Name_____ Date ____ Period ____

Unit 10: Group Practice

Choose the best answer to each question. (2pts each)

1. When gas is released from an aerosol can, the *pressure decreases* inside the can. What happens to the *temperature* of the gas in the can?
   B
   a. increases
   (b) decreases
   c. no change
   d. not enough information

   P↓ / T↓ direct

2. Critical thinking question: If you are at the base of a mountain and climb to the very top, you would expect the pressure to _____.
   B
   a. increase
   (b) decrease
   c. increase then decrease
   d. not enough information

   less air pressure, higher up

3. The air pressure in a balloon will increase when _____.
   A
   (a) the balloon is squeezed
   b. the temperature is decreased
   c. the balloon is popped
   d. not enough information

   P↑ V↓

4. According the kinetic molecular theory, which of the following describes the property of a gas?
   C
   a. Gases are large particles that move in predict motions.
   b. Gases have very strong attractive forces between the particles.
   (c) Gases are very small particles moving extremely fast in random motion.
   d. Gases are all squared shaped.

5. The pressure of a gas in an enclosed container is reduced to half its value when the volume is doubled. The *pressure and volume* must be _____.
   B
   a. directly proportional
   (b) inversely proportional
   c. unrelated
   d. not enough information

   P↓ V↑ inverse
   ½ 2x

6. If volume and the number of moles remain constant, an increase in temperature will cause the pressure to _____.
   B
   a. decrease
   (b) increase
   c. increase then decrease
   d. remain the same

   P↑ / T↑ direct

7. Pressure is caused by _____.
   B
   a. the number of gas particles present inside the container
   (b) the constant collision of molecules of a gas with the inside walls of a container
   c. the size and shape of the container which holds the gas
   d. the temperature of the gas particles inside the container

8. If pressure and the number of moles remain constant, an increase in volume will cause temperature to ____.
   B
   a. decrease
   (b) increase
   c. remain the same
   d. not enough information

   V↑ / T↑

9. 0 °C and 101.3 kPa are considered _____.
   B
   a. the lucky temperature and pressure
   (b) standard temperature and pressure
   c. average temperature and pressure
   d. variables

10. The temperature of a substance _____.
    B
    a. does not affect the average kinetic energy of the particles in the substance
    (b) is directly proportional to the average kinetic energy of the particles in the substance
    c. is increased when the average kinetic energy of the particles is decreased
    d. is decreased when the average kinetic energy of the particles is increased

11. Convert 150 K to Celsius.
    A
    (a) -123 °C b. 423 °C c. 0.549 °C d. 1.82 °C

12. Which of the following would describe a balloon being inflated when you blow into it?
    D
    a. Boyle's law
    b. Charles' law
    c. Gay-Lussac's law
    (d) Avogadro's principle

    V↑ / n↑

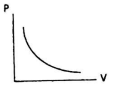
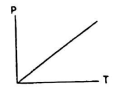
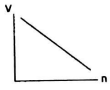
13. Critical thinking question: During the hot Texas summertime waterparks can only fill their inner tubes partially full. What is the reasoning for this?
    A
    (a) As the temperature increases over the day the volume of the gas in the inner tube increases.
    b. As the temperature increases over the day the moles of the gas in the inner tube increases.
    c. As the temperature increases over the day the pressure of the gas in the inner tube decreases.
    d. Kids like to bounce on the inner tubes.

14. If the partial pressure of oxygen is 456 mmHg and the partial pressure of hydrogen is 0.97 atm in a sealed container which of the following is the total pressure of the container? Make sure units are consistent!
    B
    a. 1193 kPa
    (b) 159 kPa
    c. 456.97 kPa
    d. 1.57 kPa

    $456\text{mmHg} \cdot \frac{101.3\text{kPa}}{760\text{mmHg}} = 60.78\text{kPa}$

    $0.97\text{atm} \cdot \frac{101.3\text{kPa}}{1\text{atm}} = 98.26\text{kPa}$

    $60.78\text{kPa} + 98.26\text{kPa} = 159.04\text{kPa}$

15. Which of the following graphs best represent Charles' law?
    B
    a. 
    b. 
    c. 
    d. 

    $\frac{V_1}{T_1} \uparrow$ direct

Solve the following problems. Show all work! (9pts each) ↗ K

16. If I have a 450 mL balloon at a temperature of 19 °C, and I leave it in my car which has a temperature of 56° C, what will the new volume of the balloon be?

Charles'

$\frac{V_1}{T_1} = \frac{V_2}{T_2} \rightarrow \frac{450mL}{292K} = \frac{V_2}{329K} \rightarrow$ $V_2 =$ **507 mL**

17. What mass (in grams) of sulfur trioxide will occupy 450 mL at 35.0 °C and 1355 mmHg ?

Ideal

$m = ?g\ SO_3$, $n = ?mol\ SO_3$

$V = 450mL \rightarrow 0.450L$

$T = 35.0°C + 273 = 308K$

$P = 1355mmHg \cdot \frac{1atm}{760mmHg} = 1.78atm$

$PV = nRT$

$n = \frac{(1.78atm)(0.450L)}{(0.0821)(308)}$

$n = 0.032mol\ SO_3$

$0.032mol\ SO_3 \cdot \frac{80.06g\ SO_3}{1mol\ SO_3}$

$m =$ **2.56g SO_3**

18. If a gas occupies 0.617 L at 3.5 atm what volume will it occupy at standard pressure? ↳ P = 1atm

Boyle's

$P_1V_1 = P_2V_2$

$(3.5atm)(0.617L) = (1atm)V_2$

$V_2 =$ **2.16 L**

19. A container initially has a volume of 1.7 L at 25 °C with a pressure of 112 kPa and 2.5 moles of gas. If there are now 4.0 moles of gas in the container, and the volume increased to 3.3 L and the temperature is now 35 °C, what is the final pressure (in kPa)?

Combined

$P_1 = 112kPa$, $V_1 = 1.7L$, $n_1 = 2.5mol$, $T_1 = 298K$

$P_2 = ?kPa$, $V_2 = 3.3L$, $n_2 = 4.0mol$, $T_2 = 308K$

$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2} \rightarrow \frac{(112)(1.7)}{(2.5)(298)} = \frac{P_2(3.3)}{(4.0)(308)}$

$P_2 =$ **95.5 kPa**

20. A tank of constant volume and moles of gas has a pressure of 2.2 atm and a temperature of 298 K, what is the resulting pressure if the temperature decreased to 254 K?

Gay-Lussac

$\frac{P_1}{T_1} = \frac{P_2}{T_2} \rightarrow \frac{2.2atm}{298K} = \frac{P_2}{254K}$

$P_2 =$ **1.88 atm**

21. A container of equal amounts of nitrogen gas and sulfur monoxide is allowed to escape. Which gas will effuse the fastest and how much faster?

N_2 ↓ 28.02 g/mol — SO ↓ 48.06 g/mol

faster b/c smaller →

Which gas effuses first? **N_2**

$\frac{R_1}{R_2} = \sqrt{\frac{M_2}{M_1}} \rightarrow \sqrt{\frac{48.06}{28.02}} = 1.31$

Rate of the gas? **N_2 is 1.31x faster than SO**