EXACADEMY

CRASH COURSE

CHEMISTRY

(FOR IIT-JEE & NEET)

Class – XI

Unit 1 : Some Basic Concept of Chemistry

Part 1 - Mole Concept (मोल की अवधारणा)

➢ Important Formula

- No. of moles, n = mass/GAM (for atoms)
  = mass/GMM (for molecules)
- Total no. of atoms or molecules,
  $N = n \times N_0$
  $= n \times 6.022 \times 10^{23}$ molecules
- Total no. of atoms = No. of molecules × atomicity
- Volume of 1 mole of all the gases at STP = 22.4 L

Q.1. Which of the following contains the highest number of atoms-

निम्न में से किसमें परमाणुओं की संख्या सबसे अधिक है -

(a) 1g of H_2

(b) 23g of Na

(c) 100g of $CaCO_3$

(d) 1 mole of CO_2

Sol^{n}.- (a) 1g of H_2 = [1g/2g] = ½ moles of H_2

= ½ × 6.022×10^{23} molecules of H_2

= ½ × 2 × 6.022×10^{23} atoms of H

= 6.022×10^{23} atoms of H

(b) 23g of Na = [23g/23g] = 1mole of Na

= 1 × 6.022×10^{23} atoms of Na

(c) 100g of $CaCO_3$ = [100g/100g] = 1mole of $CaCO_3$

= 1 × 6.022×10^{23} molecules of $CaCO_3$

= 5 × 6.022×10^{23} atoms

(d) 1mole of CO_2= $1\times6.022\times10^{23}$ molecules of CO_2

$= 3 \times 6.022\times10^{23}$atoms

Ans.- (c) 100g of $CaCO_3$

Q.2. Which of the following is the heaviest-

निम्न में से कौन सबसे भारी है-

(a) 1g of hydrogen

(b) 1 mole of H_2

(c) 6.022×10^{23} atoms of hydrogen

(d) All these have same mass

Sol^{n}.- (a) 1g of hydrogen

(b) 1mole of H_2 = [1 × 2g] = 2g of Hydrogen

(c) 6.022×10^{23} atoms of H = 1mole of H atoms

= 1g of Hydrogen

Ans.- (b) 1mole of H_2

Q.3. Which of the following is the heaviest-

निम्न में से कौन सबसे भारी है-

(a)1 mole of CO_2

(b) 22.4 L of CO_2 at STP

(c) 6.022×10^{23} molecules of CO_2

(d) All have same mass

Sol^{n}.- (a) 1mole of CO_2 = [1 × 44] g of CO_2

(b) 22.4 L of CO_2 at STP = 1mole of CO_2 at STP

= [1 × 44] g of CO_2

(c) 6.022×10^{23} molecules of CO_2 = 1mole of CO_2

= [1 × 44] g of CO_2

Ans.- (d) All have same mass

Q. 4. Which of the following is the lightest-

निम्न में से कौन सबसे हल्का है-

(a) 1 mole CO_2 (b) 22.4 L of SO_2 at STP

(c) 6.022×10^{23} molecules of H_2SO_4 (d) 108 g of Ag

Sol^{n}.- (a) 1mole of CO_2 = [1 × 44g]

= 44g of CO_2

(b) 22.4 L of SO_2 at STP = 1mole of SO_2 at STP

= [1 × 64g] = 64 g of SO_2

(c) 6.022×10^{23} molecules of H_2SO_4

= 1mole of H_2SO_4

= [1 × 98g] = 98 g of H_2SO_4

(d) 108 g of Ag

Ans.- (a) 1mole of CO_2

Q.5. Which of the following contains the highest number of molecules-

निम्न में से किसमें अणुओं की संख्या सबसे अधिक है-

(a) 44g CO_2

(b) 48g O_3

(c) 8g H_2

(d) 64g SO_2

Sol^{n}.- (a) 44g of CO_2 = 1 mole of CO_2

= $1 \times 6.022 \times 10^{23}$ molecules of CO_2

(b) 48g of O_3 = 1 mole of O_3

= $1 \times 6.022 \times 10^{23}$ molecules of O_3

(c) 8g of H_2 = [8g/2g] = 4 moles of H_2

= $4 \times 6.022 \times 10^{23}$ molecules of H_2

(d) 64g of SO_2 = [64g/64g] = 1 mole of SO_2

= $1 \times 6.022 \times 10^{23}$ molecules of SO_2

Ans.- (c) 8g of H_2

Q.6.-The number of water molecules in one drop of water is (if one ml of water has 20 drops and A is Avogadro's number)-

जल के एक बूंद में जल के अणुओं की संख्या है (जल के 1 ml में कुल 20 बूंदे हैं तथा A आवागाद्रो संख्या है) -

(a) 0.5 A/18

(b) 0.5 A

(c) 0.05 A

(d) 0.05 A/18

Sol^{n}.- 1 drop of water = 1/20 ml of H_2O

= 1/20 g of H_2O (density = 1g/ml)

= [0.05g/18g] moles of H_2O

= [$0.05 \times 6.022 \times 10^{23}$ /18g] molecules of H_2O

= 0.05 A/18 molecules of H_2O

Ans.- (d) 0.05 A/18

Q.7.-Haemoglobin contains 0.344% of iron by mass. The molar mass of haemoglobin is approximately 67200. The number of iron atoms present per molecule of haemoglobin is-

हीमोग्लोबिन में मात्रा के अनुसार 0.344% आयरन उपस्थित होता है । यदि हीमोग्लोबिन का अणुभार लगभग 67200 हो तो इसके एक अणु में आयरन परमाणुओं की संख्या होगी -

(a) 4 (b) 6 (c) 3 (d) 2

Sol^{n}.- Mass % of Fe in haemoglobin = 0.344%

$\therefore$ Mass of Fe in 67200g of haemoglobin

$= 0.344 \times 67200/100$ g of Fe

= 231.168g of Fe

$\therefore$ No. of Fe atoms per molecule of haemoglobin

$= 231.168/56 \approx 4$

Ans.- (a) 4

Q.8.-Chlorophyll contains 2.68% of magnesium by mass. The number of magnesium atoms present in 3g of chlorophyll is –

क्लोरोफिल में मात्रा के अनुसार 2.68% मैग्नीशियम है । 3g क्लोरोफिल में मैग्नीशियम परमाणुओं की संख्या होगी-

(a) 1.98×10^{21}

(b) 19.8×10^{21}

(c) 1.98×10^{23}

(d) None

Sol^{n}.- Mass % of Mg in chlorophyll = 2.68 %

$\therefore$ Mass of Mg in 3g of chlorophyll

$= 2.68 \times 3/100$ g of Mg

$= 0.0804$g of Mg

$\therefore$ No. of moles of Mg in 3g of chlorophyll

$= [0.0804\text{g}/24\text{g}]$ moles

$\therefore$ No. of atoms of Mg in 3g of chlorophyll

$= [0.0804\text{g}/24\text{g}] \times 6.022 \times 10^{23}$ atoms

$= 2.01 \times 10^{21}$ atoms

Ans.- (d) None

Q.9.-Consider following reaction-

निम्नलिखित अभिक्रिया पर ध्यान दीजिये -

$2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{2+} + 5O_2 + 8H_2O$

Here, equivalent mass of H_2O_2 is-

यहाँ H_2O_2 का तुल्यांकी भार है -

(a) 17 (b) 34

(c) 68 (d) 85

Sol^{n}.-

+7 -1 +2 0

$$2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{2+} + 5O_2 + 8H_2O$$

Here, equivalent mass of H_2O_2

= GMM / Total change in oxidation No.

= 34/ 2

= 17

Ans.- (a) 17

Q.10.-For decolourisation of one mole of $KMnO_4$, the number of moles of H_2O_2 required will be-

1 मोल $KMnO_4$ के विरंजन के लिए H_2O_2 के आवश्यक अणुओं की संख्या होगी -

(a) 1/2 (b) 3/2

(c) 5/2 (d) 7/2

Sol^{n}.-Decolourisation of $KMnO_4$ by H_2O_2 involves following reaction-

$KMnO_4$ का H_2O_2 द्वारा विरंजन निम्नलिखित अभिक्रिया के अनुसार होता है -

$$2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{2+} + 5O_2 + 8H_2O$$

Here,

2 moles of MnO_4^- ≡ 5 moles of H_2O_2

∴ 1 mole of MnO_4^- ≡ 5/2 moles of H_2O_2

Ans.- (c) 5/2

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