

Some Basic Concepts of Chemistry

1. The molality of a urea solution in which 0.0100 g of urea, $[(\text{NH}_2)_2\text{CO}]$ is added to 0.3000 dm³ of water at STP is
[AIEEE-2011]

(1) 3.33×10^{-2} m (2) 0.555 m
(3) 5.55×10^{-4} m (4) 33.3 m

2. The density of a solution prepared by dissolving 120 g of urea (mol. mass = 60 u) in 1000 g of water of 1.15 g/mL. The molarity of this solution is
[AIEEE-2012]

(1) 1.78 M (2) 1.02 M
(3) 2.05 M (4) 0.50 M

3. The molarity of a solution obtained by mixing 750 mL of 0.5 (M) HCl with 250 mL of 2 (M) HCl will be
[JEE (Main)-2013]

(1) 0.875 M (2) 1.00 M
(3) 1.75 M (4) 0.975 M

4. At 300 K and 1 atm, 15 mL of a gaseous hydrocarbon requires 375 mL air containing 20% O₂ by volume for complete combustion. After combustion the gases occupy 330 mL. Assuming that the water formed is in liquid form and the volumes were measured at the same temperature and pressure, the formula of the hydrocarbon is
[JEE (Main)-2016]

(1) C₃H₈ (2) C₄H₈
(3) C₄H₁₀ (4) C₃H₆

5. 1 gram of a carbonate (M₂CO₃) on treatment with excess HCl produces 0.01186 mole of CO₂. The molar mass of M₂CO₃ in g mol⁻¹ is
[JEE (Main)-2017]

(1) 118.6 (2) 11.86
(3) 1186 (4) 84.3

6. The most abundant elements by mass in the body of a healthy human adult are :

Oxygen (61.4%); Carbon (22.9%); Hydrogen (10.0%) and Nitrogen (2.6%).

The weight which a 75 kg person would gain if all ¹H atoms are replaced by ²H atoms is

[JEE (Main)-2017]

(1) 7.5 kg (2) 10 kg
(3) 15 kg (4) 37.5 kg

7. The ratio of mass percent of C and H of an organic compound (C_XH_YO_Z) is 6 : 1. If one molecule of the above compound (C_XH_YO_Z) contains half as much oxygen as required to burn one molecule of compound C_XH_Y completely to CO₂ and H₂O. The empirical formula of compound C_XH_YO_Z is

[JEE (Main)-2018]

(1) C₃H₆O₃ (2) C₂H₄O
(3) C₃H₄O₂ (4) C₂H₄O₃

8. A solution of sodium sulfate contains 92 g of Na⁺ ions per kilogram of water. The molality of Na⁺ ions in that solution in mol kg⁻¹ is
[JEE (Main)-2019]

(1) 16 (2) 4
(3) 8 (4) 12

9. For the following reaction, the mass of water produced from 445 g of C₅₇H₁₁₀O₆ is
2C₅₇H₁₁₀O₆(s) + 163O₂(g) → 114CO₂(g) + 110H₂O(l)

[JEE (Main)-2019]

(1) 890 g (2) 490 g
(3) 445 g (4) 495 g

10. The amount of sugar (C₁₂H₂₂O₁₁) required to prepare 2 L of its 0.1 M aqueous solution is
[JEE (Main)-2019]

(1) 136.8 g (2) 17.1 g
(3) 34.2 g (4) 68.4 g

11. 8 g of NaOH is dissolved in 18 g of H₂O. Mole fraction of NaOH in solution and molality (in mol kg⁻¹) of the solution respectively are

[JEE (Main)-2019]

(1) 0.2, 22.20 (2) 0.167, 22.20
(3) 0.167, 11.11 (4) 0.2, 11.11

12. The percentage composition of carbon by mole in methane is [JEE (Main)-2019]
 (1) 80%
 (2) 75%
 (3) 20%
 (4) 25%
13. For a reaction, $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$. Identify dihydrogen (H_2) as a limiting reagent in the following reaction mixtures. [JEE (Main)-2019]
 (1) 35 g of N_2 + 8 g of H_2
 (2) 28 g of N_2 + 6 g of H_2
 (3) 56 g of N_2 + 10 g of H_2
 (4) 14 g of N_2 + 4 g of H_2
14. What would be the molality of 20% (mass/mass) aqueous solution of KI? (molar mass of KI = 166 g mol⁻¹) [JEE (Main)-2019]
 (1) 1.48
 (2) 1.51
 (3) 1.08
 (4) 1.35
15. The minimum amount of $\text{O}_2(\text{g})$ consumed per gram of reactant is for the reaction:
 (Given atomic mass : Fe = 56, O = 16, Mg = 24, P = 31, C = 12, H = 1) [JEE (Main)-2019]
 (1) $2\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{MgO}(\text{s})$
 (2) $4\text{Fe}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Fe}_2\text{O}_3(\text{s})$
 (3) $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l})$
 (4) $\text{P}_4(\text{s}) + 5\text{O}_2(\text{g}) \rightarrow \text{P}_4\text{O}_{10}(\text{s})$
16. The mole fraction of a solvent in aqueous solution of a solute is 0.8. The molality (in mol kg⁻¹) of the aqueous solution is [JEE (Main)-2019]
 (1) 13.88×10^{-2}
 (2) 13.88×10^{-3}
 (3) 13.88
 (4) 13.88×10^{-1}
17. 5 moles of AB_2 weigh 125×10^{-3} kg and 10 moles of A_2B_2 weigh 300×10^{-3} kg. The molar mass of A(M_A) and molar mass of B(M_B) in kg mol⁻¹ are [JEE (Main)-2019]
 (1) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$
 (2) $M_A = 50 \times 10^{-3}$ and $M_B = 25 \times 10^{-3}$
 (3) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$
 (4) $M_A = 10 \times 10^{-3}$ and $M_B = 5 \times 10^{-3}$
18. 25 g of an unknown hydrocarbon upon burning produces 88 g of CO_2 and 9 g of H_2O . This unknown hydrocarbon contains [JEE (Main)-2019]
 (1) 22 g of carbon and 3 g of hydrogen
 (2) 24 g of carbon and 1 g of hydrogen
 (3) 20 g of carbon and 5 g of hydrogen
 (4) 18 g of carbon and 7 g of hydrogen
19. Amongst the following statements, that which was not proposed by Dalton was [JEE (Main)-2020]
 (1) All the atoms of a given element have identical properties including identical mass. Atoms of different elements differ in mass
 (2) Matter consists of indivisible atoms.
 (3) Chemical reactions involve reorganization of atoms. These are neither created nor destroyed in a chemical reaction.
 (4) When gases combine or reproduced in a chemical reaction they do so in a simple ratio by volume provided all gases are at the same T & P.
20. The ammonia (NH_3) released on quantitative reaction of 0.6 g urea (NH_2CONH_2) with sodium hydroxide (NaOH) can be neutralized by [JEE (Main)-2020]
 (1) 200 ml of 0.4 N HCl
 (2) 100 ml of 0.1 N HCl
 (3) 200 ml of 0.2 N HCl
 (4) 100 ml of 0.2 N HCl
21. The strength of an aqueous NaOH solution is most accurately determined by titrating (Note : consider that an appropriate indicator is used) [JEE (Main)-2020]
 (1) Aq. NaOH in a pipette and aqueous oxalic acid in a burette
 (2) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask
 (3) Aq. NaOH in a burette and concentrated H_2SO_4 in a conical flask
 (4) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask

22. A solution of two components containing n_1 moles of the 1st component and n_2 moles of the 2nd component is prepared. M_1 and M_2 are the molecular weights of component 1 and 2 respectively. If d is the density of the solution in g mL⁻¹, C_2 is the molarity and x_2 is the mole fraction of the 2nd component, then C_2 can be expressed as

[JEE (Main)-2020]

$$(1) C_2 = \frac{1000 x_2}{M_1 + x_2(M_2 - M_1)}$$

$$(2) C_2 = \frac{1000 d x_2}{M_1 + x_2(M_2 - M_1)}$$

$$(3) C_2 = \frac{d x_2}{M_2 + x_2(M_2 - M_1)}$$

$$(4) C_2 = \frac{d x_1}{M_2 + x_2(M_2 - M_1)}$$

23. The average molar mass of chlorine is 35.5 g mol⁻¹. The ratio of ³⁵Cl to ³⁷Cl in naturally occurring chlorine is close to

[JEE (Main)-2020]

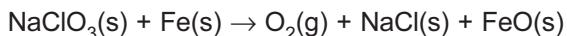
- (1) 1 : 1 (2) 2 : 1
 (3) 3 : 1 (4) 4 : 1

24. Ferrous sulphate heptahydrate is used to fortify foods with iron. The amount (in grams) of the salt required to achieve 10 ppm of iron in 100 kg of wheat is _____. [JEE (Main)-2020]

Atomic weight : Fe = 55.85; S = 32.00; O = 16.00

25. NaClO₃ is used, even in spacecrafts, to produce O₂. The daily consumption of pure O₂ by a person is 492 L at 1 atm, 300 K. How much amount of NaClO₃, in grams, is required to produce O₂ for the daily consumption of a person at 1 atm, 300 K?

[JEE (Main)-2020]



$$R = 0.082 \text{ L atm mol}^{-1} \text{ K}^{-1}$$

26. The molarity of HNO₃ in a sample which has density 1.4 g/mL and mass percentage of 63% is _____. (Molecular Weight of HNO₃ = 63)

[JEE (Main)-2020]

27. 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]

28. The mole fraction of glucose (C₆H₁₂O₆) in an aqueous binary solution is 0.1. The mass percentage of water in it, to the nearest integer, is _____

[JEE (Main)-2020]

29. 6.023×10^{22} molecules are present in 10 g of a substance 'x'. The molarity of a solution containing 5 g of substance 'x' in 2 L solution is _____ $\times 10^{-3}$. [JEE (Main)-2020]

30. The volume (in mL) of 0.1 N NaOH required to neutralise 10 mL of 0.1 N phosphinic acid is _____.

[JEE (Main)-2020]

31. The mass of ammonia in grams produced when 2.8 kg of dinitrogen quantitatively reacts with 1 kg of dihydrogen is _____. [JEE (Main)-2020]

32. A 100 mL solution was made by adding 1.43 g of Na₂CO₃·xH₂O. The normality of the solution is 0.1 N. The value of x is _____. [JEE (Main)-2020]

(The atomic mass of Na is 23 g/mol)

33. The minimum number of moles of O₂ required for complete combustion of 1 mole of propane and 2 moles of butane is _____. [JEE (Main)-2020]