1. Which of the following is an SI derived unit:

A) Liter “L” for volume
B) Pascal “Pa” for pressure
C) Kilogram “Kg” for quantity
D) Kilometer per hour “Km/h” for speed

2. The mole is:

A) Avogadro's number

B) The quantity of matter containing unit mass of its particles

C) The quantity of matter containing Avogadro's number of its particles

D) The mass of matter containing Avogadro's number of its particles

3. The following reaction is a:

$$C_6H_6(l) + 15/2O_2(g) \longrightarrow 6CO_2(g) + 3H_2O(l)$$

A) Combustion reaction

B) Combination reaction

C) Combustion and a combination reaction

D) Decomposition reaction

4. Number of moles of a solute in 1 dm^3 of a solution is the solution:

A) Density

B) Molarity

C) Capacity

D) Quantity

5. Number of hydrogen atoms in 11.22 g of glucose "$C_6H_{12}O_6$" is:

A) 4.50×10^{26}

B) 4.50×10^{23}

C) 4.50×10^{25}

D) 4.50×10^{24}

6. The number of grams of iron oxide "Fe_2O_3" that contains 0.7 mol of iron "Fe" is"

A) 55.9

B) 9.55

C) 5.59

D) 95.5

7. If the molar mass of a potassium "K" compound is 368.43 g mol $^{-1}$ and the potassium composition percent is 42.45%, the number of potassium atoms in each molecule is:

A) 5

B) 2

C) 4

D) 3

8. If the main compound of the ore chalopyrite is 34.62% by mass cupper “Cu”, 30.43% by mass iron “Fe” and the rest is sulfur “S”, the empirical formula of this compound is:

A) $CuFeS_3$

B) $Cu_2Fe_2S_2$

C) $CuFe_2S_2$

D) $CuFeS_2$

9. The concentration, in mol/L, of 750.0 mL solution of 149.4 g of potassium iodide "KI" in is:

A) 0.12

B) 1.2

C) 2.1

D) 0.21

10. What is the final concentration, in mol/L, when 25.0 mL of stock solution of $CuSO_4$ is diluted to 500.0 mL if its initial concentration is 5.0 mol/L?

A) 0.25

B) 0.52

C) 2.5

D) 0.025

11. If a solution of $NaNO_3(s)$ in water has a concentration of 27.5% by mass of, the mole fraction of the solute is:

A) 0.057

B) 0.507

C) 0.075

D) 0.705

12. At constant temperature (T), volume (V) of a gas: will…?... when (P) is decreased at constant (n), and will …?...when (n) is decreased at constant (p):

A) increase...increase

B) increase...decrease

C) decrease...increase

D) decrease...decrease

13. **Which of the following hypothesis of the kinetic molecular theory is behind gases deviation from their ideal gas law?**

I. particles' volumes are negligible
II. particles' motions are random
III. particles' kinetic energy is constant at constant temperature
IV. particles' attractive forces are negligible
V. particles' collision are elastic

A) I and II
B) II and IV
C) I and IV
D) III and V

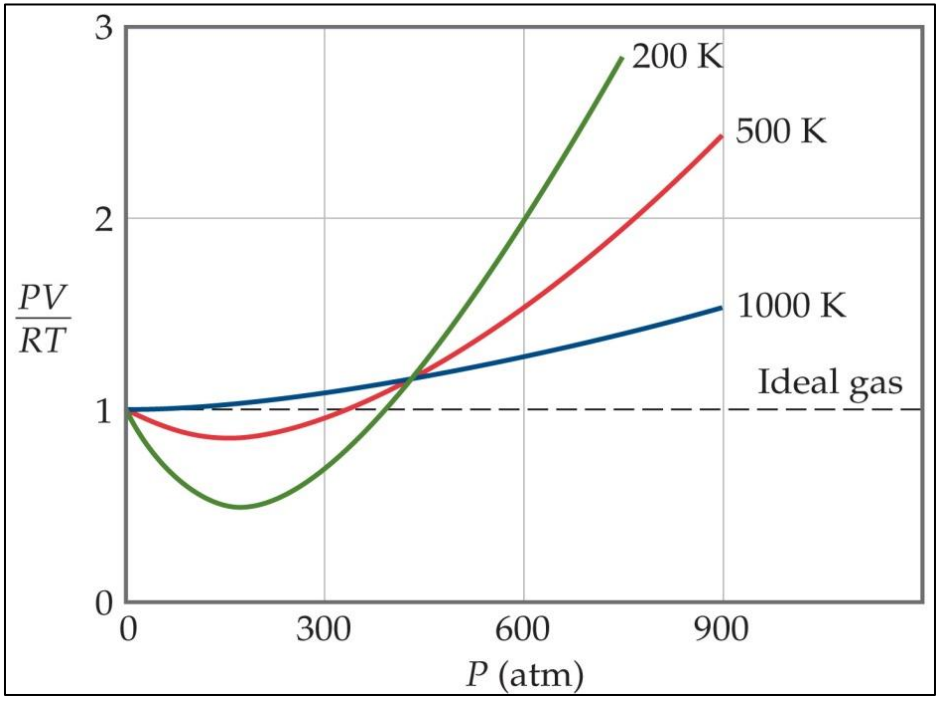
14. From the following diagram relating (PV/RT) of 1 mole of $CO_2(g)$ with its (P) at different temperature, it appears that $CO_2(g)$ as a real gas:

A) Deviates less from ideal gas law at high T

B) Deviates more from ideal gas law at high T

C) Obeys ideal gas law at all temperature

D) Deviates from ideals gas law at all temperatures



15. Pressure, in atm, exerted by 76 g of $F_2(g)$ in a 1.50 liter vessel at -37°C is:

A) 52.38

B) 25.83

C) 23.58

D) 35.28

$$PV = nRT$$

16. The density, in g/L, of $Cl_2(g)$ at STP is:

A) 3.163
B) 6.313
C) 1.363
D) 3.631

$$d = \frac{P\,\mathcal{M}}{RT}$$

17. If a sample of $H_2(g)$, collected over water ($P_{vap,H2O,24C}$ = 22.4 torr), occupied 30.0 mL at 24 °C and a total pressure of 736 torr, the volume that $H_2(g)$ occupies if it was dried at STP, in mL, is:

A) 32.4

B) 21.6

C) 36.8

D) 25.9

$$P_{\text{total}} = P_{\text{gas}} + P_{\text{H}_2\text{O}}$$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

18. If He(g) effuses through a porous barrier at a rate of 4.0 mol/min, the rate of effusion of O_2(g), in mol/min, through the same barrier at the same temperature and pressure will be:

A) 0.20

B) 0.50

C) 1.41

D) 8.0

$$\frac{r_1}{r_2} = \sqrt{\frac{\mathcal{M}_2}{\mathcal{M}_1}}$$

19. If the root-mean-square speed (rms), u, of a gas is 525.353 m/s at 310 K, the gas could be:

A) O_2

B) CO or N_2

C) NO or N_2

D) HCl

$$u = \sqrt{\frac{3RT}{\mathcal{M}}}$$

20. If the density of $Cl_2(g)$ at room temperature is 3.2 g/L, its pressure, in atm, is:

A) 1.1

B) 2.1

C) 0.11

D) 0.21

$$d = \frac{P\,\mathcal{M}}{RT}$$

I. Sodium hydroxide reacts with phosphoric acid (M_{H3PO4} = 98g/mol) to form sodium phosphate (M_{Na3PO3} = 163.94g/mol) and water:

$$3\mathbf{NaOH(aq) + H_3PO_4(aq) \longrightarrow Na_3PO_4(aq) + 3H_2O(l)}$$

If 0.89mol of NaOH is reacted with 0.49mol of H_3PO_4:

(a) Which reactant is the limiting reactant

(b) Calculate the theoretical yield of Na_3PO_4

(c) If the actual yield of Na_3PO_4 is 0.225mol, calculate its yield percentage

II. If a 10.0 L cylinder contains 20.0 mol of He(g). Calculate the temperature at which its pressure becomes 120 atm:

(a) If the gas is ideal.

$$PV = nRT$$

(b) If the gas isn't ideal (a=0.0341 L^2 atm mol^2, b=0.0237 L mol^{-1}).

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$


Thank You!