Name: _____ Block: _____ Date: _____

Chapter 10 & 12: States of Matter & Gases Study Guide

1. A sample of oxygen gas is collected over water at 22°C and 0.974 atm pressure. If the partial pressure of the water is 2.67 kPa, the partial pressure of the oxygen is –

P_{H_2O} $P_T = P_{H_2O} + P_{O_2}$ ∴ $P_{O_2} = P_T - P_{H_2O}$

P_T 0.974 atm | 101.3 kPa / 1 atm = 98.66 kPa Dalton's law 98.66 kPa − 2.67 kPa = 96.0 kPa

2. Why does the pressure inside a container of gas increase if more gas is added to the container?

more gas = less space = more collisions = ↑ Pressure

3. Why does air leave a tire when the tire valve is opened?

diffusion: less concentration outside the tire

4. What happens to the pressure of a gas inside a container if the temperature of the gas is lowered?

↓Temp = ↓ KE = ↓ movement = ↓ collisions = ↓ Pressure

5. A gas occupies a volume of 0.7 L (V_1) at 10.1 kPa (P_1). What volume will the gas occupy at 101kPa (P_2)? (V_2 = ?) Identify which law is used to solve this problem.

$\frac{P_1V_1}{P_2} = V_2$ $\frac{0.7\text{L} \times 10.1\text{kPa}}{101\text{kPa}} = 0.07\text{L}$ Boyle's Law

6. A gas storage tank has a volume of 3.5×10^3 L when the temperature is 27°C and the pressure is 101kPa. What is the new volume of the tank if the temperature drops to -10°C and the pressure drops to 95 kPa? Identify which law is used to solve this problem.

$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{3.5\times10^3\text{L} \times 101\text{kPa} \times 263\text{K}}{300\text{K} \times 95\text{kPa}} = 3262 = 3000 = 3\times10^3\text{ L}$ (a.s.f.)

7. Describe the boiling point and its relationship to external pressure.

↑external Pressure ↑ Boiling Point; ↓external Press. ↓ BP

8. If the heat of fusion is 32.2 kJ/mol, the amount of heat energy required to melt 5.67 grams of FeO is –

5.67 g FeO | 1 mole / 71.85 g | 32.2 kJ / 1 mole = 2.54 kJ

9. What are the major assumptions of the kinetic theory?

all matter is constant motion; gasses random, independent, constant, elastic collisions

liquid & gas flows solids high intermolecular force lighter

10. Which gas effuses faster at the same temperature: hydrogen or chlorine? Why?

2.02 g/mol 70.90 g/mole

11. Use kinetic theory to explain why on a cold autumn morning a camper's air mattress may appear to be somewhat flatter than it was when blown up the afternoon before. Assume no leaks.

gas particles moving slower = less collisions = less pressure

12. Explain effusion and diffusion. Provide an example of each.

effusion: gas leaving through a hole: tire

diffusion: gas moving high concentration to low concentration: candle

13. If 4.50g of methane gas (CH_4) is introduced into an evacuated 2.00L container at 35°C, what is the pressure in the container? Identify which law is used to solve this problem.

4.50 g CH_4 | 1 mole / 16.05 g = 0.280 mole

ideal $P = \frac{nRT}{V} = \frac{0.280\text{ mole} \times 0.082 \times 308\text{K}}{2.00\text{ L}}$ = 3.54 atm

14. Describe the relationship between temperature, kinetic energy, and movement of particles.

↑Temp = ↑ kinetic energy = ↑ movement of particles

15. Describe the relationship between temperature, gas particle collisions, and pressure.

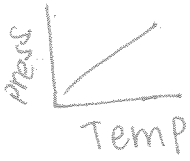
↑ temp = ↑ # gas collisions b/c moving faster = ↑ Pressure

16. Which phase changes are endothermic?

melting Sublimation

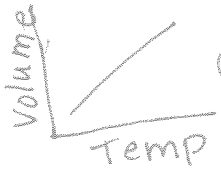
vaporizing

17. Describe the relationship between temperature and pressure keeping volume constant. Is the relationship inversely or directly proportional? Identify the law. Draw a graph that represents this relationship.



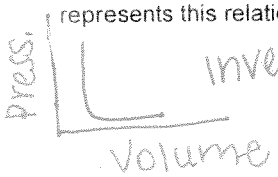
direct Lussac

18. Describe the relationship between temperature and volume keeping pressure constant. Is the relationship inversely or directly proportional? Identify the law. Draw a graph that represents this relationship.



direct Charles

19. Describe the relationship between volume and pressure keeping temperature constant. Is the relationship inversely or directly proportional? Identify the law. Draw a graph that represents this relationship.

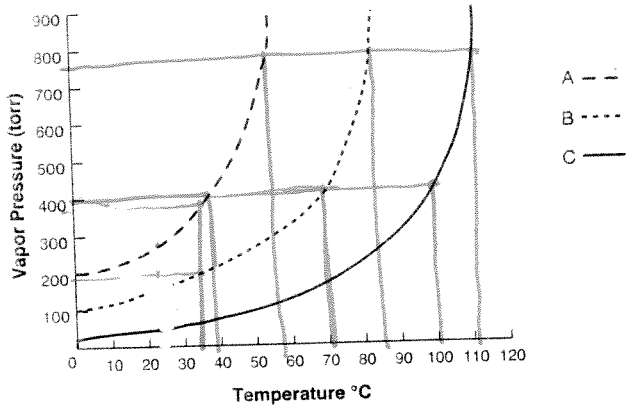


inverse Boyle

VAPOR PRESSURE AND BOILING

Name _____

A liquid will boil when its vapor pressure equals atmospheric pressure. Answer the questions following the graph.

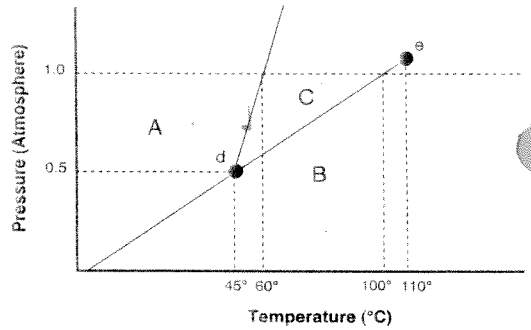


1. At what temperature would Liquid A boil at an atmospheric pressure of 400 torr? 35-40 °C
2. Liquid B? 68-72°C
3. Liquid C? 98 - 102°C
4. How low must the atmospheric pressure be for Liquid A to boil at 35° C? 380-400 torr
5. Liquid B? ~200 torr
6. Liquid C? ~50 torr
7. What is the normal boiling point of Liquid A? 55-60°C
8. Liquid B? ~85°C
9. Liquid C? ~110°C
10. Which liquid has the strongest intermolecular forces? C

(@ sea level 760 mmHg = 760 torr)

PHASE DIAGRAM

Name _____

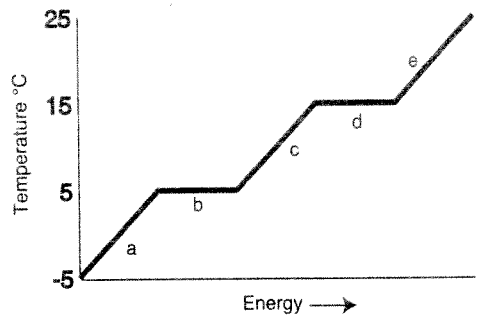


Answer the following questions using the chart above.

1. What section represents the solid phase? A
2. What section represents the liquid phase? C
3. What section represents the gas phase? B
4. What letter represents the triple point? D
5. What letter represents the critical point? e
6. What is this substance's normal melting point? 10°C (1atm)
7. What is this substance's normal boiling point? 100°C
8. Above what temperature is it impossible to liquify this substance no matter what the pressure? 110°C
9. At what temperature and pressure do all three phases coexist? 45°C, 0.5 a
10. Is the density of the solid greater than or less than the density of the liquid? greater than
11. Would an increase in pressure cause this substance to freeze or melt? freeze

FREEZING AND BOILING POINT GRAPH

Name _____



Answer the following questions using the chart above.

1. What is the freezing point of the substance? 5°C
2. What is the boiling point of the substance? 15°C
3. What is the melting point of the substance? 5°C
4. What letter represents the range where the solid is being warmed? A
5. What letter represents the range where the liquid is being warmed? C
6. What letter represents the range where the vapor is being warmed? E
7. What letter represents the melting of the solid? B
8. What letter represents the vaporization of the liquid? D
9. What letter(s) shows a change in potential energy? b & d
10. What letter(s) shows a change in kinetic energy? a, c, e
11. What letter represents condensation? D
12. What letter represents crystallization? B