Mole Concept

1. Complex A has a composition of $H_{12}O_6C_{13}Cr$. If the complex on treatment with conc. H_2SO_4 loses 13.5% of its original mass, the correct molecular formula of A is:

[Given: atomic mass of Cr = 52 amu and Cl = 35 amu] **[Jee Main, 2020]**

(1) $[Cr(H_2O)_5Cl]C1_2 \cdot H_2O$

(2) $[Cr(H_2O)_4C1_2]C1 \cdot 2H_2O$

(3) $[Cr(H_2O)_6]C1_3$

(4) $[Cr(H_2O)_3C1_3] \cdot 3H_2O$

2. The minimum amount of $O_2(g)$ consumed per gram of reactant is for the reaction :

(Given atomic mass : Fe = 56, O = 16, Mg = 24, P = 31, C = 12, H = 1) (Mole Concept)

(1) $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$ **[Jee Main, April 2019]**

(2) $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$

(3) $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

(4) $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$

3. Production of iron in blast furnace follows the following equation

$Fe_3O_4(s) + 4CO(g) \rightarrow 3Fe(l) + 4CO_2(g)$

when 4.640 kg of Fe_3O_4 and 2.520 kg of CO are allowed to react then the amount of iron (in g) produced is : **[JEE Main, June 2022]**

[Given : Molar Atomic mass (g mol^{-1}): Fe = 56

Molar Atomic mass (g mol^{-1}) : 0 = 16

Molar Atomic mass (g mol^{-1}): = C = 12

(1) 1400 (2) 2200 (3) 3360 (4) 4200

4. A 10 mg effervescent tablet containing sodium bicarbonate and oxalic acid releases 0.25 ml of CO_2 at T = 298.15 K and p = 1 bar. If molar volume of CO_2 is 25.0 L under such condition, what is the percentage of sodium bicarbonate in each tablet ? [Mole Concept]

[Molar mass of $NaHCO_3$ = 84 g mol^{-1}] [Jee Main, Jan 2019]

(1) 0.84 (2) 8.4 (3) 16.8 (4) 33.6

5. The average molar mass of chlorine is 35.5 g mol^{-1}. The ratio of ^{35}Cl to ^{37}Cl in naturally occurring chlorine is close to : **[Jee Main, 2020]**

(1) 4 : 1 (2) 1 : 1 (3) 2 : 1 (4) 3 : 1

6. Complete combustion of 1.80g of an oxygen containing compound ($C_xH_yO_z$) gave 2.64g of CO_2 and 1.08g of H_2O. The percentage of oxygen in the organic compound is: **[JEE Main, Feb 2021]**

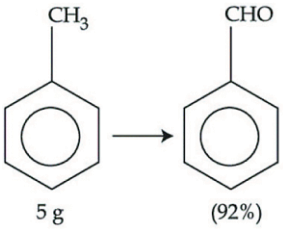
(1) 51.63 (2) 63.53 (3) 53.33 (4) 50.33

7. Consider an imaginary ion $^{48}_{22}X^{3-}$. The nucleus contains 'a'% more neutrons than the number of electrons in the ion. The value of 'a' is_____[nearest integer] **[JEE Main, July 2022]**

8. A 1.84 mg sample of polyhydric alcoholic compound 'X' of molar mass 92.0 g/mol gave 1.344 mL of H_2 gas at STP. The number of alcoholic hydrogens present 1n compound 'X' is _____.

[JEE Main, July 2022]

9.



In the above reaction, 5 g of toluene is converted into benzaldehyde with 92% yield. The amount of benzaldehyde produced is _____ × 10^{-2} g. (Nearest integer) **[JEE Main, July 2022]**

10. The ratio of the mass percentages of 'C & H' and 'C & O' of a saturated acyclic organic compound 'X' are 4 : 1 and 3 : 4 respectively. Then, the moles of oxygen gas required for complete combustion of two moles of organic compound 'X' is _____. **[Jee Main, 2020]**

11. The formula of a gaseous hydrocarbon which requires 6 times of its own volume of O_2 for complete oxidation and produces 4 times its own volume of CO_2 is C_xH_y. The value of y is _____.

[JEE Main, Feb 2021]

ANSWERS KEY

1.	(2)	**2.**	(1)	**3.**	(3)	**4.**	(2)	**5.**	(4)	**6.**	(3)
7.	(4)	**8.**	(3)	**9.**	(530)	**10.**	(5.00)	**11.**	(8)		