

Name Key Date _____ Class _____

14-4 Review and Reinforcement

Changes of State

On the line at the left, write the term from the list that matches each description below.

vaporization
condensation
freezing point

melting
phase change
sublimation

equilibrium vapor pressure
volatile
deposition

Sublimation
condensation
freezing point
phase change
Vaporization
equilibrium v.p.
volatile
deposition
melting

1. conversion of a solid directly into a gas
2. opposite of vaporization
3. temperature at which solid and liquid forms of a substance exist in equilibrium
4. conversion of a substance from one of the three physical states of matter to another
5. change of state from liquid to gas
6. pressure exerted by a constant number of gas molecules above a liquid or a solid
7. description of a liquid that evaporates easily
8. transformation of a gas directly into a solid
9. phase change from solid to liquid

If the statement is true, write "true." If it is false, change the underlined word or words to make the statement true. Write your answer on the line provided.

True
F, stronger
F, equals
F, freezing
True

10. The average kinetic energy of the particles in a liquid depends upon the temperature.
11. Solids do not flow because the attractive forces between their particles are weaker than those in liquids or gases.
12. Dynamic equilibrium is reached when the rate of vaporization exceeds the rate of condensation.
13. Condensing liquid water is the opposite of melting solid ice.
14. All three states of matter can exist in equilibrium at the triple point.

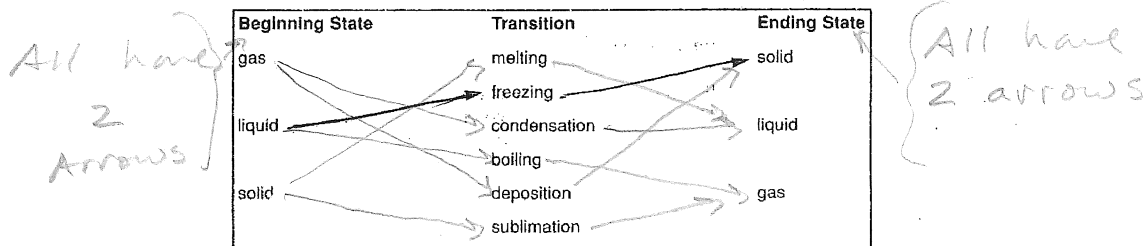
15. Why do ice cubes shrink and become rounded if left in the freezer for a long time?

The ice sublimates from the surface of the ice cube. The surface area will decrease until the cube is a sphere!

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14-4 Review and Reinforcement (continued)

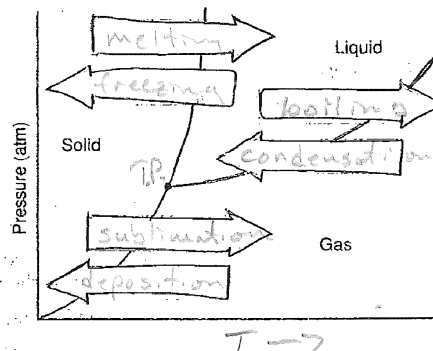
16. Six transitions are listed in the diagram below. Use arrows to connect each transition to its beginning state and its ending state. One example is done for you. When completed, each beginning state and ending state will be used twice.



17. At the triple point of water, ice, liquid water, and water vapor can all exist at the same time. Compare the kinetic energy and total energy of the molecules of ice, liquid water, and water vapor at the triple point.

Temp is equal for solid, liquid, and gas
K.E. is " " " "

18. In the phase diagram, correctly label the x-axis and the triple point. Write the names of all six phase transitions in the arrows provided.



19. The heat of fusion for water is 6 kJ/mol. Calculate how much energy must be removed to freeze completely 1500 grams of water. Show your work.

$$\frac{1500 \text{ g H}_2\text{O}}{18.0 \text{ g/mol}} \times \frac{6 \text{ kJ}}{\text{mol}} = 500 \text{ kJ}$$