KEY

States of Matter End of Unit Review

1. Identify whether the descriptions below describe an *ideal gas* or a *real gas*.

Ideal **a.** The gas will not condense because the molecules do not attract each other.
Ideal **b.** Collisions between molecules are perfectly elastic.
Real **c.** Gas particles passing close to one another exert an attraction on each other.

2. Use the kinetic-molecular theory to explain each of the following phenomena:

a. A strong-smelling gas released from a container in the middle of a room is soon detected in all areas of that room. constant random motion

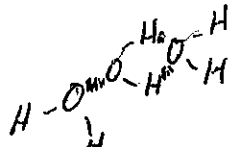
b. As a gas is heated, its rate of effusion through a small hole increases if all other factors remain constant. heated ↑ speed so pass more frequently

3. a. List the following gases in order of rate of effusion, from lowest to highest. (Assume all gases are at the same temperature and pressure.)

(a) He **(b)** Xe **(c)** HCl **(d)** Cl_2 b, d, c, a
2 131 36 71

4. Liquids possess all the following properties *except*

(a) relatively low density. **(c)** relative incompressibility.
(b) the ability to diffuse. **(d)** the ability to change to a gas.



5. Chemists distinguish between intermolecular and intramolecular forces. Explain the difference between these two types of forces. → between molecules → within molecules

6. Classify each of the following as *intramolecular or intermolecular*:

inter **b.** hydrogen bonding in liquid water
intra **c.** the O—H covalent bond in methanol, CH_3OH
inter **d.** the bonds that cause gaseous Cl_2 to become a liquid when cooled

7. Explain the following properties of liquids by describing what is occurring at the molecular level.

a. A liquid takes the shape of its container but does not expand to fill its volume. → particles slide; attraction blt molecules

b. Polar liquids are slower to evaporate than nonpolar liquids. more attracted to molecules; so less to escape

8. Match description on the right to the correct crystal type on the left.

b ionic crystal → **(a)** has mobile electrons in the crystal
c covalent molecular crystal → **(b)** is hard, brittle, and nonconducting
a metallic crystal → **(c)** typically has the lowest melting point of the four crystal types
d covalent network crystal → **(d)** has strong covalent bonds between neighboring atoms

9. Answer *amorphous solid* or *crystalline solid* to the following questions:

Crystalline **a.** Which is less compressible?
Crystalline **b.** Which has a more clearly defined shape?
amorphous **c.** Which is sometimes described as a supercooled liquid?
amorphous **d.** Which has a less clearly defined melting point?

10. Explain the following properties of solids by describing what is occurring at the atomic level.

e⁻ **a.** Metallic solids conduct electricity well, but covalent network solids do not. e⁻ are mobile

b. The volume of a solid changes only slightly with a change in temperature or pressure. particle packed together

amorphous **c.** Amorphous solids do not have a definite melting point. random arrangement

amorphous **d.** Ionic crystals are much more brittle than covalent molecular crystals. strong forces

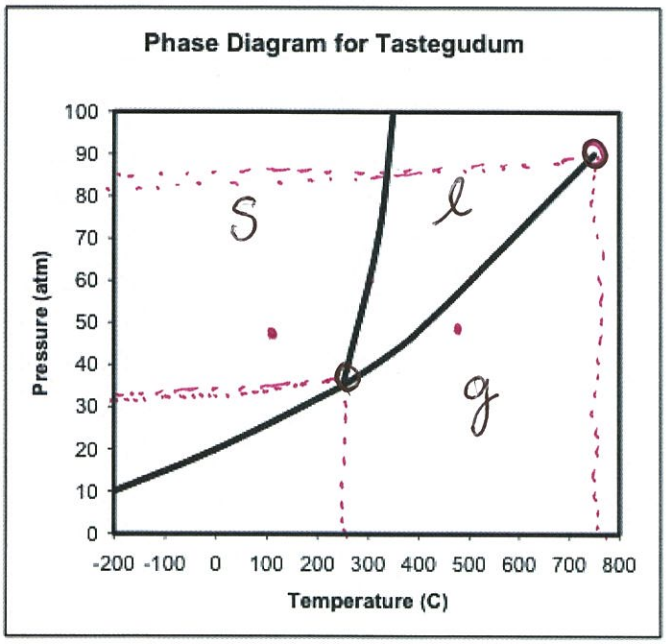
11. Match the following definitions on the right with the words on the left.

b equilibrium	**(a)** melting
c volatile	**(b)** opposing changes occurring at equal rates in a closed system
a fusion	**(c)** readily evaporated
d deposition	**(d)** a change directly from a gas to a solid

12. Match the process on the right with the change of state on the left.

c solid to gas	**(a)** melting
d liquid to gas	**(b)** condensation
b gas to liquid	**(c)** sublimation
a solid to liquid	**(d)** vaporization

On Crosbia, bolonium (Bg) and manasium (Ma) react together to form the compound tastegudum. For each of the questions below, refer to the phase diagram for tastegudum.



1. Label the regions of the diagram that correspond to the solid, liquid, and gas phases. (Write the names of these phases in the appropriate regions directly on the diagram.)
2. Draw a small red circle around the point that is the critical point for tastegudum.
3. Draw a small blue circle around the point that is the triple point for tastegudum.

4. What is the critical pressure, T_p, of tastegudum? ~90atm.

5. What is the critical temperature, T_c, of tastegudum? ~750°C

6. At what temperature and pressure will all three phases of tastegudum coexist at equilibrium? T = 250C P = ~35atm.

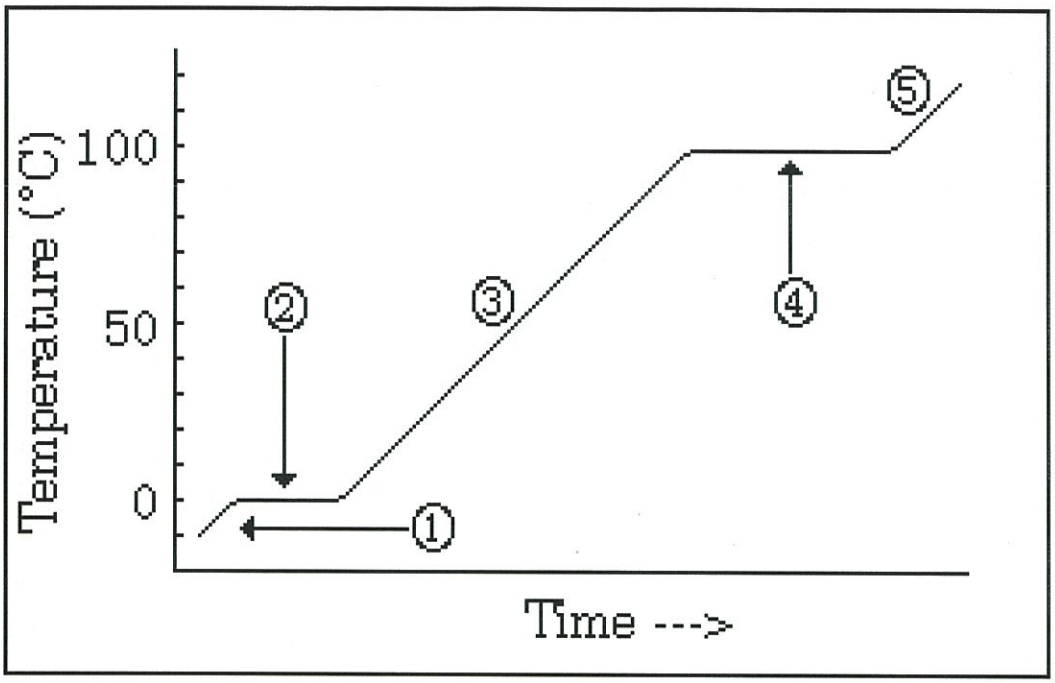
7. What is the boiling point temperature for tastegudum when the external pressure is 60 atmospheres? ~500°C

8. What is the freezing point temperature for tastegudum when the external pressure is 60 atmospheres? ~300°C

9. A container of tastegudum is sitting at a pressure of 45 atmospheres and temperature of 100° C. What phase change(s) occur when the temperature is raised to 500°C?

S → l → g

The diagram below is a plot of temperature vs. time. It represents the heating of what is initially ice at -10°C at a near constant rate of heat transfer.



1) a)What phase or phases are present during segment (1) solid

b) What is happening to the energy being absorbed from the heat source? (answer in terms of potential and/or kinetic energy) ↑ kinetic energy

c) What phase change, if any, is taking place? none

2) a)What phase or phases are present during segment (2) solid + liquid

b) What is happening to the energy being absorbed from the heat source? (answer in terms of potential and/or kinetic energy) ↑ potential energy

c) What phase change, if any, is taking place? melting

3) a)What phase or phases are present during segment (3) liquid

b) What is happening to the energy being absorbed from the heat source? (answer in terms of potential and/or kinetic energy) kinetic energy

c) What phase change, if any, is taking place? none

4) a)What phase or phases are present during segment (4) liquid & gas

b) What is happening to the energy being absorbed from the heat source? (answer in terms of potential and/or kinetic energy)

potential energy

c) What phase change, if any, is taking place? vaporization

5) a)What phase or phases are present during segment (5) gas

b) What is happening to the energy being absorbed from the heat source? (answer in terms of potential and/or kinetic energy)

kinetic energy

c) What phase change, if any, is taking place? none

6) What is the melting point of this substance? 0°C

7) At what temperature would this sample finish boiling? 100°C

8) When this substance is melting, the temperature of the ice-water mixture remains constant because:

a. Heat is not being absorbed
b. The ice is colder that the water
c. Heat energy is being converted to potential energy
d. Heat energy is being converted to kinetic energy

9) When a given quantity of water is heated at a constant rate, the phase change from liquid to gas takes longer than the phase change from solid to liquid because

a. The heat of vaporization is greater than the heat of fusion
b. The heat of fusion is greater than the heat of vaporization
c. The average kinetic energy of the molecules is greater in steam than in water
d. Ice absorbs energy more rapidly than water does