WEIRD CHEMIST

Some Basic Concepts of Chemistry – JEE Main 2025 (29 Questions)

"These are not just assignments. These are questions that once decided someone's rank. Solve them seriously... they might decide yours."

Topic–1 : Mole Concept & Avogadro Law

1. **Among 10^{-9} g of Pb, Po, Pr and Pt, element having highest number of atoms is**

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   (a) Pr
   (b) Pt
   (c) Po
   (d) Pb

2. **2.8×10^{-3} mol of CO_2 is left after removing 10^{21} molecules from its 'x' mg sample. The mass of CO_2 taken initially is given:**

   $N_A = 6.02 \times 10^{23}\ mol^{-1}$

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   (a) 98.3 mg
   (b) 196.2 mg
   (c) 150.4 mg
   (d) 48.2 mg

Topic–2 : Stoichiometry & Limiting Reagent

1. **Mass of magnesium required to produce 220 mL of hydrogen gas at STP on reaction with excess of dil. HCl is**

   [Given: Molar mass of Mg is 24 g mol^{-1}]

   (a) 0.24 mg
   (b) 235.7 g
   (c) 2.444 g
   (d) 236 mg

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2. **X g of benzoic acid on reaction with aqueous $NaHCO_3$ released CO_2 that occupied 11.2 L at STP. X is ____ g.**

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3. **When 81.0 g of aluminium is allowed to react with 128.0 g of oxygen gas, the mass of aluminium oxide produced in grams is ____. (Nearest integer)**

   Given :
   Molar mass of Al is 27.0 g mol^{-1}
   Molar mass of O is 16.0 g mol^{-1}

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4. **Consider the following reaction occurring in the blast furnace:**

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

'x' kg of iron is produced when 2.32×10^3 kg Fe_3O_4 and 2.8×10^2 kg CO are brought together in the furnace. The value of 'x' is ____. (Nearest integer)

[Given: molar mass of Fe_3O_4 = 232 g mol^{-1}, molar mass of CO = 28 g mol^{-1}, molar mass of Fe = 56 g mol^{-1}]

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5. **Butane reacts with oxygen to produce carbon dioxide and water following the equation given below.**

$$C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l)$$

If 174.0 kg of butane is mixed with 320.0 kg of O_2, the volume of water formed in liters is ____. (Nearest integer)

[Given : (a) Molar mass of C, H, O are 12, 1, 16 g mol^{-1} respectively, (b) Density of water = 1 g mL^{-1}]

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6. **$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$**
Consider the above reaction, what mass of $CaCl_2$ will be formed if 250 mL of 0.76 M HCl reacts with 1000 g of $CaCO_3$?

(Given : Molar mass of Ca, C, O, H and Cl are 40, 12, 16, 1 and 35.5 g mol^{-1}, respectively)

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(a) 3.908 g
(b) 2.636 g
(c) 10.545 g
(d) 5.272 g

7. **The amount of calcium oxide produced on heating 150 kg limestone (75% pure) is ____ kg. (Nearest integer)**

Given: Molar mass (in g mol^{-1}) of Ca-40, O-16, C-12

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Topic–3 : Concentration Terms (M, m, ppm)

1. **Density of 3 M NaCl solution is 1.25 g mL^{-1}. The molality of the solution is**

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(a) 2.79 m
(b) 2.0 m
(c) 1.79 m
(d) 3.0 m

2. **The molarity of a 70% (mass/mass) aqueous solution of a monobasic acid (X) is ____ $\times 10^{-1}$ M. (Nearest integer)**

[Given: Density of aqueous solution of (X) is 1.25 g mL^{-1}]

[Molar mass of the acid is 70 g mol^{-1}]

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3. **Concentrated nitric acid is labelled as 75% by mass. The volume in mL of the solution which contains 30 g of nitric acid is _____.**
Given : Density of nitric acid solution is 1.25 g/mL.

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(a) 32
(b) 40
(c) 55
(d) 45

4. **20 mL of 2 M NaOH solution is added to 400 mL of 0.5 M NaOH solution. The final concentration of the solution is _____. (Nearest integer)** JEE Main 2025 — 22 Jan — Evening

5. **10 mL of 2 M NaOH solution is mixed with 20 mL of 1 M HCl solution. The resulting solution is kept in a beaker. 10 mL of this solution is poured into a volumetric flask of 100 mL containing 2 moles of HCl and the volume is made upto the mark with distilled water. The final solution is**

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(a) 0.2 M NaCl
(b) 20 M HCl
(c) Neutral
(d) 10 M HCl

6. **20 mL of sodium iodide solution gave 4.74 g silver iodide when treated with excess of silver nitrate solution. The molarity of the sodium iodide solution is _____ M. (Nearest Integer value)**
[Given : Na = 23, I = 127, Ag = 108, N = 14, O = 16 g mol^{-1}]

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7. **Fortification of food with iron is done using $FeSO_4 \cdot 7H_2O$. The mass in grams of the $FeSO_4 \cdot 7H_2O$ required to achieve 12 ppm of iron in 150 kg of wheat is _____. (Nearest integer)**
[Given: Molar mass of Fe, S and O respectively are 56, 32 and 16 g mol^{-1}]

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Topic–4 : Empirical Formula & Combustion Analysis

1. **The elemental composition of a compound is 54.2% C, 9.2% H and 36.6% O. If the molar mass of the compound is 132 g mol^{-1}, the molecular formula of the compound is :**
[Given : The relative atomic mass of C : H : O = 12 : 1 : 16]

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(a) $C_4H_8O_2$
(b) $C_6H_{12}O_6$
(c) $C_4H_9O_3$
(d) $C_6H_{12}O_3$

2. **Quantitative analysis of an organic compound (X) shows the following percentage**

composition: C = 14.5%, H = 1.8%, Cl = 64.46%. The empirical formula mass is ____.

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3. **An organic compound weighing 500 mg, produced 220 mg of CO_2, on complete combustion. The percentage composition of carbon in the compound is ____%. (nearest integer)**
   (Given molar mass in g mol^{-1} of C : 12, O : 16)

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4. **0.5 g of an organic compound on combustion gave 1.46 g of CO_2 and 0.9 g of H_2O. The percentage of carbon in the compound is ____%.** JEE Main 2025 — 3 Apr — Morning

5. **0.01 mole of an organic compound (X) containing 10% hydrogen, on complete combustion produced 0.9 g H_2O. Molar mass of (X) is ____ g mol^{-1}.**

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6. **On combustion 0.210 g of an organic compound containing C, H and O gave 0.127 g H_2O and 0.307 g CO_2. The percentages of hydrogen and oxygen in the given organic compound respectively are:**

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   (a) 7.55, 43.85
   (b) 6.72, 53.41
   (c) 6.72, 39.87
   (d) 53.41, 39.6

7. **On combustion, 1.0 g organic compound gives 1.46 g CO_2 and 0.567 g H_2O. Empirical formula mass is**

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   (a) 60
   (b) 45
   (c) 30
   (d) 15

8. **X g of nitrobenzene on nitration gave 4.2 g of m-dinitrobenzene. X = ____ g. (Nearest integer)**

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9. **During sulphur estimation, 160 mg of an organic compound gives 466 mg of $BaSO_4$. The percentage of sulphur in the compound is ____%.** JEE Main 2025 — 23 Jan — Morning

10. **In Dumas' method for estimation of nitrogen 0.4 g of an organic compound gave 60 mL of nitrogen collected at 300 K temperature and 715 mm Hg pressure. The percentage composition of nitrogen in the compound is**
    (Given : Aqueous tension at 300 K = 15 mmHg)

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    (a) 15.71%
    (b) 17.46%
    (c) 7.85%
    (d) 20.95%

11. **During estimation of nitrogen by Dumas' method of compound X, 0.42 g of the compound will liberate ____ mL of N_2 gas at STP. (Nearest integer)**

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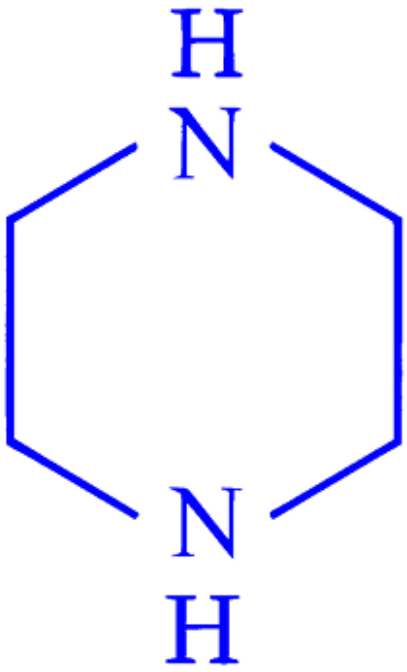

(Nearest integer) JEE Main 2025 — 3 Apr — Morning

Topic–5 : Miscellaneous & Conceptual

12. **The percentage of iodine in thyroxine is _____%. (nearest integer)**
(Given molar mass in g mol^{-1} C : 12, H : 1, O : 16, N : 14, I : 127)

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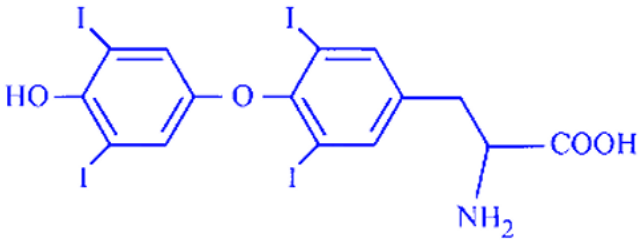

13. **Choose the correct statements: (A) Weight is amount of matter (B) Mass is force of gravity (C) Volume is space occupied (D) Negative Kelvin temperature not possible (E) Precision means closeness of measurements** JEE Main 2025 — 29 Jan — Morning

(a) B, C and D
(b) A, B and C
(c) C, D and E
(d) A, D and E