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JEE (MAIN) 2025

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-1

DATE & DAY: 22nd January 2025 & Wednesday

PAPER-1

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

SUBJECT: CHEMISTRY

PART : CHEMISTRY

1. Compare boiling point of given 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. $\Delta T_b = iK_b.m$

For dil. aq. solutions, $m \approx M$

$\therefore \Delta T_b \propto iM$

2. The ground state radius of hydrogen atom is a_0. Calculate the radius of first excited state of He^+ ?

(1) $2a_0$ (2) $4a_0$ (3) a_0 (4) $a_0/2$

Ans. **(1)**

Sol. $a_n = \frac{a_0 n^2}{z}$ $He^+ = \{Z = 2\}$

$a_n = \frac{a_0(2)^2}{2}$ for first exited state $n = 2$

$a_n = 2a_0$

3. Which of the following lanthanide ions has $7e^-$ in outermost shell?

(1) Tb^{+2} (2) Gd^{+3} (3) Eu^{+2} (4) Sm^{+3}

Ans. **(2)**

Sol. Gd : $4f^7$ $5d^1$ $6s^2$

Gd^{+3} =[Xe] $4f^7$

Atomic Number	Name	Symbol	Electronic configurations*		
			Ln	Ln^{2+}	Ln^{3+}
57	Lanthanum	La	$5d^16s^2$	$5d^1$	$4f^0$
58	Cerium	Ce	$4f^15d^16s^2$	$4f^2$	$4f^1$
59	Praseodymium	Pr	$4f^36s^2$	$4f^3$	$4f^2$
60	Neodymium	Nd	$4f^46s^2$	$4f^4$	$4f^3$
61	Promethium	Pm	$4f^56s^2$	$4f^5$	$4f^4$
62	Samarium	Sm	$4f^66s^2$	$4f^6$	$4f^5$
63	Europium	Eu	$4f^76s^2$	$4f^7$	$4f^6$
64	Gadolinium	Gd	$4f^75d^16s^2$	$4f^75d^1$	$4f^7$
65	Terbium	Tb	$4f^96s^2$	$4f^9$	$4f^8$
66	Dysprosium	Dy	$4f^{10}6s^2$	$4f^{10}$	$4f^9$
67	Holmium	Ho	$4f^{11}6s^2$	$4f^{11}$	$4f^{10}$
68	Erbium	Er	$4f^{12}6s^2$	$4f^{12}$	$4f^{11}$
69	Thulium	Tm	$4f^{13}6s^2$	$4f^{13}$	$4f^{12}$
70	Ytterbium	Yb	$4f^{14}6s^2$	$4f^{14}$	$4f^{13}$
71	Lutetium	Lu	$4f^{14}5d^16s^2$	$4f^{14}5d^1$	$4f^{14}$

4. Electrolysis of which compound gives $H_2S_2O_8$?

(1) Electrolysis of conc. Na_2SO_4 (2) Electrolysis of dil. Na_2SO_4

(3) Electrolysis of conc. H_2SO_4 (4) Electrolysis of dil. H_2SO_4

Ans. **(3)**

Sol. Cathode : $2H^+ + 2e^- \longrightarrow H_2$

Anode : $2HSO_4^- \longrightarrow H_2S_2O_8 + 2e^-$

5. Incorrect order of electronegativity is :

(1) Al <Mg <B <N (2) Mg <Al <B <N (3) C >Si (4) N <O <F

Ans. **(1)**

Sol. Order is : Mg <Al <B <N

6. Incorrect statement regarding first order kinetics :

(1) Half life $= \frac{\ln 2}{k}$

(2) k is temperature independent

(3) Conc. of reactant after 3 half lives is $\frac{1}{8}$ of initial value.

(4) As T increases, k increases.

Ans. **(2)**

Sol. k is temperature dependent. ($k = Ae^{-\frac{Ea}{RT}}$)

7. For $[NiCl_4]^{2-}$ & $[Ni(CO)_4]$:

(1) $[NiCl_4]^{2-}$: Ni^{2+}; Tetrahedral, $[Ni(CO)_4]$: Ni ; Tetrahedral
(2) $[NiCl_4]^{2-}$: Ni^{4+}; Tetrahedral, $[Ni(CO)_4]$: Ni ; Square planar
(3) $[NiCl_4]^{2-}$: Ni^{2+}; Tetrahedral, $[Ni(CO)_4]$: Ni^{2+}; Tetrahedral
(4) $[NiCl_4]^{2-}$: Ni^{4+}; Square planar, $[Ni(CO)_4]$: Ni^{2+}; Square planar

Ans. **(1)**

Sol. $[NiCl_4]^{2-}$: $Ni^{2+}(3d^8)$ +WFL with CN =4
$\Rightarrow sp^3$; Tetrahedral ; Paramagnetic (n =2)
$[Ni(CO)_4]$: Ni $(3d^{10})$ +SFL with CN =4
$\Rightarrow sp^3$; Tetrahedral ; Diamagnetic (n = 0)

8. Number of linear ions/molecules :
I_3^-, NO_2, O_3, OF_2, NO_2^+, $BeCl_2$, N_3^-, SO_2, CO_2, XeF_2

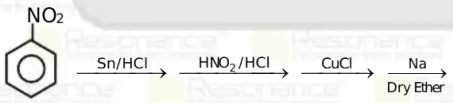
Ans. **(6)**

Sol. Linear species are I_3^-, NO_2^+, $BeCl_2$, CO_2, XeF_2 & N_3^-

9. Given weight of the organic compound is 180 mg and the weight of the AgCl precipitated is 143.5 mg.
Calculate the estimation of Cl in ……%
Atomic weight of Cl = 35.5 u
Atomic weight of Ag =108 u

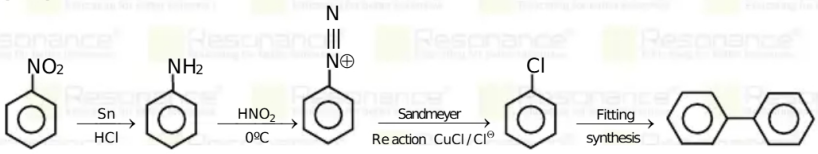
Ans. **(20)**

Sol. $\%\ Cl = \frac{35.5}{180} \times 100 \approx 20\%$

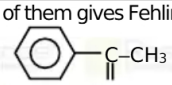
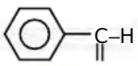
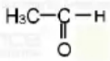
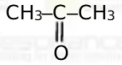
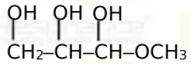
10. 

Final product is

Ans. **(154)**

Sol. 

11. Which of them gives Fehling reagent test

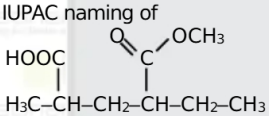
A 
B 
C 
D 
E 

(1) C, E (2) A, B, C (3) B, C, E (4) A, B, D

Ans. **(3)**

Sol. Fehling test is given by Aldehyde and hemiacetals. But aromatic Aldehyde does not give Fehling test.

12. IUPAC naming of



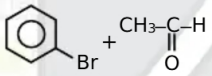
(1) 3-methoxycarbonyl-5-methyl hexonoic acid
(2) 4-methoxycarbonyl-2-methyl hexonoic acid
(3) 4-methoxycarboxylate-2-methyl hexonoic acid
(4) 2-carboxy-4-methoxy carbonyl pentane

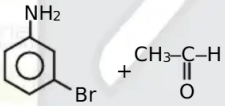
Ans. **(2)**

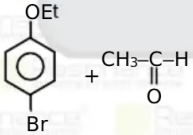
Sol. 4-methoxycarbonyl-2-methyl hexonoic acid

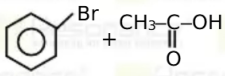
13. 

end products of reactions are

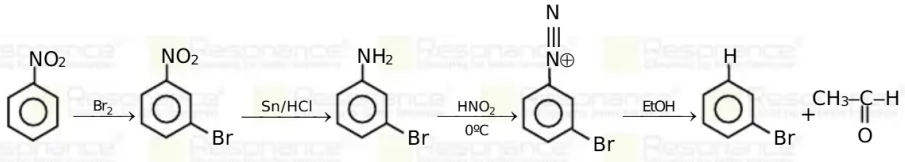
(1) 

(2) 

(3) 

(4) 

Ans. **(1)**

Sol. 

14. **Statement-I :** 1 mole propyne reacts with KNH_2 to give $\frac{1}{2}$ mole H_2 gas.

Statement-II : 4 g $CH_3–C\equiv CH$ reacts with $NaNH_2$ gives 224 ml NH_3 gas

(1) Both Statement I and statement II are true

(2) Both statement I and statement II are false

(3) Statement I is true but statement II is false

(4) Statement I is false but statement II is true

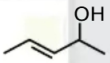
Ans. **(2)**

Sol. $CH_3–C\equiv C–H + \overset{\oplus}{K}\overset{\ominus}{N}H_2 \longrightarrow CH_3–C\equiv C^{\ominus}–NH_3(g)$

SI is incorrect as NH_3 is released and not H_2

$\frac{4g}{40g}$ =0.1 mol $CH_3–C\equiv CH$ is present

So 22400 ml ×0.1 =2240 ml gas is released.

15. 

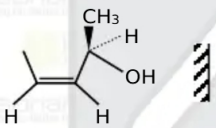
Total stereoisomers

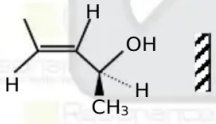
(1) 2 (2) 3 (3) 4 (4) 6

Ans. **(3)**

Sol. Two stereocentre hence

2^2 =4 stereoisomer





16. **Statement-I :** $CH_3O–CH_2–Cl$ is primary halide but gives S_N1 reaction.

Statement-II : $CH_3–\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}–CH_2–Cl$ is also primary halide but does not gives S_N2 reaction.

(1) Both Statement I and statement II are true
(2) Both statement I and statement II are false
(3) Statement I is true but statement II is false
(4) Statement I is false but statement II is true

Ans. **(2)**

Sol. Both statement I and statement II are false

17. In carius tube method, 180 mg sample gives 143.5 mg AgCl. Give % of halide in the sample.

Ans. **(20)**

Sol. $R–Cl \xrightarrow[AgNO_3]{Ag^+} AgCl\downarrow$ (white (ppt.)

1 mol 1 mol

$\frac{143}{143}\times10^{-3}$ mol

$$\text{gram of Cl} = \frac{143\times10^{-3}\times35.5}{143}$$

$$\%\ Cl = \frac{\text{gram of Cl}}{\text{wt total sample}}\times100$$

$$\%\ Cl = \frac{143\times10^{-3}\times35.5}{143\times180\times10^{-3}}\times100 = \frac{355}{18} = 19.72$$

$\%\ Cl \approx 20\%$