

## Unit 6 Study Guide

ANSWER KEY!

1. Define the Kinetic molecular theory (KMT)

Particles are in constant motion.

2. Describe the **density, collisions/kinetic energy, & compressibility** of the following:

Solid:  $\uparrow$  density,  $\downarrow$  KE,  $\downarrow$  compressibility

Liquid:  $\uparrow$  density,  $\uparrow$  KE,  $\downarrow$  compressibility

Gas:  $\downarrow$  density,  $\uparrow$  KE,  $\uparrow$  compressibility

3. What is the conversion for Kelvins to Celsius?

a.  $68.0^\circ\text{C} = \underline{341\text{ K}}$

$68 + 273 = 341$

b.  $266.6\text{K} = \underline{-6.4^\circ\text{C}}$

$266.6 - 273 = -6.4$

4. What are the standards for atmospheric pressure?

$\underline{760}$  torr/mmHg

$\underline{101.3}$  kPa

$\underline{1}$  atm

5. Convert from one pressure measurement to another:

a.  $685\text{mmHg} = \underline{\quad}\text{ atm}$

$\frac{685\text{ mmHg}}{1} \times \frac{1\text{ atm}}{760\text{ mmHg}} = \underline{0.901\text{ atm}}$

b.  $21.34\text{atm} = \underline{\quad}\text{ kPa}$

$\frac{21.34\text{ atm}}{1} \times \frac{101.3\text{ kPa}}{1\text{ atm}} = \underline{2161.7\text{ kPa}}$

c.  $135.6\text{kPa} = \underline{\quad}\text{ mmHg}$

$\frac{135.6\text{ kPa}}{1} \times \frac{760\text{ mmHg}}{101.3\text{ kPa}} = \underline{1017.3\text{ mmHg}}$

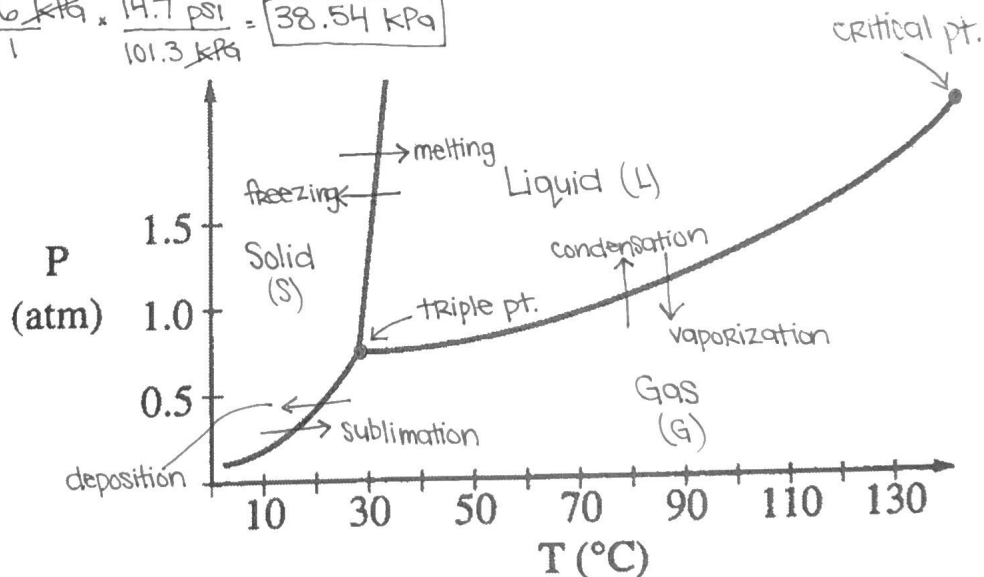
d.  $265.6\text{kPa} = \underline{\quad}\text{ lbs/in}^2$   
(psi)

$\frac{265.6\text{ kPa}}{1} \times \frac{14.7\text{ psi}}{101.3\text{ kPa}} = \underline{38.54\text{ kPa}}$

### Phase diagram review:

1. Label each section with their correct phase, then color the solid part green, the liquid part blue and the gas yellow.

2. Draw arrows on the diagram below & label each arrow with: Freezing, Sublimation, Condensation, Vaporization, Melting, Deposition.



3. Label the triple point. Describe it:

The pressure and temperature at which all three phases (S, L, G) exist in equilibrium

4. Label the critical point. Describe it: Exists at a critical pressure, at which point a liquid and gas are indistinguishable (i.e. cannot go back to a liquid)

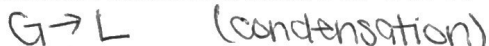
5. If the pressure decreases from 1.5 to 0.5 atm at a constant temperature of 50°C, what happens?



6. If the temperature increases from 10°C to 50°C at a constant pressure of 0.5 atm, what happens?



7. If the temperature decreases from 110°C to 40°C at a constant pressure of 1.1 atm, what happens?



**8. Use the phase diagram and answer the questions:**

a) When a solid changes to a liquid it is called melting, this (absorbs or releases) heat which is (Endothermic or Exothermic)

b) When a liquid changes to a solid it is called freezing, this (absorbs or releases) heat which is (Endothermic or Exothermic)

c) When a vapor changes to a liquid it is condensation, this (absorbs or releases) heat which is (Endothermic or Exothermic)

d) When a liquid changes to a vapor it is called vaporization, this (absorbs or releases) heat which is (Endothermic or Exothermic)

9. A sample of carbon dioxide occupies a volume of 3.50 L at 125 kPa. What pressure would the gas exert if the volume were decreased to 2.00 L? Assume constant Temp.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad P_1 V_1 = P_2 V_2 \quad (125 \text{ kPa})(3.50 \text{ L}) = (P_2)(2.00 \text{ L})$$

$$P_2 = 218.75 \text{ kPa}$$

10. If the volume of a gas container is decreased, what happens to the pressure in the container? What if the volume is increased? If  $V$  decreases, then  $P$  increases.

Boyle's Law

$$PV = k \leftarrow \text{constant}$$

If  $V$  increases, then  $P$  decreases.

11. Oxygen gas is at a temperature of 40°C when it occupies a volume of 2.3 L. What temperature in Celsius would the gas be if the volume was 1.2 L? Assume constant  $P$ .

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad 40 + 273 = 313 \text{ K} \quad V_2 \rightarrow \frac{V_1}{T_1} = \frac{V_2}{T_2} \quad \frac{2.3 \text{ L}}{313 \text{ K}} = \frac{1.2 \text{ L}}{T_2}$$

$$T_2 = 163.304 \text{ K} - 273$$

$$T_2 = -109.7 \text{ }^\circ\text{C}$$

12. What happens to the temperature of a gas when it is compressed?

Temp. increases.

13. What is the relationship between pressure and temperature?

Gay-Lussac  $\frac{P}{T} = \text{constant}$   $P$  &  $T$  are directly proportional. If  $P$  increases, then  $T$  increases. If  $P$  decreases, then  $T$  decreases.

14. Does all motion ever stop? If so at what temperature? Theoretically motion would stop at absolute zero (0 K).

$\rightarrow$  (This is 0 Kelvin, not the word 'OK'.)