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# JEE (MAIN) 2025

## MEMORY BASED QUESTIONS & TEXT SOLUTION

**SHIFT-1**

**DATE & DAY:** 03rd April 2025 & Thursday

**PAPER-1**

**Duration:** 3 Hrs.
**Time:** 09:00 – 12:00 IST

## SUBJECT: CHEMISTRY




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# PART : CHEMISTRY

**1.** In the reaction A + B → C
Both reactant A and B react according to 1st order reaction initially $[A]_0 = 8[B]_0$ and half-life of A is 10 min and half-life of B is 40 min then time after which concentration of a become equal to B is _____ min.

**Ans.** **(40)**

**Sol.**
$C_t = Ce^{-kt}$

$(C_{t_A}) = (C_t)_B$

$\Delta e^{-k_A t} = [B]_0 e^{-k_B t}$

$\Rightarrow \quad 8[B]_0 e^{-\left(\frac{\ln 2}{10}\right)t} = [B]_0 e^{-\left(\frac{\ln 2}{40}\right)t}$

$\Rightarrow \quad e^{-\left(\frac{\ln 2}{10}\right)t} = e^{-\left(\frac{\ln 2}{40}\right)t}$

$\Rightarrow \quad (2)^3 = 2^{\left[\frac{1}{10} - \frac{1}{40}\right]t}$

$\Rightarrow \quad t = 40$ min

**2.** For the following complex
(a) $[Co(NH_3)_6]^{3+}$ (b) $[Co(CN)_6]^{3-}$ (c) $[CoCl(NH_3)_5]^{2+}$ (d) $[Co(NH_3)_5(H_2O)]^{3+}$
Correct order of $\lambda$ absorbed is :
(1) c > d > a > b (2) a > b > c > d (3) d > c > a > b (4) c > d > b > a

**Ans.** **(1)**

**Sol.** Stronger the ligand, higher is spliting and greater of energy of photon absorbed and smaller will be $\lambda$ of absorbed light.

**3.** Correct matching of List-I with List-II is :

| | List – I | | List – II |
|---|---|---|---|
| (a) | $PF_5$ | (i) | $sp^3d$ |
| (b) | $[PtCl_4]^{2-}$ | (ii) | $dsp^2$ |
| (c) | $SF_6$ | (iii) | $sp^3$ |
| (d) | $[Ni(CO)_4]$ | (iv) | $sp^3d^2$ |

(1) a - I, b - II, c - III, d - IV (2) a - I, b - II, c - IV, d - III
(3) a - II, b - I, c - III, d - IV (4) a - I, b - III, c - IV, d - II

**Ans.** **(2)**

**Sol.**

| | | |
|---|---|---|
| (a) | $PF_5$ | $sp^3d$ |
| (b) | $[PtCl_4]^{2-}$ | $dsp^2$ |
| (c) | $SF_6$ | $sp^3d^2$ |
| (d) | $[Ni(CO)_4]$ | $sp^3$ |

**4.** Correct decreasing molar conductivity order of following ion $H^+$, $Ca^{2+}$, $Mg^{2+}$, $Na^+$, $Li^+$ is
(1) $H^+ > Ca^{2+} > Mg^{2+} > Na^+ > Li^+$ (2) $Ca^{2+} > Mg^{2+} > Na^+ > Li^+ > H^+$
(3) $Ca^{2+} > Mg^{2+} > H^+ > Li^+ > Na^+$ (4) $Mg^{2+} > Ca^{2+} > H^+ > Li^+ > Na^+$

**Ans.** **(1)**

**Sol.** Molar conductivity depends on size and charge of ion, in aqueous solution $H^+$ ion have highest molar conductivity.

**5.** Solution-I is prepared as

**Solution-I**

10 mole of A
+
10 lit $H_2O$

Form solution-I, 1 lit. solution is taken and prepared solution-II as

**Solution-II**

1 Lit. solution A
+
1 mole of A
+
1 mole $H_2O$

Then which of the following quantity will change.

(1) molar heat capacity (2) Gibb's free energy
(3) Density (4) Concentration

**Ans.** **(2)**

**Sol.** Density, concentration and molar heat capacity remain same as these are intensive property while Gibb's free energy is extensive quantity. So it will change.

**6.** 2 mole each of ethylene glycol and glucose added to 500 gram of water then final boiling point of the mixture is _____ . [Given : $k_b(H_2O) = 0.52 \frac{kkg}{mole}$ ]

(1) 377.16 (2) 277.16 (3) 177.16 (4) 360.16

**Ans.** **(1)**

**Sol.** $\Delta T_b = i\, k_b \times m$

$\Delta T_b = 1\left[0.52 \times \left[\frac{4}{0.5}\right]\right]$

$\Delta T_b = 0.52 \times 8$

$T_b - 373 = 4.16$

$T_b = 377.16\ K$

**7.** For reaction

$CrO_2Cl_2 + NaOH \longrightarrow B + NaCl + H_2O$

$B + H^+ \longrightarrow C + H_2O$

Then number of terminal oxygen in C is_____

**Ans.** **(6)**

**Sol.** $CrO_2Cl_2 + NaOH \longrightarrow CrO_4^{2-} + NaCl + H_2O$

$B + H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$

Structure of $Cr_2O_7^{2-}$ is

so terminal oxygen is =6.

**8.** For the reaction

$FeCl_3 + H_2C_2O_4 + KOH \longrightarrow A$

Fe obtained as a complex ion A, then number of optical isomer of complex A is_____

**Ans.** **(2)**

**Sol.** $FeCl_3 + H_2C_2O_4 + KOH \longrightarrow [Fe(C_2O_4)_3]^{3-}$

for $[M(AA)_3]$ total number of optical isomer =2.

**9.** From following statement
(a) Ionisation energy of Be is higher than B.
(b) Li is most electropositive element.
(c) Electronegativity of C in $CCl_4$, and $CH_4$ is 2.5.
(1) a, b only (2) b, c only (3) a, c only (4) a, b, c

**Ans.** **(3)**

**Sol.** Cs is most electro positive.

**10.** 0.5 gram of organic compound on complete combution give 1.46 gram of $CO_2$ and 0.90 gram of water, then % of carbon in organic compound is _____. (Nearest integer)

**Ans.** **(80)**

**Sol.** $C_xH_y + \left(x + \frac{y}{4}\right) O_2 \longrightarrow xCO_2(g) + \frac{y}{2} H_2O(l)$

0.5 gram 1.46 g 0.90 g

$(W_C)_{in\,CO_2} = \left[\frac{1.46}{44}\right] 12$

$\%\text{ of C in organic compound} = \left[\frac{1.46}{44}\right] \times \frac{12}{0.5} \times 100 = 79.63$

**11.** If separately we take $10^{-3}$ gram each of Pr, Pt, Pb, Po, then which one have maximum number of atom.
(1) Pr (2) Pt (3) Pb (4) Po

**Ans.** **(1)**

**Sol.**

| Element | Atomic number |
|---|---|
| Pr | 59 |
| Pt | 86 |
| Pb | 82 |
| Po | 84 |

So Pr have maximum number of atom.

**12.** **Statement – I :** N–N bond is weaker and longer than P–P bond.
**Statement – II :** Member of group 15 in +3 oxidation state can easily under disproportionation reaction.
(1) Both statement I and statement II are true.
(2) statement I is true and statement II is false.
(3) statement I is false and statement II is true.
(4) Both statement I and statement II are false.

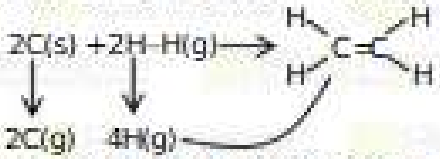
**Ans.** **(3)**

**Sol.** N–N bond is weaker than P–P bond but N–N bond length is smaller than P–P bond.

**13.** Correct enthalpy of formation of $C_2H_4(g)$ is_____ kJ /mole (Nearest integer)
given (i) $\Delta H_{sublimation}$ (C, graphite) = 717 kJ /mol
(ii) $\Delta H(C=C)$ = 346 kJ /mole.
(iii) $\Delta H(H–H)$ = 436 kJ /mole.
(iv) $\Delta H(C–H)$ = 414 kJ /mole.

**Ans.** **(304)**

**Sol.** $2C(\text{graphite}) + 2H_2(g) \longrightarrow C_2H_4(g)$




$\Delta H = 2\Delta H_{sub}(C, \text{graphite}) + 2E_{H-H} - 4E_{C-H} - E_{C=C}$
$= 2 \times 717 + 2 \times 436 - 4 \times 414 - 346$
$= 2306 - 2002$
$= 304$ kJ /mole

**14.** For equilibrium reaction

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

In equilibrium mixture 'Xe' is added at fixed temperature and pressure then at new equilibrium.

(1) Partial pressure of $PCl_5$ increase. (2) Partial pressure of $PCl_3$ decrease.

(3) Number change at equilibrium. (4) Partial pressure of $Cl_2$ increases.

**Ans.** **(2)**

**Sol.** $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

$$K_P = \frac{(P_{PCl_3(g)})(P_{Cl_2})}{(P_{PCl_5})}$$

on adding 'Xe' equilibrium shift forward direaction so partial pressure of each species decrease.

**15.** From the following ion

$Cr^{2+}$, $Mn^{2+}$, $Co^{2+}$, $Fe^{2+}$, $Mn^{3+}$, $Co^{3+}$, $Fe^{3+}$

how many of the above ion have magnetic moment (spin only) = 4.9 BM.

(1) 4 (2) 5 (3) 3 (4) 6

**Ans.** **(1)**

**Sol.**

| Ion | Number of unpaired electron |
|---|---|
| $Cr^{2+}$ | 4 |
| $Mn^{2+}$ | 5 |
| $Co^{2+}$ | 3 |
| $Fe^{2+}$ | 4 |
| $Mn^{3+}$ | 4 |
| $Co^{3+}$ | 4 |
| $Fe^{3+}$ | 5 |

**16.** Which of the following Bohr's postulate does not obey quantum mechanical model of atom.

(1) Electron moves in definite circular path around nucleus.

(2) When electron moves in its stationary orbit it does not exist electro magnetic wave.

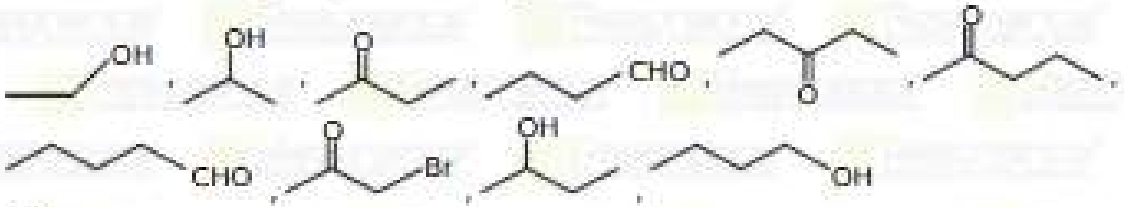
(3) In each orbit electron have definite energy that's why its transition energy quantize.

(4) Angular moment of electron in each orbit is $\left(mvr = \frac{nh}{2\pi}\right)$ is quantize.

**Ans.** **(1)**

**Sol.** According to quantum mechanical model of atom electron does not move in definite circular path.

**17.** Which of the following compounds donot give Holoform reaction.



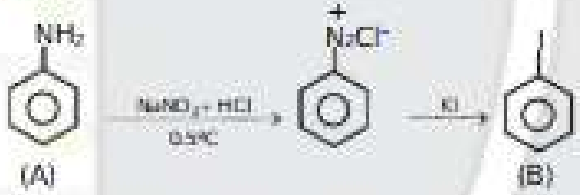

**Ans.** **(4)**

**18.** Observer the following reaction sequence.


Which of the following options has correct structure of (A) and (B) respectively.


**Ans.** (1)

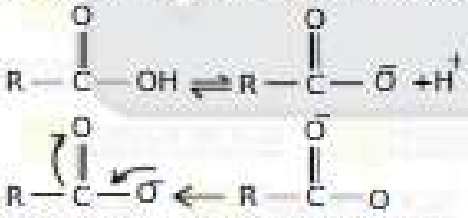
**Sol.**



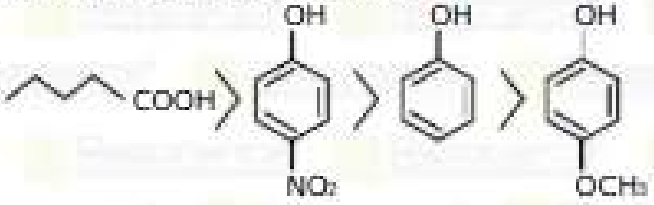

**19.** Which one of the following compounds is most acidic ?


**Ans.** **(1)**

**Sol.** Carboxylic acid is more acidic than phenol and the given phenol derivatives because carboxylate anion has two equi-energetic resonating structures



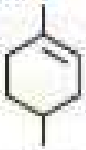
The correct acidic strength order is



**20.** 3-methyl-6 oxoheptanal, will be formed after ozonolysis of

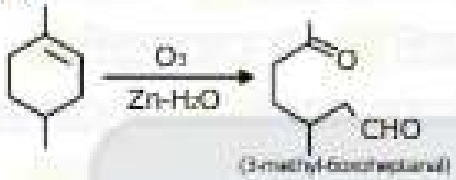
(1) 

(2) 

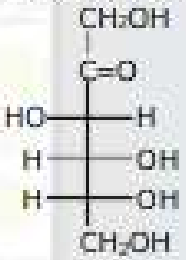
(3) 

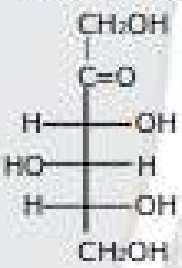
(4) 

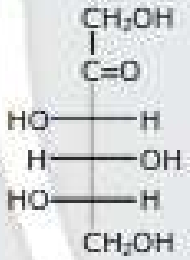
**Ans.** **(3)**

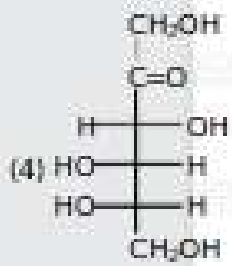
**Sol.** 


**21.** Which of the following represents the L-form of fructose ?

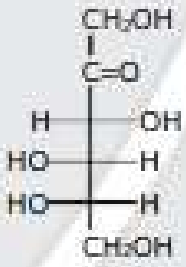
(1) 


(2) 


(3) 


(4) 


**Ans.** **(4)**

**Sol.** L-form of fructose is 


**22.** Which of the following is/are correct ?

(a) $CH_3CH_2CH_2-COCH_3$ and $CH_3-CH_2-COCH_2CH_3$ metamers

(b) $CH_3CH_2CH_2CH_2OH$ and $CH_3CH_2CH_2-CH(OH)-CH_3$ position isomers

(c) $CH_3CH_2CH_2CH_2NH_2$ and $CH_3-CH_2NH-CH_2CH_3$ homologues

(b) $CH_3CH_2CH_2CH_2CN$ and $CH_3CH_2CH_2CH_2NC$ functional isomers

(1) (a) and (b) (2) (a) and (c) (3) (b) and (c) (4) (b) and (d)

**Ans.** **(1)**

**Sol.** (1) $CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$ are metamers

(2) $CH_3CH_2CH_2-CH_2-OH$ and $CH_3-CH_2-CH_2-\underset{\underset{NH_2}{|}}{CH}-CH_3$ are different compounds (homologues)

(3) $CH_3-CH_2-CH_2-\underset{\underset{NH_2}{|}}{CH_2}$ and $CH_3-CH_2-\underset{\underset{H}{|}}{N}-CH_2-CH_3$ are functional isomers

(4) $CH_3CH_2CH_2-CH_2-CN$ and $CH_3CH_2-CH_2-CH_2-NC$ are functional isomers

**23.** 0.42 g of the following compound (x) is busjected to analysis for estimation of volume of $N_2$ gas by Duma's method

(X)

What is the volume of $N_2$ gas evolved in mL at STP (1 atm pressure and 273 K temperature) to the nearest integer

**Ans.** **(109)**

**Sol.** Mass of (X) =0.42 g

Number of moles of (X) $\frac{0.42}{86}$

Volume of $N_2$ gas at STP

$= \frac{0.42}{86} \times 22.400 \text{ mL} = 109.4 = 109 \text{ mL}$