JEE (MAIN)-2025 (Online)

Chemistry Memory Based Answer & Solutions

EVENING SHIFT

DATE : 28-01-2025

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MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY, 2025

(Held On Tuesday 28th January, 2025) TIME : 03 : 00 PM to 06 : 00 PM

CHEMISTRY

TEST PAPER WITH SOLUTION

SECTION-A

1. Consider the following oxides,

V_2O_3, V_2O_4 and V_2O_5

Change in oxidation state of vanadium when amphoteric oxide reacts with acids to form $[VO_2]^+$ is

(1) 0 (2) 1

(3) 3 (4) 4

Ans. **(1)**

Sol. $V_2O_5 \rightarrow$ Amphoteric oxide when react with acid form $[VO_2]^+$

$$\overset{+5}{V_2}O_5 \xrightarrow{\text{Acids}} \left[\overset{+5}{V}O_2\right]^+$$

Change in oxidation state = 0

2. Which has maximum oxidising power among the following?

(1) $VO_2^{\oplus}$ (2) $Cr_2O_7^{2\ominus}$

(3) $MnO_4^{\ominus}$ (4) TiO_2

Ans. **(3)**

Sol. MnO_4^- has maximum oxidising power this is due to the increasing stability of the lower oxidation state species to which they are reduced.

3. Bohr's model is applicable for single electron species of atomic number Z. Dependency of frequency of rotation of electron in n^{th} principal quantum number is proportional to:

(1) Z/n^2 (2) Z^2/n^3

(3) n^3/Z (4) Z/n

Ans. **(2)**

Sol. $r = 0.529 \dfrac{n^2}{Z}$ Å

$V = 2.188 \times 10^6 \dfrac{Z}{n}$ m/s

$f = \dfrac{v}{2\pi r}$

$f \propto \dfrac{z}{n} \times \dfrac{z}{n^2}$

$f \propto \dfrac{z^2}{n^3}$

4. The correct order of energy of the following subshell is

1s 2s 3p 3d

(1) 1s < 2s < 3d < 3p (2) 2s < 1s < 3p < 3d

(3) 1s < 3p < 2s < 3d (4) 1s < 2s < 3p < 3d

Ans. **(4)**

Sol. The energy of subshell are decided by using $(n + \ell)$ rule.

	1s	< 2s	< 3p	< 3d
$(n + \ell)$	1	2	4	5

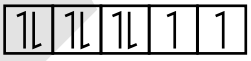
5. Which of the following complex is paramagnetic

(1) $[NiCl_4]^{2-}$ (2) $[Ni(CO)_4]$

(3) $[Ni(CN)_4]^{2-}$ (4) $[Fe(CO)_5]$

Ans. **(1)**

Sol. (1) $[NiCl_4]^{2-}$

Ni^{+2} ; $3d^8$ 

Paramagnetic, Tetrahedral

$[Ni(CO)_4]$,	$[Ni(CN)_4]^{2-}$,	$[Fe(CO)_5]$
sp^3	dsp^2	dsp^3
diamagnetic	diamagnetic	diamagnetic

6. Match the following List-I with List-II.

List-I		List-II	
(A)	$[CoF_6]^{3-}$	(i)	sp^3d^2
(B)	$[Co(NH_3)_6]^{3+}$	(ii)	d^2sp^3
(C)	$[NiCl_4]^{2-}$	(iii)	sp^3
(D)	$[Ni(CN)_4]^{2-}$	(iv)	dsp^2

Choose the correct answer from the options given below:

(1) A–(i), B–(ii), C–(iii), D–(iv)

(2) A–(ii), B–(i), C–(iv), D–(iii)

(3) A–(i), B–(ii), C–(iv), D–(iii)

(4) A–(ii), B–(i), C–(iii), D–(iv)

Ans. **(1)**

Sol. (Hybridisation)

$[CoF_6]^{3-}$ → sp^3d^2

$[Co(NH_3)_6]^{3+}$ → d^2sp^3

$[NiCl_4]^{2-}$ → sp^3

$[Ni(CN)_4]^{2-}$ → dsp^2

7. 30 gm HNO_3 is added to a solution to prepare 75% w/w solution having density 1.25 g/ml. Volume of solution is

(1) 32 mL (2) 48 mL

(3) 36 mL (4) 28 mL

Ans. **(1)**

Sol. Volume of solution = V(mL)

Weight of solution = V × 1.25 gm

Weight of solute = $V \times 1.25 \times \frac{75}{100} = 30$

V = 32 mL

8. For an elementary reaction

A + B → C + D

When volume becomes $\frac{1}{3}rd$, rate of reaction becomes

(1) 8 times (2) 9 times

(3) 6 times (4) 2 times

Ans. **(2)**

Sol. r = K[A] [B]

Because volume becomes $\left(\frac{1}{3}\right)$rd ,

So concentration becomes 3 times.

r′ = K [3A] [3B]

r′ = 9 K [A] [B]

r′ = 9 r

Hence rate becomes 9 times.

9. The correct name of I and II in the following process is:

Solid $\xrightarrow{I}$ Vapour $\xrightarrow{II}$ Solid

(1) I → Sublimation; II → Vaporisation

(2) I → Sublimation; II → Decomposition

(3) I → Sublimation; II → Deposition

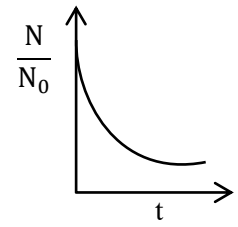
(4) I → Deposition; II → Sublimation

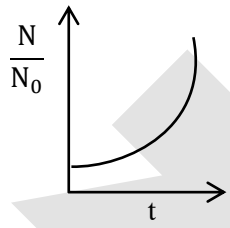
Ans. **(3)**

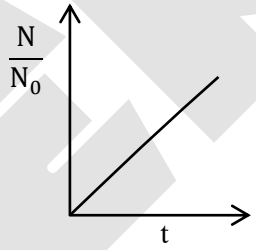
Sol. Conversion of solid to vapour is known as sublimation.

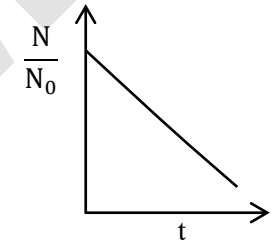
conversion of vapour to solid is known as deposition.

10. The bacterial life grows as per 1st order kinetics. Which of the following graph is correct between $\frac{N}{N_0}$ and t?

(1) 

(2) 

(3) 

(4) 

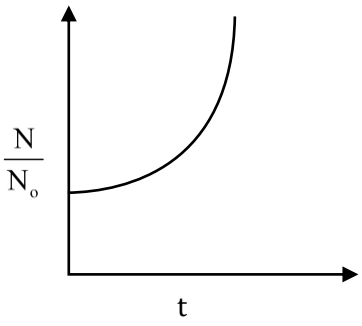
Ans. **(2)**

Sol. For first order reaction

$N_o = N e^{-kt}$

$\frac{N}{N_o} = e^{kt}$

$y = e^{kx}$



11. Consider the following statements:

Statement-1: In law of octaves, elements were arranged in increasing order of their atomic numbers.

Statement-2: Lothar Meyer, plotted the physical properties against atomic weight.

Choose the correct answer from the options given below:

(1) Both Statements are correct.

(2) Both Statements are incorrect.

(3) Statement-1 is incorrect and statement-2 is correct.

(4) Statement-1 is correct and statement-2 is incorrect.

Ans. **(3)**

Sol. Law of octave → elements were arranged in increasing order of their atomic mass.

Lothar Meyer curve → plotted the atomic volume against atomic mass.

12. Which of the group-15 element forms pπ – pπ bond and strongest basic hydride?

(1) z = 7 (2) z = 15 (3) z = 33 (4) z = 51

Ans. **(1)**

Sol. In hydra acids, down the group acidic nature increases so, basic nature decreases.

NH_3 → Most basic

(Atomic no. of N = 7)

13. $CH_3—C \equiv CH \xrightarrow[H_2]{Pd/C} (A) \xrightarrow[(ii)\ Zn,\ H_2O]{(i)\ O_3} (B) + (C)$

Product B and C can be differentiated by

(1) Tollen's reagent

(2) Fehling solution

(3) Iodoform test

(4) 2, 4-DNP

Ans. **(3)**

Sol.

$$CH_3-C\equiv CH \xrightarrow[Pd/C]{H_2} \underset{(A)}{CH_3-CH=CH_2}$$

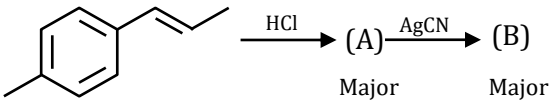
$$\downarrow (i)O_3,\ (ii)Zn/H_2O$$

$$CH_3-\underset{\underset{O}{\|}}{C}-H \quad + \quad H-\underset{\underset{O}{\|}}{C}-H$$

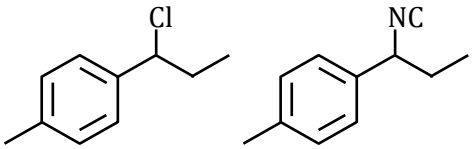
(B) (C)

B gives positive iodoform test and C do not give iodoform test.

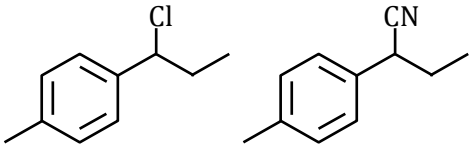
14.



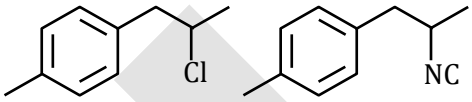
(1)



(2)



(3)



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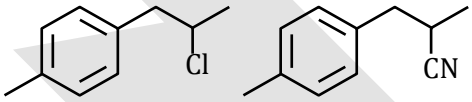
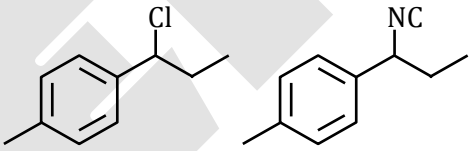
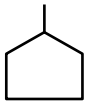
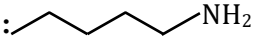
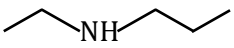


Ans. **(1)**

Sol.



15. **Statement-1:**  and  are ring chain isomers.

Statement-2:  and  are functional isomers.

(1) Both Statements are correct.

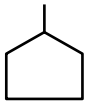
(2) Both Statements are incorrect.

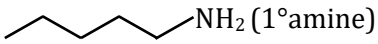
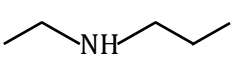
(3) Statement 1 is incorrect and statement 2 is correct.

(4) Statement 1 is correct and statement 2 is incorrect.

Ans. **(1)**

Sol. Both Statements are correct.

Statement-1:  and  are ring chain isomers.

Statement-2:  and  (2° amine) are functional isomers.

16. Which of the following biomolecules doesn't contain $C_1 - C_4$ glycosidic linkage

(1) Amylopectin (2) Maltose

(3) Lactose (4) Sucrose

Ans. **(4)**

Sol. Sucrose $\rightarrow C_1 - C_2$ glycosidic linkage

17. Consider the following sequence of reaction

$$C_6H_{12} \xrightarrow{Se/\Delta} A \xrightarrow[AlCl_3]{CH_3-Cl} B \xrightarrow[H_3O^+]{CrO_2Cl_2} C$$

Choose the correct option about major product

(1) 'C' gives Fehling's solution test

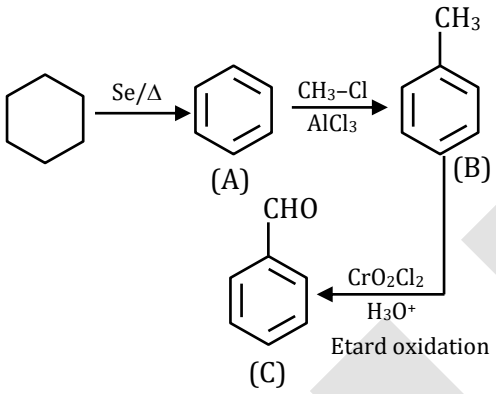
(2) 'C' can be prepared by reacting PhMgBr with CO_2

(3) 'C' can give Tollen's test

(4) 'C' can give effervescence with $NaHCO_3$

Ans. **(3)**

Sol.



Compound (C) can give Tollen's test

18. Identify the correct statements.

(A) Aromatic primary amines do not give diazonium salts when treated with $NaNO_2$ in acid medium.

(B) Aliphatic and Aromatic primary amines on heating with $CHCl_3$ and ethanolic KOH form carbylamine.

(C) Secondary and tertiary amines also give carbylamine test

(D) Benzene sulphonyl chloride is known as Hinsberg's reagent

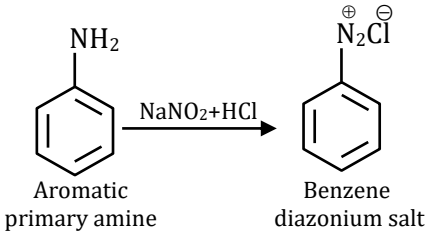
(E) Tertiary amines react with benzene sulphonyl chloride very easily.

(1) D and E only (2) A and B only

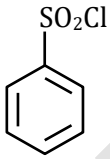
(3) B and D only (4) B and C only

Ans. **(3)**

Sol.



$R-NH_2$ / $Ph-NH_2$ $\rightarrow$ Both gives carbylamine test



Benzene sulphonyl chloride
(Hinsberg's reagent)

19. Identify correct conversions during Acidic Hydrolysis from following

(A) Starch gives Galactose

(B) Cane sugars gives Glucose and Fructose on Hydrolysis

(C) Milk sugar gives Glucose and Galactose

(D) Amylopectin give Glucose and Fructose

(E) Amylose gives only Glucose

(1) B, C and E are correct

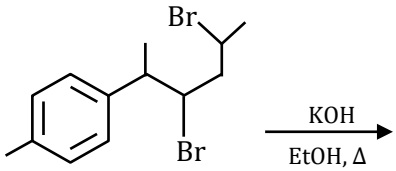
(2) Only B and C are correct

(3) B, C, D and E are correct

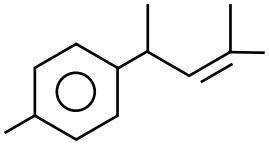
(4) A, B and C are correct

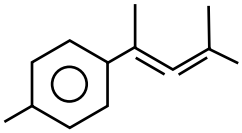
Ans. **(1)**

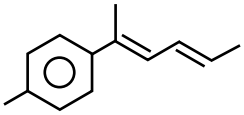
Sol. Starch gives glucose and amylopectin also gives glucose on acidic hydrolysis

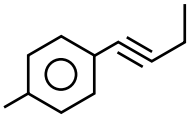
20. 

Identify major product ?

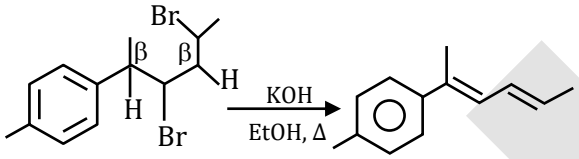
(1) 

(2) 

(3) 

(4) 

Ans. **(3)**

Sol. 

It's an E_2 reaction and more stable conjugated alkene will be major product

SECTION-B

1. How many of the following molecules are polar?

CH_4, CCl_4, CH_2Cl_2, H_2O, NH_3, H_2O_2, O_2F_2

Ans. **(5)**

Sol. CH_4, CCl_4 → non–polar ($\mu_{net} = 0$)

CH_2Cl_2, H_2O, NH_3, H_2O_2, O_2F_2 → polar ($\mu_{net} \neq 0$)

2. Number of paramagnetic species among the following is

O_2, O_2^+, O_2^-, NO_2, NO, CO

Ans. **(5)**

Sol. $NO_2, O_2^-, O_2^+, NO, O_2$ → Paramagnetic

CO → diamagnetic

3. How many of the following compound(s) is/are yellow in colour?

A. CdS

B. PbS

C. CuS

D. ZnS (Cold)

E. $PbCrO_4$

Ans. **(2)**

Sol. (a) CdS → Yellow

(b) PbS → Black

(c) CuS → Black

(d) ZnS (cold) → White

(e) $PbCrO_4$ → Yellow

4. By passing current in 600 mL of NaCl solution pH increase to 12. Find current (i) if electrolysis occur for 10 min/assume 100% efficiency.

Ans. **(1)**

Sol. $NaCl + H_2O \xrightarrow{e^-} \frac{1}{2}H_2 + \frac{1}{2}Cl_2 + NaOH$

$P^H = 12$

$P^{OH} = 2$

$[OH^-] = 10^{-2}$

Mole of $OH^- = 0.6 \times 10^{-2}$

$= 6 \times 10^{-3}$

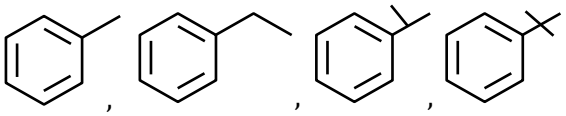
$$\text{Mole} = \frac{I.t}{V_f.F}$$

$$6\times10^{-3} = \frac{I\times10\times60}{1\times96500}$$

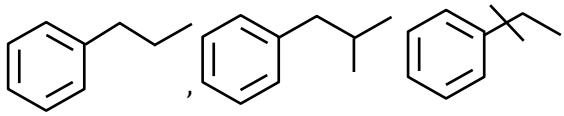
$I = 0.965$ amp

Ans. 1 amp

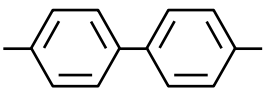
5. How many of the following will give Benzoic acid on Oxidation with $KMnO_4$?



(i) (ii) (iii) (iv)



(v) (vi) (vii)



(viii)

Ans. **(5)**

Sol. $KMnO_4/H^+$ is strong oxidising agent.

i, ii, iii, v and vi give benzoic acid