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) 2.4×10^{23} B) 2.6×10^{23}
C) 2.7×10^{23} D) 2.9×10^{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 5.70×10^{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:

$$GeH_4 + 3GeF_4 \rightarrow 4GeF_3H$$

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:

$$2S + 3O_2 \rightarrow 2SO_3$$

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 NH_3 gas present in 50 L cylinder at 31.5°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 $g.L^{-1}$) of N_2O_5 gas at 33°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 "O_2" at 153°C and 0.820 atm that can be produced by the decomposition of 22.4 g of $KClO_3$ is:

$$2KClO_3 \rightarrow 2KCl + 3O_2$$

(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 "Ar" and the other contains Helium "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 N_2 gas, O_2 gas and Cl_2 gas is:

(A)
A) equal for the three gases.
B) the greatest for the N_2 gas molecules.
C) the greatest for the O_2 gas molecules.
D) the greatest for the Cl_2 gas molecules.

B حل نموذج الأسئلة

---

(1)

$C_{12}H_{22}O_{11}$

$Mwt = 12 \times 12 + 22 \times 1 + 11 \times 16 = 342\ g/mol$

$342\ g/mol \longrightarrow 22\ g/mol$ "H"

$6.20\ g \longrightarrow x = 0.3988\ g$

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

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

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

---

(2)

Na_2SO_4

$Mwt = \underset{Na}{\underline{23 \times 2}} + 32 + 16 \times 4 = 142\ g/mol$

46 of "Na" $\longrightarrow$ 142

$x \longrightarrow 30\ g$

$x = 9.7\ g$

(3)

Cu , Mwt = 63.54 g/mol

63.54 g/mol ⟶ 6.022×10^{23}

X ⟶ 5.7×10^{22}

X = 6.01 g

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

The gold percentage = 100 − 25.05 ≃ 74.94 %

---

(4)

Ca = 40 g/mol, Cl = 35.5 g/mol, O = 16 g/mol

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

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

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

$CaCl_2O_6$

(5)

$M \longrightarrow O$

$2 \longrightarrow 3$

$10.8\,g \longrightarrow 9.6\,g$

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

$2 \longrightarrow 3$

$x \longrightarrow 0.6 \qquad x = 0.4 \text{ moles.}$

$M\,wt = \frac{m}{n} = \frac{10.8}{0.4} = 27\,g/mol \qquad \underline{\underline{Al}}$

---

(6)

from equation $\quad 3 \longrightarrow 4$

$X \longrightarrow 8 \qquad x = 6$

إذا كان التفاعل 100% فـ 6 مولات كافية لكن إذا كان المحصول 92.6% معناها هذا أن نزيد عدد المولات بأخذ النسبة بالاعتبار

$92.6 \longrightarrow 100$

$6 \longrightarrow X$

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

وهو عدد المولات اللازمة لتكوين 8 مولات من المادة الناتجة عند محصول قدره 92.6% .

(7)

$$2S + 3O_2 \longrightarrow 2SO_3$$

8g   10g

ايجاد المادة المحددة للتفاعل

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

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

n of "O_2" $= \frac{10}{32} = 0.3125$ moles

$\frac{0.3125}{3} = 0.1041$ ← أقل عدد مولات إذن
هي المادة المحددة للتفاعل

$$3O_2 \longrightarrow 2SO_3$$

$$0.3125 \longrightarrow X$$

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

$m = n \times$ Mwt of "SO_3"

$= 0.208 \times 80 = 16.64$ g

(8)

Mwt of KI = 166 g/mol

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

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

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

$V(ml) = 0.324 \times 1000 = 324$ ml

---

(9)

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

25% ⇒ 25 g of glucose

75% ⇒ 75 g ⇒ 0.075 Kg of water

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

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

(10)

$P =$ atm
$V = L$
$n =$ mole
$T = K$
$R = 0.0821$

$$PV = nRT$$

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

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

---

(11)

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

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

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

$$M = \frac{dRT}{P} = \frac{6.13 \times 0.082 \times 273}{1}$$

$$= 137.4\ g/\text{mole}$$

(12)

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

Mwt of N_2O_5 = 108 g/mol

P = 1 atm , T = 33 + 273 = 306 K

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

---

(13)

Mwt of $KClO_3$ = 122.6 g/mol

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

م المعادلة

2 of $KClO_3$ ⟶ 3 of O_2

0.183 ⟶ X

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

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

$$= 11.68 \text{ L}$$

(14)

Graham law (rate of effussion 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.