

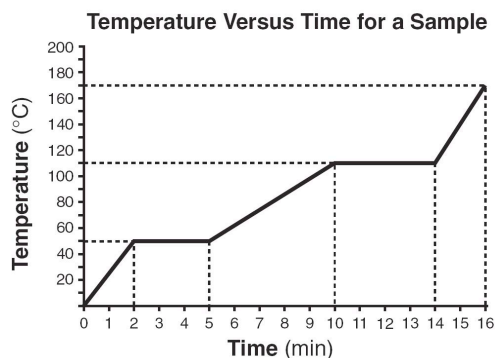
Name \_\_\_\_\_  
Date \_\_\_\_\_

## Unit 2 - Matter and Energy Practice Test

For each statement or question, choose the number of the word or expression that best completes the statement or answers the question.

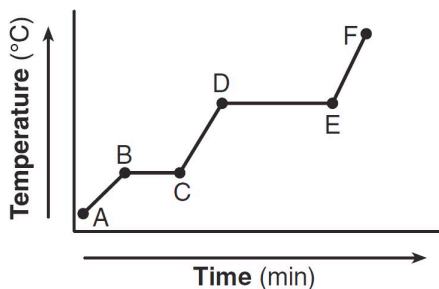
- \_\_\_\_ 1. At STP, which 5.0-gram sample of matter take the shape of its container but retains a definite volume?  
1) Br<sub>2</sub>(g)                      2) Fe(NO<sub>3</sub>)<sub>2</sub>(s)                      3) KCl(aq)                      4) Xe(g)
- \_\_\_\_ 2. Which statement best describes the shape and volume of a sample of O<sub>2</sub> (g)?  
1) It has a definite shape and a definite volume                      3) It has a definite shape and no definite volume.  
2) It has no definite shape and a definite volume.                      4) It has no definite shape and no definite volume.
- \_\_\_\_ 3. Which of the following is a homogeneous mixture?  
1) pure water                      2) NaCl (aq)                      3) Soil                      4) iron nail
- \_\_\_\_ 4. Which substance can *not* be decomposed by a chemical change?  
1) CoCl<sub>2</sub>                      2) H<sub>2</sub>O                      3) Mg                      4) CuO
- \_\_\_\_ 5. Which selection contains two pure substances?  
1) Cu (s) and Iron filings with sand                      3) NaCl (aq) and Iron filings with sand  
2) Cu (s) and H<sub>2</sub>O (s)                      4) NaCl (aq) and H<sub>2</sub>O (s)
- \_\_\_\_ 6. A student found the melting point of a solid to be 60.6°C. If the solid's actual boiling point is 70.4°C, the experimental percent error is equal to  
1) .139                      2) 13.9                      3) .16                      4) 16.2
- \_\_\_\_ 7. During a laboratory experiment, a sample of a metal is found to have a mass of 14.50 grams and a volume of 3.7 milliliters. What is the density of this sample?  
1) 3.9 g/mL                      2) 2.72 g/mL                      3) 4.5 g/mL                      4) 2.9 g/ml
- \_\_\_\_ 8. Which statement describes a chemical property of Carbon?  
1) Carbon is brittle                      3) Carbon burns in the presence of oxygen  
2) Carbon is not conductive                      4) Carbon has a density of 2.698 g/cm<sup>3</sup>
- \_\_\_\_ 9. An example of a physical property of an element is the element's ability to  
1) form compounds with Fluorine                      3) rust  
2) Burn                      4) form an aqueous solution
- \_\_\_\_ 10. Which mixture can be separated using the distillation process?  
1) C<sub>2</sub>H<sub>4</sub>OH(l) and SiO<sub>2</sub>(l)                      3) NaCl(s) and C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>(aq)  
2) CO<sub>2</sub>(g) and NaCl(aq)                      4) CO<sub>2</sub>(g) and C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>(aq)
- \_\_\_\_ 11. What is the volume of 80 g of aluminum if the density of aluminum is 2.7 g/mL?  
1) 216 mL                      2) 29.6 mL                      3) 499 mL                      4) none of the above

- \_\_\_ 12. In which of the following would the particles have the lowest average kinetic energy?  
 1) 50 mL of H<sub>2</sub>O at 60°C                      3) 100 mL of H<sub>2</sub>O at 40°C  
 2) 50 mL of H<sub>2</sub>O at 10°C                      4) 100 mL of H<sub>2</sub>O at 25°C
- \_\_\_ 13. What is the final temperature of water if 380 grams of water at 36°C absorb 47880 joules of energy?  
 1) 36.0°C                      2) 66.0°C                      3) 30.1°C                      4) 40.00°C
- \_\_\_ 14. The heat of fusion of a liquid is 400 Joules per gram. What is the minimum number of Joules needed to change 40.0 grams of the liquid to solid at its melting point?  
 1) 10                      2) 40                      3) 16,000                      4) 13,360
- \_\_\_ 15. Which phase change involves the release of energy?  
 1) melting                      2) sublimation                      3) freezing                      4) evaporation
- \_\_\_ 16. Starting as a solid, a 35 g sample of a substance is heated at a constant rate. The graph below shows the changes in the temperature of the sample. The heat of fusion of this substance is 7.65 J/g.



- Calculate the amount of heat energy needed to melt the sample and how long it would take.  
 1) 267.75J and 3 minutes                      2) 300J and 3 minutes  
 3) 11,690J 4 minutes                      4) 267.75 J and 4 minutes

- \_\_\_ 17. The graph below represents the uniform heating of a sample of a substance starting as a solid below its melting point.



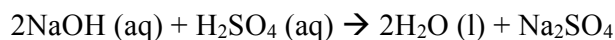
- Which statement describes what happens to the energy of the particles of the sample during time interval CD?
- 1) Average kinetic energy increases, and potential energy remains the same.
  - 2) Average kinetic energy decreases, and potential energy remains the same.
  - 3) Average kinetic energy remains the same, and potential energy increases.
  - 4) Average kinetic energy remains the same, and potential energy decreases
- \_\_\_ 18. When a substance is reacted with magnesium, the temperature of the surrounding system changes from 30 to 45°C. This reaction is described as:  
 1) endothermic, with the release of energy                      3) exothermic, with the release of energy  
 2) endothermic, with the absorption of energy                      4) exothermic, with the absorption of energy

**Record your answers in the spaces provided after each question. Be sure to show all of your work where appropriate.**

Base your answer to the following question on the information provided.

20. A student conducted an experiment in which he placed 100.5 grams of Sodium Hydroxide (NaOH) into a container with 300 grams of Sulfuric Acid (H<sub>2</sub>SO<sub>4</sub>). When the reaction was complete, there was 58.9 grams of water (H<sub>2</sub>O).

a) How many grams of sodium sulfate was produced from this reaction? Show all work for credit.



b) How does this illustrate the law of conservation of mass?

21. Classify the changes below as exothermic or endothermic and explain your answer in terms of energy and bonds.

An ice cube is melted.

Water turns to vapor.

Gas turns into a solid (directly)

Base your answer to the following questions on the simple representations for atoms of two elements:

○ = an atom of an element

● = an atom of a different element

Draw a particle diagram representing each of the following situations:

22) A pure substance



23) a mixture of two diatomic elements



Use the following information to answer questions 28 and 29.

*A piece of copper was cooled to a temperature of  $-20^{\circ}\text{C}$ . The copper was then placed into a container of water at a temperature of  $80^{\circ}\text{C}$ . The temperature of the water and the copper reaches equilibrium at  $40^{\circ}\text{C}$ . (Mass of water =  $100\text{g}$ )*

28. State the direction of heat transfer between the copper and the water when the copper was placed in the water.

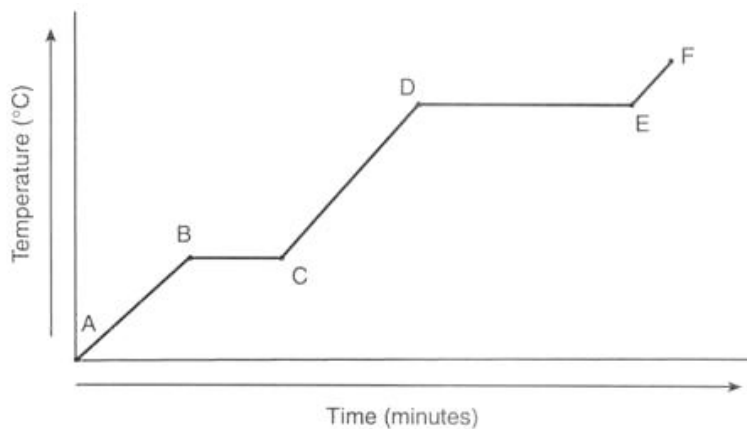
29. Show a numerical setup for calculating the amount of thermal energy change for the water.

Use the following graph to answer questions 30 - 32.

Below is the heating curve for a  $50.0\text{-gram}$  sample of water.

Label the diagram with the following attributes:

- 1) Boiling Point
- 2) Melting/Freezing Point
- 3) Phases present
- 4) Kinetic Energy behavior
- 5) Potential Energy behavior



30. Calculate the amount of heat required to completely vaporize the sample of water?

31. Calculate the amount of heat energy required to completely melt the sample of water?

32. Explain, in terms of heat of fusion and heat of vaporization, why the answer to question 30 is so much larger than the answer to question 31.

