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JEE MAIN (APRIL) 2023 (13-04-2023-FN)

Memory Based Question Paper

CHEMISTRY

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CHEMISTRY

1. 12 g of non-electrolyte 'A' dissolved in 1000 ml of solution. It is isotonic with 0.05 molar glucose solution. Find molar mass of 'A'.

Ans. **240 g**

Sol. $\Pi_A = \Pi_{glucose}$

$$\frac{12}{M} \times \frac{1}{1} = 0.05$$

$$M = \frac{12}{0.05} = 240 \text{ g}$$

2. For a real gas at P = 100 atm, T = 500 K, volume is found to be 0.15 dm^3. At this condition compressibility factor of gas is 1.07. For the same sample at P = 300 atm, T = 300 K compressibility factor is 1.7. If volume at this condition is $x \times 10^{-4}$ dm^3. Determine 'x'.

Ans. **476**

Sol. $PV = ZnRT$

$$n = \frac{PV}{ZRT}$$

$$n = n$$

$$\frac{PV}{ZRT} = \frac{PV}{ZRT}$$

$$\frac{100 \times 0.15}{1.07 \times 500} = \frac{300 \times V}{1.7 \times 300}$$

$$V = \frac{0.15 \times 1.7}{1.07 \times 5} = 0.0476 \text{ dm}^3 = 476 \times 10^{-4} \text{ dm}^3$$

$$x = 476$$

3. In which of the following options the species changes from paramagnetic to diamagnetic & bond order increases ?

(1) $N_2 \rightarrow N_2^+$ (2) $O_2 \rightarrow O_2^-$ (3) $NO \rightarrow NO^+$ (4) $O_2 \rightarrow O_2^+$

Ans. **(3)**

Sol. $N_2 \longrightarrow N_2^+$

diamagnetic — paramagnetic

B.O. = 3 — B.O. = 2.5

$O_2 \longrightarrow O_2^-$

paramagnetic — paramagnetic

B.O. = 2 — B.O. = 1.5

$NO \longrightarrow NO^+$

paramagnetic — diamagnetic

B.O. = 2.5 — B.O. = 3

$O_2 \longrightarrow O_2^+$

paramagnetic — paramagnetic

B.O. = 2 — B.O. = 2.5

4. What happens when lyophilic sol is added to lyophobic sol.

(1) Prevention form coagulation

(2) Precipitation

(3) Electrophoresis

(4) Coagulation

Ans. **(1)**

Sol. Lyophilic sol protect lyophobic sol from coagulation.

5. Radius of 2^{nd} orbit of He^+ is r_0, radius of 4^{th} orbit of Be^{3+} is x r_0. Find x.

Ans. **x = 2**

Sol. $(r_2)_{He^+} = r_0 = 0.529 \times \frac{2^2}{2}$ Å

$(r_4)_{Be^{3+}} = 0.529 \times \frac{4^2}{4} = 2\,r_0$

6. Which of the following are incorrectly matched ?

(i) Chlorophyll : Complex of Co

(ii) EDTA : Used for removal of hardness

(iii) $Au(CN_2)^-$: Used in photography

(iv) D-phenicillamine : Chelating ligand

(v) $[(Ph_3P)_3RhCl]$: Wilkinson's catalyst

(1) (i) & (iii) (2) (i), (ii) & (iii) (3) (ii) & (iv) (4) (iii), (iv) & (v)

Ans. **(1)**

Sol. Chlorophyll is a coordination compound of magnesium.

$[Ag(S_2O_3)_2]^{3-}$ is used in photography.

7. The bond enthalpy of A_2 bond is :

Given : $A_2(g) + B_2(g) \longrightarrow 2AB(g)$, $\Delta H_f(AB) = -200$ kJ/mol

The ratio of bond enthalpy of A_2, B_2, AB are in 1 : 05 : 1 ratio.

Ans. **800 kJ/mol**

Sol. Let $B.E._{A-A} = x$

$$A_2(g) + B_2(g) \longrightarrow 2AB(g)$$

$$\Delta H = -400 = B.E._{A-A} + B.E._{B-B} - 2B.E._{A-B}$$

$$\Rightarrow \quad -400 = x + \frac{x}{2} - 2x$$

$$\Rightarrow \quad \frac{x}{2} = 400 \Rightarrow \ x = 800 \text{ kJ/mol}$$

8. $Be(OH)_2 + Sr(OH)_2 \longrightarrow$ Product

For above reaction which of the following are correct?

(A) Be is tetrahedrally co-ordinated in anionic part

(B) Sr and Be are present in anionic part

(C) It is acid base neutralisation

(D) Sr and Be are present in cationic part

(1) (A) and (C) (2) (A) Only (3) (C) Only (4) (B), (C)

Ans. **(1)**

Sol. $Be(OH)_2 + Sr(OH)_2 \longrightarrow Sr[Be(OH)_4]$

Amphoteric

9. Select correct option

(1) ClF_5 is square pyramidal, colourless gas

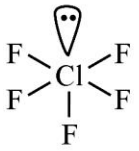
(2) ClF_5 is square pyramidal, colourless liquid

(3) ClF_5 is trigonal bipyramidal, colourless gas

(4) ClF_5 is trigonal bipyramidal, colourless liquid

Ans. **(2)**

Sol.



10. Which of following pair has high third ionisation energy ?

(1) Eu, Gd (2) Eu, Yb (3) Gd, Lu (4) Gd, Yb

Ans. **(2)**

Sol. $_{63}Eu : [Xe]4f^7\ 6s^2$

$_{70}Yb : [Xe]\ 4f^{14}\ 6s^2$

11. For a Ist order reaction, determine the ratio $t_{87.5\%}$ & $t_{50\%}$.

Ans. **3**

Sol. $$t_{87.5} = \frac{1}{k}\ln\left(\frac{100}{100-87.5}\right) = \frac{1}{k}\ln(8) = \frac{3\ln 2}{k}$$

$$t_{50\%} = \frac{\ln 2}{k}$$

$$\therefore \quad \frac{t_{87.5\%}}{t_{50\%}} = \frac{\frac{3\ln 2}{k}}{\frac{\ln 2}{k}} = 3$$

12. Which of the following is **incorrect** matched ?

(1) Zn – Liquation

(2) Cu – Electrolysis

(3) Ni – Mond's process

(4) Ti – Van arkel method

Ans. **(1)**

Sol. Zn – Distillation

13. (A) Electron gain enthalpy of F is more negative than Cl

(B) Ionisation energy decreases down the group in P.T.

(C) Electronegativity depends on the surrounding atoms

(D) NO and Al_2O_3 are amphoteric oxides

Incorrect statement is :

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

Ans. **(3)**

14. 2 molecules of $KMnO_4$ are titrated with ferrous ammonium sulphate hexahydrate in presence of H_2SO_4. Determine the number of molecules of H_2O produced.

Ans. **68**

Sol. $2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$

Corresponding to 2 molecules of $KMnO_4$, 8 molecules of H_2O are released.

Also corresponding to 10 molecule of $FeSO_4$, 60 molecules of H_2O will also be produced.

15. An aqueous solution of $Ni(NO_3)_2$ is electrolysed. How long would it take to form 10^{-3} mm thick layer on a 100 cm^2 area with 2 amp. current. (Density of Ni = 10 gm/ml, Ni = 60)

Sol. Volume of Ni deposited = (10^{-4}) (100) $cm^2 = 10^{-2}$ cm^3

$\therefore$ Weight of Ni deposited $= (10^{-2})(10) = 0.1$ gram

$$\therefore \text{ Moles of N deposited} = \frac{10^{-3}}{60} = \frac{1}{6}\times 10^{-2}$$

$Ni^{+2} + 2e^- \rightarrow Ni$

$$\Rightarrow \text{ Charge used} = \frac{1}{6}\times 10^{-2}\times 2F = (i)(t)$$

$$t = \frac{1}{6}\times 10^{-2}\times \frac{2\times 6500}{2} \approx 161 \text{ sec}$$

16. $Be(OH)_2 + Sr(OH)_2 \longrightarrow Sr[Be(OH)_4]^{2-}$

Which of the following statement is correct?

(1) Be is tetrahedrally coordinated in anionic part of salt.

(2) Sr & Be present in anionic part.

(3) Acid-base neutralisation reaction.

(4) Be is present in the cationic part.

Ans. **(1)**

17. An organic compound on combustion gives 0.022 g of CO_2 and 0.126 g H_2O. Compound contains 24% C, if the percentage of hydrogen is $x \times 10^{-1}$. Determine x.

Ans. **560**

Sol. Mass of C = $\frac{0.022}{44} \times 12\,g$

Mass of H = $\frac{0.126}{18} \times 2\,g$

Mass% of H = $\frac{\frac{0.126}{18} \times 2}{\frac{0.022}{44} \times 12} \times 24$

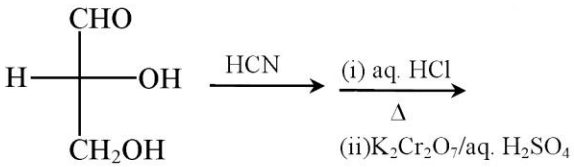
= 56%

18. Which of the following deplete ozone layer?

(1) $\dot{Cl}$ (2) $\dot{N}O$ (3) $\dot{O}H$ (4) $\dot{C}H_3$

Ans. **(1)**

19.



D(+)Glyceraldehyde

(1) Products obtained are optically active

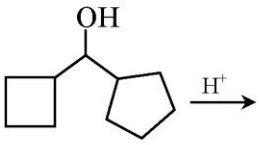
(2) Products mixture is racemic

(3) One product is optically active and the other is meso

(4) Products obtained are optically inactive

Ans. **(3)**

20.



(1) Both rings will be 5-membered in product

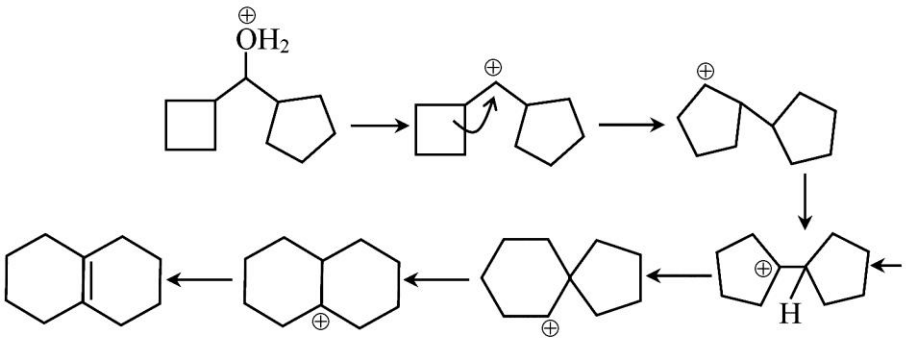
(2) One ring will be 6 membered & other will be 4 membered in product

(3) Both rings will be 6 membered in product

(4) One ring four and other ring five membered in product

Ans. **(3)**

Sol.



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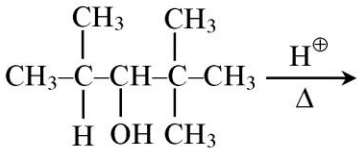
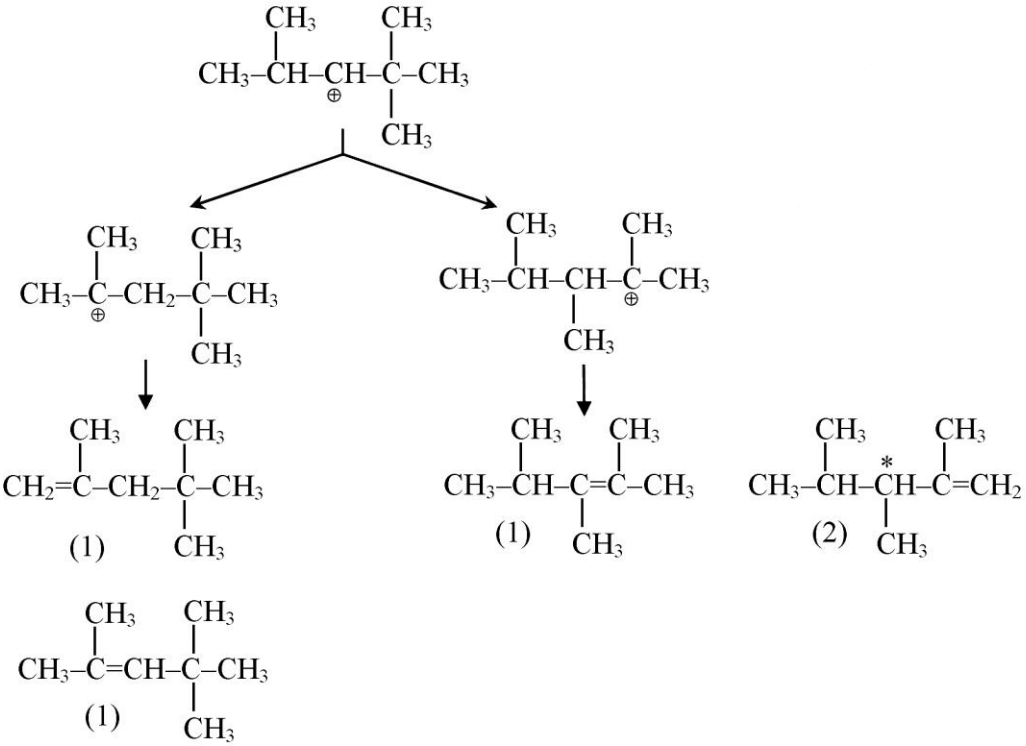


Total number of products obtained by tertiary carbocation in the above reactions.

Ans. **5**

Sol.

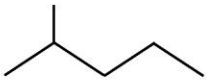


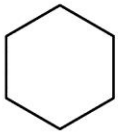
22.

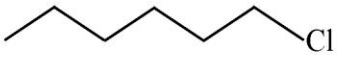
List I (Monomer)	**List II (Polymer)**
(a) caprolatum	(p) Neoprene
(b) Isoprene	(q) Dacron
(c) chloroprene	(r) Nylon-6
(d) Polyester of glycol and terephthalicacid	(s) Natural rubber

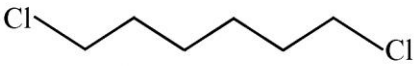
Ans. **(a) → (r), (b) → (s), (c) → (p), (d) → (q)**

23. n-hexane $\xrightarrow[\Delta]{AlCl_3+HCl}$ Product is

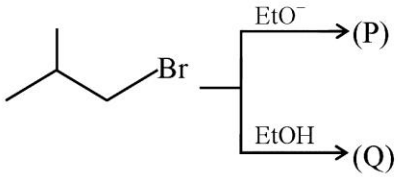
(1) 

(2) 

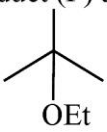
(3) 

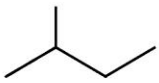
(4) 

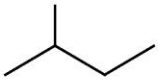
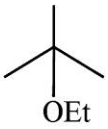
Ans. **(1)**

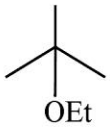
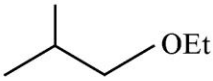
24. 

Product (P) and (Q) is :

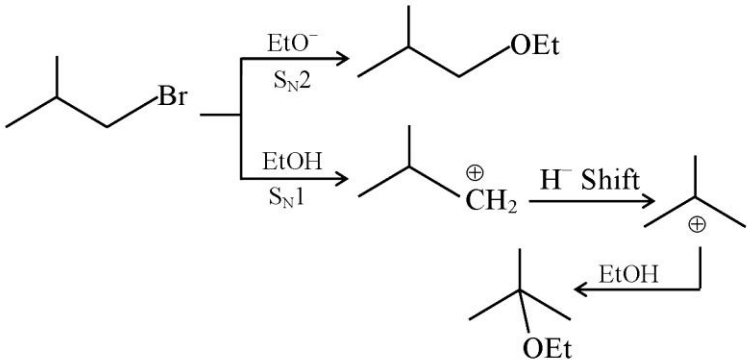
(1)  in both case

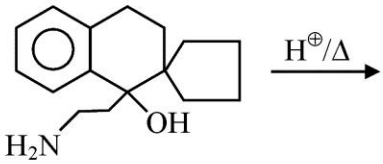
(2)  in both case

(3) (P) is  and (Q)  is

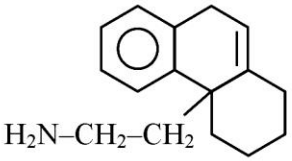
(4) (P) is  and (Q) is 

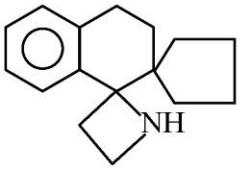
Ans. **(3)**

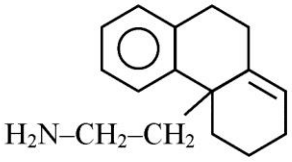
Sol. 

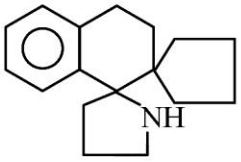
25. 

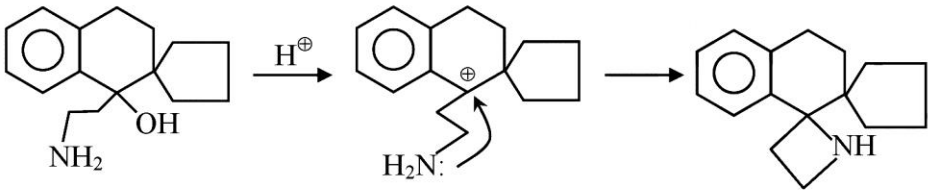
Product is

(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol.