CBSE-XII-2016 EXAMINATION

CHEMISTRY

SET-1

Series GBM Paper & Solution **Code: 56/1/N**

Time: 3 Hrs. Max. Marks: 70

General Instructions:

(i) All questions are compulsory.

(ii) Questions number **1 to 5** are very short answer questions and carry **1** mark each.

(iii) Questions **6** to **10** are short answer questions and carry **2** marks each.

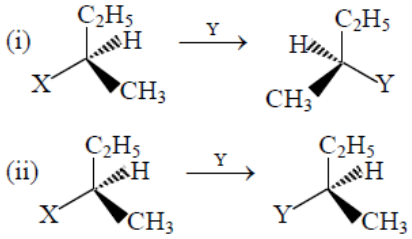
(iv) Question number **11 to 22** are also short-answer questions and carry **3** marks each.

(v) Question number **23** is a value based questions and carry **4** marks.

(vi) Question number **24 to 26** are long-answer questions and carry **5** marks each.

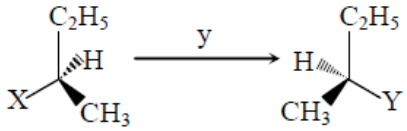
(vii) Use Log Tables, if necessary. Use of calculators is **not** allowed.

1. Which of the following two reactions is S_N2 and why?



Solution:

In following reaction the reaction (i) is a SN^2 reaction. Due to backside attack of nucleophile (y)



2. On heating $Pb(NO_3)_2$ a brown gas is evolved which undergoes dimerization on cooling. Identify the gas.

Solution:

Students may find similar question in CP board pattern exercise sheet:

Chapter: p-block elements, Section-A, Q.30(a)(i)

On heating $Pb(NO_3)_2$, NO_2 gas is evolved which forms N_2O_4 on cooling

$$2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + \underset{\text{Brown}}{4NO_2} \uparrow + O_2 \uparrow$$

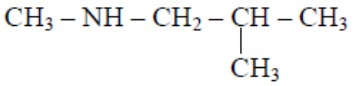
$$2NO_2 \xrightarrow{\text{upon cooling}} \underset{(\text{dimer of } NO_2)}{N_2O_4}$$

3. ZnO turns yellow on heating. Why?
Solution: On heating ZnO, looses oxygen to atmosphere

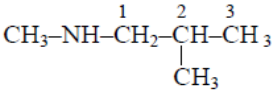
$$Zno \rightarrow Zn^{+2} + \frac{1}{2}O_2 + 2e^-$$

Free electrons present in interstitial site get excited on heating when they returns to normal state, yellow colour radiation are evolved. This is also known as metal excess defect.

4. Write the IUPAC name of the given compound:



Solution:



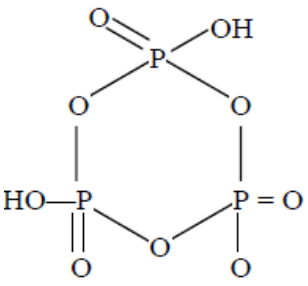
[N,2-Di-Methyl-1-propanamine]

5. Write the reason for the stability of colloidal sols.
Solution: For lyophobic colliods $\Rightarrow$ charge in responsible for stability
For lyophillic colloids $\Rightarrow$ solvation is responsible for stability.

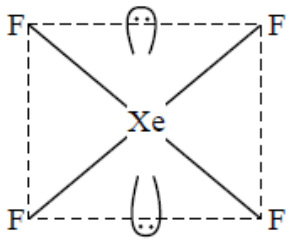
6. (i) Write the colligative property which is used to find the molecular mass of macromolecules.
(ii) In non-ideal solution, what type of deviation shows the formation of minimum boiling azeotropes?
Solution: (i) The colligative property used to find molecular mass of macromolecules is osmotic pressure
(ii) The solution showing positive deviation from ideal solution forms minimum boiling point azeotropes.

7. Write the structures of the following:
(i) $(HPO_3)_3$
(ii) XeF_4
Solution: Students may find similar question in CP board pattern exercise sheet:
(i) Chapter: p-block elements, Section-B, Q.5(a)(i)
(ii) Chapter: p-block elements, Section-A, Q.11

(i) $(HPO_3)_3$



(ii) XeF_4



8. When a coordination compound $NiCl_2 \cdot 6H_2O$ is mixed with $AgNO_3$, 2 moles of AgCl are precipitated per mole of the compound. Write

(i) Structural formula of the complex

(ii) IUPAC name of the complex

Solution:

$$\underset{1\,\text{mole}}{NiCl_2 \cdot 6H_2O} + AgNO_3 \rightarrow \underset{2\,\text{moles}}{AgCl}$$

(i) Structural formula of the complex is $[Ni(H_2O)_6]Cl_2$

(ii) IUPAC name of the complex is Hexaaquanickel (II) chloride

9. For a reaction: $2NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2(g)$

Rate = k

(i) Write the order and molecularity of this reaction.

(ii) Write the unit of k.

Solution:

$2NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2(g)$

(i) Rate law of above reaction is given

r = k

$\because$ rate does not depends upon concentration of NH_3

$\therefore$ order of reaction will be zero but

Molecularity = 2 ($\because$ it is total number of reacting molecules taking part in a balance chemical reaction)

(ii) Unit of k = mol lit^{-1} sec^{-1}

10. Write the chemical equations involved in the following reactions:

(i) Kolbe's reaction

(ii) Friedal-Crafts acetylation of anisole

OR

How do you convert?

(i) Phenol to toluene

(ii) Formaldehyde to Ethanol

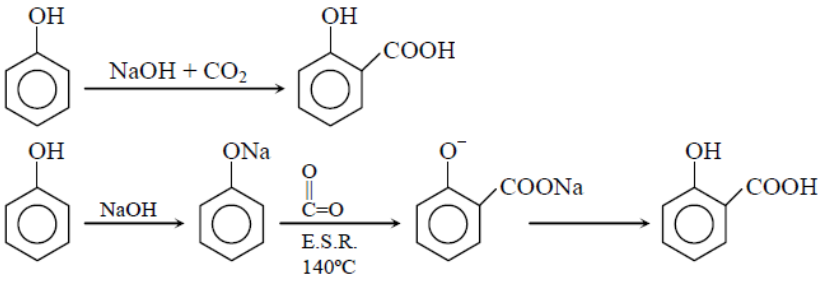
Solution:

Students may find same question in CP board pattern exercise sheet:

(i) Chapter: Alcohol, Phenol & Ether (Oxygen-I), Section-A, Q.50(i)

(ii) Chapter: Alcohol, Phenol & Ether (Oxygen-I), Section-A, Q.60(i)

(i) Kolbe's Reaction



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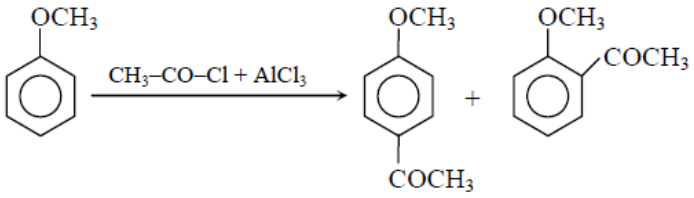
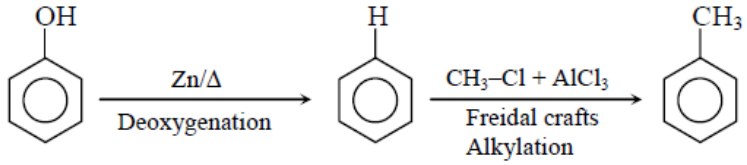
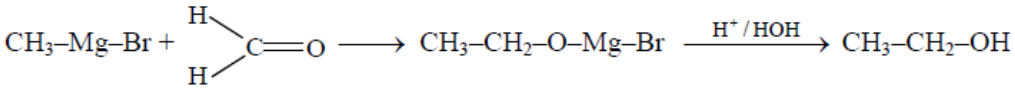


OR

(i)



(ii)



11. An element crystallizes in a f.c.c. lattice with cell edge of 400 pm. The density of the element is 7 g cm^{-3}. How many atoms are present in 280 g of the element?

Solution:

Given

a = 400 pm = 400 × 10^{-12}m = 400 × 10^{-10} cm

ρ = 7g/cm^3

m_A = 280 gm

fcc lattice, N = 4

Formula $d = \dfrac{N \times M}{N_A \times a^3}$

$$7 = \frac{4 \times M}{6.023 \times 10^{23} \times (4 \times 10^{-8})^3}$$

M = 67.2 g/mol

Now no. of moles = $\dfrac{\text{mass}}{\text{molar mass}}$

$n = \frac{280}{67.2} = 4.17$

no. of atoms = n × N_A = 4.17 × 6.023 × 10^{23} = 25.11 × 10^{23}

12. The rate constant for the first order decomposition of H_2O_2 is given by the following equation:

$\log k = 14.2 - \frac{1.0 \times 10^4 K}{T}$

Calculate E_a for this reaction and rate constant k if its half-life period be 200 minutes.
(Given: R = 8.314 JK^{-1} mol^{-1})

Solution: Students may find same question in CP board pattern exercise sheet:
Chapter: Chemical Kinetics, Section-A, Q.57
For calculation of 'Ea'

Formula: $\log_{10}k = \log_{10}A - \frac{E_a}{2.303RT}$

so, on comparing $\frac{-E_a}{2.303R} = -10^4$

E_a = 2.303 × 8.314 × 10_4 J/mol
or
E_a = 19.147 × kJ/mol
For calculation of 'k'

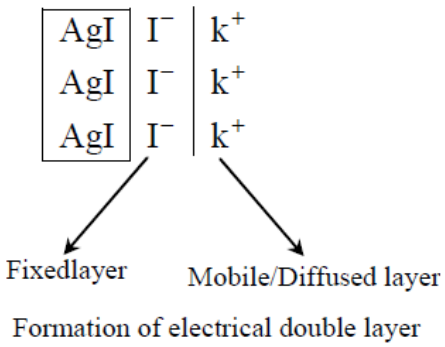
Formula: $k = \frac{0.693}{t_{1/2}}$

So, $k = \frac{0.693}{200} \text{min}^{-1}$

k = 3.465 × 10^{-3} min^{-1}

13. Define the following terms:
(i) O/W Emulsion
(ii) Zeta potential
(iii) Multimolecular colloids

Solution:
Students may find same question in CP board pattern exercise sheet:
(i) Chapter: Surface Chemistry, Section-A, Q.15
(iii) Chapter: Surface Chemistry, Section-A, Q.17
(i) **O/W Emulsion:** It is a type of emulsion in which oil is dispersed phase and water is dispersed medium. For Example: milk, it is an emulsion of liquids fat dispersed in water.
(ii) **Zeta potential:** The absorbed ion on the surface of collidol particle form a fixed lyer, the absorbed ion attracts oppositively charged ions to form diffused layer. The electrical doubled layer thus formed is called Helmholtz electrical double layer. The potential between fixed and diffused layer is called zeta potential.



Formation of electrical double layer

(iii) **Multimolecular colloids :** In this type of colloid, the dispersed phase consist of aggregotes of atoms (or) small molecules with molecular size less than 1 nm. For example, Collidal sol of sulphur consist of aggregates of S_8 molecules.

14. (i) Name the method of refining which is based on the principle of adsorption.
(ii) What is the role of depressant in froth floatation process?
(iii) What is the role of limestone in the extraction of iron from its oxides?
Solution:
Students may find similar question in CP board pattern exercise sheet:
(ii) Chapter: Metallurgy, Section-A, Q.5
(i) Chromatography is the method of refining which is based on the principle of adsorption.
(ii) Depressant in froth floatation process does not allow some specific impurity to come with froth. It forms soluble complex with impurity.
(iii) Limestone ($CaCO_3$) acts as flux in the extraction of iron from its oxides. It forms slag with impurity SiO_2.

$$CaCO_3 \xrightarrow{\Delta} CaO + CO_2 \uparrow$$

$$\underset{\text{(impurity)}}{CaO + SiO_2} \rightarrow \underset{\text{(Slag)}}{CaSiO_3}$$

15. Calculate the boiling point of solution when 2 g of Na_2SO_4 (M = 142 g mol^{-1}) was dissolved in 50 g of water, assuming Na_2SO_4 undergoes complete ionization.
(K_b for water = 0.52 K kg mol^{-1})
Solution:
Given

$$W_{Na_2SO_4} = 2gm \;\; M = 142 \;\; \underset{(H_2O)}{W_B} = 50gm \;\; \alpha = 1 \;\; k_{b(H_2O)} = 0.52$$

Formula

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

$$= 3 \times 0.52 \times \frac{2/142}{50/1000} \left\{ \begin{array}{l} \alpha = \dfrac{i-1}{n-1} \\ 1 = \dfrac{i-1}{3-1} \\ i = 3 \end{array} \right\}$$

$\Delta T_b = 0.439$

$B.P. = 100 + \Delta T_b$

= 100.439 K.

16. Assign reason for the following :

(i) H_3PO_2 is a stronger reducing agent than H_3PO_4.

(ii) Sulphur shows more tendency for catenation than Oxygen.

(iii) Reducing character increases from HF to HI.

Solution:

Students may find similar question in CP board pattern exercise sheet:

(i) Chapter: p-block elements, Section-A, Q.34(iii)

(ii) Chapter: p-block elements, Section-A, Q.25 (C)

(i) H_3PO_2 is a stronger reducing agent than H_3PO_4 because in H_3PO_2 oxidation state of 'P' is +1 while in H_3PO_2 oxidation state of 'P' is +5.

Hence, H_3PO_2 can be oxidized to higher oxidation state while in H_3PO_4, 'P' is present in its highest oxidation state.

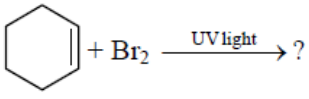
(ii) Sulphur shows more tendency for catenation than oxygen because S-S bond energy is higher than O-O bond energy. Tendency of catenation depends on bond energy of single bond between identical atoms.

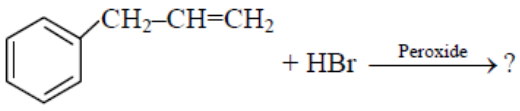
(iii) As we move from HF to HI bond length increases. Hence, removal of hydrogen becomes easier and chance of oxidation also increases.

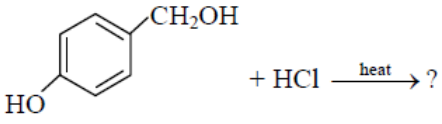
Order of reducing character:

HF < HCl < HBr < HI

17. Write the major monohalo products(s) in each of the following reactions :

(i) 

(ii) 

(iii) 

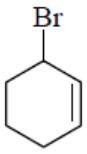
Solution:

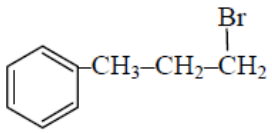
Students may find same/similar question in CP board pattern exercise sheet:

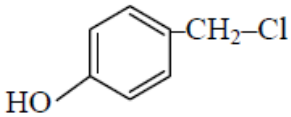
(i) Chapter: Haloalkane, Haloarene, Section-A, Q.34(vi)

(ii) Chapter: Haloalkane, Haloarene, Section-A, Q.6(vii)

(iii) Chapter: Haloalkane, Haloarene, Section-A, Q.34(iii)

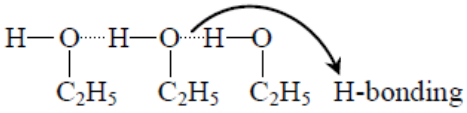
(i) 

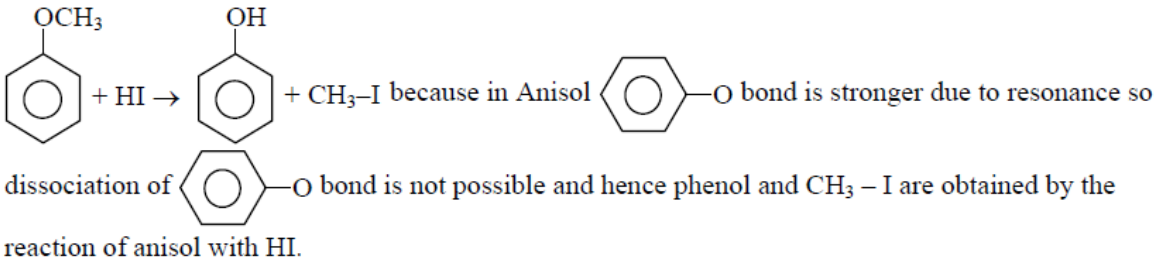
(ii) 

(iii) 

18. Students may find same question in CP board pattern exercise sheet:
(a) Chapter: Alcohol, Phenol & Ether (Oxygen-I), Section-A, Q.23
(c) Chapter: Alcohol, Phenol & Ether (Oxygen-I), Section-A, Q.26
Give reasons for the following:
(a) Protonation of Phenols is difficult whereas ethanol easily undergoes protonation
(b) Boiling point of ethanol is higher than that of dimethyl ether.
(c) Anisole on reaction with HI gives phenol and CH_3–I as main products and not iodobenzene and CH_3OH.

Solution:
(a) The protonation of phenol is difficult because in phenol the *l* p. of oxygen atom are use in resonance with benzene ring and oxygen atom have low electron density where as in ethanol the electron density on oxygen atom is increases due to +I effect of C_2H_5 group which makes it's protonation easy.
(b) Boiling point of ethanol is higher because ethanol form intermolecular hydrogen bond with each other but in ether there is no hydrogen bonding is possible and hence ether have low boiling point in comparison to ethanol



(c) 

19. Write the structures of A, B and C in the following reactions:
(i) $C_6H_5-COO^-NH_4^+ \xrightarrow{\Delta} A \xrightarrow{Br_2/KOH} B \xrightarrow{CH_3COCl/pyridine} C$
(ii) $C_6H_5N_2^+BF_4^- \xrightarrow[\Delta]{NaNO_2/Cu} A \xrightarrow{Sn/HCl} B \xrightarrow{CHCl_3+alc.KOH} C$

Solution:

Students may find same/similar question in CP board pattern exercise sheet:

(i) Chapter: Organic compound containing nitrogen, Section-B, Q.5(iii)

(ii) Chapter: Organic compound containing nitrogen, Section-A, Q.20(vii)

(i) A $\Rightarrow$ $C_6H_5 - CO - NH_2$

B $\Rightarrow$ $C_6H_5 - NH_2$

C $\Rightarrow$ $C_6H_5 - NH - CO - CH_3$

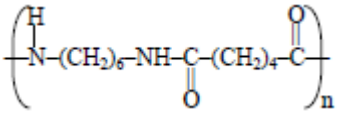
(ii) A $\Rightarrow$ $C_6H_5 - NO_2$

B $\Rightarrow$ $C_6H_5 - NH_2$

C $\Rightarrow$ $C_6H_5 - N \equiv C$

20. (i) What is the role of benzoyl peroxide in the polymerization of ethene?

(ii) Identify the monomers in the following polymer:



(iii) Arrange the following polymers in the increasing order of their intermolecular forces:

Nylon–6, 6 Polythene, Buna-S

OR

Write the mechanism of free radical polymerization of ethane

Solution:

Students may find same/similar question in CP board pattern exercise sheet:

(ii) Chapter: Polymer, Section-A, Q.5

OR

(ii) Chapter: Polymer, Section-B, Q.10(iii)

(iii) Chapter: Polymer, Section-B, Q.7(iii)

(i) Benzoyl peroxide is initiated the free radical polymerization due to formation of free radical by decomposition.

(ii) $NH_2 - (CH_2)_6 - NH_2$ Hexamethelene-di-amine

$HOOC - (CH_2)_4 - COOH$ Adipic Acid

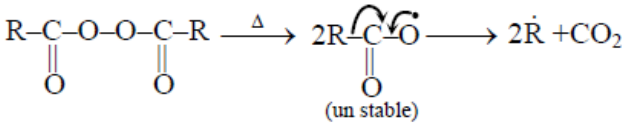
Buna-S < Polythene < Nylon 6, 6

(Elastomer < Plastic < Fiber)

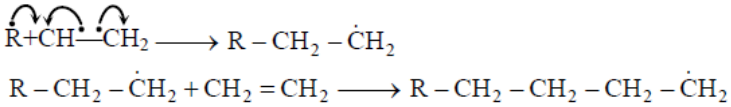
OR

Mechanism of free radical polymerization of ethane. It is completed in following three steps

(i) Chain initiation : Hemolysis of peroxide



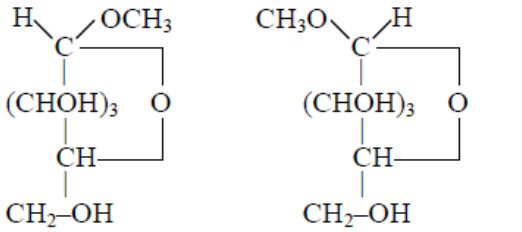
(ii) Chain propagation :



(iii) Chain termination :

$$2R(CH_2CH_2)_nCH_2CH_2 \xrightarrow{\text{Disproportionation}} \underset{\text{Alkane}}{R-(CH_2CH_2)_n(CH)=CH_2} + \underset{\text{Alkane}}{C_6H_5(CH_2CH_2)_nCH_2CH_3}$$

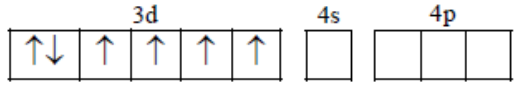
21. (i) Write one reaction of D-Glucose which cannot be explained by its open chain structure.
(ii) What type of linkage is present in Nucleic acids
(ii) Give one example each for water-soluble vitamins and fat-soluble vitamins?
Solution:
(i) Formation of glycosides :
When glucose react with CH_3–OH, a mixture of α and β -methyl ether is formed, it is only possible by cyclic structure of glucose.



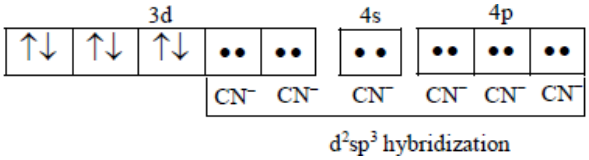
α-D methyl glycoside β-D methyl glycoside

(ii) Phosphodi-ester bond
(iii) Water soluble vitamin $\Rightarrow Vit-B-1$
fat soluble vitamin $\Rightarrow Vit-A$

22. (a) For the complex $[Fe(CN)_6]^{4-}$, write the hybridization, magnetic character and spin type of the complex. (At. number : Fe = 26)
(b) Draw one of the geometrical isomers of the complex $[Co(en)_2Cl_2]^+$ which is optically active.
Solution:
Students may find similar question in CP board pattern exercise sheet:
(b) Chapter: Coordination Compounds, Section-B, Q.3(i)
(a) In the complex $[Fe(CN)_6]^4$, oxidation state of Fe is +2.
Electronic configuration of Fe^{+2} is [Ar] $4s^0$ $3d^6$.
Orbital diagram is,

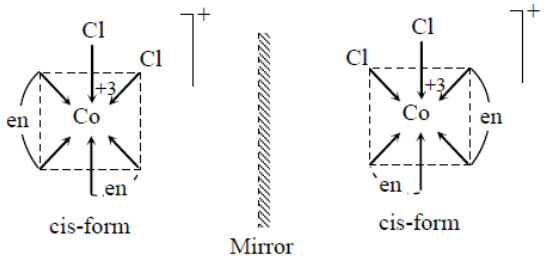


CN^- is a strong field ligand hence, pairing of electron occurs. After pairing configuration becomes,



d^2sp^3 hybridization

Name of hybridization is d^2sp^3.
Magnetic character is diamagnetic and this complex is low spin complex.
(b) Complex $[Co(en)_2Cl_2]^+$ has two geometrical isomers :- cis and trans, trans form is optically inactive while cis form is optically active.



23. Due to hectic and busy schedule, Mr. Awasthi made his life full of tensions and anxiety. He started taking sleeping pills to overcome the depression without consulting the doctor. Mr. Roy, a close friend of Mr. Awasthi advised him to stop taking sleeping pills and suggested to change his lifestyle by doing Yoga, meditation and some physical exercise. Mr. Awasthi followed his friend's advice and after few days he started feling better.

After reading the above passage, answer the following :

(i) What are the values (at least two) displayed by Mr. Roy?

(ii) Why it is not advisable to take sleeping pills without consulting doctor?

(iii) What are tanquilizers? Give two examples.

Solution:

(i) (a) caring

(b) true friendship

(ii) Because sleeping drugs are made addict and increase acidity in stomach and made adverse effect on other body organ like liver, kideny etc

(iii) (a) Diazepam

(b) Barbituric acid

24. (a) Calculate E^{o}_{cell} for the following reaction at 298 K:

$$2Cr(s) + 3Fe^{2+}(0.01M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe(s)$$

Given : E_{cell} = 0.261 V

(b) Using the E^{o} values of A and B, predict which one is better for coating the surface of iron [$E^{o}(Fe^{2+}/Fe)$ = –0.44 V] to prevent corrosion and why?

Given: E^{o} (A^{2+}/A) = –2.37 V : E^{o} (B^{2+}/B) = –0.14 V

OR

(a) The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is 3.905×10^{-5} S cm^{-1}. Calculate its molar conductivity and degree of dissociation (α). Given

$$\lambda^{\circ}(H^{+}) = 349.65\ cm^2mol^{-1}\ \&\ \lambda^{\circ}(CH_3COO^{-}) = 40.95\ cm^2mol^{-1}$$

(b) Define electrochemical cell. What happens if external potential applied becomes greater than E^{o}cell of electrochemical cell?

Solution:

$$E_{cell} = E^{o}_{Cell} - \frac{0.0591}{n}\log\frac{[Cr^{+3}]^2}{[Fe^{+2}]^3} \text{ (Nernst Equation)}$$

$$0.261 = E^{o}_{Cell} = \frac{0.0591}{6}\log\frac{[0.01]^2}{[0.01]^3}$$

$$0.261 = E^{o}_{Cell} - \frac{0.591\times 2}{6}$$

$$E^{o}_{Cell} = 0.2807 \text{ V}$$

(b) 'A' is better for coating the surface of iron because SOP of A is greater than that of iron so before oxidation of iron oxidation of A will take place.

OR

Students may find similar question in CP board pattern exercise sheet:

Chapter: Electro Chemistry, Section-A, Q.26

$$\lambda^{\infty}_{MCH_3COOH} = \lambda^{\infty}_{M(H^+)} + \lambda^{\infty}_{M(CH_3COO^-)} \text{ (Kohlarausch's Law)}$$

$$= 349.6 + 40.9 = 390.5$$

$$\lambda_{CH_3COOH} = \frac{1000\times k}{M} = \frac{1000\times 3.905\times 10^{-5}}{0.001} = 39.05$$

$$\alpha_{CH_3COOH} = \frac{\lambda_{MCH_3COOH}}{\lambda^{\infty}_{MCH_3COOH}} = \frac{39.05}{390.5} = 0.1 \, or \, 10\%$$

(b) Electrochemical Cell :- It is a device in which redox reactin is carried out to convert chemical energy in to electrical energy.

If external potential applied becomes greater than E^{o}_{Cell} of electrochemial cell than electrochemical cell starts workings as electrolytic cell and polarity of electrode get reversed.

25. (a) Account for the following :

(i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4

(ii) Zirconium and Hafnium exhibit similar properties.

(iii) Transition metals act as catalysts.

(b) Complete the following equations:

$$(i)\ 2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta}$$

$$(ii)\ Cr_2O_7^{2-} + 14H^+ + 6I^- \xrightarrow{\Delta}$$

OR

The elements of 3d transition series are given as :

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Answer the following :

(i) Write the element which is not regarded as a transition element. Give reason.

(ii) Which element has the highest m.p?

(iii) Write the element which can show an oxidation state of +1.

(iv) Which element is a strong oxidizing agent in +3 oxidation state and why?

Solution:

Students may find similar question in CP board pattern exercise sheet:

(a) (i) Chapter: d & f-block elements, Section-B, Q.7(a) (iii)
(ii) Chapter: d & f-block elements, Section-A, Q.14
(iii) Chapter: d & f-block elements, Section-A, Q.7(iv)
(b) (i) Chapter: d & f-block elements, Section-A, Q.9
(ii) Chapter: d & f-block elements, Section-B, Q.5(i)

OR

(i) Chapter: d & f-block elements, Section-A, Q.6
(iv) Chapter: d & f-block elements, Section-A, Q.21

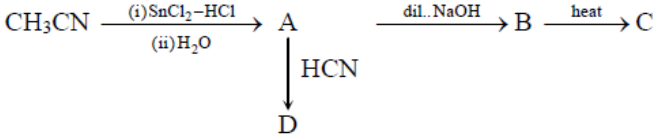
(a) (i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4 because oxygen can form multiple bond while fluorine can form single bond.
(ii) Due to lanthanoid contraction, Zirconium and Hafnium exhibit similar properties.
(iii) Transition metals act as catalysts because they can show variable oxidation state and they are good adsorbent.

(b) $(i)\ 2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta} 2K_2MnO_4 + 2H_2O$

$(ii)\ Cr_2O_7^{-2} + 14H^+ + 6I^- \longrightarrow 2Cr^{+3} + 3I_2 + 7H_2O$

(i) Zn is not regarded as a transition element because in transition elements or ions inner d-subshell must be partially filled but in Zn, inner d-subshell is fully filled
(ii) Cr has the highest m.p.
(iii) Cu can show an oxidation state of +I
(iv) Mn is a strong oxidizing agent in +3 oxidation state because its +2 Oxidation state is more stable. Mn^{+2} has half-filled d-subshell

26. (a) Write the structures of A, B, C and D in the following reactions :



(b) Distinguish between :
(i) C_6H_5–CH=CH–$COCH_3$ and C_6H_5–CH=CH–CO CH_2CH_3
(ii) CH_3CH_2COOH and HCOOH
(c) Arrange the following in the increasing order of their boiling points :
CH_3CH_2OH, CH_3COCH_3, CH3COOH

OR

(a) Write the chemical reaction involved in Etard reaction.
(b) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction :
CH_3–CHO $C_6H_5COCH_3$, HCHO
(c) Why pKa of Cl–CH_2–COOH is lower than the pKa of CH_3COOH?
(d) Write the product in the following reaction.

$CH_3CH_2CH{=}CH{-}CH_2CN \xrightarrow[2.\ H_2O]{1.\ (i\text{-}Bu)2AlH}$

(e) A and B are two functional isomers of compound C_3H_6O. On heating with NaOH and I_2, isomer A forms yellow precipitate of iodoform whereas isomer B does not form any precipitate. Write the formulae of A and B.

Solution:

Students may find same/similar question in CP board pattern exercise sheet:

(a) Chapter: Aldehyde, Ketone & Carboxylic Acid, Section-B, Q.5(a)(iii)

OR

(a) Chapter: Aldehyde, Ketone & Carboxylic Acid, Section-A, Q.15 (iv)

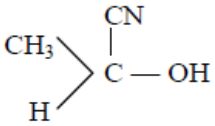
(b) Chapter: Aldehyde, Ketone & Carboxylic Acid, Section-B, Q.6 (i)

(c) Chapter: Aldehyde, Ketone & Carboxylic Acid, Section-B, Q.5(a)(i)

(a) $A \Rightarrow CH_3 - CHO$

$B \Rightarrow CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CHO$

$C \Rightarrow CH_3 - CH = CH - CHO$

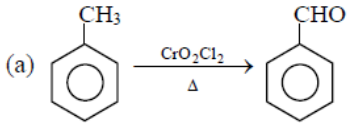
$D \Rightarrow$ 

(b) (i) Iodoform test

(ii) Tollen's test (Tollen's reagent)

(c) $CH_3 - \underset{\underset{O}{||}}{C} - CH_3 < CH_3 - CH_2 - OH < CH_3 - COOH$

OR

(a) 

(b) $\underset{\left(\begin{array}{c}\text{Nucleophilic}\\ \text{Addition Rx}^n\end{array}\right)}{NAR} \Rightarrow HCHO > CH_3 - CHO > C_6H_5COCH_3$

(c) Due to presence of Cl as a – I group which increases the Ka Value of $Cl - CH_2 - COOH$.

(d) $CH_3 - CH = CH - CH_2 - CH_2 - CHO$

(e)