CHEMISTRY
JEE-MAIN (July-Attempt)
25 July (Shift-2) Paper Solution

SECTION - A

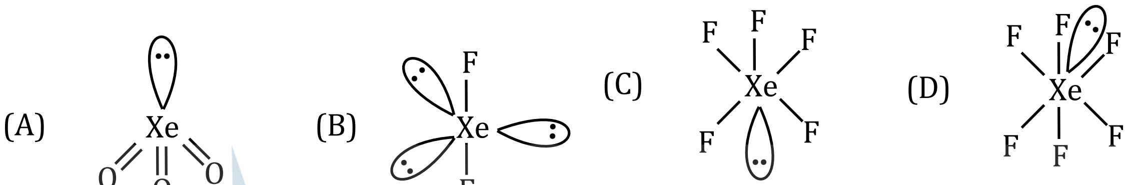
1. Match List I with List II :

List I (molecule)	List II (hybridization ; shape)
A. XeO_3	I. sp^3d ; linear
B. XeF_2	II. Sp^3 ; pyramidal
C. $XeOF_4$	III. Sp^3d^3 ; distorted octahedral
D. XeF_6	IV. Sp^3d^2 ; square pyramidal

Choose the correct answer from the option given below:

(A) A-II, B-I, C-IV, D-III
(B) A-II, B-IV, C-III, D-I
(C) A-IV, B-II, C-III, D-I
(D) A-IV, B-II, C-I, D-III

Sol. **A**



Sp3, pyramidal Sp^3d, Linear Sp^3d^2, (square pyramidal) Sp^3d^3, (distorted octahedral)

2. Two solutions A and B are prepared by dissolving 1 g of non-volatile solutes X and Y, respectively in 1kg of water. THe ratio of depression in freezing points for A and B is found to be 1:4. The ratio of molar masses of X and Y is

(A) 1:4
(B) 1:0.25
(C) 1:0.20
(D) 1:5

Sol. **B**

$$\frac{(\Delta T_f)_A}{(\Delta T_f)_B} = \frac{K_f.m_A}{K_f m_B} = \frac{M_B}{M_A} = \frac{1}{4}$$

$$\frac{M_A}{M_B} = 4$$

3. K_{a_1}, K_{a_2} and K_{a_3} are the respective ionization constants for the following reactions (a),(b) and(c).

(a) $H_2C_2O_4 = H^+ + HC_2O_4^-$

(b) $HC_2O_4^- = H^+ + HC_2O_4^{2-}$

(c) $H_2C_2O_4 = 2H^+ + C_2O_4^{2-}$

The relationship between K_{a1}, K_{a2} and K_{a3} is given as

(A) $K_{a_3} = K_{a_1} + K_{a_2}$
(B) $K_{a_3} = K_{a_1} - K_{a_2}$
(C) $K_{a_3} = K_{a_1}/K_{a_2}$
(D) $K_{a_3} = K_{a_1} \times K_{a_2}$

Sol. **D**

On adding two reactions equilibrium constant gets multiplied.

4. The molar conductivity of a conductivity cell filled with 10 moles of 20 mL NaCl solution is Λ_{m1} and that of 20 moles another identical cell heaving 80 mL NaCl solution is Λ_{m2}. The conductivities exhibited by these two cells are same.

The relationship between Λ_{m2} and Λ_{m1} is

(A) $\Lambda_{m2} = 2\Lambda_{m1}$ (B) $\Lambda_{m2} = \Lambda_{m1}/2$ (C) $\Lambda_{m2} = \Lambda_{m1}$ (D) $\Lambda_{m2} = 4\Lambda_{m1}$

Sol. **A**

$\Lambda_{m1} = \frac{K\times1000}{M}$

$\Lambda_{m1} = \frac{K\times1000}{\frac{10\times10^3}{20}} = 2K$

$\Lambda_{m2} = \frac{K\times1000}{20\times10^{+3}/80} = 4\,K$

$\frac{\Lambda_{m1}}{\Lambda_{m2}} = \frac{2K}{4K} = \frac{1}{2}$

$2\Lambda_{m1} = \Lambda_{m2}$

5. For micelle formation, which of the followiong statements are correct?

A. Micelle formations is an exothermic process.

B. Micelle formations is an endothermic process

C. The entropy change is positive

D. The entropy change is negative.

(A) A and D only (B) A and C only (C) B and C only (D) B and D only

Sol. A

Micelle formation is exothermic.

$\Delta S>0$ – Spontaneous Process.

6. The first ionization enthalpies of Be, B, N and O follow the order

(A) O<N<B<Be (B) Be<B<N<O (C) B<Be<N<O (D) B<Be<O<N

Sol. **D**

(1) IE of Be is more than B due to stable full filled 2s-orbital

(2) IE of N is more than O due to more stable half filled 2p-orbital

7. Given below are two statements.

Statement I : Pig iron is obtained by heating cast iron with scrap iron.

Statement II : Pig iron has a relatively lower carbon content than that of cast iron.

In the light of the above statements, choose the ocrrect answer from the options

(A) Both Statement I and Statement II

(B) Both Statement I and Statement II are not correct

(C) Statement I is correct but Statement II is not correct.

(D) Statement I is not correct but Statement II is correct

Sol. **B**

Cast iron has slightly lower carbon content (about 3%) Cast iron is made by melling pig iron with scrap iron and CoKe using hot air blast

8. High purity (>99.5%) dihydrogen is obtained by
(A) reaction zine with aqueous alkali
(B) electrolysis of acidified water using platinum electrodes.
(C) electrolysis of warm aqueous barium hydroxide solution between nickel
(D) reaction of zine with dilute acid.

Sol. **C**
Fact (NCERT Based)

9. The correct order of density is
(A) Be>Mg>Ca>Sr (B) Sr>Ca>Mg>Be (C) Sr>Be>Mg>Ca (D) Be>Sr>Mg>Ca

Sol. **C**
Order of density Ca<Mg<Be<Sr<Ba<Ra
Ca has lower denisty than Mg and Be due to large size

10. The total number of acidic oxides from the following list is
NO, N_2O, B_2O_3, N_2O_5, CO, SO_3, P_4O_{10}
(A) 3 (B) 4 (C) 5 (D) 6

Sol. **B**
Acidic → B_2O_3, N_2O_5, SO_3, P_4O_{10}
Neutral → NO, N_2O, CO

11. The correct order of energy of absorption for the following metal complexes is
A : $[Ni(en)_3]^{2+}$, B : $[Ni(NH_3)]^{2+}$, C : $[Ni(H_2O)_6]^{2+}$
(A) C<B<A (B) B<C<A (C) C<A<B (D) A<C<B

Sol. **A**
Absorption energy $\propto \Delta_o \propto$ stregth of ligand
Strength of ligand → $H_2O<NH_3<en$

12. Match List I with List II.

List I	List II
A. Sulphate	I. Pesticide
B. Fluoride	II. Bending of bones
C. Nicotine	III. Laxative effect
D. Sodium arsinite	IV. Herbicide

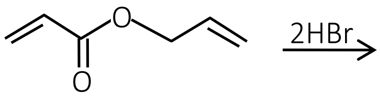
Choose the correct answer from the options given below:
(A) A-II, B-III, C-IV, D-I (B) A-IV, B-III, C-II, D-I
(C) A-III, B-II, C-I, D-IV (D) A-III, B-II, C-IV, D-I

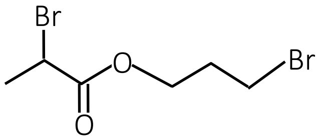
Sol. **C**
A. Sulphate → Laxative effect
B. Fluoride → Bending of bone

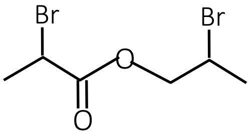
C. Nicotine → Pesticide

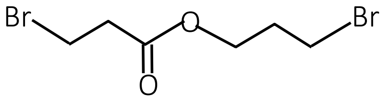
D. Sodium arsinite → Herbicide

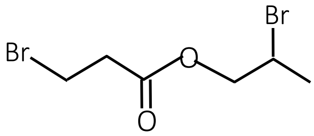
13. Major product of the following reaction is



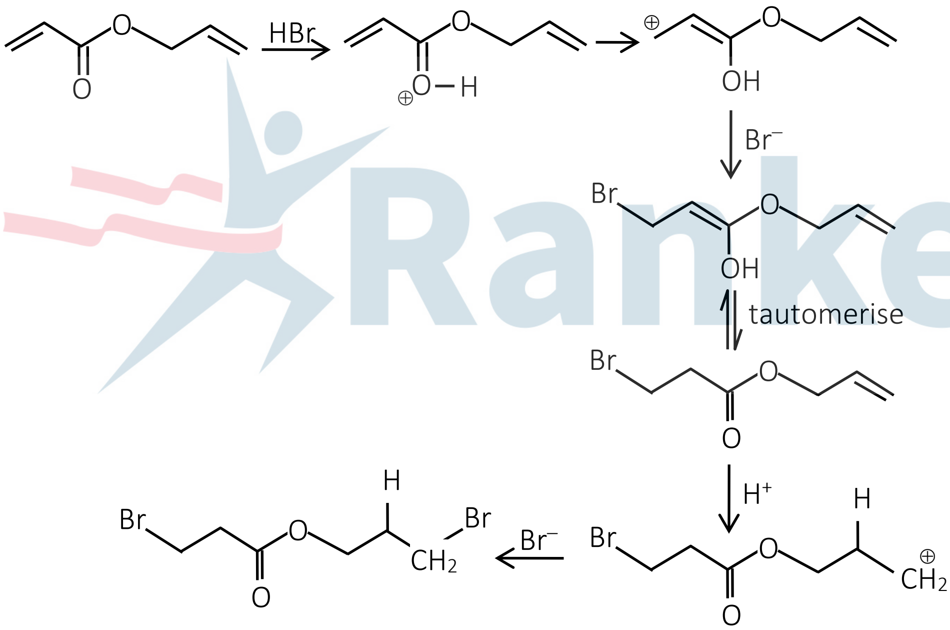
(A) 

(B) 

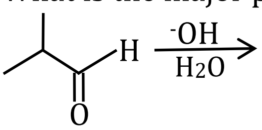
(C) 

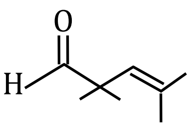
(D) 

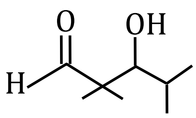
Sol. **C**

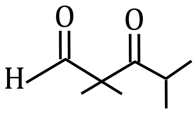


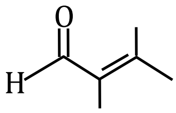
14. What is the major product of the following reation?



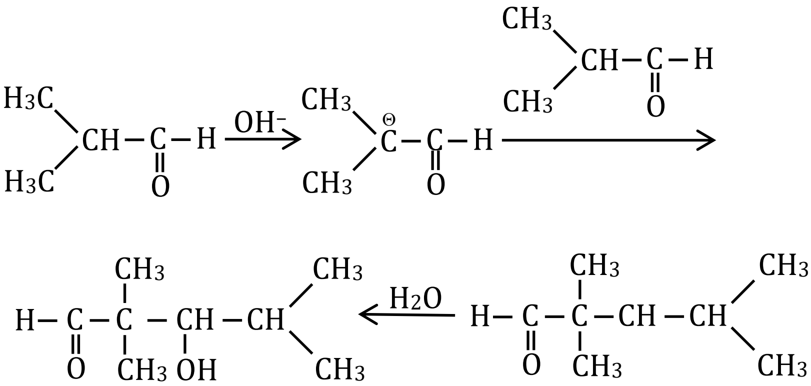
(A) 

(B) 

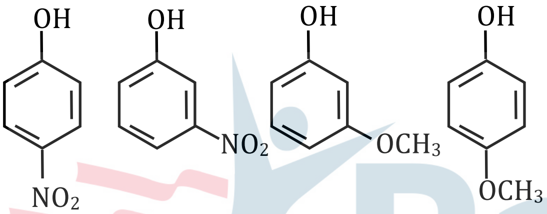
(C) 

(D) 

Sol. **B**



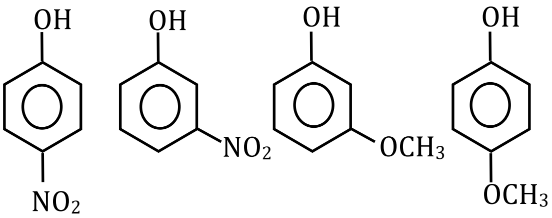
15. Arrange the following in decreasing acidic strength.



(A) (B) (C) (D)

(A) A>B>C>D
(B) B>A>C>D
(C) D>C>A>B
(D) D>C>B>A

Sol. **A**



−M −I −I +M

A > B > C > D

16. $CH_3–CH_2–CN \xrightarrow[\text{Ether}]{CH_3MgBr} A \xrightarrow{H_3O^+} B \xrightarrow[\text{HCl}]{\text{Zn–Hg}} C$

The correct structure of C is

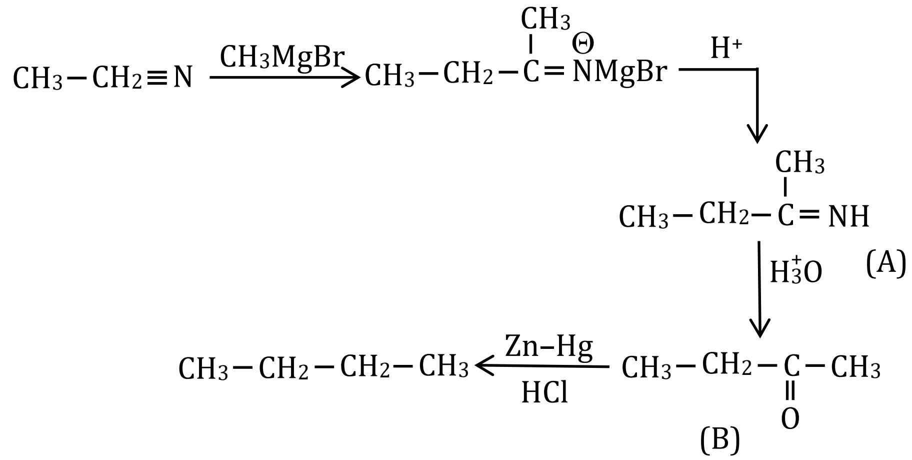
(A) CH_3-CH_2-CH_2-CH_3

(B) CH_3-CH_2-$\overset{\large O}{\overset{\|}{C}}$-$CH_3$

(C) CH_3-CH_2-$\overset{O}{\overset{|}{C}}H$-$CH_3$

(D) CH_3-CH_2-CH=CH_2

Sol. **A**



17. Match List I with List II :

List I Polymer	List II used for items
A. Nylon 6.6	I. Buckets
B. Low density polythene	II. Non-stick utensils
C. High density polythene	III. Bristles of brushes
D. Teflon	IV. Toys

Choose the correct answer from the options given below:

(A) A-III, B-I, C-IV, D-II

(B) A-III, B-IV, C-I, D-II

(C) A-II, B-I, C-IV, D-III

(D) A-II, B-IV,C-I,D-III

Sol. **B**

A. Nylon → Bristles of brushes

B. Low density polythene → Toys

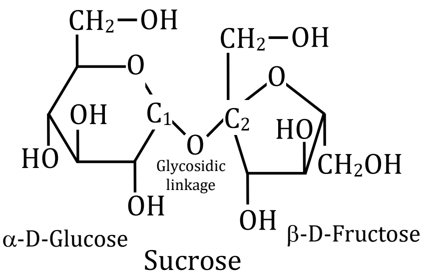
C. High clensity polyethene → Bucket

D. Teflon → Non-stick utensils

18. Glycosidic linkage between C1 of α-glucose and C2 of β-fructose is found in

(A) maltose (B) sucrose (C) lactose (D) amylose

Sol. **B**

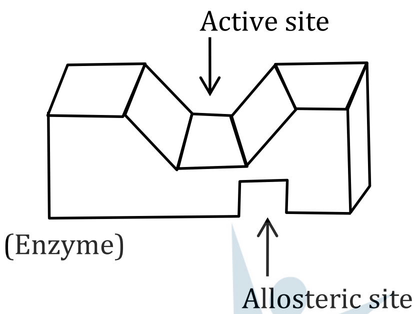


19. Some drugs bind to a site other than the active site of an enzyme. This site is known as

(A) non-active site (B) allosteric site

(C) competitive site (D) therapeutic site

Sol. **B**

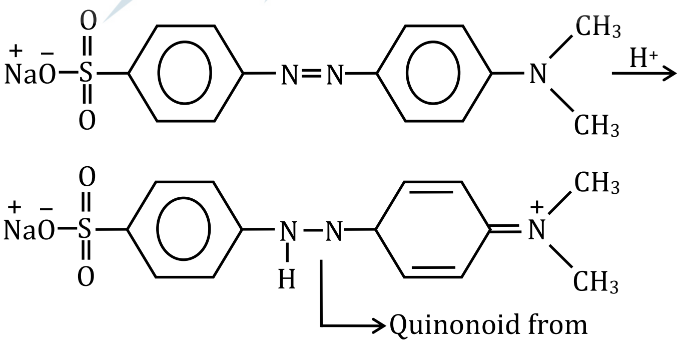


20. In base vs. acid titration, at the end point methyl orange is present as

(A) quinonoid form (B) heterocyclic form

(C) phenolic form (D) benzenoid form

Sol. **A**



21. 56.0 L of nitrogen gas is mixed with excess of hydrogen gas and it is found that 20 L of ammonia gas is produced. The volume of unused nitrogen gas is found to be____L.

Sol. **46**

$$\underset{56\,L}{N_2g} + \underset{excess}{3H_2g} \rightarrow \underset{20\,lit}{2NH_3}$$

Used N_2 = 10 lit, unused N_2 = 46 L

22. A sealed flask with a capacity of 2 dm^3 contains 11 g of propane gas. The flask is so weak that it will burst if the pressure becomes 2 MPa. The minimum temperature at which the flask will burst is________ ^oC. [Nearest integer]
(Given: R=8.3 JK^{-1} mol^{-1}, Atomic masses of C and H are 12u and 1u, respectively)(Assume that propane behaves as an ideal gas.)

Sol. **1655**
Pv = nRT
$2 \times 10^6 \times 2 \times 10^{-3} = \frac{11}{44} \times 8.3 \times T$
T = 1927.7 K
T = 1654.7^{o}C
Ans 1655

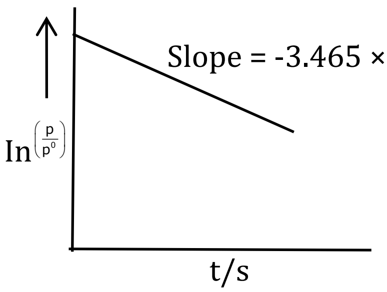
23. When the excited electron of a H atom from n = 5 drops to the ground state, the maximum number of emission lines observed are___________.

Sol. **10**
Number of emission line
$= \frac{n(n-1)}{2} = \frac{5\times(5-1)}{2} = 10$

24. While performing a thermodynamics experiment, a student made the following observations.
$HCl + NaOH \rightarrow NaCl + H_2O$ ΔH = -57.3 kJ mol^{-1}
$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$ ΔH = -55.3 kJ mol^{-1}
The enthalpy of ionization of CH_3COOH as calculated by the student is________kJ mol^{-1},(nearest integer)

Sol. **2**
Ionisation energy of CH_3COOH = 57.3 – 55.3 = 2 KJ

25. For the decomposition of azomethane,
$CH_3N_2CH_3(g) \rightarrow CH_3CH_3(g) + N_2(g)$, a first order reaction, the variation in partial pressure with time at 600 K is given as

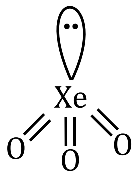


The half life of the reaction is______×10^{-5}s. [Nearest integer]

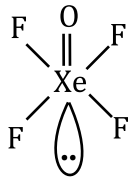
Sol. **2**
$IN \frac{P}{P^0} = -kt$
Slope = -k
K = 3.465 × 10^4
$t_{1/2} = \frac{0.693}{K}$ = 0.2 × 10^{-4} = 2 × 10^{-5}

26. The sum of number of lone pairs of electrons present on the central atoms of XeO_3, $XeOF_4$ and XeF_6, is__________

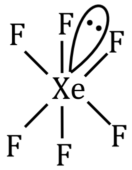
Sol. **3**



lp on C.A. = 1



lp on C.A. = 1



lp on C.A. = 1

Total lp = 1 + 1 + 1 = 3

27. The spin-only magnetic moment value of M^{3+} ion (in gaseous state) from the pairs Cr^{3+}/Cr^{2+}, Mn^{3+}/Mn^{2+}, Fe^{3+}/Fe^{2+} and Co^{3+}/Co^{2+} that has negative standard electrode potential, is_____B.M. [Nearest integer]

Sol. **4**

SRP (E^o/V) M^{3+}/M^{2+}

	Ti	V	Cr	Mn	Fe	Co
$E^o_{M^{3+}/M^{2+}}$	−0.37	−0.26	−0.41	1.57	0.77	1.97

$Cr^{3+}(3d^3) \rightarrow \mu = \sqrt{3(3+2)} = \sqrt{15} = 3.89 = 4$

28. A sample of 4.5 mg of an unknown monohydric alcohol, R-OH was added to methylmagnesium iodide. A gas is evolved and is collected and its volume measured to be 3.1 mL. The molecular weight of the unknown alcohol is_____g/mol. [Nearest integer]

Sol. **33 & 35**

$ROH + CH_3MgI \rightarrow ROMgI + CH_4(g)$

Assume T = 25°C

Moles of $CH_4 = \frac{3.1}{24.47} = 0.127$ mole

Moles of ROH = 0.127

$$\frac{4.5}{M} = 0.127 \Rightarrow \boxed{M \simeq 35}$$

T = 0°C i.e. S.T.P. condition

Moles of $CH_4 = \frac{3.1}{22.4} = 0.138$

$\frac{4.5}{M} = 0.138 \Rightarrow M = 32.6 \simeq 33$

29. The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and B from the base line are 3.25 cm, 2.08 cm and 1.05 cm, respectively. The ratio of R_f values of A to B is_____.

Sol. **2**

$R_f(A) = \frac{2.08}{3.25} = 0.64$

$R_f(B) = \frac{1.05}{3.25} = 0.32$

$R_f(A) : R_f(B) = 2:1$

30. The total number of monobromo derivatives formed by the alkanes with molecular formula C_5H_{12} is (excluding stereo isomers)________.

Sol. **8**

C_6H_{12} Dou = 0