because some concrete expands and some concrete shrinks.

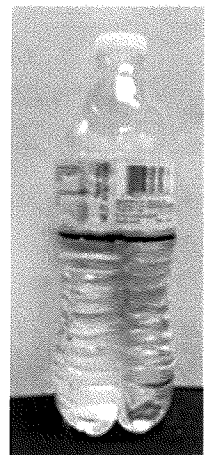


66. Your dad cooks up some tasty scrambled eggs in his iron frying pan. Afterwards, he sits the pan back on the countertop to cool. What happens to the pan?

- A. Even though you cannot see it, the pan gets a tiny bit smaller because the iron atoms decrease in size.
- B. Even though you cannot see it, the pan gets a tiny bit smaller because the distance between iron atoms decreases.
- C. Even though you cannot feel it, the pan gets a tiny bit heavier because the iron atoms increase in mass.
- D. Even though you cannot feel it, the pan gets a tiny bit heavier because the number of iron atoms increases.

67. You want to have a cold drink after practice, so you put a water bottle filled to the marked line in the freezer, but then you forget about it until the next day. What will the water bottle look like when you take it out?

- A. The ice level will be higher than the original water level
- B. The ice level will be lower than the original water level
- C. The ice level and water level will be the same.



Station 18

68. Your friends and yourself have decided to have a race. However, when everyone starts running, somehow everyone is running at the same speed and everyone finishes at the same time! So, instead it is agreed upon that the person with the greatest kinetic energy is the victor. So, if Jenna weighs 50 kg, Bobby weighs 35 kg, Zach weighs 55 kg, and you weigh 45 kg, who had the largest kinetic energy and is the winner?

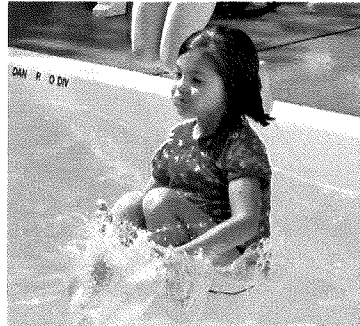
- a. Jenna
- b. Bobby
- c. Zach
- d. You

69. Scientists are working in a laboratory. They are trying to split atoms apart to create energy. If they are success, what form of energy would they have?

- a. Kinetic
- b. Potential
- c. Nuclear
- d. Electric

70. Which of these people has the most thermal energy?

- A. A runner at the end of a race B. Someone enjoying a splash in the pool



- C. This kid playing in the snow in her shorts

