JEE (MAIN)-2025 (Online)

Chemistry Memory Based Answer & Solutions

MORNING SHIFT

DATE : 22-01-2025

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MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY, 2025

(Held On Wednesday 22nd January, 2025) TIME : 9 : 00 AM to 12 : 00 PM

CHEMISTRY

TEST PAPER WITH SOLUTION

SECTION-A

1. Correct decreasing order of electronegativity.

(1) F > Cl > I > Br (2) Cl > F > Br > I

(3) F > Cl > Br > I (4) Br > F > I > Cl

Ans. **(3)**

Sol. F → 4.0

Cl → 3.0

Br → 2.8

I → 2.5

"EN order : F > Cl > Br > I"

2. Compare boiling point of given dilute solutions

(I) 10^{-4} M NaCl (II) 10^{-3} M NaCl

(III) 10^{-2} M NaCl (IV) 10^{-4} M urea

(1) I > II > III > IV (2) III > II > I > IV

(3) II > I > III > IV (4) III > I > II > IV

Ans. **(2)**

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

$\Delta T_b \propto i \times m$

For NaCl

$i = 2$

urea = $i = 1$

(I) $\Delta T_b(NaCl) = 10^{-4} \times 2$

(II) $\Delta T_b (NaCl) = 10^{-3} \times 2$

(III) $\Delta T_b (NaCl) = 10^{-2} \times 2$

(IV) ΔT_b (urea) = 10^{-4}

Order of ΔT_b = [III > II > I > IV]

3. The Lassiagne's extract is boiled with dil. HNO_3 before testing for halogens because.

(1) AgCN is soluble in HNO_3

(2) Silver halides are soluble in HNO_3

(3) Ag_2S is soluble in HNO_3

(4) Na_2S and NaCN are decomposed by HNO_3

Ans. **(4)**

Sol. $NaCN + HNO_3 \longrightarrow NaNO_3 + HCN\uparrow(g)$

$Na_2S + HNO_3 \longrightarrow NaNO_3 + H_2S\uparrow(g)$

After removal of NaCN and Na_2S, $AgNO_3$ is added for the detection of halide in sodium extract.

4. For $[Ni(Cl)_4]^{-2}$ and $[Ni(CO)_4]$ what is the charge on metal and shape of complex respectively –

(1) Ni (II) Square planar, Ni (0) Tetrahedral

(2) Ni (II) Tetrahedral, Ni (0) Square planar

(3) Ni (II) Tetrahedral, Ni (0) Tetrahedral

(4) Ni (0) Tetrahedral Ni (II) Square planar

Ans. **(3)**

Sol. $[Ni(Cl)_4]^{2-}$

Ni^{+2} : $[Ar]3d^8$

Cl → WFL

Tetrahedral (sp^3)

$[Ni(CO)_4]$

Ni^0 : $[Ar]4S^2\,3d^8$

CO → SFL

After rearrangement

Ni : [Ar] $3d^{10}$

sp^3 (Tetrahedral).

5. Which of the following given complex has crystal field splitting energy (Δ_o) = 0

(1) $[Fe(en)_3]Br_2$

(2) $[Fe(NH_3)_6]Br_2$

(3) $K_4[Fe(CN)_6]$

(4) $K_3[Fe(SCN)_6]$

Ans. **(4)**

Sol. $K_3[Fe(SCN)_6]$

Fe^{+3} : $3d^5$

$\uparrow\ \uparrow\ e_g$

$\underline{\uparrow}\ \underline{\uparrow}\ \underline{\uparrow}\ t_{2g}$

$\Delta_0 = 3 \times (-0.4\Delta_0) + 2 \times (+0.6\,\Delta_0)$

$= 0$

6. Which of following is vitamin

(1) Aspartic Acid

(2) Ascorbic Acid

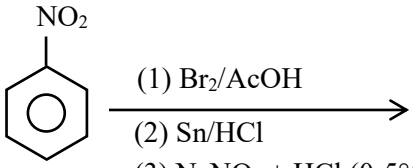
(3) Saccharic Acid

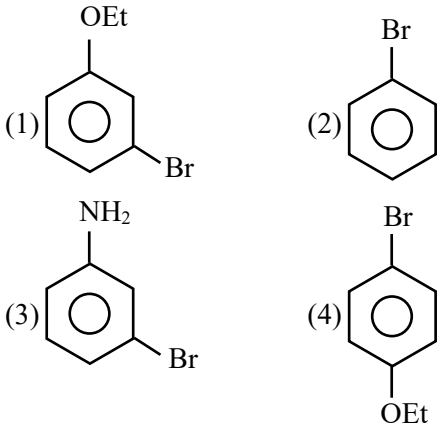
(4) Gluconic Acid

Ans. **(2)**

Sol. Vitamin C is Ascorbic acid

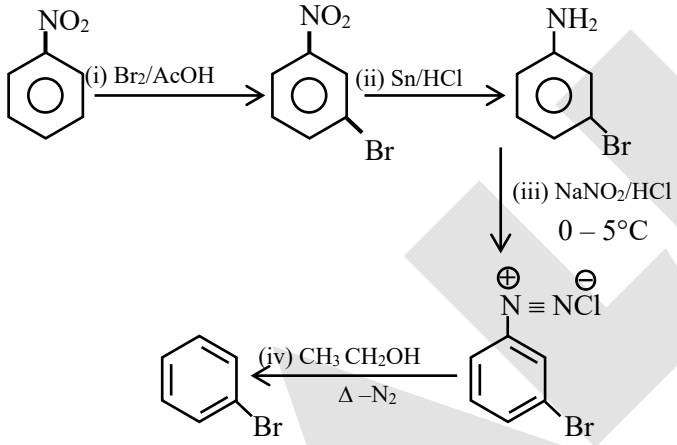
7. The final product of following reaction sequence is





Ans. **(2)**

Sol.



8. $CO_2(g)$ at 0.5 atm is allowed to react with excess of C(s). Equilibrium pressure is 0.8 atm. Calculate K_P of $CO_2(g) + C(s) \rightleftharpoons 2CO(g)$.

(1) 1.8 atm (2) 0.8 atm

(3) 1.5 atm (4) 0.5 atm

Ans. **(1)**

Sol. $CO_2 + (Cs) \rightleftharpoons 2CO(g)$

t = 0	0.5	
t = t	0.5 – x	2x

equilibrium pressure = 0.8

= 0.5 – x + 2x = 0.8

= 0.5 + x = 0.8

x = 0.3

$$K_P = \frac{(P_{CO})^2}{P_{Co_2}} = \frac{(2\times0.3)^2}{(0.5-0.3)} = \frac{(2\times0.3)^2}{0.2}$$

K_P = 1.8 atm

9. 2 amp. Current is passed for 30 minutes through molten $AlCl_3$. Mass of Al deposited (Al = 27)

(1) 0.335 (2) 0.273

(3) 0.421 (4) 0.520

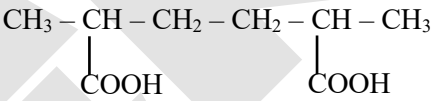
Ans. **(1)**

Sol. $w = \frac{Eit}{96500}$

$$w = \frac{27\times2\times30\times60}{3\times96500}$$

w = 0.335

10. The IUPAC name of following compound is:



(1) Hexane-2, 4-dicarboxylic acid

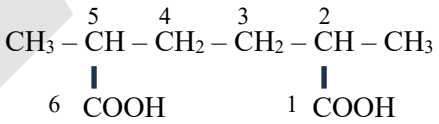
(2) 2,5-dimethyl pentanedioic acid

(3) 2,5-dimethyl hexanedioic acid

(4) 2,5-dicarboxyhexane

Ans. **(3)**

Sol.



2,5-dimethyl hexanedioic acid

11. For I[st] order isomerisation reaction A→ B incorrect statement is:

(1) Rate constant increase with temperature

(2) Rate constant is independent of temperature

(3) After 3 half lives of reaction 1/8[th] of the initial amount of reactant is left

(4) Half life $t_{1/2} = \frac{\ell n2}{k}$ where k → rate constant

Ans. **(2)**

Sol. Rate constant is dependent of temperature.

$k = Ae^{-Ea/RT}$

12. Which of the following incorrect order of electronegativity.

(1) Mg < Be < B < N (2) Al < Si < C < N

(3) S < Cl < O < F (4) Al < Mg < B < N

Ans. **(4)**

Sol. Mg → 1.2
Be → 1.5
Al → 1.5
B → 2.0
N → 3.0
O → 3.5
F → 4.0
Si → 1.8
C → 2.5
S → 2.5
Cl → 3.0

13. To form $H_2S_2O_8$ by the electrolysis can be done in
(1) Conc. H_2SO_4
(2) dil. H_2SO_4
(3) Acidified sodium sulphate
(4) Dil sodium sulphate

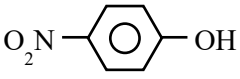
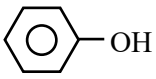
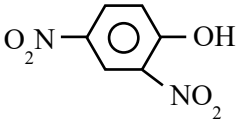
Ans. **(1)**

Sol. Peroxydisulfuric acid ($H_2S_2O_8$) can be prepared by electrolytic oxidation of con. H_2SO_4 .

14. Which of the following is/are incorrect –
(a) Cis but-2-ene is more polar than trans-but-2-ene
(b) Boiling point of cis isomer is greater than trans isomer (in general)
(c) 2-Methylbut-2-ene shows geometrical isomerism
(d) Propene shows geometrical isomerism
(e) Stability of transbut-2-ene is greater than cis-but-2-ene
(1) a, b (2) c, d (3) a, e (4) a, b, c

Ans. **(2)**

Sol. Statement c and d are incorrect.

15. Correct order of Acidic strength is:
(i) Bu – OH
(ii) 
(iii) 
(iv) 

(1) iv > ii > iii > i (2) i > iii > ii > iv
(3) iv > iii > ii > i (4) i > iv > ii > iii

Ans. **(1)**

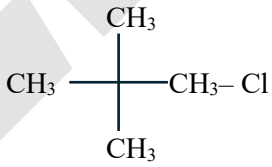
Sol. Correct order of Acidic strength is iv > ii > iii > I
Nitro group increases acidic strength due to –M, –I

16. **Statement-1** → $CH_3—O—CH_2—Cl$ will give S_N1 reaction.

Statement-2 → Neopentyl chloride give S_N2 reaction with difficulty.
(1) Statement-1 is correct and statement-2 is correct
(2) Statement-1 is correct and statement-2 is incorrect
(3) Statement-1 is incorrect and statement-2 is correct
(4) Statement-1 is incorrect and statement-2 is incorrect

Ans. **(1)**

Sol. $CH_3-O-\overset{\oplus}{C}H_2$ carbocation is stable so it give S_N1.



is more sterically hindered, So S_N2 is difficult.

17. The ground state radius of Hydrogen atom is a_0. Calculate the radius of first excited state of He^+?
(1) a_0 (2) $2a_0$
(3) $3a_0$ (4) $4a_0$

Ans. **(2)**

Sol. First excited of He^+

$n = 2$

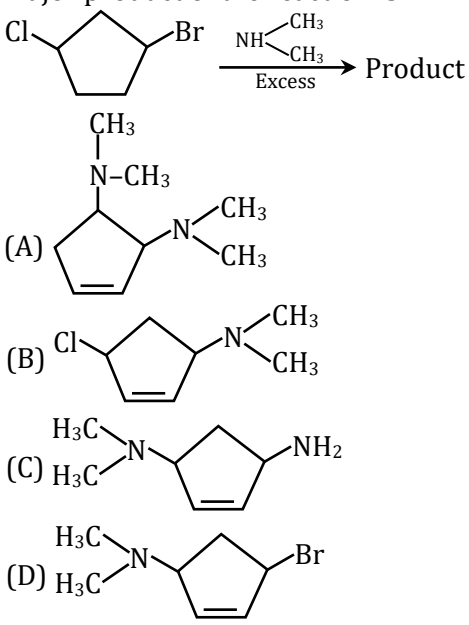
$$r = a_0 \times \frac{n^2}{z}$$

$$r = a_0 \times \frac{(2)^2}{2}$$

$r = a_0 \times 2$

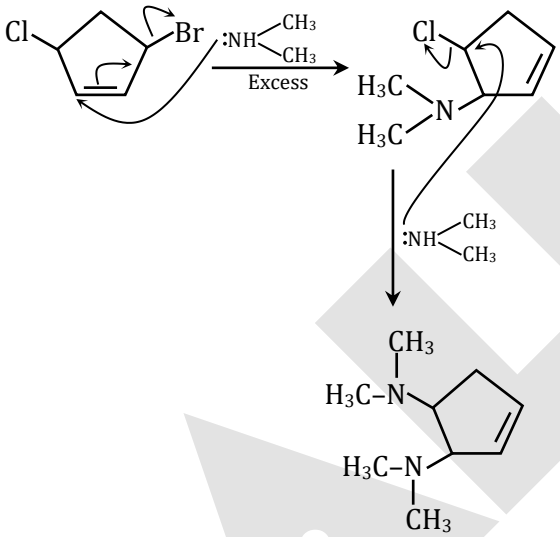
$r = 2a_0$

18. Major product of the reaction is



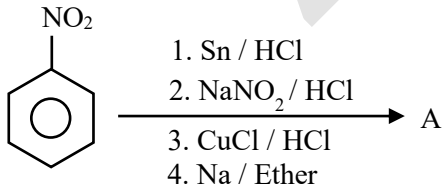
Ans. (A)

Sol.



SECTION-B

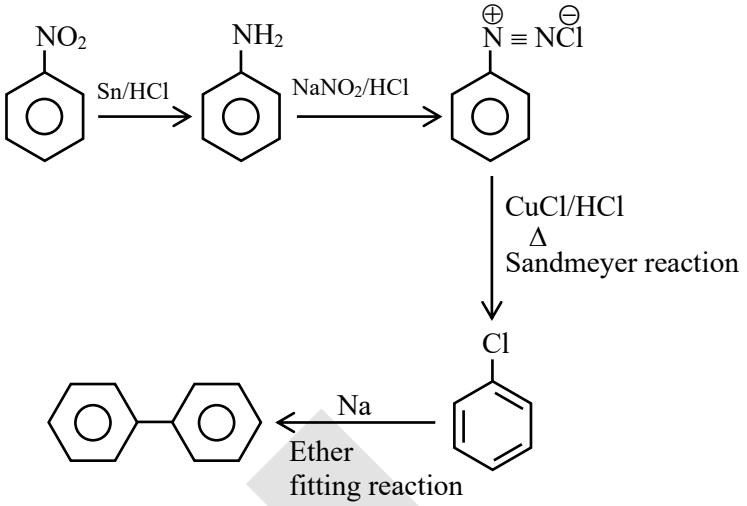
19.



Molecular weight of product A is:

Ans. (154)

Sol.



Molecular weight of $C_{12}H_{10}$

$12 \times 12 + 10 = 154$.

20. Number of species with liner shape is

NO_2^+, NO_2, I_3^-, XeF_2, O_3, $BeCl_2$

OF_2, N_3, SO_2, CO_2

Ans. (6)

Sol. $NO_2^+ \rightarrow$ Linear

$NO_2 \rightarrow$ Bent

$I_3 \rightarrow$ Linear

$XeF_2 \rightarrow$ Linear

$O_3 \rightarrow$ Bent

$BeCl_2 \rightarrow$ Linear

$OF_2 \rightarrow$ Bent

$N_3^- \rightarrow$ Linear

$SO_2 \rightarrow$ Bent

$CO_2 \rightarrow$ Linear

21. How many of the following have half-filled 4f-subshells among

Gd^{+3}, Eu^{+2}, Tb^{+2} & Sm^{+2}

Ans. (2)

Sol. $Gd^{+3}: 4f^7$

$Eu^{+2}: 4f^7$

$Eu^{+3}: 4f^6$

$Tb^{+2}: 4f^9$

$Sm^{+2}: 4f^6$

22. In carius method of estimation of halogen 180 mg of an organic compound gives 143.5 mg of AgCl. Find out the percentage of chlorine in the compound. (Mark your answer to nearest integer)

Ans. **(20)**

Sol. $\underset{180\text{ mg}}{\text{Organic compound}} \longrightarrow \underset{143.5\text{ mg}}{\text{AgCl}}$

mole of AgCl

$$= \frac{\text{mass}}{\text{molar mass}}$$

$$= \frac{143.5\times10^{-3}}{143.5} = 10^{-3}\text{ mole}$$

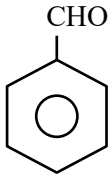
mole of Cl = 10^{-3} mole

mass of Cl = $10^{-3} \times 35.5$

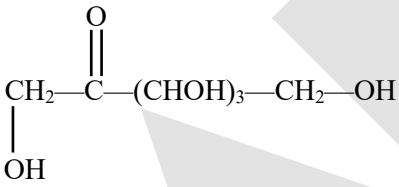
$$\% \text{ of compound} = \frac{35.5\times10^{-3}}{180\times10^{-3}}\times100$$

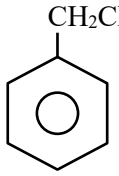
$$= 19.7 \simeq 20\%$$

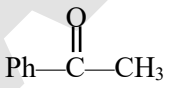
23. How many of the following gives positive Fehling's solutions.

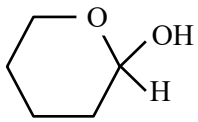
(1) 

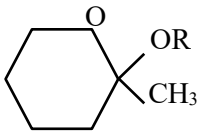
(2) CH_3CHO

(3) 

(4) 

(5) 

(6) 

(7) 

Ans. **(4)**

Sol. (2), (3), (4) and (6)

24. CO_2 gas is reacted with excess of $Ca(OH)_2$ & after the reaction remaining $Ca(OH)_2$ is completely reacted 0.1 M 40 ml HCl solution.

Given CO_2 consumed half of the given $Ca(OH)_2$

Vol. of CO_2 gas initially given at 273 K & 1 atm is x cm^3. Value of x is

Ans. **(45)**

Sol. $Ca(OH)_2 + 2HCl \longrightarrow CaCl_2 + 2H_2O$

m mole of $Ca(OH)_2$ reacts with HCl

$$= \frac{40\times0.1}{2} = 2$$

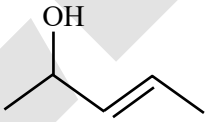
$\therefore$ m mole of CO_2 present initially = 2

Volume of CO_2 present initially at 273K and 1 atm

$= 2 \times 10^{-3} \times 22.4$

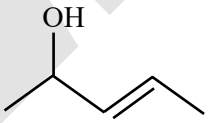
$= 45$

25. Calculate total number of stereoisomers in the given structure



Ans. **(4)**

Sol.



Total stereoisomers = 2^n

$= 2^2 = 4$