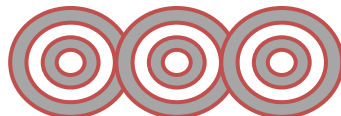




CHEM 101+103



First Exam Sample 1

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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:



- A) Combustion reaction**
- B) Combination reaction**
- C) Combustion and a combination reaction**
- D) Decomposition reaction**

4. Number of moles of a solute in 1 dm³ 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 “C₆H₁₂O₆” 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
“Fe₂O₃” 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 $368.43 \text{ g mol}^{-1}$ 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 chalcopyrite is 34.62% by mass copper “Cu”, 30.43% by mass iron “Fe” and the rest is sulfur “S”, the empirical formula of this compound is:



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 $\text{NaNO}_3(\text{s})$ 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

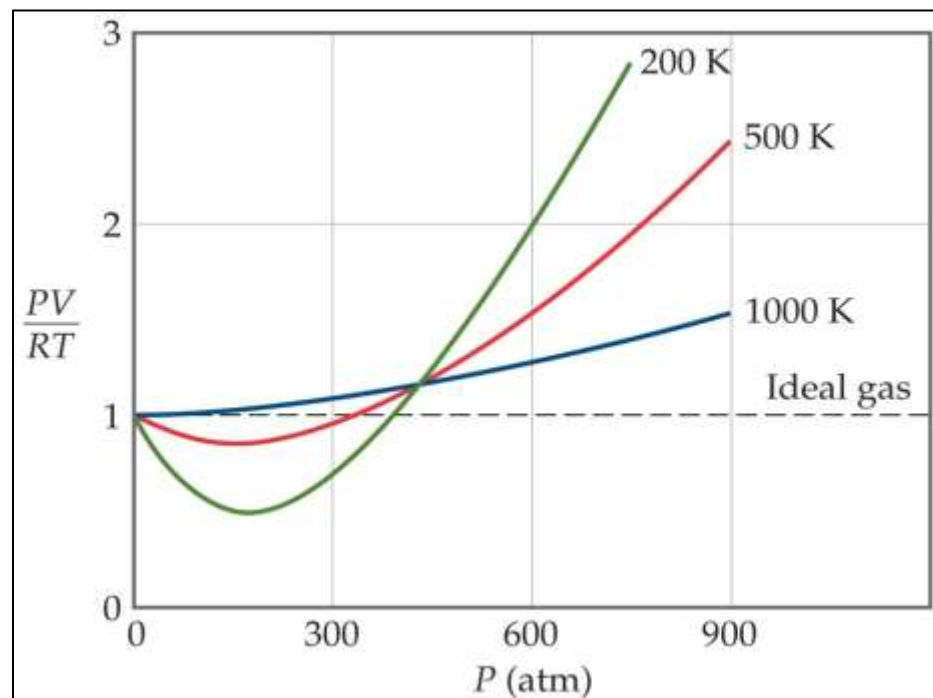
14. From the following diagram relating (PV/RT) of 1 mole of $\text{CO}_2(\text{g})$ with its (P) at different temperature, it appears that $\text{CO}_2(\text{g})$ as a real gas:

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 $\text{Cl}_2(\text{g})$ 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 $\text{H}_2(\text{g})$, collected over water ($P_{\text{vap,H}_2\text{O},24\text{C}} = 22.4 \text{ torr}$), occupied 30.0 mL at 24 °C and a total pressure of 736 torr, the volume that $\text{H}_2(\text{g})$ occupies if it was dried at STP, in mL, is:

A) 32.4

B) 21.6

C) 36.8

D) 25.9

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

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

18. If He(g) effuses through a porous barrier at a rate of 4.0 mol/min, the rate of effusion of O₂(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 $\text{Cl}_2(\text{g})$ 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 ($M_{\text{H}_3\text{PO}_4} = 98\text{g/mol}$) to form sodium phosphate ($M_{\text{Na}_3\text{PO}_4} = 163.94\text{g/mol}$) and water:



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 ($a=0.0341 \text{ L}^2 \text{ atm mol}^2$, $b=0.0237 \text{ L mol}^{-1}$).

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

