

Topic : Mole Concept and Atomic Structure
Type of Questions
M.M., Min.
Topic : Mole Concept

Single choice Objective ('-1' negative marking) Q.1 to Q.20

(3 marks, 3 min.)

[60, 60]

Topic : Atomic Structure

Single choice Objective ('-1' negative marking) Q.1 to Q.20

(3 marks, 3 min.)

[60, 60]

- The weight of a molecule of the compound $C_6H_{12}O_6$ is about :
 (A) 180 g (B) 3×10^{-22} g (C) 22×10^{-23} g (D) 132 g
- A person adds 1.71 gram of sugar ($C_{12}H_{22}O_{11}$) in order to sweeten his tea. The number of carbon atoms added are : (Mol. mass of sugar = 342)
 (A) 3.6×10^{22} (B) 3×10^{21} (C) 3.6×10^{23} (D) 3×10^{22}
- If V ml of the vapours of substance at NTP weight W mg, then mol. wt. of substance in amu is :
 (A) $(W/V) \times 22400$ (B) $\frac{V}{W} \times 22.4$ (C) $(V/W) \times 22400$ (D) $\frac{W}{V} \times 22.4$
- Percentage of Se in peroxidase anhydrous enzyme is 0.5% by weight. Then min. mol. wt. of peroxidase anhydrous enzyme is : (at. wt. of Se = 78.4 amu)
 (A) 1.568×10^4 (B) 1.568×10^3 (C) 15.68 (D) 1.568×10^2
- Caffeine has a molecular weight of 194. It contains about 30% by mass of nitrogen. The number of atoms of nitrogen in one molecule of it is :
 (A) 2 (B) 3 (C) 4 (D) 5
- Vapour density of a gas, if its density is $\frac{1}{5.6}$ g/L at NTP, is :
 (A) 1 (B) 2 (C) 4 (D) 8
- Assuming that petrol is iso-octane (C_8H_{18}) and has a density 0.8 g ml^{-1} , 1.425 litre of petrol on complete combustion will consume what amount of oxygen :
 (A) 250 L (B) 125 L (C) 125 mole (D) 250 mole
- The volume of gas at NTP produced by reaction of 128 g of CaC_2 with excess of water is :
 (A) 44.8 litre (B) 89.6 litre (C) 67.2 litre (D) 22.4 litre
- If 0.5 mole of $BaCl_2$ is mixed with 0.1 mole of Na_3PO_4 , the maximum number of mole of $Ba_3(PO_4)_2$ that can be formed is :
 (A) 0.166 (B) 0.05 (C) 0.6 (D) 0.1
- A 21.6 g silver coin is dissolved in HNO_3 . When NaCl is added to this solution, all silver is precipitated as AgCl. The weight of AgCl is found to be 14.35 g. Then % of silver in coin is :
 (A) 50% (B) 75% (C) 100% (D) 15%
- What is the concentration of nitrate ions if equal volumes of 0.1 M $AgNO_3$ and 0.1 M NaCl solutions are mixed together :
 (A) 0.1 M (B) 0.2 M (C) 0.05 M (D) 0.25 M
- 300 ml of 3.0 M NaCl is added to 200 ml of 4.0 M $BaCl_2$ solution. The concentration of Cl^- ions in the resulting solution is :
 (A) 4.5 M (B) 3.4 M (C) 6 M (D) 5 M



13. One mole of potassium chlorate is thermally decomposed and excess of aluminium is burnt in the gaseous product. How many mole of aluminium oxide are formed :
 (A) 1 (B) 1.5 (C) 2 (D) 3
14. Calculate the mole of FeO produced from 1.34 g VO & 4.8 g Fe₂O₃ :
 $\text{VO} + \text{Fe}_2\text{O}_3 \longrightarrow \text{FeO} + \text{V}_2\text{O}_5$ (At. wt. of V = 51)
 (A) 0.06 (B) 0.03 (C) 0.12 (D) 0.015
15. Mole fraction of A in aqueous solution is 0.2. The molality of solution is :
 (A) 13.9 (B) 15.5 (C) 14.5 (D) 16.8
16. What is the quantity of water that should be added to 16 g methanol to make the mole fraction of methanol in solution as 0.25 :
 (A) 27 g. (B) 12 g. (C) 18 g. (D) 36 g.
17. If 100 ml of 1M H₂SO₄ solution is mixed with 100 ml of 9.8%(w/w) H₂SO₄ solution (d = 1 g/ml), then :
 (A) concentration of solution increases (B) concentration of solution decreases
 (C) mass of H₂SO₄ in the solution is 1.96 g (D) mass of H₂SO₄ in the solution is 19.6 g
18. Match List-I (Compounds) with List-II (Oxidation states of Nitrogen) and select answer using the codes given below the lists :
- | | | | |
|-----|-------------------------------|-----|---------|
| | List-I | | List-II |
| (a) | NaN ₃ | (1) | +5 |
| (b) | N ₂ H ₂ | (2) | +2 |
| (c) | NO | (3) | -1/3 |
| (d) | N ₂ O ₅ | (4) | -1 |
- (Code) :
- | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | (a) | (b) | (c) | (d) | | (a) | (b) | (c) | (d) |
| (A) | 3 | 4 | 1 | 2 | (B) | 4 | 3 | 2 | 1 |
| (C) | 3 | 4 | 2 | 1 | (D) | 4 | 3 | 1 | 2 |
19. The incorrect order of decreasing oxidation number of S in compounds is :
 (A) H₂S₂O₇ > Na₂S₄O₆ > Na₂S₂O₃ > S₈
 (B) H₂SO₅ > H₂SO₃ > SCl₂ > H₂S
 (C) H₂SO₄ = H₂S₂O₈ > SO₂ > H₂S
 (D) SO₃ > SO₂ > H₂S > S₈
20. For the redox reaction $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$, the correct whole number stoichiometric coefficients of MnO₄⁻, C₂O₄²⁻ and H⁺ are respectively :
 (A) 2, 5, 16 (B) 5, 2, 8 (C) 2, 5, 8 (D) 5, 2, 16

Topic : Atomic Structure

1. The charge-to-mass ratio for A³⁺ ion is about $\frac{1}{9} \times 10^8 \text{ C kg}^{-1}$. Calculate the approximate mass of A atom :
 (A) $4.5 \times 10^{-26} \text{ kg}$ (B) $1.5 \times 10^{-26} \text{ kg}$ (C) $1.5 \times 10^{-28} \text{ kg}$ (D) $4.5 \times 10^{-28} \text{ kg}$
2. Which of the following is isoelectronic with P³⁻ :
 (A) Cl⁻ (B) Mg²⁺ (C) Both (A) & (B) (D) None of these
3. Light of wavelength λ falls on metal having work function hc/λ_0 . Photoelectric effect will take place only if :
 (A) $\lambda \geq \lambda_0$ (B) $\lambda \geq 2\lambda_0$ (C) $\lambda \leq \lambda_0$ (D) $\lambda \leq \lambda_0/2$
4. A photon of X region is more energetic than of the visible region. X may be :
 (A) Infrared (B) Ultra violet (C) Microwave (D) Radio wave
5. A bulb of 40 W is producing a light of wavelength 620 nm with 80% of efficiency. Then the number of photons emitted by the bulb in 20 seconds are :
 (A) 2×10^{18} (B) 10^{18} (C) 10^{21} (D) 2×10^{21}

6. The ionization energy of He^+ is $19.6 \times 10^{-18} \text{ J ion}^{-1}$. The energy of the first stationary state of Be^{3+} will be :
 (A) $15.68 \times 10^{-17} \text{ J/ion}$ (B) $78.4 \times 10^{-18} \text{ J/ion}$ (C) $4.9 \times 10^{-18} \text{ J/ion}$ (D) $39.2 \times 10^{-18} \text{ J/ion}$
7. Which of the following electron transition in a hydrogen atom will require the largest amount of energy :
 (A) From $n = 1$ to $n = 2$ (B) From $n = 2$ to $n = 3$ (C) From $n = \infty$ to $n = 1$ (D) From $n = 3$ to $n = 5$
8. S_1 : Potential energy of the two opposite charge system increases with the decrease in distance.
 S_2 : When an electron make transition from higher orbit to lower orbit, its kinetic energy increases.
 S_3 : When an electron make transition from lower energy to higher energy state, its potential energy increases.
 S_4 : 11eV photon can free an electron from the 1st excited state of He^+ ion.
 (A) T T T F (B) F T T F (C) F T F T (D) T F F T
9. If r_1 is the radius of the first orbit of hydrogen atom, then the radii of second, third and fourth orbits in terms of r_1 are :
 (A) r_1^2, r_1^3, r_1^4 (B) $8r_1, 27r_1, 64r_1$ (C) $4r_1, 9r_1, 16r_1$ (D) $2r_1, 3r_1, 4r_1$
10. If the series limit wavelength of the Lyman series for the hydrogen atom is 912 \AA , then the series limit wavelength for the Balmer series of the Li^{2+} ion is :
 (A) $912 \times \frac{9}{4} \text{ \AA}$ (B) $912 \times \frac{4}{9} \text{ \AA}$ (C) $912 \times \frac{2}{9} \text{ \AA}$ (D) $912 \times \frac{4}{3} \text{ \AA}$
11. In hydrogen spectrum, which of the following has some of its lines in the wavelength range $350 - 700 \text{ nm}$:
 (A) Balmer series (B) Lyman series (C) Brackett series (D) Paschen series
12. In a sample of H-atom, electrons make transition from 5th excited state upto ground state, producing all possible types of photons. Then, maximum number of lines in infrared region are :
 (A) 4 (B) 5 (C) 6 (D) 3
13. Calculate wavelength of 3rd line of Bracket series in hydrogen spectrum :
 (A) $\frac{33}{784R}$ (B) $\frac{33R}{784}$ (C) $\frac{784R}{33}$ (D) $\frac{784}{33R}$
14. A ball weighs 25 g and moves with a velocity of $6.6 \times 10^4 \text{ cm/sec}$. Then find out the de Broglie wavelength :
 (A) $0.4 \times 10^{-33} \text{ cm}$ (B) $0.4 \times 10^{-31} \text{ cm}$ (C) $0.4 \times 10^{-35} \text{ cm}$ (D) $0.4 \times 10^{-37} \text{ cm}$
15. Calculate the de-Broglie wavelength of the electron in the ground state of hydrogen atom :
 (A) $3.3284 \times 10^{-10} \text{ m}$ (B) $1.6642 \times 10^{-10} \text{ m}$ (C) $6.6568 \times 10^{-10} \text{ m}$ (D) Cannot be determined.
16. The uncertainty in position and velocity of an object are 10^{-10} m and $5.27 \times 10^{-24} \text{ ms}^{-1}$ respectively. Calculate the mass of the object :
 (A) 0.1 g (B) 1 g (C) 10 g (D) 100 g
17. A given orbital is labelled by the magnetic quantum number $m = -1$. This could be :
 (A) p-orbital (B) d-orbital (C) f-orbital (D) All of these
18. An electron with $n = 3$ is in an orbital with only one radial node. The orbital angular momentum of the electron will be :
 (A) 0 (B) $\sqrt{6} \frac{h}{2\pi}$ (C) $\sqrt{2} \frac{h}{2\pi}$ (D) $\sqrt{6} \frac{h}{\pi}$
19. After np orbitals are filled, the next orbital filled will be :
 (A) nd (B) $(n + 1) p$ (C) $(n + 1) s$ (D) $(n - 1) s$
20. The correct set of four quantum numbers for the valence electron of Rubidium ($Z = 37$) is :
 (A) $n = 6, \ell = 0, m = 0, s = +\frac{1}{2}$ (B) $n = 5, \ell = 1, m = 0, s = +\frac{1}{2}$
 (C) $n = 6, \ell = 1, m = 1, s = +\frac{1}{2}$ (D) $n = 5, \ell = 0, m = 0, s = +\frac{1}{2}$

Answer Key

DPP No. # 56

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (B) | 2. (A) | 3. (D) | 4. (A) | 5. (C) |
| 6. (B) | 7. (C) | 8. (A) | 9. (B) | 10. (A) |
| 11. (C) | 12. (D) | 13. (A) | 14. (A) | 15. (A) |
| 16. (A) | 17. (D) | 18. (C) | 19. (D) | 20. (A) |

Topic : Atomic Structure

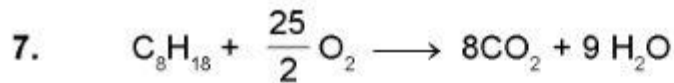
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|---------|---------|---------|---------|---------|
| 1. (A) | 2. (A) | 3. (C) | 4. (B) | 5. (D) |
| 6. (B) | 7. (A) | 8. (B) | 9. (C) | 10. (B) |
| 11. (A) | 12. (C) | 13. (D) | 14. (A) | 15. (A) |
| 16. (D) | 18. (C) | 19. (C) | 20. (D) | |

Hints & Solutions

DPP No. # 56

1. Gram mol. wt. of $C_6H_{12}O_6 = 180$ g
i.e. wt. of 6.023×10^{23} molecules = 180
so wt. of 1 molecules = $\frac{180}{6.023 \times 10^{23}} = 2.988 \times 10^{-22}$ g.
2. No. of carbon atom in glucose = $\frac{1.71}{342} \times 12 N_a$
 $= 3.6 \times 10^{22}$
4. $x \times \frac{0.5}{100} = 78.4 \quad \Rightarrow \quad x = \frac{78.4 \times 10^2}{5 \times 10^{-1}} = \frac{78.4}{5} \times 10^3 = 1.568 \times 10^4$.
6. At NTP, weight of 1 litre gas = 0.178 gm
so weight of 22.4 litre gas = weight of 1 mole gas = molar mass of gas = 0.178×22.4 gm
vapour density = molar mass of gas / 2
so V.D. = $\frac{0.178 \times 22.4}{2} = 2$





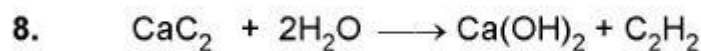
$M = 1.425 \times 1000 \times 0.8 = 1140 \text{ g}$

$\text{mol} = \frac{1140}{114} = 10 \text{ mol}$

Now from mole–mole analysis

$\frac{\text{mole of } C_8H_{18}}{1} = \frac{\text{mole of } O_2}{25/2}$

$\frac{10}{1} = \frac{\text{mole of } O_2}{25/2} \Rightarrow \text{mole of } O_2 = \frac{25}{2} \times 10 = 125 \text{ mol.}$



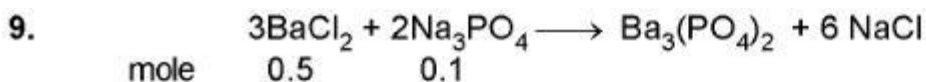
$\frac{100}{64}$ (excess)

From mole-mole analysis

$\frac{100}{64} = \frac{n_{C_2H_2}}{1}$ (here n = mole)

$\text{vol.} = n_{C_2H_2} \times 22.4 \text{ (at N.T.P) (N.T.P पर)}$

$= \frac{100}{64} \times 22.4 = 35 \text{ lit.}$



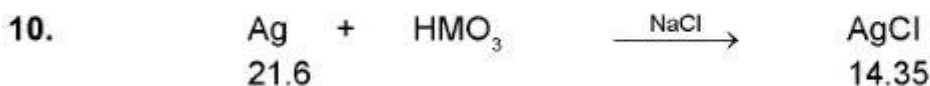
mole $\frac{0.5}{3} \quad \frac{0.1}{2}$ (L.R is Na_3PO_4)

Now from mole– mole analysis अब मोल–मोल विश्लेषण से

$\frac{\text{mole of } Na_3PO_4}{2} = \frac{\text{mole of } Ba_3(PO_4)_2}{1}$

$= \frac{0.1}{2} = \text{mole of } Ba_3(PO_4)_2$ $Ba_3(PO_4)_2$ के मोल

$\Rightarrow \text{mole of } Ba_3(PO_4)_2 = 0.05 \text{ mol.}$ $Ba_3(PO_4)_2$ के मोल = 0.05 mol.



mole $\frac{21.6}{108} = 0.2$

Ag Atom remain conserved

So No. of mole of Ag = No. of mole of Ag Cl

So. No. of mole of AgCl = 0.2

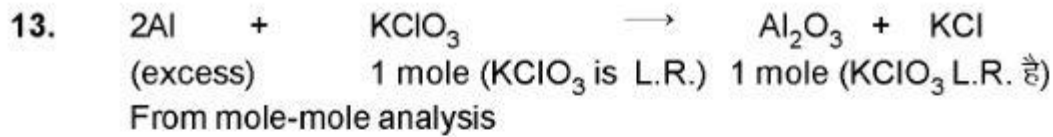
Weight of AgCl = 28.7

% Yield = $\frac{14.35}{28.7} \times 100 = 50 \%$.

$$11. \quad [\text{NO}_3^-] = \frac{0.1V + 0}{2V} = \frac{0.1}{2} = 0.05 \text{ M.}$$

$$12. \quad [\text{Cl}^-] = \frac{300 \times 3 + 200 \times 4 \times 2}{500}$$

$$= \frac{2500}{500} = 5 \text{ M}$$



$$\frac{n_{\text{KClO}_3}}{1} = \frac{n_{\text{Al}_2\text{O}_3}}{1}$$

$$\Rightarrow n_{\text{Al}_2\text{O}_3} = 1 \text{ mole.}$$

15. Mole fraction of A i.e. $X_A = \frac{n_A}{\text{Total moles}}$

So $X_{\text{H}_2\text{O}} = \frac{n_{\text{H}_2\text{O}}}{\text{Total moles}}$

Now $\frac{X_A}{X_{\text{H}_2\text{O}}} = \frac{n_A}{n_{\text{H}_2\text{O}}}$

and molality = $\frac{n_A \times 1000}{n_{\text{H}_2\text{O}} \times 18} = \frac{X_A \times 1000}{X_{\text{H}_2\text{O}} \times 18} = \frac{0.2 \times 1000}{0.8 \times 18} = 13.9 \text{ Ans.}$

16. Let wg water in added to 16 g CH₃OH

$$\text{molality} = \frac{16 \times 1000}{W \times 32} = \frac{500}{W}$$

$$\frac{500}{W} = \frac{x_A \times 1000}{(1 - x_A)m_B} = \frac{0.25 \times 1000}{0.75 \times 18} \quad W = 27 \text{ gm.}$$

17. (A) Molarity of second solution is = $\frac{10 \times d \times x}{M} = 1 \text{ M}$ (B) Volume = 100 + 100 = 200 ml

(D) Mass of H₂SO₄ = $\frac{200 \times 1}{1000} \times 98 = 19.6 \text{ gm.}$

18. $\text{NaN}_3 \Rightarrow 1(+1) + 3(x) = 0 \therefore x = -1/3$

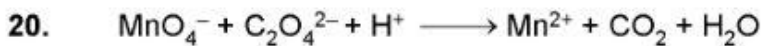
$\text{N}_2\text{H}_2 \Rightarrow 2(x) + 2(+1) = 0 \therefore x = -1$

$\text{NO} \Rightarrow 1(x) + 1(-2) = 0 \therefore x = +2$

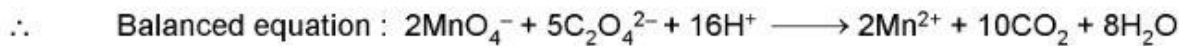
$\text{N}_2\text{O}_5 \Rightarrow 2(x) + 5(-2) = 0 \therefore x = +5$

19. (D) $\begin{array}{cccc} \text{SO}_3 & \text{SO}_2 & \text{H}_2\text{S} & \text{S}_8 \\ 6 & 4 & -2 & 0 \end{array}$





V.f. = 5 V.f. = 2



Topic : Atomic Structure

3. For photoelectric effect to take place, $E_{\text{light}} \geq W \therefore \frac{hc}{\lambda} \geq \frac{hc}{\lambda_0}$ or $\lambda \leq \lambda_0$.

4. More energy means less wavelength.

5. $\text{Power} = \frac{nhc}{\lambda \times t} \Rightarrow 40 \times \frac{80}{100} = \frac{n \times 6.62 \times 10^{-34} \times 3 \times 10^8}{620 \times 10^{-9} \times 20} \Rightarrow n = 2 \times 10^{21}$

9. $r \propto n^2$

11. This is the range of visible region.

12. infrared lines = total lines – visible lines – UV lines = $\frac{6(6-1)}{2} - 4 - 5 = 15 - 9 = 6$.

(visible lines = 4 6→2, 5→2, 4→2, 3→2)

(UV lines = 5 6→1, 5→1, 4→1, 3→1, 2→1)

13. For third line of Bracket series (4 → 7)

$$\frac{1}{\lambda} = R \left(\frac{1}{16} - \frac{1}{49} \right) \Rightarrow \lambda = \frac{784}{33R}$$

14. $\lambda = \frac{h}{mv} = 0.4 \times 10^{-33} \text{ cm}$

15. $\lambda = \frac{h}{\sqrt{2mK}} = 3.328 \times 10^{-10} \text{ m.}$

18. Number of radial nodes = $n - \ell - 1 = 1, n = 3. \therefore \ell = 1$.

Orbital angular momentum = $\sqrt{\ell(\ell+1)} \frac{h}{2\pi} = \sqrt{2} \frac{h}{2\pi}$.

19. After np orbital, (n + 1) s orbital is filled.

20. $\text{Rb}_{37} : [\text{Kr}] 5s^2. \therefore n = 5, \ell = 0, m = 0, s = \pm \frac{1}{2}$.

