JEE MAIN 2023
JAN ATTEMPT
PAPER-1 (B.Tech / B.E.)

QUESTIONS & SOLUTIONS
Reproduced from Memory Retention

31 JANUARY, 2023
9:00 AM to 12:00 Noon

SHIFT - 1

Duration : 3 Hours
Maximum Marks : 300

SUBJECT - CHEMISTRY

RESULT JEE ADVANCED 2022
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STARTING FROM:
15 & 29 MARCH’23
1. In a nonpolar solvent arrangement of micelle can be shown by which of the following

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

Ans. (1)  
(Surface chemistry)

2. Match the column

Shapes

(A) NH₄⁺    (P) Square planar
(B) XeF₄    (Q) See-saw
(C) SF₄    (R) Tetrahedral
(D) BrCl₃    (S) T-shape

Sol. NH₄⁺ : Tetrahedral
XeF₄ : Square planar
SF₄ : See-saw
BrCl₃ : T-shape

3. Cu²⁺ + KI → A → B + C

B & C are:

Sol. Cu²⁺ + KI → CuI₂  → Cu₂I₂⁺ + I₂  
(B)  (C)

4. Which transition in hydrogen atom will have the same wavelength as 4 → 2 transition in He⁺ ion spectrum?

Ans. 2 → 1

Sol. \[ \frac{Z_1}{Z_2} = \frac{n_1}{n_3} = \frac{n_2}{n_4} \]

\[ \frac{2}{1} = \frac{n_1}{n_3} = \frac{n_2}{n_4} \]

for He⁺  
Z₁ = 2  
n₁ = 2  
n₂ = 4  
H  
Z₂ = 1  
n₃ = ?  
n₄ = ?

\[ \frac{2}{1} = \frac{2}{n_3} = \frac{4}{n_4} \]

\[ n_3 = 1 \]
\[ n_4 = 2 \]

(Atomic Structure)
5. \[ \text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2 \]

Find volume of \( \text{H}_2 \) at STP

\[
V_m \text{ at STP} = 22.7L,
\]

Atomic mass of \( \text{Zn} \) = 64.5

\[
\text{Ans.} \quad 4.047 \text{ L} \quad \text{(Mole Concept)}
\]

\[
\text{Sol.} \quad \text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2
\]

Mole of \( \text{Zn} \) = \[
\frac{11.5}{64.5}
\]

Mole of \( \text{H}_2 \) = \[
\frac{11.5}{64.5} \text{ mole}
\]

Volume of \( \text{H}_2 \) at STP = \[
\frac{11.5}{64.5} \times 22.7
\]

\[
= 4.047 \text{ L}
\]

6. Oxidation state of phosphorus in Hypophosphoric acid is \( \text{____} \).

\[
\text{Ans.} \quad +4 \quad \text{(Chemical Bonding)}
\]

\[
\text{Sol.} \quad \text{Hypophosphoric acid: H}_4\text{P}_2\text{O}_6
\]

\[
\text{O.S. of P} \Rightarrow +4
\]

7. Which of the following is/are not a method of concentration of ore?

(a) Hydraulic washing  
(b) Froth Floatation  
(c) Electrolysis  
(d) Leaching  
(e) Liquation

\[
\text{Sol.} \quad \text{Except electrolysis and liqation all other are methods of concentration of ore.}
\]

8. Lead storage battery contains 38% \( \text{H}_2\text{SO}_4 \) by mass, then find the temperature at which liquid of battery will freeze? (\( i = 2.67, K_f \) of water = 1.86 k-kg/mole).

\[
\text{Ans.} \quad -31.05^\circ \text{C} \quad \text{(Solution & Colligative properties)}
\]

\[
\text{Sol.} \quad \Delta T_f = i \times K_f \times m
\]

\[
= 2.67 \times 1.86 \times \frac{38 \times 1000}{98 \times 62}
\]

\[
= 31.05^\circ \text{C}
\]

\[
\Delta T_f = (T_f)_{\text{solvent}} - (T_f)_{\text{solution}}
\]

\[
31.05 = 0 - (T_f)_{\text{solution}}
\]

\[
(T_f)_{\text{solution}} = -31.05^\circ \text{C}
\]
9. 0.6g \( x \) gas (MW = 20g) and 0.45g \( y \) gas (MW = 45g) are mix together in non-reacting mixture. If total pressure is 740 mm of Hg, then calculate partial pressure of \( x \) gas in mixture.

Ans. 555

(Solution & Colligative properties)

Sol. 
\[ n_x = \frac{0.6}{20} = 0.03 \text{ mole} \]
\[ n_y = \frac{0.45}{45} = 0.01 \text{ mole} \]
Total mole = 0.03 + 0.01 = 0.04 mole

\[ P_x = \frac{n_x}{n_{total}} \times 740 = \frac{0.03}{0.04} \times 740 = 3 \times 740 = 555 \]

10. \( V_2O_5, V_2O_3, V_2O_4 \) basicity order:

Ans. \( V_2O_5 < V_2O_4 < V_2O_3 \) (basic strength)

(Solution & Colligative properties)

Sol. \( V_2O_5 > V_2O_4 > V_2O_3 \)
As oxidation number increasing acidic strength increases.

11. The electronic configuration of \( Nd^{2+} \) is given as:

   (1) \( 4f^2 \)  
   (2) \( 4f^3 \)  
   (3) \( 4f^4 \)  
   (4) \( 4f^5 \)

Ans. (3)

(d- & f-Block Elements)

Sol. Neodymium for \( Nd^{2+} \) (Z = 60) : \([Xe]4f^4\)
as \( Nd \) : \([Xe]4f^4\) \( 6s^2 \)

12. 2.56 g of a non-electrolyte solute is dissolved in one litre of a solution, it has osmotic pressure equal to 4 bar at 300 K temperature. Then find the molar mass of the compound.

Given \( R = 0.083 \) bar, round off to the nearest integer.

Ans. 16 gm/mole

(Solution & Colligative properties)

Sol. \( \pi = iCST \)
\[ 4 = 1 \times \frac{2.56}{M} \times 0.083 \times 300 \]
\[ M = \frac{2.56 \times 0.083 \times 300}{4} \]
\[ = 15.936 \approx 16 \text{ gm/mole} \]
13. Arrange the following isoelectronic species in order of their radius:
   K⁺, Ca²⁺, S²⁻, Cl⁻  
   \( \text{(Periodic Table)} \)

   \[ S^{2-} > Cl^- > K^+ > Ca^{2+} \]

   16 \( p \)  17 \( p \)  19 \( p \)  20 \( p \)
   18 \( e^- \)  18 \( e^- \)  18 \( e^- \)  18 \( e^- \)

14. \( \text{SO}_2 (g) + \frac{1}{2} \text{O}_2 (g) \rightleftharpoons \text{SO}_3(g), \ T = 27°C \)

   If \( K_C = 5 \times 10^{-12} \) and \( K_P = x \times 10^{-12} \), then find out value of \( x \).
   \( R = \frac{1}{12} \text{ atm litre mole}^{-1}\text{K}^{-1} \)

   \[ \text{Ans. 1} \]

   \( \text{Sol.} \quad \Delta n_g = 1 - (1 +1/2) = -1/2 \)
   \[ K_P = K_C (RT)^{\Delta n_g} \]
   \[ x \times 10^{-12} = 5 \times 10^{-12} \times \left( \frac{1}{12} \times 300 \right)^{-1/2} = 5 \times 10^{-12} \times \left( \frac{1}{5} \right) \]
   \[ x = 1 \]

15. Determine \( \Delta H^o \) for \( \frac{1}{2} \text{Cl}_2(g) \rightarrow \text{Cl}^- (aq) \)

   Given
   - Bond enthalpy of Cl−Cl = 240 kJ/mole
   - Electron gain enthalpy of Cl(g) = −350 kJ/mole
   - Hydration enthalpy of Cl⁻(g) = −360 kJ/mole

   \( \text{Sol.} \quad \frac{1}{2} \text{Cl}_2(g) \rightarrow \text{Cl}^- (aq) \)
   \[ \frac{1}{2} \text{B.E.} \]
   \[ \text{Cl}^- (aq) \quad \Delta H_{\text{hyd.}} \text{ of Cl}^- (g) \]
   \[ \text{Cl}^- (g) \quad \Delta H_{\text{b.e.}} \text{ of Cl}^- (g) \]

   \[ \Delta H^o = \frac{1}{2} \times 240 + (-350) + (-360) = -590 \text{ kJ/mole} \]

16. A compound of Co²⁺ on dissolution in water gives pink coloured octahedral compound (X), which on reaction with Cl⁻ gives blue coloured compound (Y) of shape 'Z'. X, Y & Z are

   \( \text{(Coordination Compounds)} \)

   \[ \text{Sol.} \quad [\text{Co(H}_2\text{O)}_6]^{2+} + \text{Cl}^- \rightarrow \text{CoCl}_4^{2-} \]
   \[ \text{Pink} \quad \text{Blue, sp}^3 \text{ tetrahedral} \]
17. The correct order of melting point of following compound is [Haloalkanes & Haloarene]

\[ \text{Cl} \begin{array}{c} \text{Cl} \\ \text{Cl} \end{array} \quad \text{Cl} \begin{array}{c} \text{Cl} \\ \text{Cl} \end{array} \quad \text{Cl} \begin{array}{c} \text{Cl} \\ \text{Cl} \end{array} \]

(I) (II) (III)

(1) I > II > III    (2) III > I > II
(3) III > II > I    (4) I > II > III

Ans. (2)

Sol.

\[ \begin{array}{c} \text{Cl} \\ \text{Cl} \end{array} \quad \begin{array}{c} \text{Cl} \\ \text{Cl} \end{array} \quad \begin{array}{c} \text{Cl} \\ \text{Cl} \end{array} \]

M.P. = 256K  M.P. = 249K  M.P. = 323K

18. Choose correct option for following conversion [Haloalkanes & Haloarene Part-2]

\[ \begin{array}{c} \text{Ph} \\ \text{H} \end{array} \begin{array}{c} \text{C} = \text{C} \\ \text{CH}_3 \end{array} \quad \begin{array}{c} \text{Ph} \\ \text{H} \end{array} \begin{array}{c} \text{C} = \text{C} \\ \text{CH}_3 \end{array} \]

(cis) (trans)

(1) Br\textsubscript{2}/CCl\textsubscript{4}, alc. KOH followed by NaNH\textsubscript{2}/\Delta, Na/NH\textsubscript{3}(l)
(2) Br\textsubscript{2}/CCl\textsubscript{4}, alc. KOH followed by NaNH\textsubscript{2}/\Delta, H\textsubscript{2}/Pd-BaSO\textsubscript{4}
(3) Br\textsubscript{2}/CCl\textsubscript{4}, Na/NH\textsubscript{3}(l), H\textsubscript{2}/Pd-BaSO\textsubscript{4}
(4) Br\textsubscript{2}/CCl\textsubscript{4}, alc. KOH/\Delta, H\textsubscript{2}/Pd-BaSO\textsubscript{4}

Ans. (1)

19. Which artificial sugar have highest sweetness value in comparison to cane sugar ? [Chemistry in every day life]

(1) Aspartame  (2) Saccharin  (3) Sucralose  (4) Alitame

Ans. (4)

Sol. Artificial sweetener  Sweetness value in comparison to cane sugar

Aspartame  100
Saccharin  550
Sucralose  600
Alitame  2000
20. In how many of the following reactions aromatic amine is formed?

[Aromatic compounds]

(a) \( \text{NH}^- \text{C}^- \text{CH}_3 \quad \text{dil. H}_2\text{SO}_4 \quad \Delta \)

(b) \( \text{CH}_2^- \text{C}^- \text{NH}_2 \quad \text{Br}_2/\text{NaOH} \)

(c) \( \text{CONH}_2 \quad \text{LiAlH}_4 \)

(d) \( \text{NO}_2 \quad \text{H}_2/\text{Ni} \)

Ans. (2)

21. Propanal + Methanal \( \xrightarrow{\text{NaOH}} \Delta \text{NaCN} \xrightarrow{\text{H}_2\text{O}^-} \) Final product

(1) Final product is optically active.
(2) Final product is racemic mixture and releases gas with \( \text{NaHCO}_3 \).
(3) Final product is racemic mixture and gives ppt with Lucas reagent.
(4) Final product is achiral.

Ans. (2)

Sol. 

22. A protein with molecular mass 70000 u on hydrolysis gives amino acids. Which amino acid will be obtained from the followings?

[Biomolecules]

(1) \( \text{H}_2\text{N}^-\text{CH}^-\text{CH}_2^-\text{CH}_2^-\text{CH}_2^-\text{COOH} \)

(2) \( \text{H}_2\text{N}^-\text{CH}^-\text{COOH} \)

(3) \( \text{CH}_3^-\text{CH}^-\text{CH}^-\text{COOH} \)

(4) \( \text{H}_2\text{N}^-\text{CH}^-\text{CH}_2^-\text{CH}_2^-\text{COOH} \)

Ans. (2)

Sol. Only one of the given amino acids is \( \alpha \)-amino acid.
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