States of Matter Application Questions. **Name:** _____ **Block:** ___

Remember to ask your teacher when you need help.

1. Explain the relationship between absolute zero (0 K) and kinetic energy

temperature is the movement of particles. Kinetic energy is the movement of particles. So at absolute zero there is no movement, no kinetic energy.

2. Convert 25°C to the Kelvin scale (show work)

$25°C + 273 = 298K$

3. If the temperature is increased the kinetic energy (increases/decreases). This relationship is (directly/inversely) portional.

4. Explain the difference between temperature and heat.

temp. is the kinetic energy particles have, the movement of particle Heat is the transfer of energy ~~change~~ until both are moving the same amount (same temp)

5. What is 385 mm Hg in: (show work)

a. kPa $\frac{385mmHg}{760mmHg} \left|\frac{101.3kPa}{}\right. = 51.3kPa$

b. atm $\frac{385mmHg}{760mmHg} \left|\frac{1atm}{}\right. = 0.507atm$

6. According to the assumptions of kinetic theory, how do the particles in a gas move?

independent, rapid, straight paths, random, constantly moving

7. In simplistic terms, describe elastic collisions.

no loss of energy, energy transfered b/w particles

8. Use kinetic theory to explain the differences between the particles in a gas and those in a liquid.

liquids have attractive forces by cause the particles to be closer together.

9. Use kinetic theory to explain what causes gas pressure.

force exerted by gas particles colliding

10. Use the kinetic theory to explain how the pressure inside a car tire changes as a function of the air temperature outside the tire.

↑ air temp. = ↑ in movement of gas particles = ↑ # collisions of gas particles inside tire = ↑ Pressure inside the tire.

11. Explain why increasing the temperature of a liquid increases the rate of evaporation.

evaporation is when surface liquid particles have enough energy to overcome attractive forces. Increasing temp causes liquid particles to have more energy to break the intermolecular (attract forces thus evaporati faster.

12. Why is dynamic equilibrium reached in a closed container and not in an open container?

dynamic equilibrium : rate evaporation = rate of condensation. when a "top" is added the liquid particles will evaporate into gas particles but they will hit the "top" and then condense back into a liquid. in an open container gas particles will just "float" away.

13. Use kinetic theory to explain the difference between evaporation and boiling of a liquid.

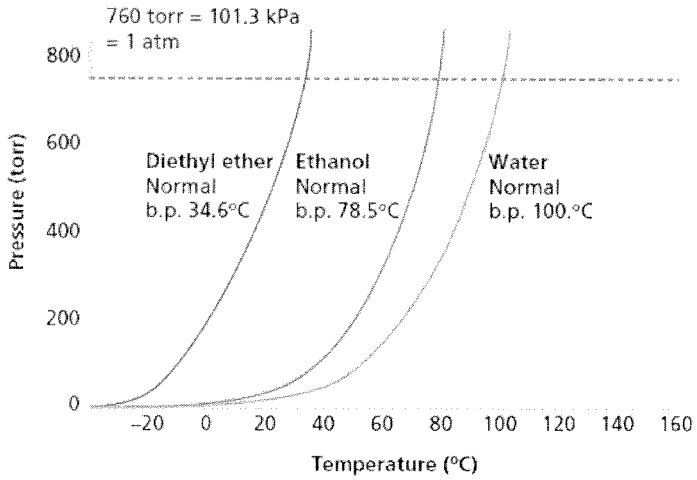
Both cause a liquid to turn into a gas. Evaporation is surface partic only having enough energy to become a gas. Boiling is particles throughc due to enough energy to cause internal pressure = external pressure.

14. A vacuum is where there are no gas particles, thus no external gas pressure. Why does water boil at room temperature in a vacuum? What affect will have on cooking times?

there is no external pressure "forcing" the liquid into a liquid. the boiling pt is when external Pressure = internal Pressure. so the liquid will not need high internal Pressure, = low temperatur long cooking times.

15. (Low/High) External Pressure = (Low/High) Boiling Point temperatures = (Increase/Decrease) Cooking Times

Vapor Pressures of Diethyl Ether, Ethanol, and Water at Various Temperatures



16. Use the figure to the right:

a. Diethyl ether boils at what temperature when the pressure is 200 torr? 0°C

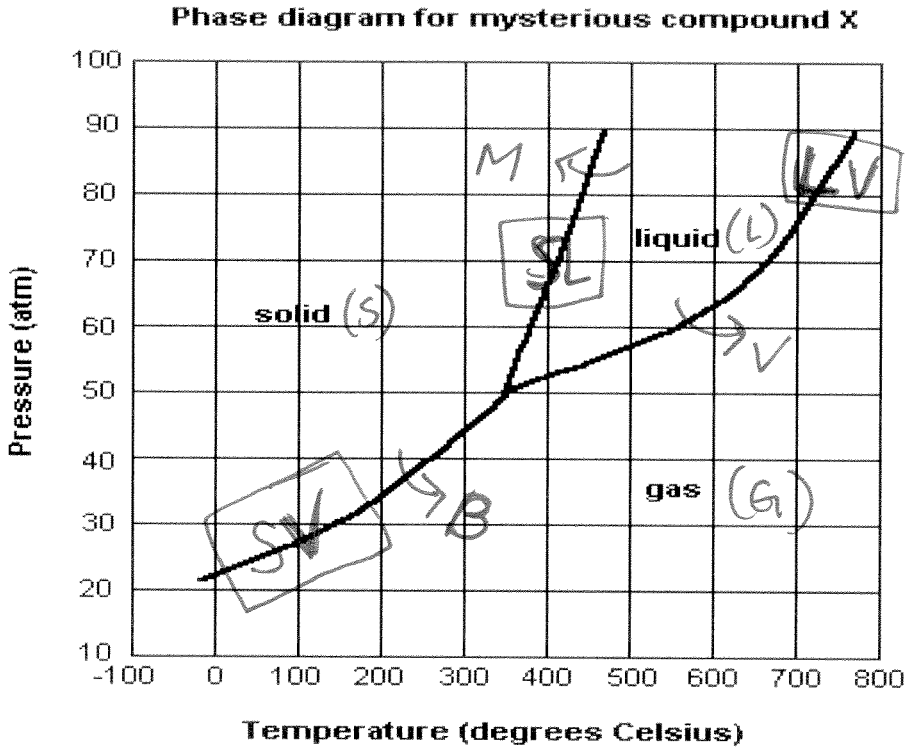
b. What pressure makes water boil at 70°C? 250 torr

c. Which substance boils at 313K when the pressure is **100 torr**?

313K - 273 = 40°C ∴ Ethanol

* d. which liquid has the strongest intermolecular force?

water



17. Phase Diagram : Sea Level = 1 atm & Room Temp = 25°C

a. Label in the appropriate boxes as
- **"S"**= solid, **"L"** = liquid, **"G"** = gas
- "**SL**" = equilibrium between solid & liquid phase
- "**LV**" = equilibrium between liquid & vapor phase
- "**SV**" = equilibrium between solid & vapor phase

b. Draw an **arrow** to show sublimation, vaporization, and solidification.
c. Now, **Label** those **arrows** as "**B**" for sublimation, "**V**" for vaporization, & "**M**" for solidification.
d. If a bottle containing compound X was in your closet, what phase would it most likely be in?

gas

e. At what temperature & pressure will all three phases coexist?

50atm & 350 °C

f. A bottle of compound X is at a pressure of 45 atm & temperature of 100^0 C, what happens if the temperature is raised to 400^0 C? solid → gas (sublimate)

g. Why can't compound X be boiled at a temperature of 200^0 C? Boiling occurs to liquids only
comp. X is a solid or a gas @ 200°C

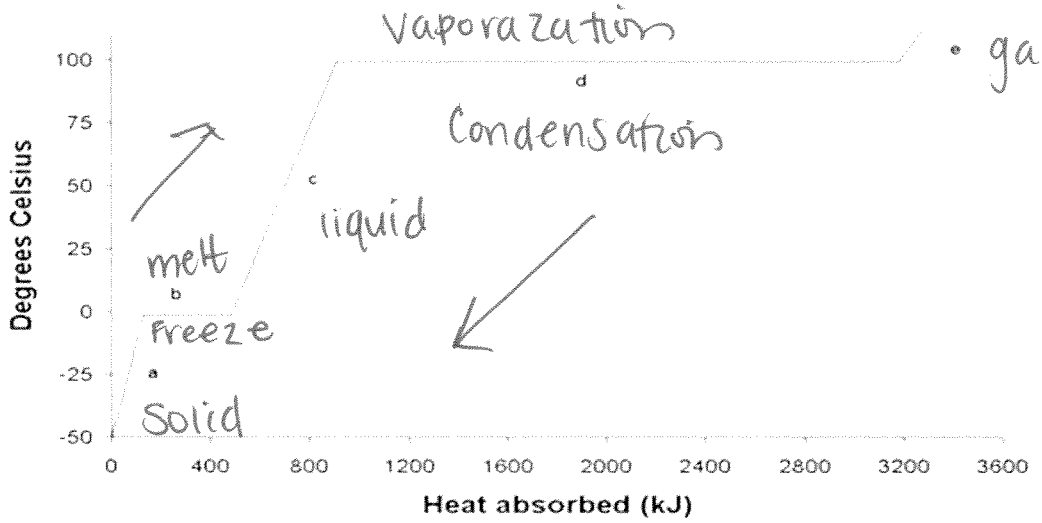
h. If you wanted to, could you drink compound X right now? Why or Why not?
No, because its a gas

18. A phase of matter is dependent on what two factors:

Pressure & Temperature

19. Explain how water can freeze at 0°C but it can also melt at 0°C, keeping pressure constant

depends on the beginning state of matter



20. **Heating Curve**

a. During which segments is kinetic energy increasing? a c e

b. During which segments does kinetic energy remain the same? b d

c. During which segment (s) do particles have the highest average kinetic energy? e

d. What is the freezing point of the substance? 0 °C ; b

e. What is the boiling point of the substance? 100 °C ; d

f. What is the melting point of the substance? 0 °C ; b

g. During which segments is one phase only present? a c e

h. During which segments are two phases present? b d

i. What letter represents the range where the solid is being warmed? a

j. What letter represents the range where the liquid is being warmed? c

k. What letter represents the range where the vapor is being warmed? e

l. What letter represents the melting? b

m. What letter represents vaporization? d

n. What letter represents crystallization? b

o. What letter represents condensation? d

p. Phase changes that are endothermic are melting & vaporization

q. During which segment could the heat of fusion be determined? b

r. During which segment could the heat of vaporization be determined? d

Pg 356 #1 & 2

1. ΔH_f = ? of Ag

$$\Delta H_f = \frac{\text{energy}}{\text{moles}}$$

1.940 mole

22.60 KJ to solid → liquid

mp 961°C

$$\Delta H_{fusion} = \frac{22.60\ KJ}{1.940\ mole}$$

$$\Delta H_f \text{ Ag} = 11.65\ \frac{KJ}{mole}$$

#2

E=? KJ melt

6.47 mole $HC_2H_3O_2$

mp 16.7 °C

$$\Delta H_f = 11.54\ \frac{KJ}{mole}$$

always start w/ given

6.47 mole	11.54 KJ
	mole

= 74.7 KJ

Pg 354: #28, 29, 30, & 31

#28

$$\Delta H_f \text{ } H_2O = 6.009\ \frac{KJ}{mole}$$

E=? KJ melt

7.95×10^5 g H_2O ice

g: MM_{H_2O}: $\frac{18.02\ g}{mole}$

7.95×10^5 g H_2O	1 mole	6.009 KJ
	18.02 g	mole

2.65×10^5 KJ

#29

$\Delta H_v = \frac{31.6\,KJ}{mole}$

$E = 57.0\,KJ$

? mole to vaporize

$$\frac{57.0\,KJ \mid 1\,mole}{31.6\,KJ} = 1.80\,mole$$

#30

$\Delta H_v = \frac{40.79\,KJ}{mol}$

? g H_2O

0.545KJ

$MM_{H_2O} = \frac{18.02g}{1\,mole}$

$$\frac{0.545KJ \mid 1\,mole \mid 18.02g}{40.79KJ \mid 1\,mole}$$

0.241 g

#31

? KJ released

13.3g

$MM = \frac{82.9g}{mole}$

$\Delta H_f = \frac{4.60\,KJ}{mole}$

$$\frac{13.3g \mid 1\,mole \mid 4.60KJ}{82.9g \mid 1\,mole} =$$

0.738 KJ released