

**B**

Multiple Choice

1. The number of hydrogen "H" atoms present in 6.20 g of table sugar " $C_{12}H_{22}O_{11}$ " is:

- (A) A)  $2.4 \times 10^{23}$                       B)  $2.6 \times 10^{23}$   
C)  $2.7 \times 10^{23}$                       D)  $2.9 \times 10^{23}$

2. The mass (in g) of sodium "Na" present in 30.0 g of  $Na_2SO_4$  is:

- (D) A) 12.2                      B) 11.8                      C) 10.5                      D) 9.7

3. Copper "Cu" is usually added to gold "Au" to obtain a hard alloy suitable for making jewelry. A 24.0 g piece of such jewelry contains  $5.70 \times 10^{22}$  atom of Cu. The percentage by mass of gold in this jewelry is:

- (B) A) 72.72%                      B) 74.94%                      C) 76.85%                      D) 78.75%

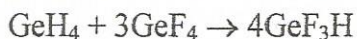
4. The empirical formula of a certain pesticide which has the percentage by mass composition of 19.36% Ca, 34.26% Cl and 46.38% O is:

- (C) A)  $CaCl_2O_3$                       B)  $CaCl_2O_4$                       C)  $CaCl_2O_6$                       D)  $CaCl_3O_4$

5. A metal "M" reacts with oxygen to give  $M_2O_3$  metal oxide. If 9.6 g of oxygen combines with 10.8 g of this metal, the atomic mass (in a.m.u.) of this metal is:

- (A) A) 27                      B) 45                      C) 51                      D) 55

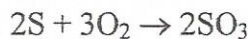
6.  $GeF_3H$  is formed from  $GeH_4$  and  $GeF_4$  in the combination reaction:



If the reaction yield is 92.6%, the numbers of moles of  $GeF_4$  needed to produce 8.0 moles of  $GeF_3H$  are:

- (B) A) 6.18                      B) 6.48                      C) 6.78                      D) 6.98

7. According to the following reaction:



The maximum mass of  $SO_3$  (in g) that can be produced by the reaction of 8.0 g of sulfur, S, with 10.0 g of oxygen " $O_2$ " gas is:

- (C) A) 15.2                      B) 17.6                      C) 16.7                      D) 18.4

8. The volume (in mL) of 0.251 M potassium iodide "KI" solution that contains 13.5 g KI is:

- (D) A) 385                      B) 368                      C) 346                      D) 324

9. The molality "m" of a 25% by mass of glucose " $C_6H_{12}O_6$ " solution is:

- (A) A) 1.85                      B) 1.75                      C) 2.25                      D) 2.15

**B**

10. The number of moles of  $\text{NH}_3$  gas present in 50 L cylinder at  $31.5^\circ\text{C}$  and a pressure equals 20.0 atm is:

**A**

- A) 40                      B) 42                      C) 45                      D) 50
- 

11. 18.39 g of Freon gas occupies 3 L at STP. Therefore, the molar mass of this gas is:

**B**

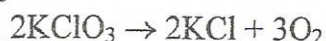
- A) 142.6                      B) 137.4                      C) 132.8                      D) 128.7
- 

12. The density (in  $\text{g}\cdot\text{L}^{-1}$ ) of  $\text{N}_2\text{O}_5$  gas at  $33^\circ\text{C}$  and 1.0 atm pressure is:

**A**

- A) 4.3                      B) 3.9                      C) 3.6                      D) 3.2
- 

13. The volume (in L) of oxygen gas " $\text{O}_2$ " at  $153^\circ\text{C}$  and 0.820 atm that can be produced by the decomposition of 22.4 g of  $\text{KClO}_3$  is:



**D**

- A) 10.5 L                      B) 10.8 L                      C) 11.2 L                      D) 11.7 L
- 

14. Two identical balloons are filled at the same temperature and pressure. One contains Argon gas " $\text{Ar}$ " and the other contains Helium " $\text{He}$ " gas. The argon gas leaks out of its balloon at a rate of 150 mL per hour. Therefore, the rate of leakage (in mL per hour) of helium gas of its balloon is:

**C**

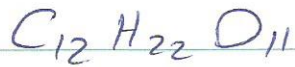
- A) 1497                      B) 848                      C) 474                      D) 424
- 

15. At STP, the average kinetic energy of the molecules of  $\text{N}_2$  gas,  $\text{O}_2$  gas and  $\text{Cl}_2$  gas is:

**A**

- A) equal for the three gases.  
B) the greatest for the  $\text{N}_2$  gas molecules.  
C) the greatest for the  $\text{O}_2$  gas molecules.  
D) the greatest for the  $\text{Cl}_2$  gas molecules.
-

1



$$M_{ut} = 12 \times 12 + 22 \times 1 + 11 \times 16 = 342 \text{ g/mol}$$

$$342 \text{ g/mol} \longrightarrow 22 \text{ g/mol "H"}$$

$$6.20 \text{ g} \longrightarrow x = 0.3988 \text{ g}$$

$$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$1 \text{ g/mol} \longrightarrow 6.022 \times 10^{23} \text{ atoms}$$

$$0.3988 \text{ g} \longrightarrow x = 2.40 \times 10^{23}$$

2



$$M_{ut} = \frac{23 \times 2 + 32 + 16 \times 4}{Na} = 142 \text{ g/mol}$$

$$46 \text{ of "Na"} \longrightarrow 142$$

$$x \longrightarrow 30 \text{ g}$$

$$x = 9.7 \text{ g}$$



3

$$\text{Cu}, M_{\text{at}} = 63.54 \text{ g/mol}$$

$$63.54 \text{ g/mol} \longrightarrow 6.022 \times 10^{23}$$

$$X \longrightarrow 5.7 \times 10^{22}$$

$$X = 6.01 \text{ g}$$

$$\% \text{ mass} = \frac{6.01}{24} \times 100 = 25.05 \% \text{ of Cu}$$

$$\text{The gold percentage} = 100 - 25.05 \approx 74.94 \%$$

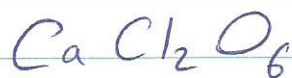
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$$\text{Ca} = 40 \text{ g/mol}, \text{Cl} = 35.5 \text{ g/mol}, \text{O} = 16 \text{ g/mol}$$

$$\text{Ca} = \frac{19.36}{40} = 0.484 \Rightarrow \frac{0.484}{0.484} = 1$$

$$\text{Cl} = \frac{34.26}{35.5} = 0.965 \Rightarrow \frac{0.965}{0.484} = 1.99 \approx 2$$

$$\text{O} = \frac{46.38}{16} = 2.898 \Rightarrow \frac{2.898}{0.484} = 5.78 \approx 6$$



2

5



$$n \text{ of "O"} = \frac{9.6}{16} = 0.6 \text{ moles}$$



$$x = 0.4 \text{ moles.}$$

$$M_{wt} = \frac{m}{n} = \frac{10.8}{0.4} = 27 \text{ g/mol} \quad \underline{\underline{Al}}$$

6

from equation



$$x = 6$$

إذا لم يتفاعل 100% ف 6 مولات كافيّة لكم إذا كان  
الحصول 92.6% يعني هذا أن تزيد عدد المولات بأقل نسبة  
بالاعتبار

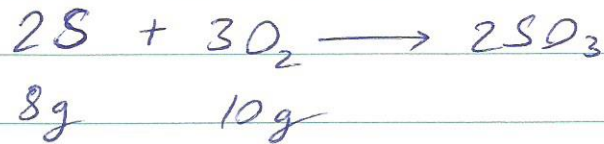


$$x = \frac{6 \times 100}{92.6} = 6.48 \text{ moles.}$$

وهو عدد المولات اللازمة لتكوين 8 مولات من الماء الناتجة  
عند حصول قدره 92.6% .

3

7



إيجاد كمية المتفاعل

$$n \text{ of "S"} = \frac{8}{32} = 0.25 \text{ moles}$$

$$\frac{0.25}{2} = 0.125 \text{ moles.}$$

$$n \text{ of "O}_2" = \frac{10}{32} = 0.3125 \text{ moles}$$

$$\frac{0.3125}{3} = 0.1041 \leftarrow \text{أقل عدد مولات إذاً من المتفاعلات المتفاعل}$$



$$X = \frac{0.3125 \times 2}{3} = 0.208 \text{ moles.}$$

$$m = n \times \text{Mut of "SO}_3"$$

$$= 0.208 \times 80 = 16.64 \text{ g}$$

4



8

$$\text{Mwt of KI} = 166 \text{ g/mol}$$

$$n = \frac{13.5}{166} = 0.081 \text{ moles}$$

$$M = \frac{n}{V} \Rightarrow V(L) = \frac{n}{M}$$

$$= \frac{0.081}{0.251} = 0.324 \text{ L}$$

$$V(\text{ml}) = 0.324 \times 1000 = 324 \text{ ml}$$

9

$$\text{Molality (m)} = \frac{\text{moles of solute}}{\text{Kilograms of solvent}}$$

$$.25\% \Rightarrow 25 \text{ g of glucose}$$

$$.75\% \Rightarrow 75 \text{ g} \Rightarrow 0.075 \text{ kg of water}$$

$$\text{moles of } C_6H_{12}O_6 = \frac{25}{12 \times 6 + 12 + 16 \times 6} = \frac{25}{180} = 0.1389 \text{ moles}$$

$$m = \frac{0.1389}{0.075 \text{ kg}} = 1.85 \text{ m}$$

5

10

$$P = \text{atm}$$

$$V = L$$

$$n = \text{mole}$$

$$T = K$$

$$R = 0.0821$$

$$PV = nRT$$

$$n = \frac{PV}{RT}$$

$$n = \frac{20 \text{ atm} \times 50 L}{0.0821 \times 304.5} = 40 \text{ moles}$$

11

at STP:  $T = 273 K$ ,  $P = 1 \text{ atm}$

$$M = \frac{dRT}{P}$$

$$d = \frac{18.39 \text{ g}}{3 L} = 6.13 \text{ g/L}$$

$$M = \frac{dRT}{P} = \frac{6.13 \times 0.082 \times 273}{1}$$
$$= 137.4 \text{ g/mole}$$

6



12

$$d = \frac{MP}{RT}$$

$$\text{Mwt of } N_2O_5 = 108 \text{ g/mol}$$

$$P = 1 \text{ atm}, T = 33 + 273 = 306 \text{ K}$$

$$d = \frac{MP}{RT} = \frac{108 \times 1}{0.082 \times 306} = 4.3 \text{ g/L}$$

13

$$\text{Mwt of } KClO_3 = 122.6 \text{ g/mol}$$

$$n = \frac{22.4}{122.6} = 0.183 \text{ moles.}$$



$$0.183 \longrightarrow X$$

$$X = \frac{0.183 \times 3}{2} = 0.2745$$

$$V = \frac{nRT}{P} = \frac{0.274 \times 0.082 \times 426}{0.82}$$

$$= 11.68 \text{ L}$$

7

14

Graham law (rate of effusion of two substances)

$$\frac{r_{Ar}}{r_{He}} = \sqrt{\frac{M_{He}}{M_{Ar}}}$$

$$\frac{150}{r_{He}} = \sqrt{\frac{4}{40}}$$

$$r_{He} = \frac{150}{\sqrt{0.1}} = 474 \text{ ml/hour}$$

15

(A) equal for the three gases.