Name: Cey - 2017 Per: ____ Date: _____

Study Guide - Unit A KMT

You should use the following resources:

- Textbook & Cornell Notebook
- All of the worksheets we did in class - your Unit A packet.
- You can find any worksheets and answer keys on School Loop or in the resource folder in class.

Directions: Students will be able to:

i. draw a picture to model that matter can get bigger macroscopically without having more mass.

ii. relate temperature to the speed of particles. Students can relate their observation of examples of thermal expansion to particles having higher kinetic energy.

iii. explain the similarities and differences among the properties of three states of matter.

iv. use models to explain the molecular-level causes of these different properties.

v. explain that the process of vaporization entails particles escaping from being "stuck" to one another as a liquid.

vi. explain that pressure is caused by gas particles colliding elastically against a surface.

vii. use real-life examples and particle diagrams to describe the physical properties of gases.

viii. explain the relationship between temperature, volume, and pressure at the molecular-level using models and in terms of the words "directly" and "inversely" proportional.

ix. interpret word problems about real-life scenarios to complete algebraic calculations involving these relationships.

x. identify real-life situations in which the gas laws are used and can explain these situations on the molecular level.

Directions: Answer the following questions.

1. Use Dalton's Law of Partial Pressure to calculate the total pressure of a sample of gas or partial pressure of a single gas within the sample.

   a. A mixture of fluorine, chlorine, and bromine gases has a total pressure of 258 mmHg. If the partial pressure of chlorine is 81 mmHg and the partial pressure of bromine is 112 mmHg, what is the partial pressure of fluorine?

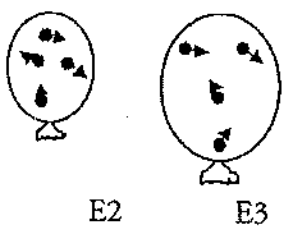
   P_T P_{Cl} P_{Br}

   $P_F = 65$ mmHg

   ~~b.~~ Calculate the partial pressure of oxygen that a diver breathes with a heliox mixture containing 0.0821% oxygen at a depth where the total pressure is 23.4 atm.

   DO NOT DO.

2. Based on the diagram of balloons filled with helium gas at the right,



E2 E3

   a. Which balloon has a higher temperature? same temp

   b. Explain your answer to part A:

   particle arrows are same size.

   c. Which balloon has a higher internal pressure (pressure inside the balloon? E2

   d. Explain your answer to part C:

   same # of particles, but less area = particles in E2 will have greater pressure $\left(\frac{\text{force}}{\text{area}}\right)$ (more collisions)

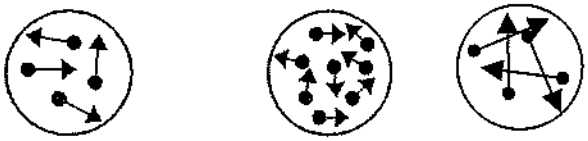
3. The diagram at the right shows three balloons filled with helium ~~has~~ gas. They may be in different environments: at different temperatures and external (outside) pressures.

   a. In which balloon is the temperature the highest? C

   b. In which balloon is the temperature the lowest? B

   c. Explain your answers to parts ~~D~~ A and ~~E~~ B:

Arrows correlate to speed of particles (velocity) ∴ C is faster (longest arrows) ↑ high temp.



4. The combined gas law is given as: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ Solve the equation for T_1. T_2

$$T_2 = \frac{P_2 V_2 T_1}{P_1 V_1}$$

5. 10.0 L of propane is released from a container at a pressure of 5.20 atm and 18.0 °C into a different container having a volume of 20.0 L and a pressure of 1.50 atm. What is the temperature of the propane in the new container?

$V_1 = 10.0\,L$ $V_2 = 20.0\,L$

$P_1 = 5.20\,atm$ $P_2 = 1.50\,atm$ E:

$T_1 = 18° + 273\,K = 291\,K$ $T_2 = ?$

$\boxed{= 168\,K}$

6. A gas in a rigid container exerts a pressure of 75.0 kPa at a temperature of -20.0 °C. At what temperature would it exert a pressure of 112 kPa? Assume the volume remains constant. → ignore in combined gas law

$P_1 = 75.0\,kPa$ $T_2 = ?$

$T_1 = -20.0° + 273\,K = 253\,K$

$P_2 = 112\,kPa$

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$ $T_2 = \frac{P_2 T_1}{P_1}$

$\boxed{= 378\,K}$

7. A balloon of helium has a volume of 21.0 L at a temperature of 5.0 °C. What will be the volume of the balloon if the balloon is heated to 88.0 °C?

$V_1 = 21.0\,L$ $V_2 = ?$

$T_1 = 5.0° + 273\,K = 278\,K$

$T_2 = 88.0° + 273\,K = 361\,K$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $V_2 = \frac{V_1 T_2}{T_1}$

$\boxed{= 27.3\,L}$

   a. What should we assume about the pressure?

Pressure is constant

8. A container of propane is filled with a gas at a volume of 1.00 L at a pressure of 5.20 atm. What volume of container would be required to hold the same amount of gas at sea level (1.0 atm)?

$V_1 = 1.00\,L$ $V_2 = ?$

$P_1 = 5.20\,atm$ $V_1 P_1 = V_2 P_2$ $V_2 = \frac{V_1 P_1}{P_2}$

$P_2 = 1.00\,atm$

$\boxed{5.2\,L}$

9. Gas pressure is caused by _____.

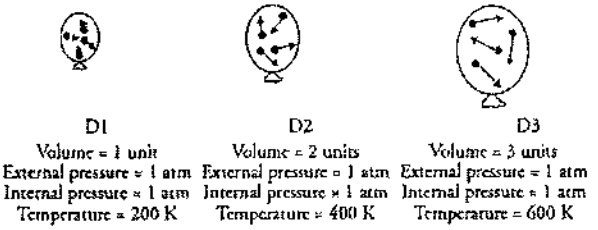
   (a) gas molecules colliding with surfaces
   b. gas molecules condensing to a liquid
   c. gas molecules hitting other gas molecules
   d. barometers

10. When using the combined gas law for calculations, correct units for V and T could include which of the following?

   (a.) mL and K b. L and °C c. atm and K d. kPa and °C

11. If a substance is cooled down, which statement is true about its particles?
   (a) The particles have less kinetic energy.
   b. The particles increase in mass.
   c. The particles are further apart.

12. which of the following statements does the figure demonstrate?
   (a) Volume and temperature are directly related.
   b. Temperature and pressure are directly related.
   c. Pressure and volume are inversely related.
   d. None of the above.

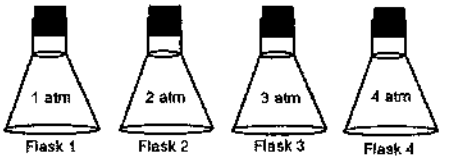


13. What happens to the density of a solid when you heat it?
   a. It increases b. it states the same (c) it decreases

14. Which particles in a liquids are most likely to evaporate?
   a. The ones with the highest kinetic energy.
   b. The ones on the surface.
   c. The ones that vibrate so much that they overcome the attractive forces holding the particles together.
   (d) All of the above.

15. Why does cold water sink to the bottom of the ocean?
   a. Its molecules are smaller than hot water.
   (b) Its molecules are closer than hot water.
   c. It's attracted to the heat at the bottom of the ocean.
   d. All of the above are true.

16. Each of these flasks is the same size and at the same temperature. Which one contains the fewest molecules?
   (a) Flask 1 c. Flask 3
   b. Flask 2 d. Flask 4

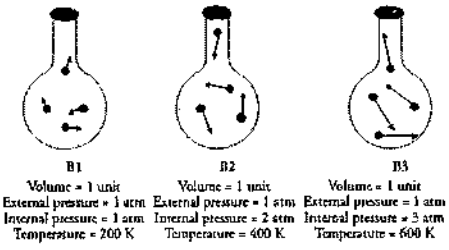


17. In which of the following substances do the particles have the highest average kinetic energy?
   a. 10 grams of liquid water at 80°C. (c) 10 grams of solid copper at 90°C.
   b. 100 grams of liquid water at 70°C. d. 100 grams of solid copper at 70°C.

18. a block of copper metal is heated at its left side, so that the left side is warmer than the right. Which of the following is true about the two ends of the block?
   a. The atoms of the left side are spaced further apart than those on the right.
   b. The atoms of the left side are moving faster than those on the right.
   c. The density of the copper is lower on the left side than the right.
   d. Both a and b are true.
   (e) All of the above are true.

19. Which of the following changes to a system will NOT result in an increase in pressure?
   a. Adding more gas molecules c. Decreasing the volume of the container
   b. Raising the temperature (d) increasing the volume of the container

20. Which of the following statements does the figure demonstrate?
   a. Volume and temperature are directly related.
   (b) Temperature and pressure are directly related.
   c. Pressure and volume are inversely related.
   d. None of the above.

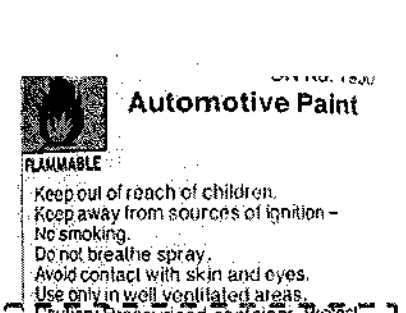


21. The escape of molecules from the surface of a liquid is called _____.
   a. boiling (b) evaporation c. sublimation d. condensation

22. If the volume of a gas is doubled ~~which~~ while the Kelvin temperature is held constant, then the pressure of the gas should
    a. remain unchanged.
    b. is doubled.
    c. is reduced by half.
    d. depends on the kind of gas.

23. As the temperature of the gas in a balloon decreases
    a. The volume increases.
    b. The pressure increases.
    c. the average kinetic energy of gas particles decreases.
    d. All of the above are true.

24. Which of these would increase the pressure? ***(Circle all that apply)***
    a. Adding more gas to the container
    b. Increasing the temperature of the gas in the container.
    c. Increasing the volume of the container.



25. Which of the following statements explains the warning label (within the dashed box) on aerosol cans like the one to the right?
    a. Volume and temperature are directly related
    b. Temperature and pressure are directly related
    c. Pressure and volume are inversely related
    d. None of the above

26. Increasing the volume of a given amount of gas at a constant temperature causes the pressure to decrease because _____.
    a. The molecules are striking a larger area with the same force.
    b. There are fewer molecules.
    c. The molecules are moving more slowly.
    d. There are more molecules.

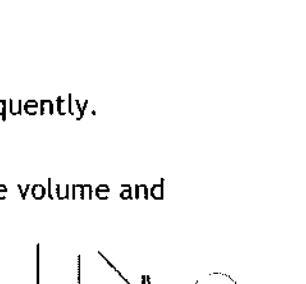
27. Which of these changes would not cause an increase in the pressure of a contained gas?
    a. Another gas is added to the container.
    b. Additional amounts of the same gas are added to the container.
    c. The temperature is increased.
    d. The gas is moved to a larger container.

28. If the temperature of a gas in a closed container increases
    a. The pressure of the gas decreases.
    b. The average kinetic energy of the molecules decreases.
    c. The molecules collide with the walls of the container less frequently.
    d. The pressure of the gas increases.

29. Which of the following graphs represent the relationship between the volume and temperature of an ideal gas? C

30. At constant pressure, the ~~column~~ volume of a gas and its Kelvin temperature are said to be _____.
    a. Directly related
    b. Inversely related
    c. Unrelated
    d. Constant

31. Which of the following terms best describes the relationship between pressure and temperature at constant volume?
    a. Inversely related
    b. Directly related
    c. Complimentary
    d. No relationship



32. Which unit of measurement is directly proportional to the average kinetic energy of particles of a substance?
    a. Atmospheres
    b. Kelvin
    c. Fahrenheit
    d. Pascal