

**JEE
MAIN
4th
Attempt**

CHEMISTRY
26th August 2021 [SHIFT – 2]
QUESTION WITH SOLUTION

JEE | NEET | Foundation

MOTION[®]

29900+
SELECTIONS SINCE 2007

हो चुकी है ऑफलाइन क्लासरूम की शुरुआत
अपने सपने को करो साकार, कोटा कोचिंग के साथ

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Exp. : 17 yrs



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JEE DROPPER BATCH

Online + Offline Mode

English & Hindi Medium

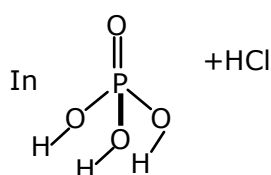
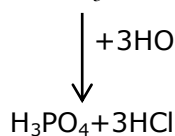
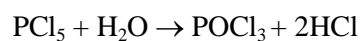
Batch Starting from :
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SECTION - A

Q.1 The number of non-ionisable hydrogen atoms present in the final product obtained from the hydrolysis PCl_5 is :

- (1) 2 (2) 0 (3) 3 (4) 1

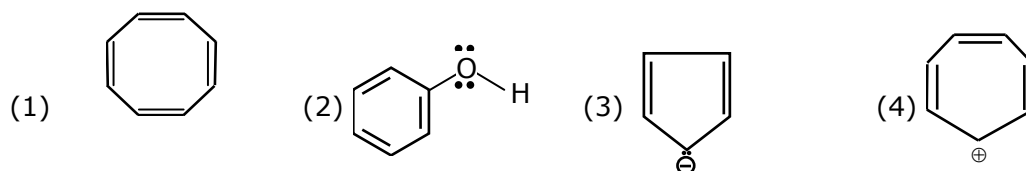
Sol. 2



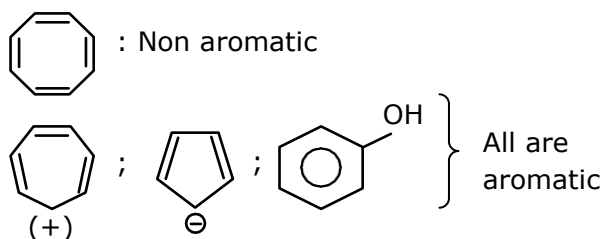
all hydrogens are ionisable

∴ Ans is zero.

Q.2 Which one of the following compounds is not aromatic?



Sol. 4



Q.3 The sol given below with negatively charged colloidal particles is :

- (1) $\text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ in water (2) KI added to AgNO_3 solution
 (3) AgNO_3 added to KI solution (4) FeCl_3 added to hot water



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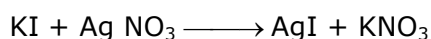
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Sol. 3

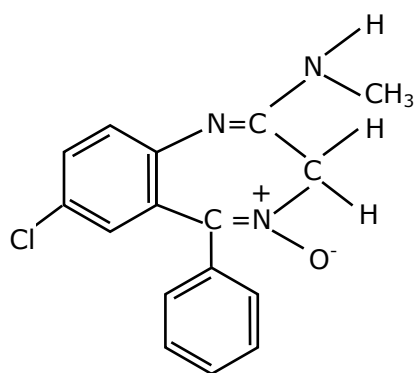
KI added to Ag NO₃



AgI/I⁻ → negative sol

Direct from NCERT Examples

Q.4



Chlordiazepoxide

The class of drug to which chlordiazepoxide with above structure belongs is :

- (1) Tranquilizer (2) Antibiotic (3) Antacid (4) Analgesic

Sol. 1

The drug named chlordiazepoxide is example of tranquilizer.

Q.5 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Photochemical smog causes cracking of rubber.

Reason (R) : Presence of ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate in photochemical smog makes it oxidizing.

Choose the most appropriate answer from the options given below:

- (1) Both (A) and (R) are true and (R) is the true explanation of (A).
 (2) (A) is true but (R) is false.
 (3) (A) is false but (R) is true.
 (4) Both (A) and (R) are true but (R) is not the true explanation of (A).

Sol. 4

Photochemical smog causes cracking of rubber, the common component of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN).

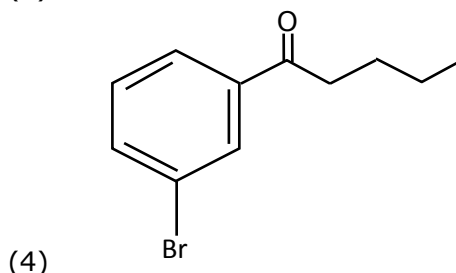
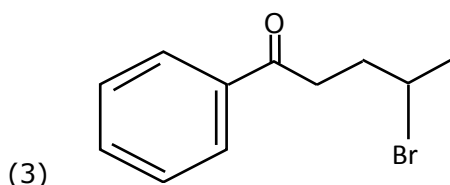
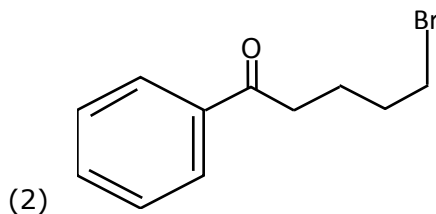
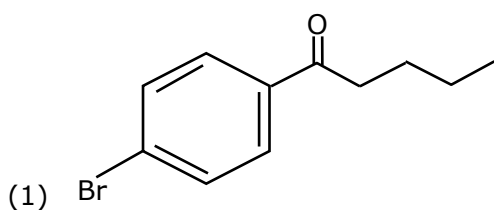
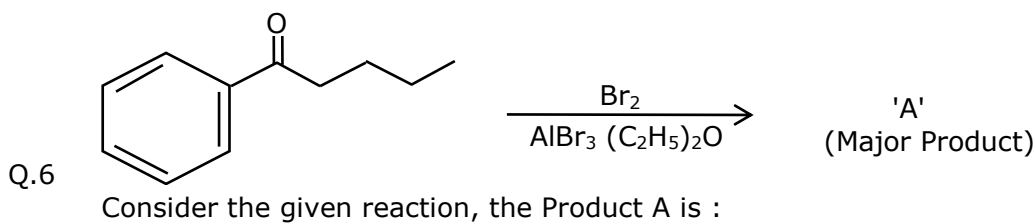
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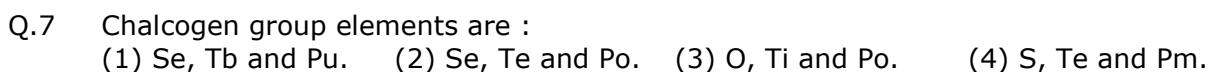
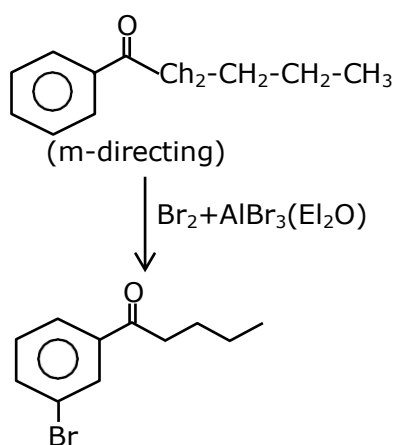
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Sol. 4



Sol. 2

Group 16/oxygen family is known as Chalcogens. And the members are O, S, Se, Te, Po



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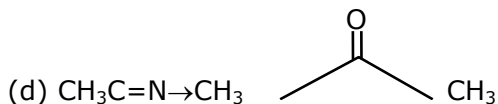


Q.8 Match List -I with List - II

List - I

(Chemical Reaction)

- (a) $\text{CH}_3\text{COOCH}_2\text{CH}_3 \rightarrow \text{CH}_3\text{CH}_2\text{OH}$
 (b) $\text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{CHO}$
 (c) $\text{CH}_3\text{C} \equiv \text{N} \rightarrow \text{CH}_3\text{CHO}$



Choose the most appropriate

- (1) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
 (3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

List - II

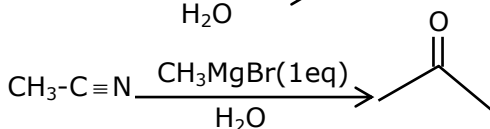
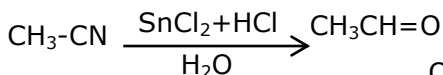
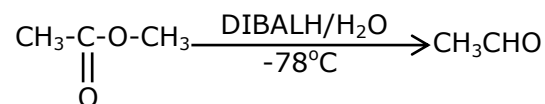
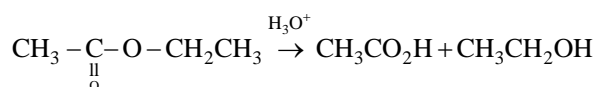
(Reagent used)

- (i) $\text{CH}_3\text{MgBr}/\text{H}_3\text{O}^+$ (1 equivalent)
 (ii) $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$
 (iii) DIBAL-H/ H_2O

(iv) $\text{SnCl}_2, \text{HCl}/\text{H}_2\text{O}$

- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (4) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

Sol. 2



Q.9 Indicate the complex/complex ion which did not show any geometrical isomerism:

- (1) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ (2) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$
 (3) $[\text{CoCl}_2(\text{en})_2]$ (4) $[\text{Co}(\text{CN})_5(\text{NC})]^{3-}$

Sol. 4

- (1) $[\text{CoCl}_2(\text{en})_2]$ show Cis-trans isomerism
 (2) $[\text{Co}(\text{CN})_5(\text{NC})]^{3-}$ can't Show G.I.
 (3) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$ Show fac & mer isomerism
 (4) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^\oplus$ show cis & trans isomerism

Q.10 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R)

- Assertion (A) :** Sucrose is a disaccharide and non-reducing sugar.
Reason (R) : Sucrose involves glycosidic linkage between C_1 of β -glucose and C_2 of α -fructose.

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Choose the most appropriate answer from the option given below :

- (1) Both (A) and (R) are true and (R) is the true explanation of (A).
- (2) Both (A) and (R) are true but (R) is not the true explanation of (A).
- (3) (A) is false but (R) is true.
- (4) (A) is true but (R) is false.

Sol. 4

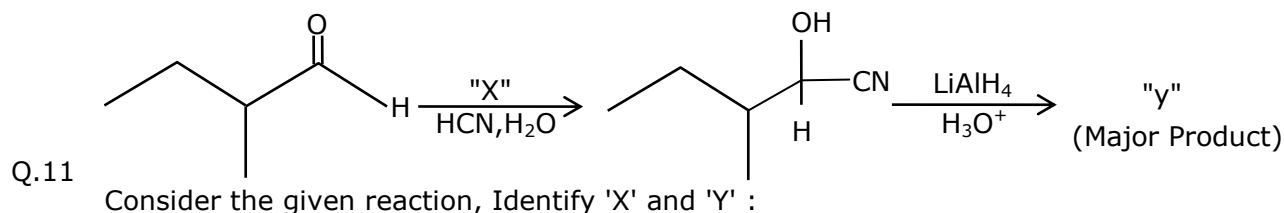
Sucrose is example of disaccharide & nonreducing sugar

Assertion : correct

Sucrose involves glycosidic linkage between C₁ of

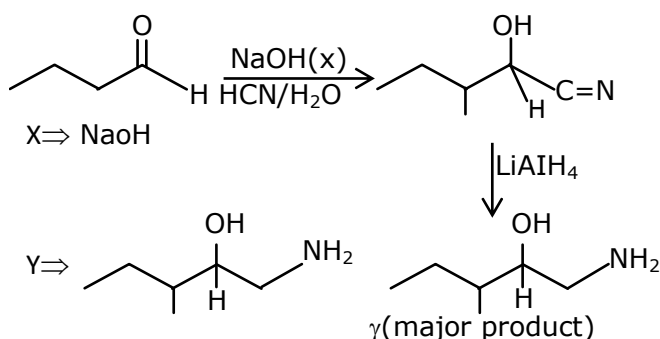
α-D-glucose C₂ of β-D-fructose

Reason : Incorrect



- (1) X-NaOH
-
- (2) X-NaOH
-
- (3) X-HNO₃
-
- (4) X-HNO₃
-

Sol. 2



Q.12 Give below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Heavy water is use for the study of reaction mechanism.

Reason (R) : The rate of reaction for the cleavage of O-H bond is slower than of O-D bond.



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Choose the most appropriate answer from the options given below :

- (1) (A) is true but (R) is false.
- (2) Both (A) and (R) are true but (R) is not the true explanation of (A).
- (3) (A) is false but (R) is true.
- (4) Both (A) and (R) are true and (R) is the true explanation of (A).

Sol. 1

D₂O is used for the study of reaction mechanism. Rate of reaction for the cleavage of O-H bond > O-D bond.

Q.13 The interaction energy of London forces between two particles is proportional to r^x , where r is the distance between the particles. The value of x is:

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

Sol. 4

For London dispersion forces.

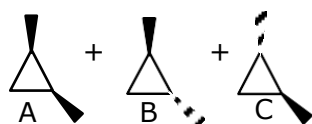
$$E \propto \frac{1}{r^6}$$

Hence $x = -6$

Q.14 The number of stereoisomers possible for 1,2-dimethyl cyclopropane is :

- (1) One
- (2) Four
- (3) Two
- (4) Three

Sol. 4



Q.15 Given below are two statements :

Statement I : Sphalerite is a sulphide ore of zinc and copper glance is a sulphide ore of copper.

Statement II : It is possible to separate two sulphide ores by adjusting proportion of oil to water or by using 'depressants' in a froth flotation method.

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

Sol. 2

Sphalerite-ZnS, copper glance - Cu₂S two sulphide ores can be separated by adjusting proportions of oil to water or by using 'Depressants'



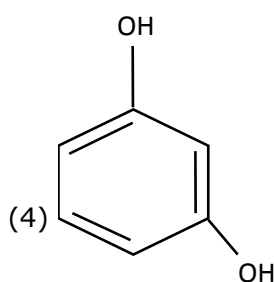
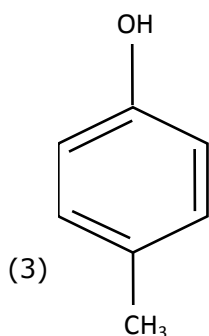
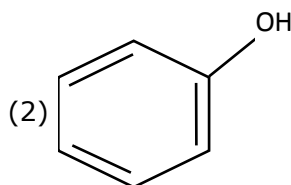
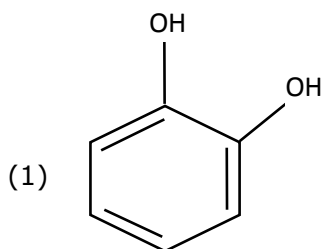
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Q.16 Which one of the following phenols does not give colour when condensed with phthalic anhydride in presence of conc. H_2SO_4 ?



Sol. 3

Only p-methyl, phenol does not give any colour with phthalic anhydride with cons. H_2SO_4 .

Q.17 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Barium carbonate is insoluble in water and is highly stable.

Reason (R) : The thermal stability of the carbonates increase with increasing cationic size.

Choose the most appropriate

- (1) Both (A) and (R) are true but (R) is not the true explanation of (A).
- (2) Both (A) and (R) are true and (R) is the true explanation of (A)
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Sol. 2

In IIA group on moving down the group size of cation increases and so thermal stability of carbonate increases.

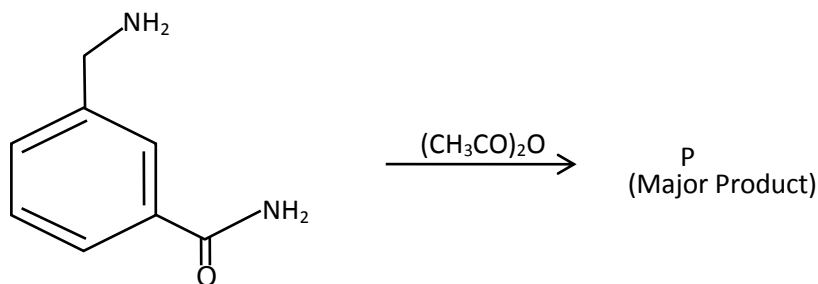


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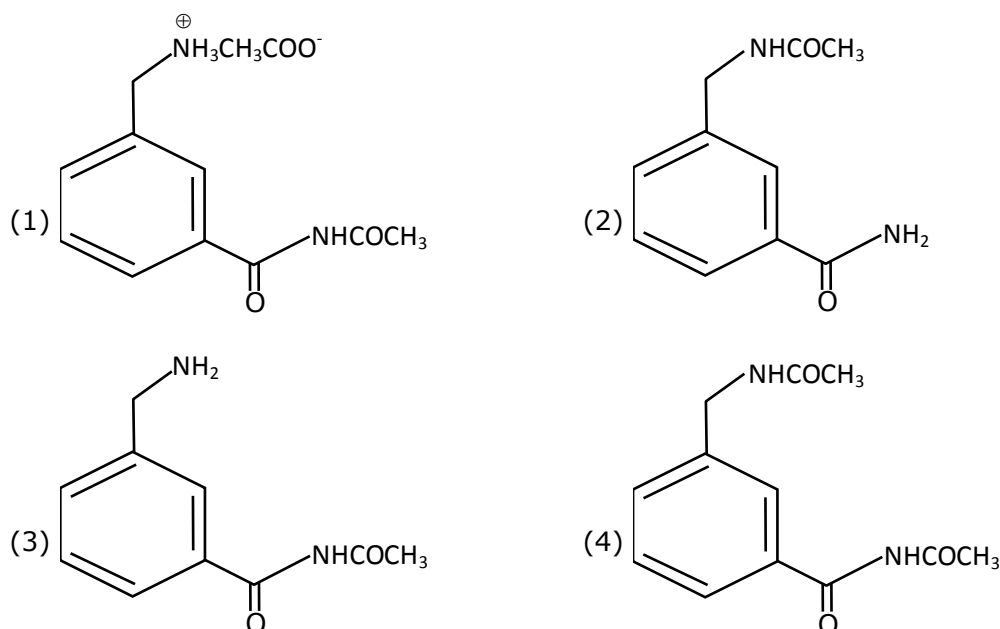
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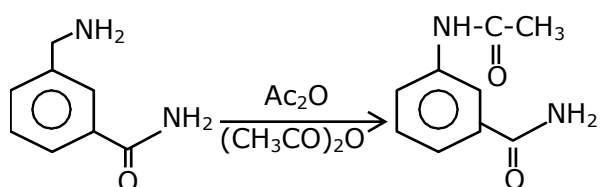




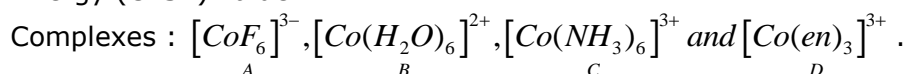
Q.18 The Major Product in the above reaction is :



Sol. 2



Q.19 Arrange the following Cobalt complexes in the order of increasing Crystal Field Stabilization Energy (CFSE) value.



Choose the correct option.

- (1) $A < B < C < D$ (2) $B < C < D < A$ (3) $B < A < C < D$ (4) $C < D < B < A$



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Sol. 3

(i) CFSE \propto charge or oxidation no. of central metal ion.

(ii) CFSE \propto strength of ligand $en > NH_3 > H_2O > F^-$

\therefore order of CFSE $[Co(en_3)]^{+3} > [Co(NH_3)_6]^{+3} > [Co(H_2O)_6]^{+2}$

20. The bond order and magnetic behaviour of O_2^- ion are, respectively :

(1) 1 and paramagnetic.

(2) 2 and diamagnetic.

(3) 1.5 and diamagnetic.

(4) 1.5 and paramagnetic.

Sol. 4

$$O_2^- = (\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\sigma_{2p_x})^2$$

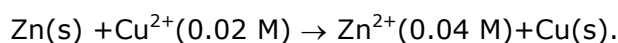
$$\left(\pi_{2p_x}^2 = \pi_{2p_y}^2 \right) \left(\pi_{2p_x}^{*2} = \pi_{2p_y}^{*1} \right)$$

$$\text{Bond order} = \frac{10-7}{2} = 1.5$$

and paramagnetic

Section B

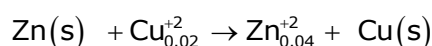
Q.1 For the galvanic cell,



$E_{cell} = \text{_____} \times 10^{-2} V$. (Nearest integer)

$$\left[\text{Use: } E_{Cu/Cu^{2+}}^0 = -0.34 V, E_{Zn/Zn^{2+}}^0 = +0.76 V, \frac{2.303 RT}{F} = 0.059 V \right]$$

Sol. 109



According to Nernst equation

$$E_{cell} = E_{cell}^0 - \frac{0.059}{n} \log \frac{[Zn^{+2}][Cu]}{[Zn][Cu^{+2}]}$$

$[Cu] = [Zn] = 1$ (Pure solid)

$n=2$ (Change of e^-)

Zn is oxidized (anode)

Cu is reduced (Cathode)

$$E_{cell}^0 = E_{Cathode}^0 - E_{anod}^0$$



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$$E_{\text{Cell}}^0 = 0.76 - (-0.34)$$

$$E_{\text{Cell}}^0 = 1.10$$

Put value

$$E_{\text{cell}} = 1.10 - \frac{0.059}{2} \log\left(\frac{0.04}{0.02}\right)$$

$$E_{\text{cell}} = 1.0911$$

$$E_{\text{cell}} = 109.11 \times 10^{-2}$$

$$E_{\text{cell}} = 110 \text{ V}$$

Q.2 83 g of ethylene glycol dissolved in 625 g of water. The freezing point of the solution is _____ K. (Nearest integer)

[Use : Modal Freezing point depression constant of water = $(1)86 \text{ K kg mol}^{-1}$

Freezing point of water = 273 K

Atomic masses : C : 12 u, O : 16.0 u, H : 1 u]

Sol. 269

$$W_{\text{C}_2\text{H}_6\text{O}_2} = 83 \text{ gm}$$

$$n_{\text{C}_2\text{H}_6\text{O}_2} = \frac{83}{62} \text{ mole}$$

$$W_{\text{H}_2\text{O}} = 625 \text{ gm} \Rightarrow 0.625 \text{ Kg}$$

$$\Delta T_f = K_f m$$

$$= \times \frac{n_B}{W_A (\text{kg})}$$

$$\Delta T_f = 1.86 \times \frac{83}{62 \times 0.625}$$

$$\Delta T_f = 3.984$$

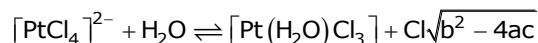
$$(T_f)_{\text{sol}} = (T_f^0)_A - \Delta T_f$$

$$(T_f)_{\text{sol}} = 273 - 3.984$$

$$(T_f)_{\text{sol}} = 269.016$$

Freezing point of solution $\Rightarrow 269 \text{ K}$

Q.3 The reaction rate for the reaction



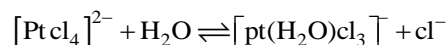
was measured as a function of concentrations of different species. It was observed that

$$\frac{-d[\text{PtCl}_4]^{2-}}{dt} = 4.8 \times 10^{-5} [\text{PtCl}_4]^{2-} - 24 \times 10^{-3} [\text{Pt}(\text{H}_2\text{O})\text{Cl}_3] [\text{Cl}^-]$$

Where square brackets are used denote molar concentrations. The equilibrium constant

$K_c =$ _____. (Nearest integer)

Sol. 50



By rate law of reverse reaction

$$\text{Rate} = k_f [\text{PtCl}_4]^{2-} - k_b [\text{Pt}(\text{H}_2\text{O})\text{Cl}_3] [\text{Cl}^-]$$

Compare with given data



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$$\frac{-d[\text{PtCl}_4^{2-}]}{dt} = 4.8 \times 10^{-5} [\text{PtCl}_4^{2-}] - 2.4 \times 10^{-3} [\text{Pt}(\text{H}_2\text{O})\text{Cl}_3^-] [\text{Cl}^-]$$

$$K_y = 4.8 \times 10^{-5} \quad K_b = 2.4 \times 10^{-3}$$

$$K_c = \frac{K_y}{K_b} = \frac{4.8 \times 10^{-5}}{2.4 \times 10^{-3}}$$

$$K_c = 2 \times 10^{-2}$$

$$K_c = 0.02$$

$$K_c = 0$$

Q.4 100 ml. of Na_3PO_4 solution contains 3.45 g of sodium. The molarity of the solution is _____ $\times 10^{-2}$ mol L^{-1} (Nearest integer)

[Atomic Masses – Na : 23.0 u, O : 16.0 u, P : 31.0 u]

Sol. 50

$$V_{\text{Na}_3\text{PO}_4} = 100 \text{ ml} \Rightarrow 0.1 \text{ L}$$

$$W_{\text{Na}} = 3.45 \text{ gm}$$

$$h_{\text{Na}} = \frac{3.45}{23} \text{ mole}$$

$$h_{\text{Na}} = 3 \times h_{\text{Na}_3\text{PO}_4}$$

$$h_{\text{Na}_3\text{PO}_4} = \frac{3.45}{23 \times 3} \text{ mole}$$

$$[\text{Na}_3\text{PO}_4] = \frac{3.45}{23 \times 3 \times 0.1}$$

$$[\text{Na}_3\text{PO}_4] = 0.5$$

$$[\text{Na}_3\text{PO}_4] = 50 \times 10^{-2}$$

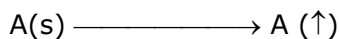
Q.5 A chloro compound "A"

(i) forms aldehydes on ozonolysis followed by the hydrolysis

(ii) When vaporized completely 1.53 g of A, gives 448 ml. of vapour at STP.

The number of carbon atoms in a molecule of compound A is _____

Sol. 3



$$1.53 \text{ gm} \quad \quad \quad 448 \text{ ml}$$

$$\text{STP :- } P = 1 \text{ atm}$$

$$T = 273 \text{ K}$$

We ideal gas equation

$$PV = \frac{w}{M} RT$$



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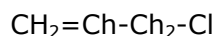


$$M = \frac{WRT}{PV}$$

$$M = \frac{1.53 \times 0.0821 \times 273}{1 \times 0.448}$$

$$M = 76.54$$

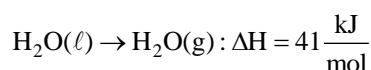
The compound must contain 1 Cl and it will be an alkene



No. of Carbon atoms = 3

- Q.6 For water $\Delta_{\text{vap}} H = 41 \text{ kJ mol}^{-1}$ at 373 K and 1 bar pressure. Assuming that water vapour is an ideal gas that occupies a much larger volume than liquid water, the internal energy change during evaporation of water is _____ kJ mol^{-1}

Sol. 38



$$\Rightarrow \text{From the relation: } \Delta H = \Delta U + \Delta n_g RT$$

$$\Rightarrow 41 \frac{\text{kJ}}{\text{mol}} = \Delta U + (1) \times \frac{8.3}{1000} \times 373$$

$$\Rightarrow \Delta U = 41 - 3.0959$$

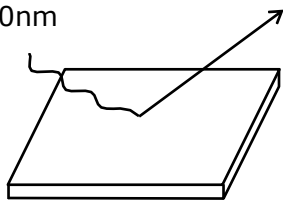
$$= 38 \text{ kJ/mol}$$

- Q.7 A metal surface is exposed to 500 nm radiation. The threshold frequency of the metal for photoelectric current is $4.3 \times 10^{14} \text{ Hz}$. The velocity of ejected electron is _____ $\times 10^5 \text{ ms}^{-1}$ (Nearest integer)

[Use : $h = 6.63 \times 10^{-34} \text{ Js}$, $m_e = 9.0 \times 10^{-31} \text{ kg}$]

Sol. 5

$$\lambda = 500 \text{ nm}$$



v : speed of electron having max. K.E.

$$\Rightarrow \text{from Einstein equation: } E = \phi + \text{K.E.}_{\text{max}}$$

$$\Rightarrow \frac{hc}{\lambda} = h\nu_0 + \frac{1}{2}mv^2$$

$$\Rightarrow \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{500 \times 10^{-9}} = 6.63 \times 10^{-34} \times 4.3 \times 10^{14} + \frac{1}{2}mv^2$$



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$$\Rightarrow \frac{6.63 \times 30 \times 10^{-20}}{5} = 6.63 \times 4.3 \times 10^{-20} + \frac{1}{2}mv^2$$

$$\Rightarrow 11.271 \times 10^{-20} \text{ J} = \frac{1}{2} \times 9 \times 10^{-31} \times v^2$$

$$\Rightarrow v = 5 \times 10^5 \text{ m/sec.}$$

Q.8 In the sulphur estimation, 0.471 g of an organic compound gave 1.44 g of barium sulphate. The percentage of sulphur in the compound is _____ & (Nearest integer)
(Atomic Mass of Ba=137 u)

Sol. 42

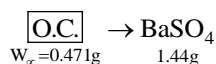
Molecular mass of BaSO₄ = 233 g
 ⊕ 233 BaSO₄ contain → 32 g sulphur

$$\therefore 1.44 \text{ g BaSO}_4 \text{ contain} \rightarrow \frac{32}{233} \times 1.44 \text{ g sulphur}$$

given : 0.471 g of organic compound

$$\% \text{ of S} = \frac{32 \times 1.44}{233 \times 0.471} \times 100 = 41.98\% \approx 42\%$$

OR



$$\Rightarrow n_s = n_{\text{BaSO}_4} = \frac{1.44}{233}$$

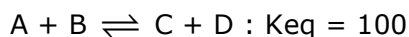
$$\Rightarrow W_s = \frac{1.44}{233} \times 32 \text{ g}$$

$$\text{therefore } \% \text{ S} = \frac{W_s}{W_{\text{O.C.}}} \times 100 = \frac{1.44 \times 32}{233 \times 0.471} \times 100$$

$$= \frac{46.08}{109.743} \times 100 = 41.98 \approx 42$$

Q.9 The equilibrium constant K_c at 298 K for reaction
 A+B = C+D
 is 100. Starting with an equimolar solution with concentrations of A,B C and D all equal to 1 M,
 the equilibrium concentration of D is _____ × 10⁻²M. (Nearest integer)

Sol. 182



1M 1M 1M 1M

First check direction of reversible reaction.

$$\text{Since } Q_c = \frac{[C][D]}{[A][B]} = 1 < k_{eq} \Rightarrow \text{reaction will}$$



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move in forward direction to attain equilibrium state.

$$\Rightarrow A + B \rightleftharpoons C + D : K_{eq} = 100$$

to 1 1 1 1

$$t_{eq} \quad 1-x \quad 1-x \quad 1+x \quad 1+x$$

$$\text{Now } K_{eq} = 100 = \frac{(1+x)(1+x)}{(1-x)(1-x)}$$

$$\Rightarrow \boxed{100 = \left(\frac{1+x}{1-x}\right)^2}$$

$$(i) 10 \left(\frac{1+x}{1-x}\right)$$

$$\Rightarrow 10 - 10x = 1 + x$$

$$\Rightarrow 11x = 9$$

$$\Rightarrow \boxed{x = \frac{9}{11}}$$

$$(ii) -10 = \frac{1+x}{1-x}$$

$$\Rightarrow -10 + 10x = 1 + x$$

$$\Rightarrow -9x = -11$$

$$\Rightarrow \boxed{x = \frac{11}{9}}$$

→ 'x' cannot be more than one, therefore not valid.
therefore equation concentration of (D) = 1 + x

$$= 1 + \frac{9}{11} = \frac{20}{11}$$

$$= 1.8181 = 181.81 \times 10^{-2}$$

$$= 182 \times 10^{-2}$$

Q.10 The overall stability constant of the complex ion $[\text{Co}(\text{NH}_3)_4]^{2+}$ is 2.1×10^{13} . The overall dissociation constant is $y \times 10^{-14}$. Then y is _____ (Nearest integer)

Sol. 5

$$\text{Given } k_f = 2.1 \times 10^{13}$$

$$K_d = \frac{1}{k_f} = 4.7 \times 10^{-14} k_f$$

$$\therefore y = 4.7 \approx 5$$



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