

Solved Paper 2019

CHEMISTRY

Class-XII

Time : 3 Hours

Max. Marks : 70

General Instructions :

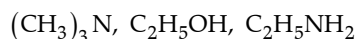
- All questions are compulsory.
- Section A** : Question number 1 to 5 are very short answer questions and carry 1 mark each.
- Section B** : Question number 6 to 12 are short answer questions and carry 2 marks each.
- Section C** : Question number 13 to 24 are also short answer questions and carry 3 marks each.
- Section D** : Question number 25 to 27 are long answer questions and carry 5 marks each.
- There is no overall choice. However, an internal choice has been provided in two questions of **one** mark, **two** questions of **two** marks, **four** questions of **three** marks and all the **three** questions of **five** marks weightage. You have to attempt only one of the choices in such questions.
- Use log tables, if necessary. Use of calculators is not allowed.

Delhi Set I

Code No. 56/1/1

SECTION -A

- Out of NaCl and AgCl, which one shows Frenkel defect and why? [1]
- Arrange the following in increasing order of boiling points. [1]



Ans. $(\text{CH}_3)_3\text{N} < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_2\text{H}_5\text{OH}$ 1
[CBSE Marking Scheme, 2019]

- Why are medicines more effective in colloidal state?

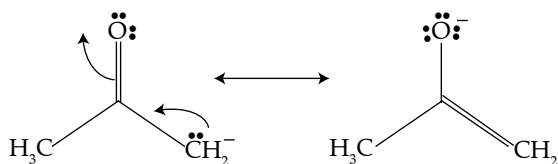
OR

- What is the difference between an emulsion and a gel? [1]
- Define ambident nucleophile with an example. [1]

Ans. Nucleophiles having two nucleophilic centres.
 $\text{CN}^- / \text{SCN}^- / \text{NO}_2^-$ (any one) $\frac{1}{2} + \frac{1}{2}$
[CBSE Marking Scheme, 2019]

Detailed Answer:

An ambident nucleophile is an anionic nucleophile in which the negative charge is delocalized by resonance over two unlike atoms.



- What is basic structural difference between glucose and fructose? [1]

OR

Write products obtained after hydrolysis of lactose.

Ans. Glucose has aldehydic group while fructose has ketonic group/ Glucose is aldose while fructose is ketose. 1

[CBSE Marking Scheme, 2019]

OR

Glucose and galactose 1
[CBSE Marking Scheme, 2019]

SECTION -B

- Write the balanced chemical equations for the following process:

(i) XeF_2 undergoes hydrolysis.

(ii) MnO_2 is heated with concentrated HCl.

[2]

OR

- Arrange the following in order of property indicated for each set:

(i) $\text{H}_2\text{O}, \text{H}_2\text{S}, \text{H}_2\text{Se}, \text{H}_2\text{Te}$ – increasing acidic character.

(ii) $\text{HF}, \text{HCl}, \text{HBr}, \text{HI}$ – decreasing bond enthalpy

- State Raoult's law for a solution containing volatile components. Write two characteristics of the solution which obey Raoult's law at all concentrations. [2]

Ans. For a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional to its mole fraction present in solution. 1

(i) $\Delta_{\text{mix}} H = 0$ (ii) $\Delta_{\text{mix}} V = 0$ (iii) The components have nearly same intermolecular force of attraction $\frac{1}{2}, \frac{1}{2}$

(any two) [CBSE Marking Scheme, 2019]

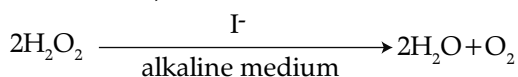
Detailed Answer:

Raoult's law for a solution containing volatile components - The partial vapour pressure of each volatile components of the solution is directly proportional to mole fraction present in solution.

The ideal solutions have characteristics to obey Raoult's law for the following conditions.

1. The enthalpy of mixing of the pure components to form the solution is zero, $\Delta_{\text{mix}} H = 0$. That means no heat is absorbed or released during the mixing of the two pure components.
2. The volume of the mixing also be zero, $\Delta_{\text{mix}} V = 0$. That means the total volume of the solution is equal to the sum of the volume of the two components.
3. In pure components, A and B, the intermolecular attractions between solute-solute interactions and solvent-solvent interaction are almost similar to the solute-solvent interaction.

8. For a reaction,



the proposed mechanism is given below:

- (1) $\text{H}_2\text{O}_2 + \text{I}^- \rightarrow \text{H}_2\text{O} + \text{IO}^-$ (slow)
- (2) $\text{H}_2\text{O}_2 + \text{IO}^- \rightarrow \text{H}_2\text{O} + \text{I}^- + \text{O}_2$ (fast)
 - (i) Write rate law of the reaction.
 - (ii) Write overall order of reaction.
 - (iii) Out of step (1) and (2), which one is rate determining step? [2]

Ans. (i) Rate = $k[\text{H}_2\text{O}_2][\text{I}^-]$ 1

(ii) order = 2 $\frac{1}{2}$

(iii) Step 1 $\frac{1}{2}$

[CBSE Marking Scheme, 2019]

Detailed Answer:

(i) The rate law for the reaction is

$$\text{rate} = -\frac{d[\text{H}_2\text{O}_2]}{dt} = k[\text{H}_2\text{O}_2][\text{I}^-]$$

* Out of Syllabus

(ii) This reaction is first order with respect to both H_2O_2 and I^- .

The overall order of the reaction is bimolecular, 2. The order of the reaction is determined from the slowest step of the reaction mechanism.

(iii) The first reaction is slow, so this is the rate determining step.

9. When MnO_2 is fused with KOH in presence of KNO_3 as an oxidizing agent, it gives a dark green compound (A). Compound (A) disproportionates in acidic solution to give purple compound (B). An alkaline solution of compound (B) oxidises KI to compound (C) whereas an acidified solution of compound (B) oxidises KI to (D). Identify (A), (B), (C) and (D). [2]

Ans. $\text{A} = \text{K}_2\text{MnO}_4 / \text{MnO}_4^{2-}$, $\text{B} = \text{KMnO}_4 / \text{MnO}_4^-$, $\text{C} = \text{IO}_3^-$ or KIO_3 , $\text{D} = \text{I}_2$ $\frac{1}{2} \times 4$

[CBSE Marking Scheme, 2019]

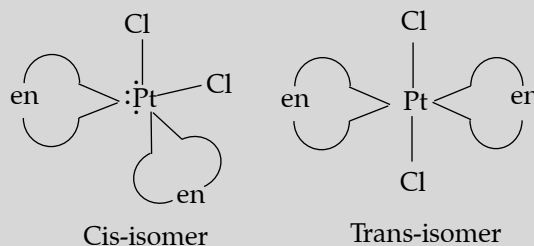
10. Write IUPAC name of the complex $[\text{Pt}(\text{en})_2\text{Cl}_2]$. Draw structures of geometrical isomers for this complex. [2]

OR

Using IUPAC norms write the formulae for the following:

- (i) Hexaamminecobalt(III) sulphate
- (ii) Potassium trioxalatochromate(III)

Ans. Bis(ethan-1,2-diamine)dichloridoplatinum (II) 1

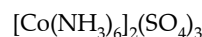


$\frac{1}{2} + \frac{1}{2}$

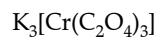
[CBSE Marking Scheme, 2019]

OR

(i) Hexaamminecobalt(III) sulphate



(ii) Potassium trioxalatochromate(III)



11. Out of $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{en})_3]^{3+}$, which one complex is,

- (i) Paramagnetic,
- (ii) More stable,
- (iii) Inner orbital complex and

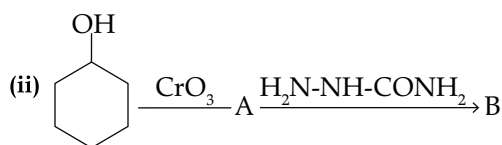
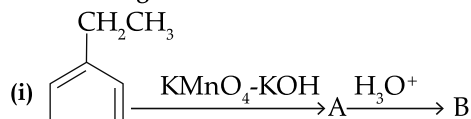
- (iv) High spin complex
(Atomic number of Co = 27)

[2]

- Ans. (i) $[\text{CoF}_6]^{3-}$
(ii) $[\text{Co}(\text{en})_3]^{3+}$
(iii) $[\text{Co}(\text{en})_3]^{3+}$
(iv) $[\text{CoF}_6]^{3-}$ $\frac{1}{2} \times 4$

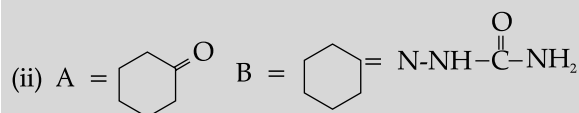
[CBSE Marking Scheme, 2019]

12. Write structures of compound A and B in each of the following reactions:



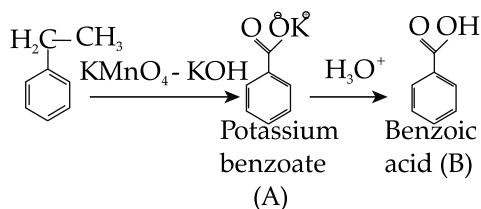
[2]

Ans.

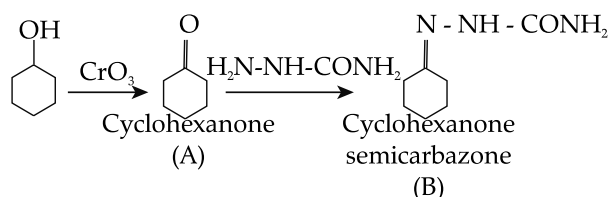
[CBSE Marking Scheme, 2019] $\frac{1}{2} \times 4$

Detailed Answer:

- (i) Ethyl benzene when treated with KMnO_4 and KOH , undergoes oxidation to produce potassium benzoate. The potassium benzoate when treated with an acid forms benzoic acid.



- (ii) Cyclohexanol is oxidized by CrO_3 to cyclohexanone. Cyclohexanone when treated with semicarbazide produces cyclohexanone semicarbazone.



SECTION - C

13. The decomposition of NH_3 on platinum surface is zero order reaction. If rate constant k is $4 \times 10^{-3} \text{Ms}^{-1}$, how long will it take to reduce the initial concentration of NH_3 from 0.1M to 0.064M. [3]

Ans. $t = \frac{[R]_0 - [R]_t}{k}$ 1
 $= \frac{[0.1 - 0.064]}{4 \times 10^{-3}}$ 1
 $= 9 \text{ s}$ [CBSE Marking Scheme, 2019]

Detailed Answer:

The equation for the zero order reaction is:
 $[A] = [A_0] - kt$

Given:

$[A_0] = 0.1 \text{ M}$

$[A] = 0.064$

$k = 4 \times 10^{-3} \text{ M/s}$

Putting the values in the equation, and solving the equation for t , we get:

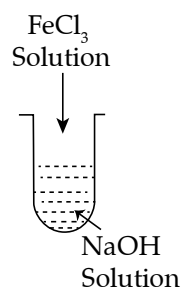
$0.064 = 0.1 - (4 \times 10^{-3} \times t)$

$0.064 - 0.1 = - (4 \times 10^{-3} \times t)$

$-0.036 = - (4 \times 10^{-3} \times t)$

$t = \frac{-0.036}{-4 \times 10^{-3}} = 9 \text{ s}$

14. (i) What is the role of activated charcoal in gas mask? [3]
 (ii) A colloidal sol is prepared by the given method in figure. What is the charge on hydrated ferric oxide colloidal particles formed in the test tube? How is the sol represented?



- (iii) How does chemisorption vary with temperature?

- Ans. (i) Adsorption of toxic gases
 (ii) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{OH}^-$
 (iii) Increases with increase in temperature/ first increases then decreases

[CBSE Marking Scheme, 2019]

Detailed Answer:

- (iii) Adsorption is an exothermic process. According to Le Chatelier's principle, at low temperature forward reaction is favourable. As temperature increases enough energy is being provided for the molecules to reach the activation energy.

Therefore, initially as temperature increases, chemisorption increases. As the high temperature helps in bond breaking, after certain temperature, chemisorption decreases.

- *15. An element crystallizes in fcc lattice with a cell edge of 300 pm. The density of the element is 10.8 g cm^{-3} . Calculate the number of atoms in 108 g of the element. [3]
16. A 4% solution w/w of sucrose ($M = 342 \text{ g mol}^{-1}$) in water has a freezing point of 271.15K. Calculate the freezing point of 5% glucose ($M = 180 \text{ g mol}^{-1}$) in water. (Given: Freezing point of pure water = 273.15 K) [3]

Ans. $\Delta T_f = K_f m$

$$K_f = \Delta T_f \times \frac{M_2 \times w_1}{w_2 \times 1000}$$

$$= \frac{2 \times 342 \times 96}{4 \times 1000}$$

$$= 16.4 \text{ Km}^{-1}$$

$$\Delta T_f = K_f m'$$

$$= \frac{K_f w_2 \times 1000}{M_2 \times w_1}$$

$$= \frac{16.4 \times 5 \times 1000}{95 \times 180}$$

$$= 4.8 \text{ K}$$

$$\Delta T_f = T_f^\circ - T_f$$

$$4.8 = 273.15 - T_f$$

$$T_f = 268.35 \text{ K}$$

[CBSE Marking Scheme, 2019]

Detailed Answer:

Given:

$$\text{Sucrose solution} = 4\% (w/w)$$

$$M = 342 \text{ g mol}^{-1}$$

$$\text{Freezing point of solution} = 271.15 \text{ K}$$

$$\text{Freezing point of pure water} = 273.15 \text{ K}$$

$$\text{Glucose solution} = 5\%$$

$$M = 180 \text{ g mol}^{-1}$$

To calculate:

Freezing point of 5% glucose solution.

Formula:

$$\Delta T_f = i \times K_f \times m$$

$$m = \frac{\text{moles of solute}}{\text{Kg of solvent}}$$

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

Sucrose solution is 4% (w/w) which means there is 4.0 grams of sucrose dissolved in 100g of solution.

Mass of solution = mass of solute + mass of solvent

$$100.0 \text{ g} = 4.0 \text{ g} + \text{mass of solvent.}$$

$$\text{Hence, mass of solvent} = 100.0 - 4.0 = 96.0 \text{ g}$$

$$96 \text{ g} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.096 \text{ kg}$$

Moles of solute

$$\text{moles} = \frac{\text{mass}}{\text{molar mass}} = \frac{4.0 \text{ g}}{342 \text{ g mol}^{-1}}$$

$$= 0.011695 \text{ moles}$$

Molality of solution:

$$m = \frac{\text{moles of solute}}{\text{kg of solvent}} = \frac{0.011695 \text{ moles}}{0.096 \text{ kg water}} = 0.1218 \text{ m}$$

Sucrose is a non-electrolyte, hence $i = 1$

$$\Delta T_f = \text{Freezing point of solvent}$$

$$- \text{Freezing point of solution}$$

$$\Delta T_f = 273.15 \text{ K} - 271.15 \text{ K} = 2.00 \text{ K}$$

$$\Delta T_f = i \times K_f \times m$$

$$2.00 \text{ K} = i \times K_f \times 0.1218$$

$$K_f = 16.42 \text{ Km}^{-1}$$

For glucose solution,

Glucose solution is 5% (w/w) which means there is 5.0 grams of glucose dissolved in 100g of solution.

Mass of solution = mass of solute + mass of solvent

$$100.0 \text{ g} = 5.0 \text{ g} + \text{mass of solvent.}$$

$$\text{Hence, mass of solvent} = 100.0 - 5.0 = 95.0 \text{ g}$$

$$95.0 \text{ g} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.095 \text{ kg}$$

Moles of solute

$$\text{moles} = \frac{\text{mass}}{\text{molar mass}} = \frac{5.0 \text{ g}}{180 \text{ g mol}^{-1}} = 0.0277 \text{ moles}$$

Molality of solution:

$$m = \frac{\text{moles of solute}}{\text{kg of solvent}} = \frac{0.0277 \text{ moles}}{0.095 \text{ kg water}} = 0.2923 \text{ m}$$

Glucose is a non - electrolyte, hence $i = 1$

$$\Delta T_f = i \times K_f \times m$$

$$\Delta T_f = 1 \times 16.42 \times 0.2923$$

$$\Delta T_f = 4.801 \text{ Km}^{-1}$$

$$\Delta T_f = \text{Freezing point of solvent}$$

$$- \text{Freezing point of solution}$$

$$4.801 = 273.15 \text{ K} - \text{Freezing point of solution}$$

$$\text{Freezing point of solution} = 273.15 \text{ K} - 4.801 \text{ K}$$

$$= 268.35 \text{ K}$$

Thus, the freezing point of the glucose solution is 268.35 K.

- *17. (a) Name the method of refining which is
 (i) used to obtain semiconductor of high purity,
 (ii) used to obtain low boiling metal.

(b) Write chemical reactions taking place in the extraction of copper from Cu_2S . [3]

18. Give the reasons for following: [3]

- (i) Transition elements and their compounds act as catalysts.
 (ii) E° value for $(\text{Mn}^{2+}/\text{Mn})$ is negative whereas for $(\text{Cu}^{2+}/\text{Cu})$ is positive.
 (iii) Actinoids show irregularities in their electronic configuration.

Ans. (i) Due to variable oxidation state.	1
(ii) Mn^{2+} is stable due to exactly half filled $3d^5$ configuration/ Due to high $\Delta_a H^\circ$ and low $\Delta_{\text{hyd}} H^0$ for Cu^{2+}/Cu is positive.	1
(iii) Due to comparable energies of $5f$, $6d$ and $7s$ -orbitals.	1
[CBSE Marking Scheme, 2019]	

Detailed Answer:

(i) Transition metals have the ability to adsorb many other substances on their surface and activate them as a result of chemisorption. Transition metals also exhibit a variety of oxidation states, and can change oxidation states relatively easily. This makes transition metals and their compounds good catalysts.

(ii) E° values are indicative of the stability of the oxidized form of the element. The lower the E° value, more stable the oxidized form of the element. Mn^{2+} with a half filled d-subshell (d^5) is stable, so Mn is easily oxidized to Mn^{2+} , making the E° value negative. Cu^{2+} with a partially filled d subshell (d^9) is not stable, and is relatively easily reduced to element form. This makes its E° value positive.

(iii) The electronic configurations of actinoids show irregularities because the energies of their $5f$, $6d$, and $7s$ -orbitals are close to each other. Electrons can easily move between these subshells.

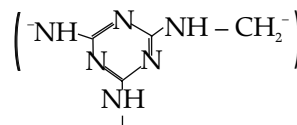
*19. Write the structure of monomers used for getting the following polymers: [3]

- (i) Nylon-6,6
 (ii) Glyptal
 (iii) Buna - S

OR

- (i) Is $\text{[CH}_2\text{-CH(CH}_3\text{)]}_n$ a homopolymer or copolymer? Give reason.

(ii) Write the monomers of the following polymer:



(iii) What is the role of sulphur in vulcanization of rubber?

- *20. (i) What type of drug is used in sleeping pills? [3]
 (ii) What type of detergents are used in toothpastes?
 (iii) Why the use of alitame as artificial sweetener is not recommended?

OR

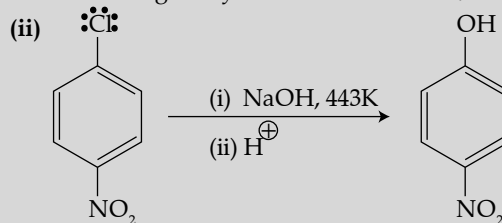
* Define the following terms with suitable example in each:

- (i) Broad-spectrum antibiotics
 (ii) Disinfectants
 (iii) Cationic detergents

21. (i) Out of $(\text{CH}_3)_3\text{C-Br}$ and $(\text{CH}_3)_3\text{C-I}$, which one is more reactive towards $\text{S}_\text{N}1$ and why?
 (ii) Write the product formed when p-nitrochlorobenzene is heated with aqueous NaOH at 443 K followed by acidification.

* (iii) Why dextro - and laevo - rotatory isomers of Butan-2-ol are difficult to separate by fractional distillation? [3]

Ans. (i) $(\text{CH}_3)_3\text{C-I}$, Due to large size of iodine / better leaving group / due to lower electronegativity. $\frac{1}{2} + \frac{1}{2}$

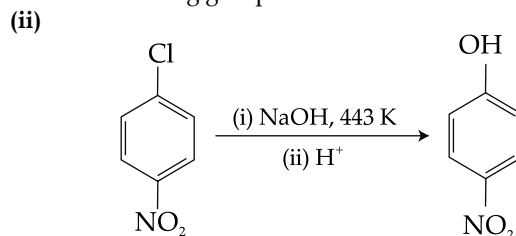


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[CBSE Marking Scheme, 2019]

Detailed Answer:

(i) Within a group, larger atoms are better nucleophiles. $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$, therefore I^- is better leaving group than Br^- .

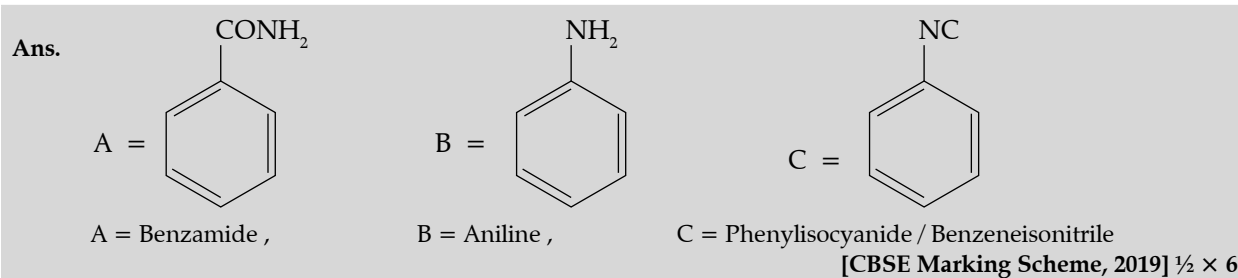


p-Nitrochlorobenzene

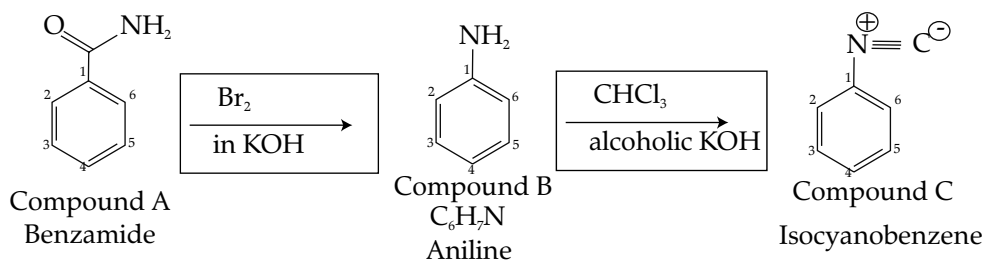
p-Nitrophenol

The presence of an electron withdrawing group ($-\text{NO}_2$) at ortho- and para- positions increases the reactivity of haloarenes.

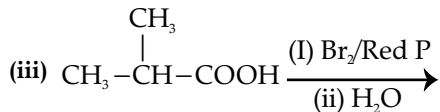
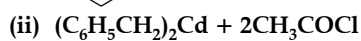
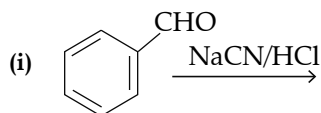
22. An aromatic compound 'A' on heating with Br_2 and KOH forms a compound 'B' of molecular formula $\text{C}_6\text{H}_7\text{N}$ which on reacting with CHCl_3 and alcoholic KOH produces a foul smelling compound 'C'. Write the structure and IUPAC names of compound A, B and C. [3]



Detailed Answer:



23. Complete the following reactions:

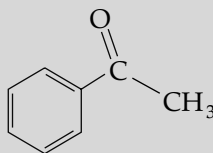


[3]

OR

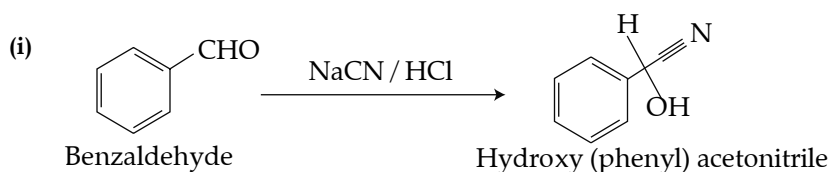
Write chemical equations for the following reactions:

- (i) Propanone is treated with dilute $\text{Ba}(\text{OH})_2$.
 (ii) Acetophenone is treated with $\text{Zn}(\text{Hg})/\text{Conc. HCl}$
 (iii) Benzoyl chloride is hydrogenated in presence of Pd/BaSO_4 .

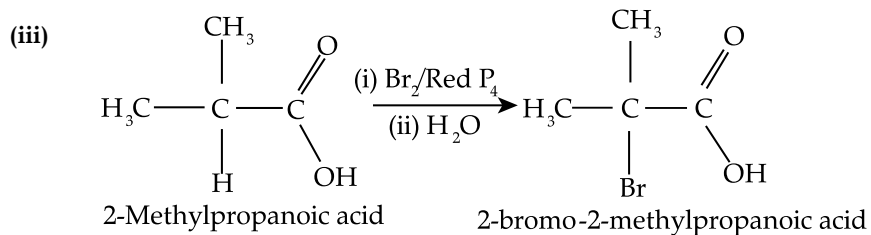
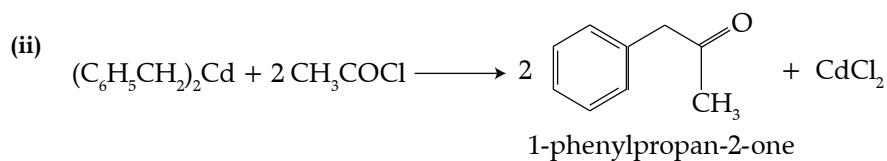


[CBSE Marking Scheme, 2019]

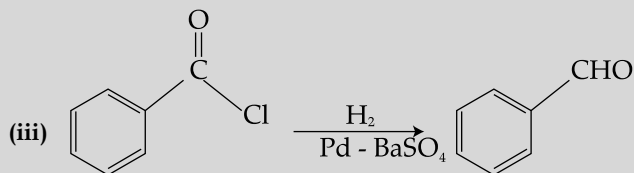
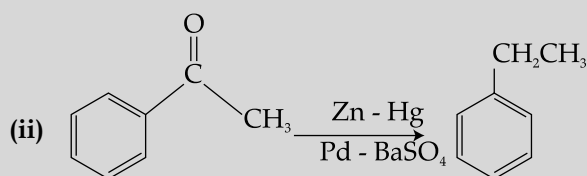
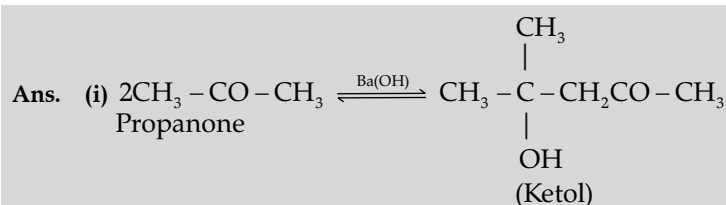
Detailed Answer



* Out of Syllabus

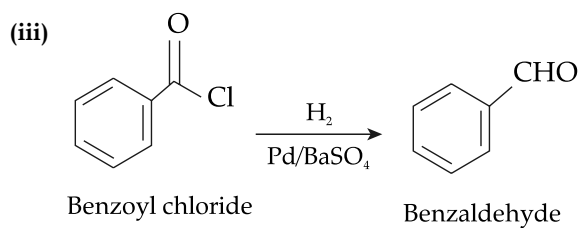
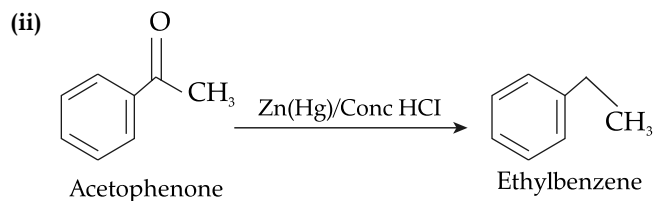
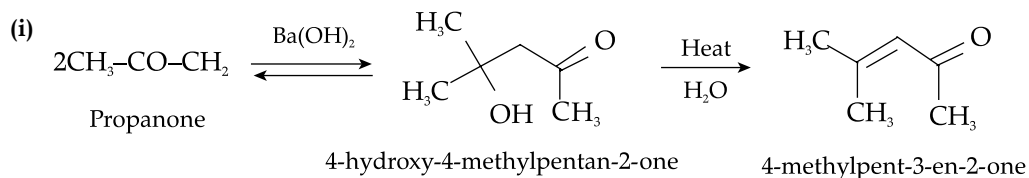


OR



[CBSE Marking Scheme, 2019]

Detailed Answer:



24. Differentiate between the following : [3]

- (i) Amylose and Amylopectin
 (ii) Peptide linkage and glycosidic linkage
 (iii) Fibrous protein and globular protein

OR

Write chemical reactions to show that open structure of D-glucose contains the following :

- (i) Straight chain
 (ii) Five alcohol groups
 (iii) Aldehyde as carbonyl group

Ans. (i) Amylose is water soluble component while amylopectin is water insoluble. **1**

(ii) Peptide linkage is $-CONH-$ formed between two amino acids while glycosidic linkage is an oxide linkage between two monosaccharides. **1**

(iii) In fibrous protein, the polypeptide chains run parallel while in globular protein, the chains of polypeptides coil around to give a spherical shape. **1** (or any other correct difference.)

[CBSE Marking Scheme, 2019]

Detailed Answer:

(i)

Amylose	Amylopectin
Chemically it is straight chain polymer.	Chemically it is branched chain polymer.
It is soluble in water.	It is insoluble in water.
It constitutes 15-20% of starch.	It constitutes 80-85% of starch.

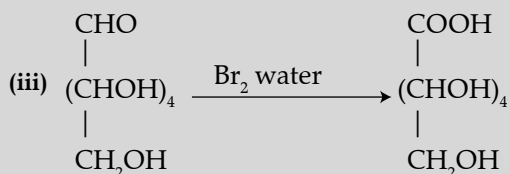
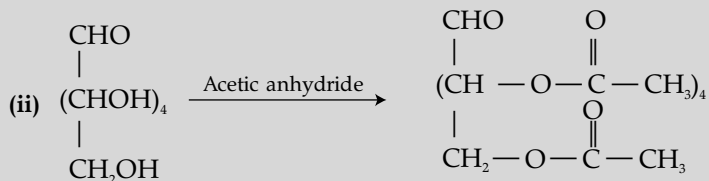
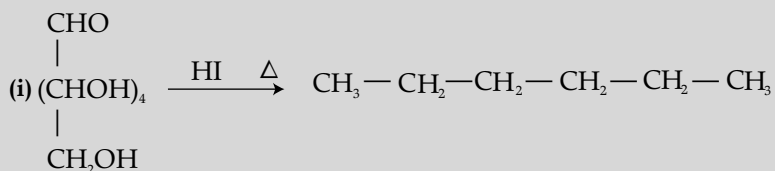
(ii)

Peptide linkage	Glycosidic linkage
Peptide linkage is formed between two amino acids.	Glycosidic linkage is formed between two monosaccharides.
Hydrolysis of peptide linkage forms two amino acids.	Hydrolysis of glycosidic linkage forms two monosaccharides.
It links carbon and nitrogen atoms.	It links two carbon atoms through an oxygen atom.
It is found in polypeptides.	It is found in polysaccharides.
It can be given as $-CONH-$.	It can be given as $-C-O-C-$.

(iii)

Fibrous protein	Globular protein
When the polypeptide chains run parallel and are held together by hydrogen and disulphide bonds then fibrous protein is formed.	When the chains of polypeptides coil around to get a spherical shape then globular protein is formed.
Generally it is insoluble in water.	Generally it is soluble in water.
They have comparatively stronger intermolecular forces of attraction.	They have weak intermolecular hydrogen bonding.

OR



[CBSE Marking Scheme, 2019]

SECTION - D

25. E_{cell}° for the given redox reaction is 2.71 V.



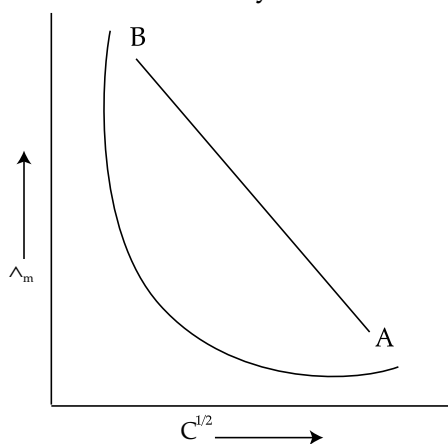
Calculate E_{cell} for the reaction. Write the direction of flow of current when an external opposite potential applied is

- (i) Less than 2.71 V
 (ii) Greater than 2.71 V [5]
 OR

(a) A steady current of 2 amperes was passed through two electrolytic cells X and Y connected in series containing electrolytes FeSO_4 and ZnSO_4 until 2.8 g of Fe deposited at the cathode of cell X. How long did the current flow? Calculate the mass

(Molar mass: $\text{Fe} = 56 \text{ g mol}^{-1}$, $\text{Zn} = 65.3 \text{ g mol}^{-1}$, $1 \text{ F} = 96500 \text{ C mol}^{-1}$)

(b) In the plot of molar conductivity Λ_m vs. square root of concentration ($C^{1/2}$), following curve obtained for two electrolytes A and B:



Answer the following :

- (i) Predict the nature of electrolytes A and B:
 (ii) What happens on extrapolation of Λ_m to concentration approaching zero for electrolytes A and B?

Ans. $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{n} \log K$ 1
 $= E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{10^{-3}}{10^{-2}}$ 1
 $= 2.71 + 0.0295$ 1
 $E_{\text{cell}} = 2.7395 \text{ V}$

- (i) Cu to Mg / Cathode to anode / Same direction 1
 (ii) Mg to Cu / Anode to cathode / Opposite direction [CBSE Marking Scheme, 2019] 1

Detailed Answer:

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{n} \log \left[\frac{\text{Mg}^{2+}}{\text{Cu}^{2+}} \right]$$

$$E_{\text{cell}} = 2.71 - \frac{0.059}{2} \log \left[\frac{0.001}{0.01} \right]$$

$$E_{\text{cell}} = 2.71 - (-0.0295) = 2.74 \text{ V}$$

- (i) When external opposite applied voltage is less than 2.71, it is less than E_{cell}° , therefore, the electrons will flow from the anode to the cathode, and current will flow from cathode (copper electrode) to anode (magnesium electrode).
 (ii) When external opposite applied potential is greater than 2.71, it is greater than E_{cell}° , therefore, the reaction will be reversed, and the current will flow from anode to cathode.

OR

$$m = z I t \quad \frac{1}{2}$$

$$2.8 = \frac{56 \times 2 \times t}{2 \times 96500} \quad \frac{1}{2}$$

$$t = 4825 \text{ s} / 80.417 \text{ min}$$

$$\frac{m^1}{m^2} = \frac{E_1}{E_2} \quad \frac{1}{2}$$

$$\frac{2.8}{m_{\text{Zn}}} = \frac{56}{2} \times \frac{2}{65.3} \quad \frac{1}{2}$$

$$m_{\text{Zn}} = 3.265 \quad 1$$

- (b) (i) A- Strong electrolyte, B-weak electrolyte 1
 (ii) Λ° for weak electrolytes cannot be obtained by extrapolation while Λ° for strong electrolytes can be obtained as intercept. 1

[CBSE Marking Scheme, 2019]

Detailed Answer:

(a) Charge required to deposit 2.8 g Fe:

$$\text{mol Fe} = \frac{\text{mass}}{\text{molar mass}} = \frac{2.8 \text{ g}}{56 \text{ g mol}^{-1}} = 0.05 \text{ mol}$$

2F charge is required to discharge 1 mol of Fe^{2+} ions as Fe, therefore deposition of 0.05 mol Fe will need

$$0.05 \times 2 = 0.1 \text{ F} = 0.1 \text{ F} \times \frac{96500 \text{ C}}{\text{F}} = 9650 \text{ C}$$

The quantity of charge is related to current as

$$Q = It$$

Therefore, the time needed to deposit 2.8 g Fe is:

$$t = \frac{Q}{I} = \frac{9650 \text{ C}}{2 \text{ A}} = 4825 \text{ s}$$

So, the current flowed through the cells for 4825 seconds.

The amount of Zn deposited in cell Y can be

calculated using Faraday's second law:

$$\frac{\text{mass of Zn}}{\text{mass of Fe}} = \frac{\text{Eq.wt of Zn}}{\text{Eq wt of Fe}}$$

$$= \frac{\text{molar mass of Zn / charge on zircon}}{\text{molar mass of Fe / charge on iron ion}}$$

$$\text{mass of Zn} = 2.8 \text{ g} \times \frac{65.3 \text{ g/2}}{56 \text{ g/2}} = 3.265 \text{ g} \approx 3.3 \text{ g}$$

Therefore, the mass of Zn deposited in cell Y in the same time is 3.3 g.

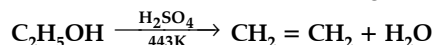
(b) (i) Molar conductivity of strong electrolytes increases linearly as the square root of the concentration decreases; therefore,

26. (a) How do you convert the following?

(i) Phenol to Anisole.

(ii) Ethanol to Propan-2-ol

(b) Write mechanism for the following reaction.



(c) Why Phenol undergoes electrophilic substitution more easily than benzene? [5]

OR

(a) Account for the following:

(i) *o*-nitrophenol is more steam volatile than *p*-nitrophenol

(ii) *t*-butyl chloride on heating with sodium methoxide gives 2-methylpropene instead of *t*-butylmethylether.

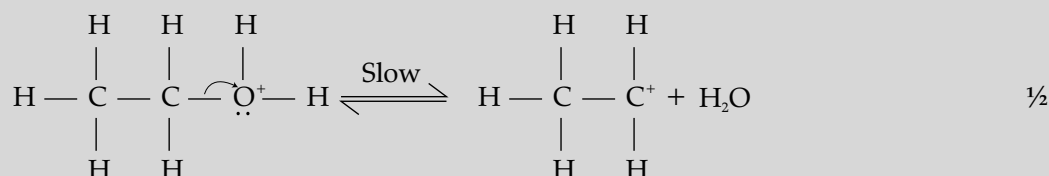
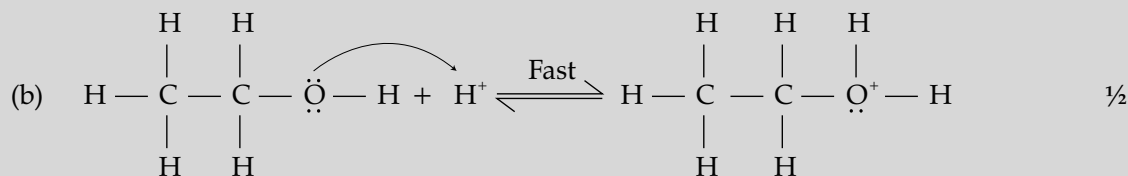
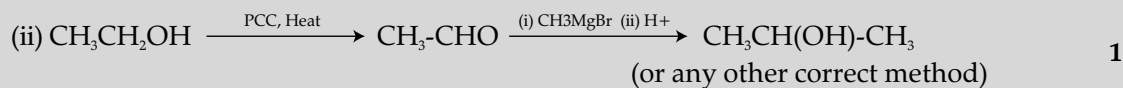
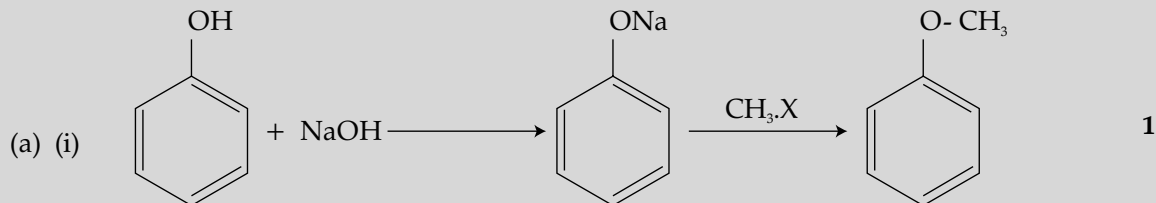
(b) Write the reaction involved in the following:

(i) Reimer-Tiemann reaction

(ii) Friedal-Crafts alkylation of phenol

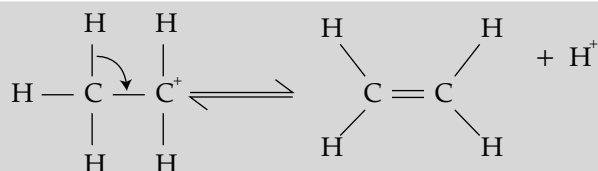
(c) Give simple chemical test to distinguish between ethanol and phenol.

Ans.



electrolyte A is a strong electrolyte. Molar conductivity of weak electrolytes increases non-linearly as square root of concentration decreases; therefore, electrolyte B is a weak electrolyte.

(ii) As concentration of strong electrolyte approaches zero, the molar conductivity of the plot intercepts the molar conductivity axis, giving the limiting value of molar conductivity E_m^0 . The plot of molar conductivity of weak electrolyte tends to infinity as its concentration approaches zero; it does not intersect the molar conductivity axis.



1

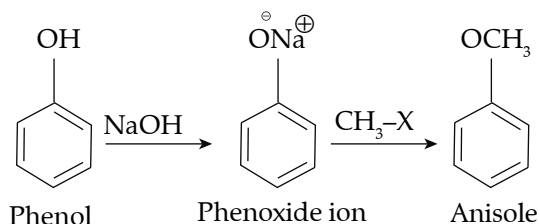
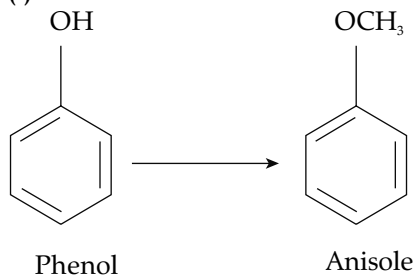
(c) Due to involvement of lone pair of oxygen in delocalisation makes the benzene ring electron rich.

1

[CBSE Marking Scheme, 2019]

Detailed Answer:

(a) (i) Phenol to anisole

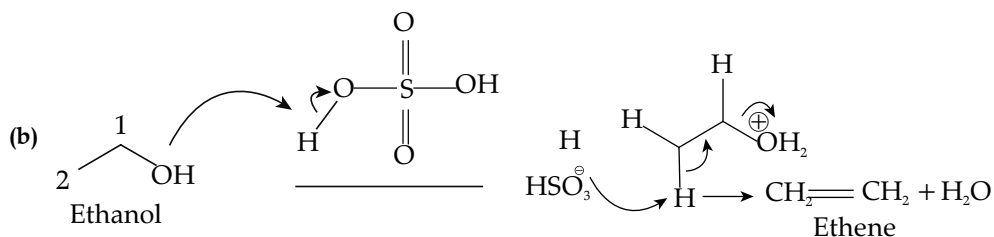
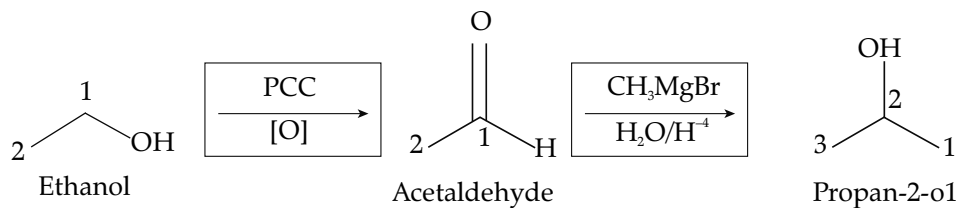


(ii) Ethanol to propan-2-ol



Ethanol (a primary alcohol) when oxidized partially with the partial oxidizing agent such as PCC (Pyridinium chlorochromate) will be converted into acetaldehyde.

If we treat acetaldehyde with Grignard reagent ($\text{CH}_3\text{-Mg-X}$) followed by acid hydrolysis, we will get propan-2-ol which is the desired product.



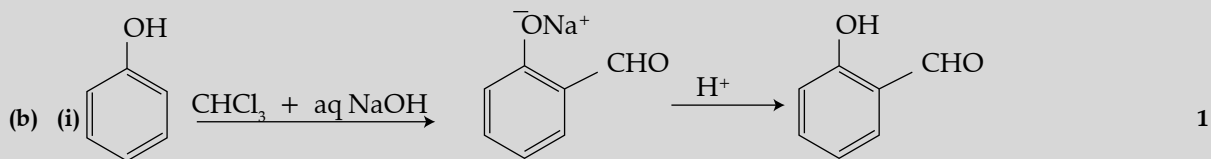
(c) The $-\text{OH}$ group attached to the benzene ring in phenol is the highly activating group. The lone pair on oxygen is delocalised into the benzene ring and makes the phenol more electron rich than simple

benzene. Thus, phenol undergoes electrophilic substitution more easily than benzene.

OR

(a) (i) *o*-Nitrophenol is steam volatile due to intramolecular hydrogen bonding while *p*-nitrophenol is less volatile due to intermolecular hydrogen bonding. 1

(ii) Due to the formation of stable intermediate tertiary carbocation / CH_3O^- being a strong base favours elimination reaction. 1



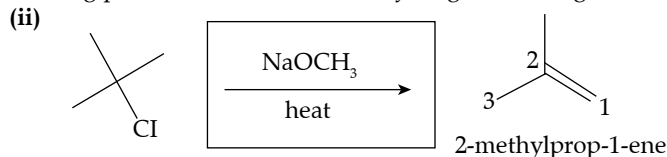
(ii) (Award 1 mark if attempted in any way) 1

(c) Add neutral FeCl_3 to both the compounds, phenol will give violet colouration while ethanol does not. 1

[CBSE Marking Scheme, 2019]

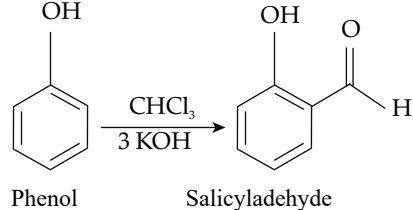
Detailed Answer:

(a) (i) *o*-Nitrophenol forms intramolecular H bond whereas molecules of *p*-Nitrophenol get associated through intermolecular H bond. During boiling, the strong intermolecular hydrogen bonding increases the boiling point but intramolecular hydrogen bonding cannot do so.

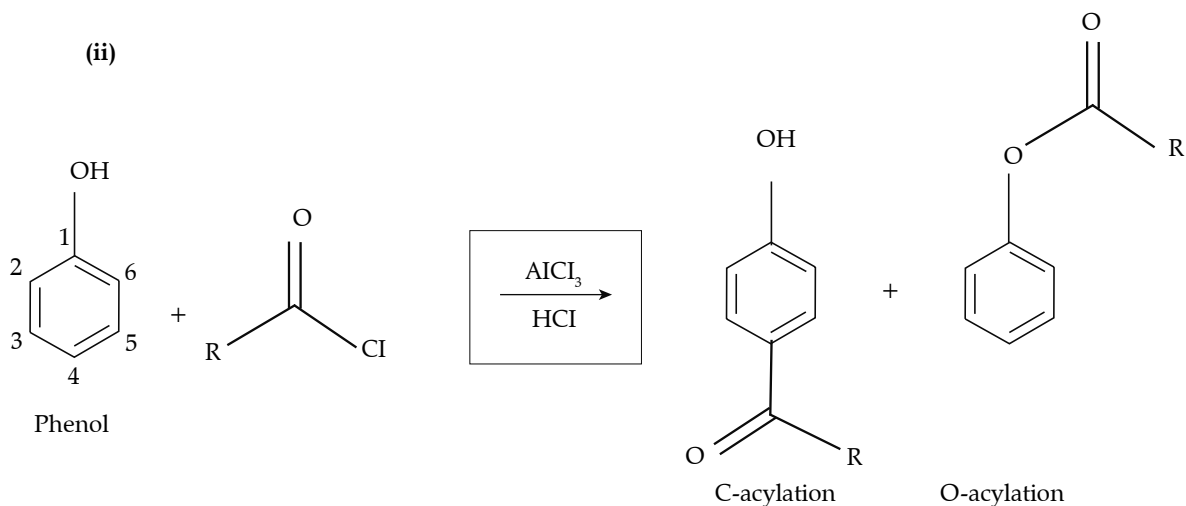


As the given alkyl halide is tertiary in nature, therefore on reaction with sodium methoxide, elimination reaction takes place in place of substitution and hence, alkene is formed as a major product. Therefore, in the given reaction, 2-methyl propene is formed as a major product.

(b) (i) The Reimer-Tiemann reaction is a chemical reaction used for the *o*-formylation of phenol.



(ii)



(c) Phenol being more acidic than ethanol will turn the blue litmus paper red but ethanol doesn't. Haloform test is also used to distinguish ethanol and phenol. Ethanol when treated with NaOH and iodine, iodoform is obtained which

is yellow needle shaped. But phenol does not show positive haloform test.

*27. (a) Give reasons for the following: [5]

(i) Sulphur in vapour state shows paramagnetic behaviour:

- (ii) N-N bond is weaker than P-P bond:
 (iii) Ozone is thermodynamically less stable than oxygen.
- (b) Write the name of the gas released when Cu is added to
 (i) Dilute HNO_3
 (ii) Conc. HNO_3 [5]
- OR
- * (a) (i) Write the disproportionation reaction of H_3PO_3 .
- (ii) Draw the structure of XeF_4 .
 (b) Account for the following:
 (i) Although fluorine has less negative electron gain enthalpy yet F_2 is a strong oxidizing agent.
 (ii) Acidic character decreases from N_2O_3 to Bi_2O_3 in group 15.
 (c) Write a chemical reaction to test sulphur dioxide gas. Write the chemical equation involved.

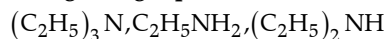
Delhi Set II

Code No. 56/1/2

Note: Except these questions, other questions are from Delhi Set-I

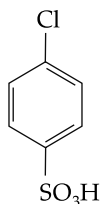
SECTION - A

2. Arrange the following in increasing order of base strength in gas phase: [1]



Ans. $\text{C}_2\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_2\text{NH} < (\text{C}_2\text{H}_5)_3\text{N}$ 1
 [CBSE Marking Scheme, 2019]

5. Write the IUPAC name of the given compound:



[1]

Ans. 4-chlorobenzenesulphonic acid

[CBSE Marking Scheme, 2019] 1

SECTION - B

8. Write two differences between an ideal solution and a non-ideal solution. [2]

Ans.

Ideal Solution	Non-ideal Solution
Obeys Raoult's law at all range of concentrations	Does not obey
$\Delta_{\text{mix}} H = 0, \Delta_{\text{mix}} V = 0,$	$\Delta_{\text{mix}} H \neq 0, \Delta_{\text{mix}} V \neq 0$ (or any other difference)

1 + 1

[CBSE Marking Scheme, 2019]

Detailed Answer:

	Ideal solution	Non-ideal solution
Raoult's Law	Solutions which obey Raoult's law over the entire range of concentrations.	Do not obey Raoult's law over the entire range of concentrations.
$\Delta_{\text{mix}} H$	The enthalpy of mixing of the pure components to form a solution is zero . $\Delta_{\text{mix}} H = 0$	The enthalpy of mixing of pure components to form a solution is not zero . $\Delta_{\text{mix}} H > 0$

$\Delta_{\text{mix}} V$	The volume of the mixing is also zero , $\Delta_{\text{mix}} V = 0$. That means the total volume of the solution is equal to the sum of the volume of the two components.	The volume of the mixing is not zero , $\Delta_{\text{mix}} V \neq 0$. The total volume of the solution is not equal to the sum of the volume of the two components.
Intermolecular interactions	In pure components, A and B, the intermolecular attractions between solute-solute interactions and solvent-solvent interactions are almost similar to the solute-solvent interaction.	In pure components, A and B, the intermolecular attractions between solute-solute interactions and solvent-solvent interaction are not similar to the solute-solvent interaction.

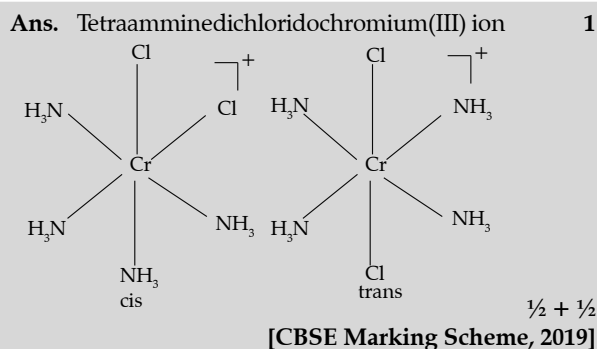
10. Write IUPAC name of the complex $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$. Draw structures of geometrical isomers for this complex.

OR

Using IUPAC norms write the formulae for the following:

(i) Pentaammine nitrito-o-cobalt (III) Chloride

(ii) Potassium tetracyanonickelate (II) [2]



OR

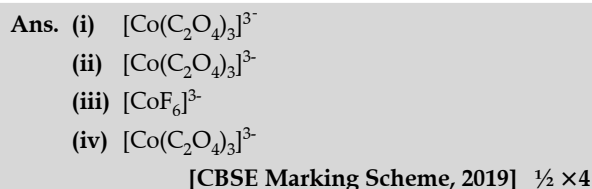
(i) $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$ 1

(ii) $\text{K}_2[\text{Ni}(\text{CN})_4]$ 1

[CBSE Marking Scheme, 2019]

11. Out of $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$ which one complex is,

- (i) Diamagnetic,
(ii) More stable,
(iii) Outer orbital complex and
(iv) Low spin complex
(Atomic number of Co = 27) [2]



SECTION - C

- *17. (i) Write the role of 'CO' in the purification of nickel.
(ii) What is the role of silica in the extraction of copper?
(iii) What type of metals are generally extracted by electrolytic method? [3]

18. Give reasons for the following:

- (i) Transition metals form alloys.
(ii) Mn_2O_3 is basic whereas Mn_2O_7 is acidic.
(iii) Eu^{2+} is a strong reducing agent. [3]

Ans. (i) Due to comparable radii / comparable size. 1

(ii) In Mn_2O_3 , Mn is in +3 (lower) oxidation state while in Mn_2O_7 , Mn is in higher oxidation state (+7) 1

(iii) Because its stable oxidation state is +3. 1

[CBSE Marking Scheme, 2019]

Detailed Answer:

- (i) Transition metals easily form alloys with other transition metals because they have almost similar size. So they can easily replace each other in the crystal lattice.
(ii) The transition metal oxides in the lower oxidation state of metals are basic in nature and in higher oxidation state they are acidic in nature. The oxidation state of Mn in Mn_2O_3 is +3 and Mn_2O_7 has +7. Therefore, Mn_2O_3 is basic and Mn_2O_7 is acidic.
(iii) The common oxidation state of lanthanide metals is +3. Eu^{2+} is formed by losing the two s electrons, acquires half filled ($4f^7$) configuration. But still, they oxidize to their common +3 state. So, the Eu^{2+} loses one electron and is oxidized to Eu^{3+} . So Eu^{2+} acts as a strong reducing agent.
- *20. (i) Why bithional is added in soap?
(ii) Why magnesium hydroxide is a better antacid than sodium bicarbonate?
(iii) Why soaps are biodegradable whereas detergents are non-biodegradable? [3]

OR

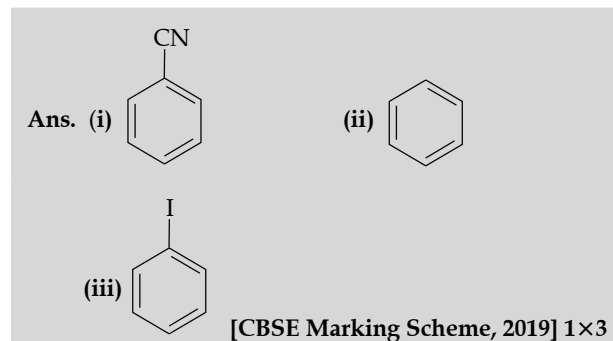
- * Define the following terms with a suitable example in each:

- (i) Antibiotics
(ii) Artificial sweeteners
(iii) Analgesics

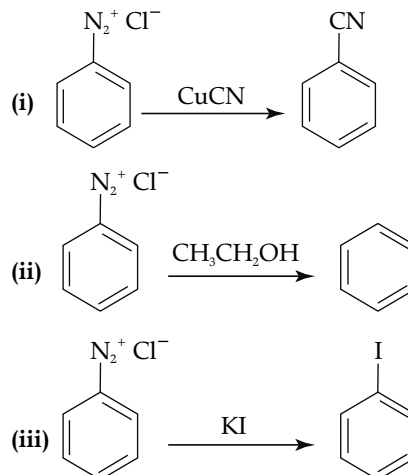
21. Write the structures of main products when benzene diazonium chloride reacts with the following reagents.

- (i) CuCN
(ii) CH₃CH₂OH
(iii) KI

[3]



Detailed Answer:



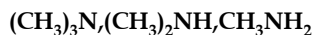
Delhi Set III

Code No. 56/1/3

Note: Except these questions, other questions are from Delhi Set-I and II

SECTION - A

1. Arrange the following in decreasing order of solubility in water: [1]



Ans. CH₃NH₂ > (CH₃)₂NH > (CH₃)₃N 1

[CBSE Marking Scheme 2019]

* 2. What type of stoichiometric defect is shown by ZnS and why? [1]

3. Write one stereochemical difference between S_N¹ and S_N² reactions. [1]

Ans.	S _N ¹	S _N ²
	Produces racemic mixture	Does not produce racemic mixture

[CBSE Marking Scheme 2019] [1]

SECTION - B

7. State Henry's law and write its two applications. [2]

Ans. Henry's law states that "the partial pressure of the gas in vapour phase (*p*) is proportional to the mole fraction of the gas (*x*) in the solution" 1

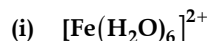
- To increase the solubility of CO₂ in soft drinks
- At high altitudes, the partial pressure of oxygen is less than that at the ground level. This leads to low concentration of oxygen in the blood and tissues of people living at high altitudes or climbers.
- Scuba divers must cope with high concentrations of dissolved gases while breathing air at high

pressure underwater. Increased pressure increases the solubility of atmospheric gases in blood.

(Any two) ½ + ½

[CBSE Marking Scheme 2019]

11. Write the hybridization and magnetic character of the following complexes:



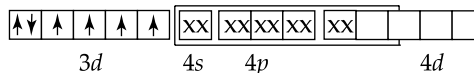
Ans. (i) sp³d², Paramagnetic ½

(ii) dsp³ / trigonal bipyramidal, Diamagnetic ½

[CBSE Marking Scheme 2019]

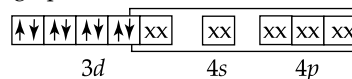
Detailed Answer:

- (i) In [Fe(H₂O)₆]²⁺ the oxidation state of Fe is +2. The outermost electronic configuration of Fe is 3d⁶ 4s² 4p⁰. H₂O is weak field ligand and does not cause pairing up of electrons.



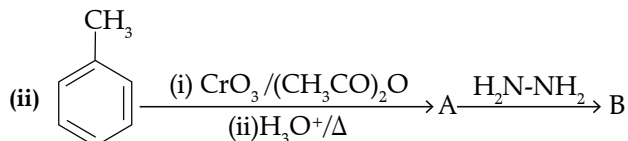
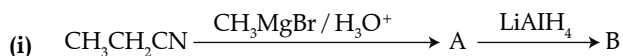
In this complex, there are 4 unpaired electrons. Therefore, it involves sp³d² hybridisation and is paramagnetic.

- (ii) In [Fe(CO)₅], the oxidation state of Fe is zero. The outermost electronic configuration of Fe is 3d⁶ 4s² 4p⁰. CO is strong field ligand, causes pairing up of 4s-electrons into the 3d-orbitals.



In this complex, there is no unpaired electron. diamagnetic.
Therefore, it involves dsp^3 hybridisation and is

12. Write structures of main compounds A and B in each of the following reactions: [2]



Ans. A \Rightarrow $\text{CH}_3\text{CH}_2\text{CO}-\text{CH}_3$,

B \Rightarrow $\text{CH}_3\text{CH}_2-\text{CH}(\text{CH}_3)-\text{OH}$

$\frac{1}{2} + \frac{1}{2}$

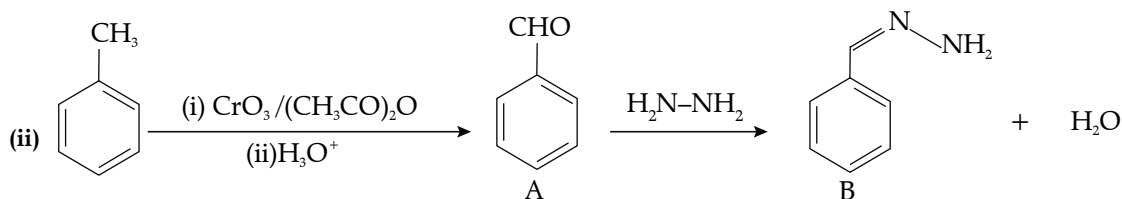
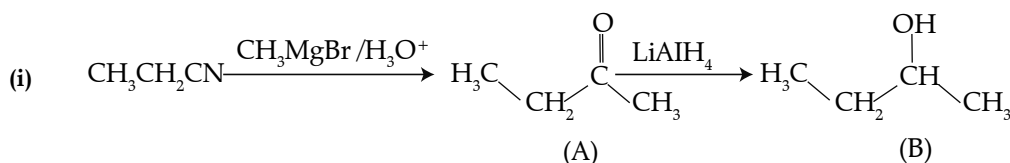
A \Rightarrow $\text{C}_6\text{H}_5\text{CHO}$,

B \Rightarrow $\text{C}_6\text{H}_5-\text{CH}=\text{N}-\text{NH}_2$

$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme 2019]

Detailed Answer:



SECTION - C

*17. How will you convert the following?

(i) Impure nickel to pure nickel

(ii) Zinc blende to zinc metal

(iii) $[\text{Ag}(\text{CN})_2]^-$ to Ag

[3]

22. Write equations of the following reactions:

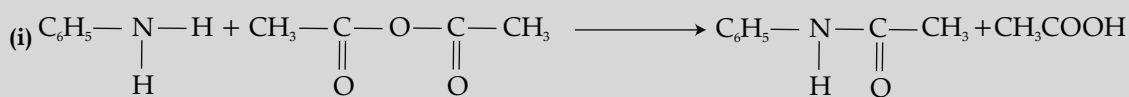
(i) Acetylation of aniline

(ii) Coupling reaction

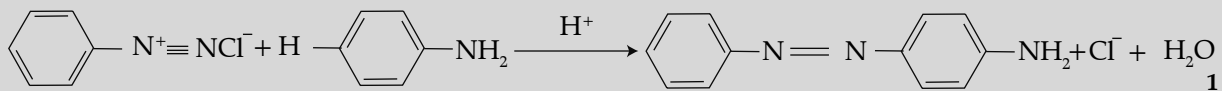
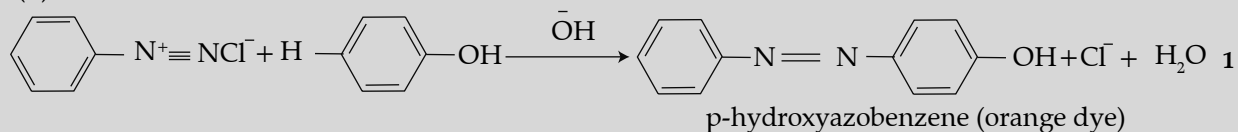
(iii) Carbyl amine reaction

[3]

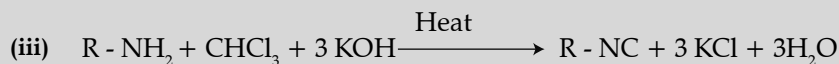
Ans.



(ii)



(any one)



1

[CBSE Marking Scheme 2019]

24. Define the following with a suitable example in each.

- (i) Oligosaccharides
 (ii) Denaturation of protein
 (iii) Vitamins

[3]

OR

Write the reactions involved when D-glucose is treated with the following reagents:

- (i) Br₂ water
 (ii) H₂N-OH
 (iii) (CH₃CO)₂O

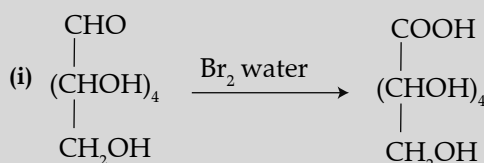
Ans. (i) Carbohydrates that yield two to ten monosaccharide units, on hydrolysis, are called oligosaccharides. Example- Sucrose or any other. 1

(ii) When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. Example- Boiling of egg. 1

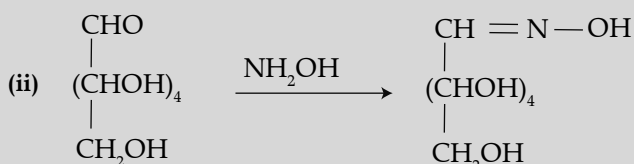
(iii) Organic compounds required in the diet in small amounts to perform specific biological functions for normal maintenance of optimum growth and health of the organism. Example- Vitamin A 1

[CBSE Marking Scheme 2019]

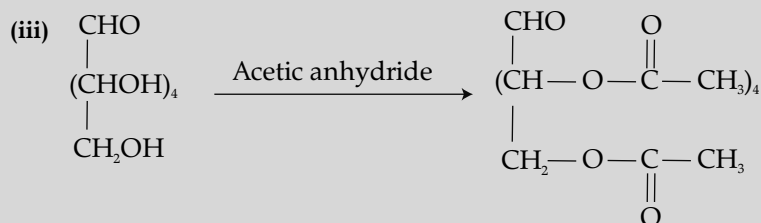
OR



1



1



1

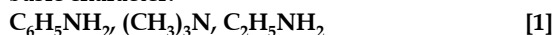
[CBSE Marking Scheme 2019]

Outside Delhi Set-I

Code No. 56/2/2

SECTION - A

1. Arrange the following in decreasing order of the basic character:



Ans. $(\text{CH}_3)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2 > \text{C}_6\text{H}_5\text{NH}_2$ 1
 [CBSE Marking Scheme 2019]

* 2. What type of colloid is formed when a solid is dispersed in a liquid? Give an example. [1]

3. Out of Chlorobenzene and cyclohexyl chloride, which one is more reactive towards nucleophilic substitution reaction and why? [1]

Ans. Cyclohexyl chloride. Because of partial double bond character of C-Cl bond in chlorobenzene/Resonance effect/ sp^3 hybridised carbon in cyclohexyl chloride whereas sp^2 carbon in chlorobenzene. 1

[CBSE Marking Scheme 2019]

SECTION - B

4. Give reasons:

(a) Cooking is faster in pressure cooker than in cooking pan.

(b) Red Blood Cells (RBC) shrink when placed in saline water but swell in distilled water. [2]

Ans. (a) Due to increase of pressure in cooker, boiling point of water increases.

(b) RBC loses water in saline water and absorbs water in distilled water due to osmosis.

(Or any other correct reason) 1 + 1

[CBSE Marking Scheme, 2019]

5. Write IUPAC name of the complex $[\text{Co}(\text{en})_2(\text{NO}_2)\text{Cl}]^+$. What type of structural isomerism is shown by this complex? [2]

OR

Using IUPAC norms, write the formulae for the following complexes:

- (a) Hexaaquachromium(III) chloride
(b) Sodium trioxalatoferrate(III)

Ans. Chloridobis(ethane-1,2-diamine)nitrito-N-cobalt(III) ion

Linkage isomerism 1 + 1

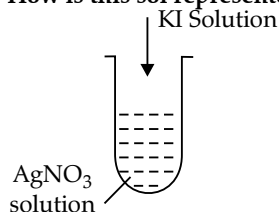
OR

- (i) $\text{Cr}(\text{H}_2\text{O})_6\text{Cl}_3$
(ii) $\text{Na}_3[\text{Fe}(\text{ox})_3]$ 1 + 1

[CBSE Marking Scheme, 2019]

SECTION - C

- * 6. (a) Write the dispersed phase and dispersion medium of dust.
(b) Why is physisorption reversible whereas chemisorption is irreversible?
(c) A colloidal sol is prepared by the method given in the figure. What is the charge on AgI colloidal particles formed in the test tube? How is this sol represented?

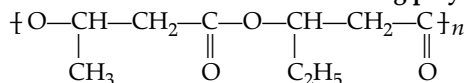


[3]

- * 9. Write the structures of monomers used for getting the following polymers:
(a) Nylon-6 (b) Terylene (c) Buna-N [3]

OR

- * (a) Is $\left[\text{CH}_2 - \text{CH}(\text{C}_6\text{H}_5) \right]_n$ a homopolymer or copolymer? Give reason.
(b) Write the monomers of the following polymer:



- (c) Write the role of benzoyl peroxide in polymerisation of ethene.

Outside Delhi Set-II

Code No. 56/2/1

SECTION - A

1. What is the basic structural difference between starch and cellulose? [1]

OR

Write the products obtained after hydrolysis of DNA.

Ans. Starch is a polymer of α -glucose whereas cellulose is a polymer of β -glucose. 1

[CBSE Marking Scheme 2019]

OR

2-deoxyribose + nitrogen containing heterocyclic base + phosphate 1

[CBSE Marking Scheme 2019]

- * 7. Write the name and principle of the method used for refining of (a) Zinc, (b) Germanium, (c) Titanium. [3]

8. Give reasons for the following :

- (a) Transition metals form complex compounds.
(b) E° values for $(\text{Zn}^{2+}/\text{Zn})$ and $(\text{Mn}^{2+}/\text{Mn})$ are more negative than expected.
(c) Actinoids show wide range of oxidation states.

[3]

Ans. (i) Due to small size, high ionic charge and availability of d -orbital. 1

(ii) Due to stable $3d^{10}$ configuration in Zn^{2+} and $3d^5$ configuration in Mn^{2+} . 1

(iii) Due to comparable energies of $5f$, $6d$ and $7s$ -orbitals / levels. 1

[CBSE Marking Scheme, 2019]

Detailed Answers:

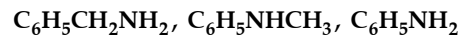
- (a) Transition metals are able to form complex compounds due to the small size of metal, high ionic charge and availability of vacant d -orbital.
(b) E° values of $(\text{Mn}^{2+}/\text{Mn})$ and $(\text{Zn}^{2+}/\text{Zn})$ are more negative than expected due to the greater stability of half filled d -subshell of $\text{Mn}^{2+}(3d^5)$ and completely filled d -subshell of $\text{Zn}^{2+}(3d^{10})$.
(c) Due to a very small energy gap between $5f$, $6d$ and $7s$ -subshells resulting in easier excitation of the outermost electrons to higher energy levels.

Detailed Answer:

The products formed after hydrolysis of DNA are :

- (i) Pentose sugar,
(ii) Phosphoric acid and
(iii) Nitrogenous bases.

2. Arrange the following in increasing order of p_{Kb} values: [1]



Ans. $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 < \text{C}_6\text{H}_5\text{NHCH}_3 < \text{C}_6\text{H}_5\text{NH}_2$ 1
[CBSE Marking Scheme 2019]

- * 3. What type of colloid is formed when a liquid is dispersed in a sol? Give an example. [1]

4. Out of chlorobenzene and *p*-nitrochlorobenzene, which one is more reactive towards nucleophilic substitution reaction and why? [1]

Ans. *p*-Nitrochlorobenzene ; Due to electron withdrawing nature of $-\text{NO}_2$ group. $\frac{1}{2} + \frac{1}{2}$
[CBSE Marking Scheme 2019]

Detailed Answer:

The relative *p*-nitrochlorobenzene is more reactive towards nucleophilic substitution reaction due to its electron-withdrawing inductive and resonance effects which results in the stabilised carbanion formed by the $-\text{NH}_2$ group.

- * 5. Out of KCl and AgCl, which one shows Schottky defect and why? [1]

OR

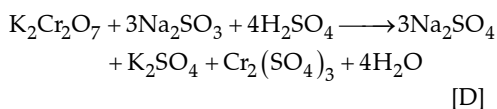
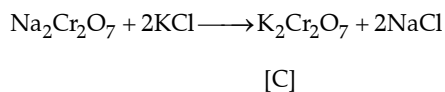
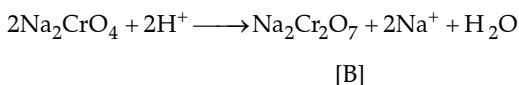
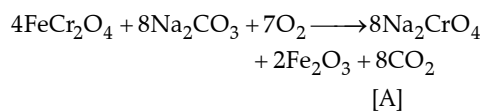
- * Why does ZnO appear yellow on heating?

SECTION - B

6. When FeCr_2O_4 is fused with Na_2CO_3 in the presence of air it gives a yellow solution of compound (A). Compound (A) on acidification gives compound (B). Compound (B) on reaction with KCl forms an orange coloured compound (C). An acidified solution of compound (C) oxidises Na_2SO_3 to (D). Identify (A), (B), (C) and (D). [2]

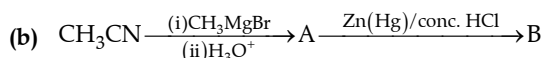
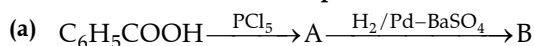
Ans. A = Na_2CrO_4 , B = $\text{Na}_2\text{Cr}_2\text{O}_7$, C = $\text{K}_2\text{Cr}_2\text{O}_7$, D = Na_2SO_4
 $\frac{1}{2} \times 4 = 2$
[CBSE Marking Scheme 2019]

Detailed Answer:



[A] Na_2CrO_4 : Sodium chromate, [B] $\text{Na}_2\text{Cr}_2\text{O}_7$: Sodium dichromate, [C] $\text{K}_2\text{Cr}_2\text{O}_7$: Potassium dichromate, [D] Na_2SO_4 : Sodium sulphate.

9. Write structures of main compounds A and B in each of the following reactions: [2]



7. Give reasons:

- (a) A decrease in temperature is observed on mixing ethanol and acetone.
(b) Potassium chloride solution freezes at a lower temperature than water. [2]

Ans. (a) Ethanol-acetone interaction is weaker than pure ethanol or acetone interactions.

- (b) On adding KCl, vapour pressure of the solution decreases 1 + 1

[CBSE Marking Scheme 2019]

Detailed Answer:

- (a) When ethanol is mixed with acetone, it shows positive deviation from Raoult's law and acetone molecules get in between the host molecules and break some hydrogen bonds, which requires higher energy than energy released in the formation of new hydrogen bonds. This results fall in temperature.
(b) According to Raoult's law, when a non-volatile solid is added to the solvent, its vapour pressure decreases resulting in decrease in freezing point. Also, the freezing point of water is higher than when water contains KCl.

- * 8. Write balanced chemical equations for the following processes:

- (a) Cl_2 is passed through slaked lime.
(b) SO_2 gas is passed through an aqueous solution of Fe(III) salt. [2]

OR

- * (a) Write two poisonous gases prepared from chlorine gas.
(b) Why does Cu^{2+} solution give blue colour on reaction with ammonia?

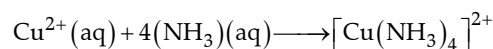
OR

- (b) Because it forms blue coloured complex $[\text{Cu}(\text{NH}_3)_4]^{2+}(\text{aq})$ or Equation 1

[CBSE Marking Scheme 2019]

Detailed Answer:

- (b) Cu^{2+} ion reacts with ammonia solution to form a deep blue coloured complex because of the property of ammonia to form complex compounds. Ammonia acts as a lewis base due to presence of lone pair of electrons on the nitrogen atom. Hence, it is able to form coordinate bond with electron deficient molecules or a number of transition metal cations.



Tetra-ammine copper (II) (blue colour)

Ans. (a) A = C₆H₅COCl B = C₆H₅CHO ½ + ½
 (b) A = CH₃COCH₃ B = CH₃CH₂CH₃ ½ + ½

[CBSE Marking Scheme 2019]

10. Define the following terms with a suitable example of each:

- (a) Chelate complex
 (b) Ambidentate ligand [2]

OR

Using IUPAC norms, write the formula for the following complexes: [2]

- (a) Tetraamminediaquacobalt(III) chloride
 (b) Dibromidobis(ethane-1,2-diamine) platinum(IV) nitrate

Ans. (a) A complex formed by bi or polydentate ligands with metal Example - [Co(en)₃]³⁺

½ + ½

(b) A ligand which can ligate through two different donor atoms. Example: SCN⁻

½ + ½

(Or any other correct example)

[CBSE Marking Scheme 2019]

OR

(i) [Co(NH₃)₄(H₂O)₂]Cl₃ 1(ii) [Pt Br₂(en)₂](NO₃)₂ 1

[CBSE Marking Scheme 2019]

11. (a) Using valence bond theory, write the hybridization and magnetic character of the complex [Fe(CN)₆]⁴⁻. (Atomic no. of Fe=26)

(b) Write the electronic configuration of d⁶ on the basis of crystal field theory when:

- (i) Δ₀ < P and
 (ii) Δ₀ > P [2]

Ans. (a) d²sp³, diamagnetic ½+½

(b) (i) t_{2g}⁴e_g² (ii) t_{2g}⁶e_g⁰ ½+½

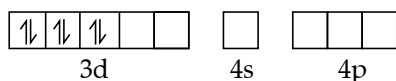
[CBSE Marking Scheme 2019]

Detailed Answer:

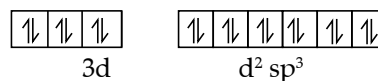
(a) Oxidation number of Fe is + 2 in [Fe(CN)₆]⁴⁻

Fe²⁺ - 3d⁶

CN⁻ being strong ligand pairs with 3d- orbital of Fe²⁺

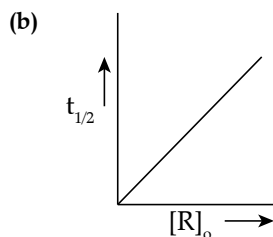
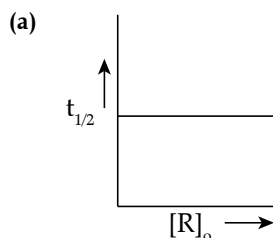


Six CN⁻ ions give their six pairs of electron to the empty orbitals. The orbitals utilized for hybridization is d² sp³.



Magnetic character -Diamagnetic.

12. Define order of reaction. Predict the order of reaction in the given graphs:



Where [R]₀ is the initial concentration of reactant and t_{1/2} is half life. [2]

Ans. It is defined as the sum of powers to which the concentration terms are raised in the rate law equation. 1

(a) First order (b) zero order ½+½

[CBSE Marking Scheme 2019]

SECTION - C

*13. (a) Write the dispersed phase and dispersion medium of milk.

(b) Why is adsorption exothermic in nature?

(c) Write Freundlich adsorption isotherm for gases at high pressure. [3]

Ans. (i) Dispersed phase = liquid ;

Dispersion medium = liquid

(ii) Due to the formation of new bonds / force of attraction between adsorbate and adsorbent .

(iii) x/m = kp⁰ = k 1 × 3 = 3

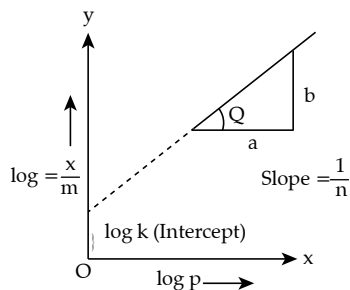
[CBSE Marking Scheme 2019]

Detailed Answer:

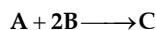
- (b) Because adsorption leads to a decrease in the residual forces on the surface of the adsorbent. This causes a decrease in the surface energy of the adsorbent. Therefore, adsorption is always exothermic.

$$(c) \log \frac{x}{m} = \log k + \frac{1}{n} \log p$$

At high pressure $\frac{x}{m} \propto p^{\circ}$



14. The following data were obtained for the reaction:



Experiment	[A]/M	[B]/M	Initial rate of formation of C/M min ⁻¹
1	0.2	0.3	4.2×10^{-2}
2	0.1	0.1	6.0×10^{-3}
3	0.4	0.3	1.68×10^{-1}
4	0.1	0.4	2.40×10^{-2}

- (a) Find the order of reaction with respect to A and B.
 (b) Write the rate law and overall order of reaction.
 (c) Calculate the rate constant (k).

Ans. Rate = $k[A]^p[B]^q$

On solving

(a) Order with respect to A=2, B=1 $\frac{1}{2} + \frac{1}{2}$

(b) Rate = $k[A]^2[B]^1$; overall order = $3 \frac{1}{2} + \frac{1}{2}$

(c) Experiment 1 : $4.2 \times 10^{-2} = k(0.2)^2(0.3)$; $k=3$
 $\frac{.5}{1}$

Experiment 2 : $6.0 \times 10^{-3} = k(0.1)^2(0.1)$; $k=6$

(Full marks may be awarded for any one correct answer)

[CBSE Marking Scheme 2019]

Detailed Answer:

Let the order of reaction with respect to A be x and with respect to B be y.

$$\therefore \text{Rate of reaction} = k[A]^x[B]^y$$

According to details given ,

$$4.2 \times 10^{-2} = k[0.2]^x [0.3]^y \quad \dots (1)$$

$$6.0 \times 10^{-3} = k[0.1]^x [0.1]^y \quad \dots (2)$$

$$1.68 \times 10^{-1} = k[0.4]^x [0.3]^y \quad \dots (3)$$

$$2.40 \times 10^{-2} = k[0.1]^x [0.4]^y \quad \dots (4)$$

Dividing equation (4) by (2), we get

$$\frac{2.40 \times 10^{-2}}{6.0 \times 10^{-3}} = \frac{k[0.1]^x [0.4]^y}{k[0.1]^x [0.1]^y}$$

$$4 = \frac{[0.4]^y}{[0.1]^y}$$

$$(4)^1 = (4)^y$$

$$y = 1$$

Dividing equation (1) by (3), we get

$$\frac{4.2 \times 10^{-2}}{1.68 \times 10^{-1}} = \frac{k[0.2]^x [0.3]^y}{k[0.4]^x [0.3]^y}$$

$$0.25 = \frac{[0.1]^x}{[0.2]^x}$$

$$(0.25) = (0.5)^x$$

$$(0.5)^2 = (0.5)^x \quad x = 2$$

- (i) So the rate of reaction with respect to A is 2 and with respect to B is 1.

(ii) Rate law = $k[A]^2[B]$

Overall order of reaction is 3.

(iii) Rate constant, $K = \frac{\text{Rate}}{[A]^2[B]}$

$$= \frac{6.0 \times 10^{-3}}{(0.1)^2(0.1)}$$

$$= 6.0 \text{ mol}^{-2} \text{ L}^2 \text{ min}^{-1}$$

- *15. Write the name and principle of the method used for refining of (a) Tin, (b) Copper, (c) Nickel. [3]

16. Give reasons for the following:

- (a) Transition metals show variable oxidation states.
 (b) E° value for $(\text{Zn}^{2+}/\text{Zn})$ is negative while that of $(\text{Cu}^{2+}/\text{Cu})$ is positive.
 (c) Higher oxidation state of Mn with fluorine is +4 whereas with oxygen is +7. [3]

Ans. (i) Because of comparable energies of $(n-1)d$ and ns -orbitals / Incomplete filling of d-orbital.

(ii) Because of stable $3d^{10}$ configuration of Zn^{2+} whereas due to low hydration enthalpy and high enthalpy of atomization of Cu^{2+} .

(iii) Due to the ability of oxygen to form multiple bonds with metal.

[CBSE Marking Scheme 2019] $1 \times 3 = 3$

Detailed Answer:

(a) Because of availability of partially filled orbitals and comparable energies of ns and $(n-1)d$ -orbitals.

(b) E° value for (Zn^{2+}/Zn) is negative due to stable completely filled d^{10} configuration in Zn^{2+} . The positive value of (Cu^{2+}/Cu) accounts for its ability to liberate H_2 from acids due to its high enthalpy of atomization and low hydration energy.

(c) Mn can form multiple bonds with oxygen by using $2p$ -orbital of oxygen and $3d$ -orbital of Mn because of which it shows highest oxidation state of +7 with fluorine, Mn cannot form multiple bonds thus shows an oxidation state of +4. [3]

*17. An element X with an atomic mass of 81 u has density 10.2 g cm^{-3} . If the volume of unit cell is $2.7 \times 10^{-23} \text{ cm}^3$, identify the type of cubic unit cell. (Given : $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$) [3]

18. A solution containing 1.9 g per 100 mL of KCl ($M = 74.5 \text{ g mol}^{-1}$) is isotonic with a solution containing 3 g per 100 mL of urea ($M = 60 \text{ g mol}^{-1}$). Calculate the degree of dissociation of KCl solution. Assume that both the solutions have same temperature. [3]

Ans.	$\pi_1(\text{urea}) = \pi_2(\text{KCl})$	$\frac{1}{2}$
	$C_1RT = i C_2RT$	1
	$\frac{n_1}{V_1} = i \frac{n_2}{V_2} \quad (V_1 = V_2)$	
	$\frac{30}{60} = i \times \frac{1.9}{74.5}$	$\frac{1}{2}$
	$i = 1.96$	
	$\alpha = \frac{i-1}{n-1}$	
	$= \frac{1.96-1}{2-1}$	
	$= 0.96 \text{ or } 96\%$	$\frac{1}{2}$

[CBSE Marking Scheme 2019]

*19. Write the structures of monomers used for getting the following polymers:

(a) Nylon-6,6

(b) Bakelite

(c) Buna-S

[3]

OR

* **(a)** Write one example each of

(i) Thermoplastic polymer

(ii) Elastomers

(b) Arrange the following polymers in the increasing order of their intermolecular forces: Polythene, Nylon-6,6, Buna-S

(c) Which factor provides crystalline nature to a polymer like Nylon?

20. Among all the isomers of molecular formula C_4H_9Br , identify

(a) the one isomer which is optically active.

(b) the one isomer which is highly reactive towards S_N^2 .

(c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH. [3]

Ans. (i) $CH_3CH_2CH(Br)CH_3$ 1

(ii) $CH_3CH_2CH_2CH_2Br$ 1

(iii) $(CH_3)_3CBr$ and $(CH_3)_2CHCH_2Br$ $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme 2019]

*21. **(a)** Pick out the odd one from the following on the basis of their medicinal properties :

Equanil, Seconal, Bithional, Luminal

(b) What type of detergents are used in dish washing liquids?

(c) Why is the use of aspartame limited to cold foods? [3]

OR

* Define the following terms with a suitable example of each: [3]

(a) Antibiotics

(b) Antiseptics

(c) Anionic detergents

22. **(a)** What are the products of hydrolysis of maltose?

(b) What type of bonding provides stability to α -helix structure of protein ?

(c) Name the vitamin whose deficiency causes pernicious anaemia. [3]

OR

Define the following terms: [3]

(a) Invert sugar

(b) Native protein

(c) Nucleotide

Ans. (a) Glucose + Glucose 1

(b) Hydrogen bonding 1

(c) Vitamin $-B_{12}$ 1

[CBSE Marking Scheme 2019]

Detailed Answer:

- (a) 2 molecules of glucose.
 (b) Intramolecular hydrogen bonding.
 (c) Vitamin B₁₂.

OR

- Ans. (i)** Hydrolysis of sucrose brings a change of sign of rotation from dextro(+) to laevo(-) and the product is named as invert sugar.
(ii) Protein found in biological system with unique three dimensional structure and biological activity is called native protein.
(iii) A unit formed by the combination of nitrogenous base, pentose sugar and phosphate. 1
 [CBSE Marking Scheme 2019]

23. (a) Give reasons:

- (i) Benzoic acid is a stronger acid than acetic acid.
 (ii) Methanal is more reactive towards nucleophilic addition reaction than ethanol.
 (b) Give a simple chemical test to distinguish between propanal and propanone. [3]

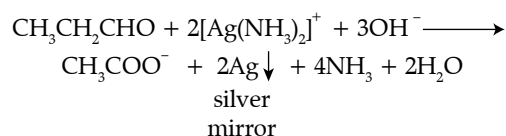
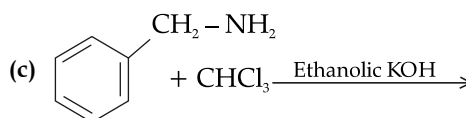
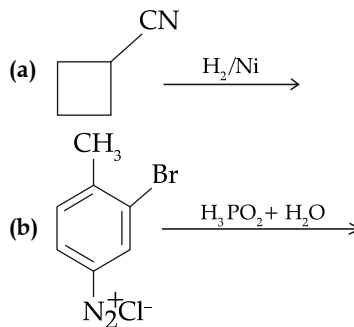
- Ans. (a) (i)** Due to greater electronegativity of sp² hybridised carbon to which carboxyl carbon is attached / due to greater resonance stabilization of carboxylate ion with the benzene ring. 1
(ii) Because carbonyl carbon of methanal is more electrophilic than that of ethanol / due to +I effect of methyl group in ethanol, reactivity decreases. 1
(b) On heating with Tollens' reagent / [Ag(NH₃)₂]⁺, propanal forms silver mirror whereas propanone does not. (or any other suitable chemical test) 1
 [CBSE Marking Scheme 2019]

Detailed Answer:

- (a) (i) Strength of acid depends on the ease of release of H⁺ ions. Benzoic acid contains benzene ring which is electron withdrawing whereas acetic acid contains methyl group which is electron releasing. The benzoate ion resulted from dissociation of benzoic acid is stabilized by

resonance whereas the acetate ion resulted from dissociation of acetic acid is not stabilized. Therefore, benzoic acid easily releases H⁺ ion than acetic acid.

- (ii) In methanal, presence of comparatively bulky group than methanol attached to carbonyl group hinders the attack of nucleophile. Also CH₃ group present in ethanol decreases the positive charge on carbonyl carbon by +I effect which is not possible in methanal. As Nu⁻ attack is favourable with more positive charge and less hindrance at carbonyl carbon, therefore methanal is more reactive than ethanol.
 (b) Propanal being an aldehyde when heated with Tollens' reagent to give silver mirror but propanone being a ketone does not.

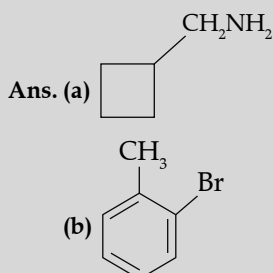
**24. Complete the following reactions:**

OR

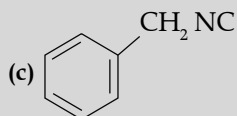
How do you convert the following:

- (a) N-phenylethanamide to *p*-bromoaniline
 (b) Benzene diazonium chloride to nitrobenzene
 (c) Benzoic acid to aniline

[3]

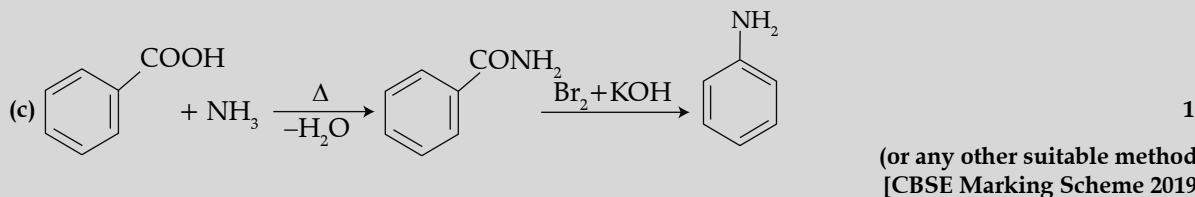
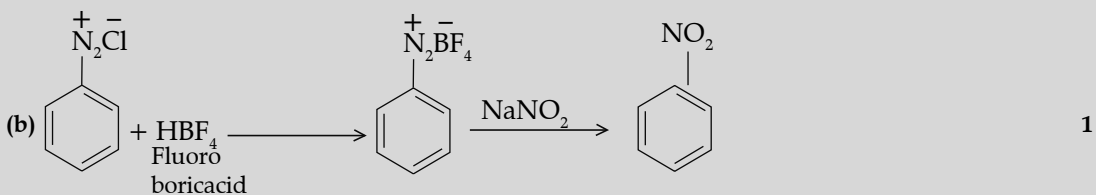
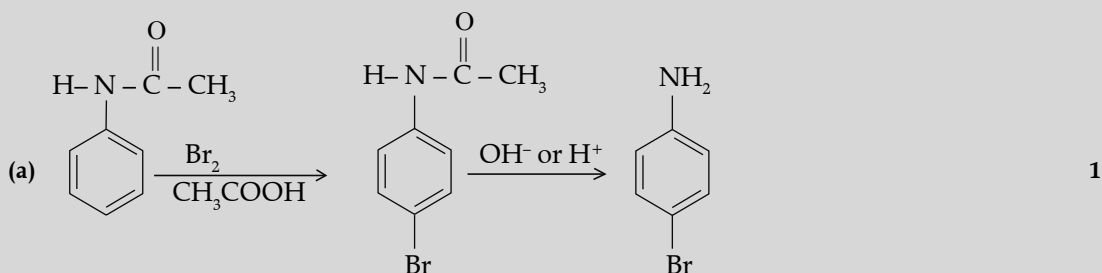
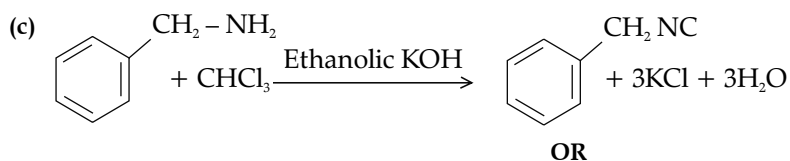
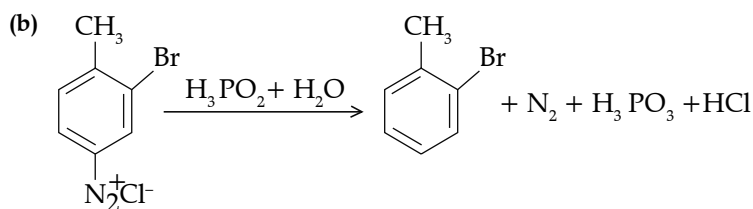
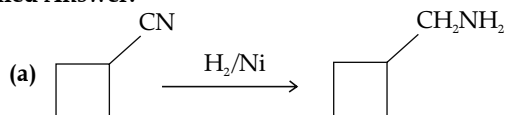


1 × 3 = 3



(or any other suitable method) [CBSE Marking Scheme 2019]

Detailed Answer:



SECTION - D

25. (a) Give equations of the following reactions:

(i) Phenol is treated with conc. HNO₃.(ii) Propene is treated with B₂H₆ followed by H₂O₂/OH⁻.(iii) Sodium t-butoxide is treated with CH₃Cl.

(b) How will you distinguish between butan-1-ol and butan-2-ol?

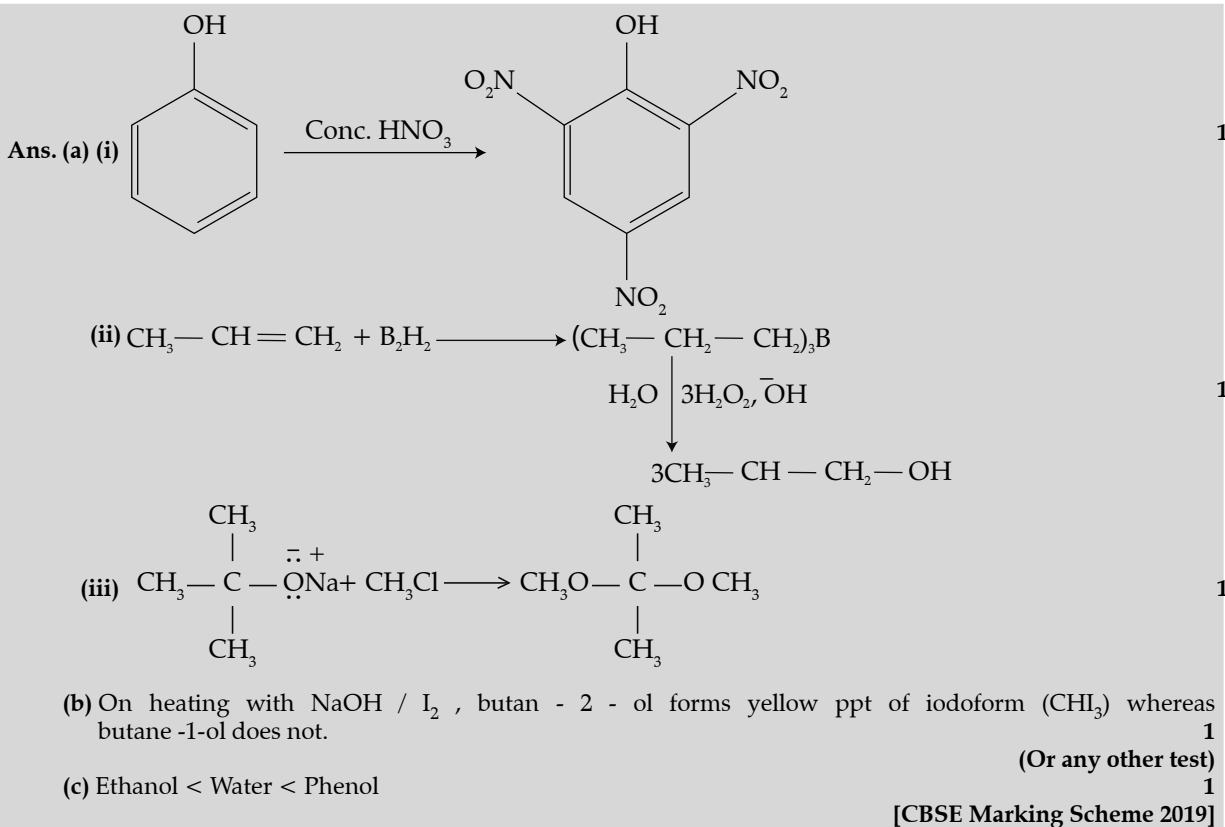
(c) Arrange the following in increasing order of acidity:

Phenol, Ethanol, Water

[5]

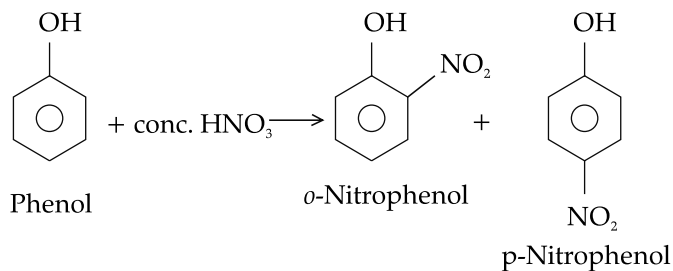
OR

- (a) How can you obtain Phenol from (i) Cumene, (ii) Benzene sulphonic acid, (iii) Benzene diazonium chloride?
 (b) Write the structure of the major product obtained from dinitration of 3-methylphenol.
 (c) Write the reaction involved in Kolbe's reaction.

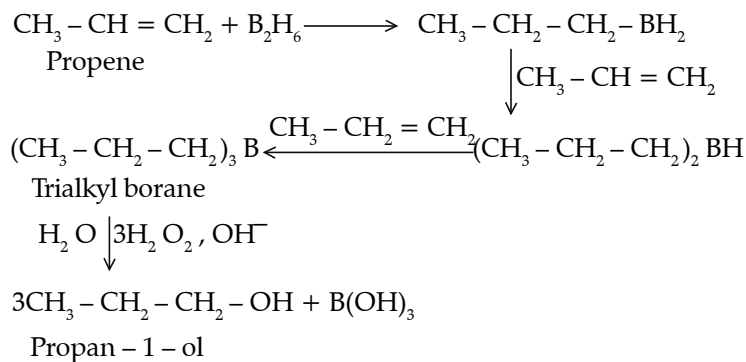


Detailed Answer:

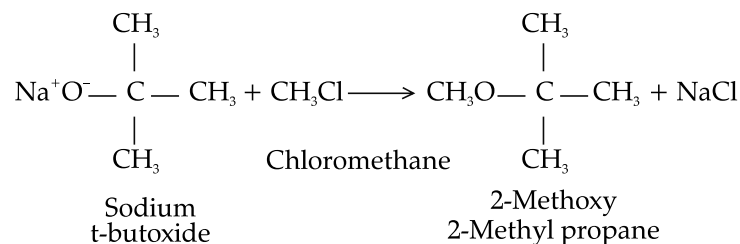
- (a) (i)



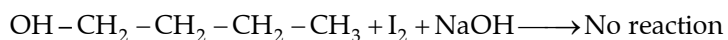
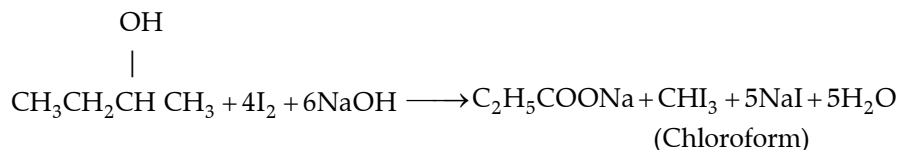
- (ii)



(iii)

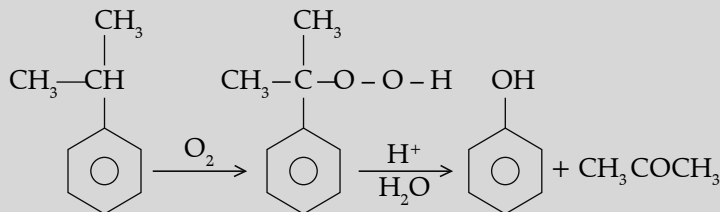


(b) **Iodoform test:** Butan-2-ol (secondary alcohol) reacts with iodine and NaOH to give yellow precipitate of CHI_3 (iodoform) whereas butan-1-ol does not react with iodine and NaOH.

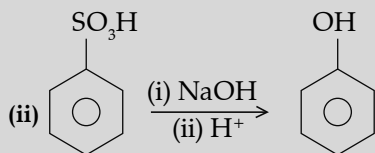


OR

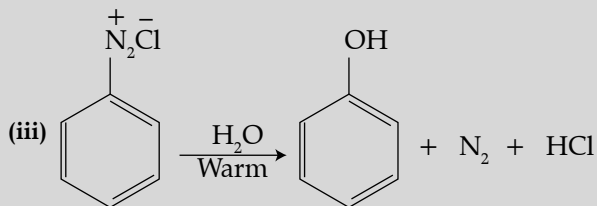
Ans. (a) (i)



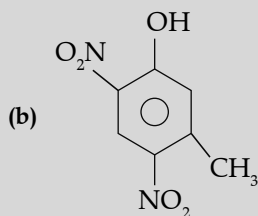
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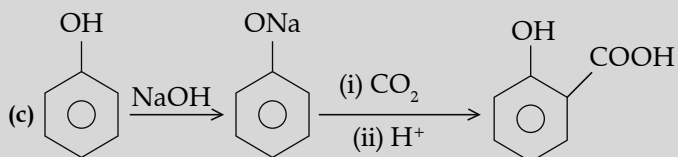


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(b)

1



[CBSE Marking Scheme 2019] 1

- *26. (a) Account for the following:
- Tendency to show -3 oxidation state decreases from N to Bi in group 15.
 - Acidic character increases from H_2O to H_2Te .
 - F_2 is more reactive than ClF_3 , whereas ClF_3 is more reactive than Cl_2 .

(b) Draw the structure of (i) XeF_2 , (ii) $\text{H}_4\text{P}_2\text{O}_7$. [5]

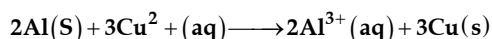
OR

- * (a) Give one example to show the anomalous reaction of fluorine.
- (b) What is the structural difference between white phosphorus and red phosphorus?
- (c) What happens when XeF_6 reacts with NaF ?
- (d) Why is H_2S a better reducing agent than H_2O ?
- (e) Arrange the following acids in the increasing order of their acidic character:

HBr , HI , HCl , HF [5]

27. (a) The conductivity of 0.001 mol L^{-1} acetic acid is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate the dissociation constant if Λ_m^0 for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$.

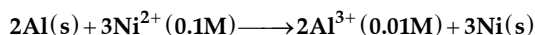
(b) Write Nernst equation for the reaction at 25°C :



(c) What are secondary batteries? Give an example. [5]

OR

(a) Represent the cell in which the following reaction takes place:



Calculate its emf if $E_{\text{cell}}^0 = 1.41\text{V}$.

(b) How does molar conductivity vary with increase in concentration for strong electrolyte and weak electrolyte? How can you obtain

limiting molar conductivity (Λ_m^0) for weak electrolyte? [5]

$$\text{Ans. (a)} \quad \Lambda_m = \frac{k}{c} = \frac{4.95 \times 10^{-5} \text{ S cm}^{-1}}{0.001 \text{ mol L}^{-1}} \times \frac{1000 \text{ cm}^3}{\text{L}} \quad 1$$

$$= 49.5 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^0} = \frac{49.5 \text{ S cm}^2 \text{ mol}^{-1}}{390.5 \text{ S cm}^2 \text{ mol}^{-1}} = 0.126 \quad 1$$

$$K = \frac{c\alpha^2}{(1-\alpha)} = \frac{0.001 \text{ mol L}^{-1} \times (0.126)^2}{1-0.126} \quad 1$$

$$= 1.8 \times 10^{-5} \text{ mol L}^{-1}$$

(If $K = c\alpha^2$, then $K = 1.6 \times 10^{-5} \text{ mol L}^{-1}$)

$$\text{(b)} \quad E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{6} \log \frac{[\text{Al}^{3+}]^2}{[\text{Cu}^{2+}]^3} \quad 1$$

(c) Batteries which are rechargeable
Example- Lead storage, Ni-Cd batteries (Or any other one example) $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme 2019]

OR

(a) $\text{Al}(\text{s}) | \text{Al}^{3+}(0.01\text{M}) || \text{Ni}^{2+}(0.1\text{M}) | \text{Ni}(\text{s})$ 1

$$E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{6} \log \frac{[\text{Al}^{3+}]^2}{[\text{Cu}^{2+}]^3} \quad \frac{1}{2}$$

$$E_{\text{cell}} = 1.41\text{V} - \frac{0.059}{6} \log \frac{[0.01]^2}{[0.1]^3} \quad 1$$

$$E_{\text{cell}} = 1.4198\text{V} \quad \text{or} \quad E_{\text{cell}} = 1.42\text{V} \quad \frac{1}{2}$$

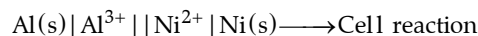
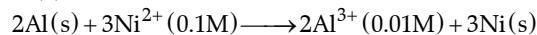
(b) Λ_m decreases with increase in concentration for both strong & weak electrolyte. Λ_m^0 can be obtained for weak electrolyte by applying Kohlrausch law /

$$\Lambda_m^0 = V_+ \lambda_+^0 + V_- \lambda_-^0 \quad 1 + 1$$

[CBSE Marking Scheme 2019]

Detailed Answer:

(a)



$$E_{\text{cell}} = E^0 - \frac{0.0591}{6} \log \frac{[0.01]^2}{[0.1]^3}$$

$$= 1.41 - \frac{0.0591}{6} \log 0.1$$

$$= 1.41 + \frac{0.0591}{6} \log 10$$

$$= 1.41 + \frac{0.0591}{6}$$

$$= 1.41 + 0.00985$$

$$= 1.42\text{V}$$

(b) When the concentration of weak electrolyte becomes very low, its degree of ionization rises. This increase leads to increase in the number of ions in the solution. Thus, the molar conductivity rises sharply of a weak electrolyte at low concentration. The molar conductivity of strong electrolyte decreases a bit with an increase in concentration. This is due to increase in interionic attraction due to higher number of ions per unit volume. On dilution, ions move apart, weakening interionic attractions and thus conductance increases.

Limiting molar conductivity for weak electrolytes is obtained by using Kohlrausch law of independent migration of ions.

Outside Delhi Set-III

Code No. 56/2/3

Note: Except these, all other questions are from Outside Delhi Set-I and II

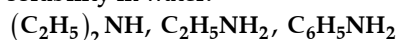
SECTION - A

1. Out of chlorobenzene and cyclohexyl chloride, which one is more reactive towards nucleophilic substitution reaction and why? [1]

Ans. Cyclohexyl chloride, because chlorobenzene is resistant to nucleophilic substitution reaction/ sp^3 hybridised carbon in cyclohexyl chloride whereas sp^2 carbon in chlorobenzene.

[CBSE Marking Scheme 2019]

2. Arrange the following in decreasing order of solubility in water:



[1]

Ans. $C_2H_5NH_2 > (C_2H_5)_2NH > C_6H_5NH_2$

1

[CBSE Marking Scheme 2019]

- * 3. What type of colloid is formed when a solid is dispersed in a gas? Give an example. [1]

5. What is the difference between amylase and amylopectin? [1]

OR

Write the products obtained after hydrolysis of lactose. [1]

Ans. Amylose is a linear polymer of α - glucose whereas amylopectin is a branched polymer of α - glucose/ Amylose is water soluble whereas amylopectin is water insoluble. 1

(Or any other correct difference)

[CBSE Marking Scheme 2019]

Detailed Answer:

Amylose is a long unbranched chain of α -D-glucose units held by C_1 - C_4 glycosidic linkage whereas amylopectin is a branched chain polymer of α -D-glucose units, units in which chain is formed by C_1 - C_6 glycosidic linkage while branching occurs by C_1 - C_6 glycosidic linkage.

OR

Ans. Glucose + Galactose

1

(Or any other correct difference)

[CBSE Marking Scheme 2019]

SECTION - B

7. Give reasons:

- (a) An increase in temperature is observed on mixing chloroform and acetone.
(b) Aquatic animals are more comfortable in cold water than in warm water. [2]

Ans. (a) Due to stronger interaction between chloroform and acetone than pure chloroform or acetone interactions. 1

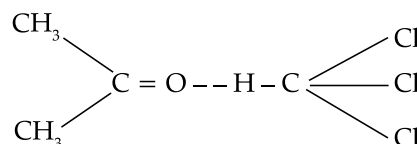
- (b) Because of high solubility of oxygen gas /low K_H value in cold water than in warm water.

1

[CBSE Marking Scheme 2019]

Detailed Answer:

- (a) On addition of chloroform and acetone, chloroform forms strong hydrogen bonding with acetone.



This results in release of energy due to increase in attractive forces. Hence, the dissolution is an exothermic process.

- (b) At a given pressure, the solubility of oxygen in water increases with decrease in temperature. Therefore, the concentration of oxygen in sea is more in cold water and thus, the presence of more oxygen at lower temperature makes the aquatic animals more comfortable in cold water.

10. Define the following terms with a suitable example of each:

(a) Polydentate ligand

(b) Homoleptic complex

[2]

OR

Using IUPAC norms, write the formulae for the following complexes:

(a) Potassium tri(oxalato)chromate(III)

(b) Hexaaquamanganese(II) sulphate

Ans. (i) A ligand having several donor atoms. Example: EDTA 1

- (ii) A complex in which a metal is bound to only one kind of donor groups / ligands. Example: $[Co(NH_3)_6]^{3+}$ 1

[CBSE Marking Scheme 2019]

OR

(i) $K_3[Cr(C_2O_4)_3]$

1

(ii) $[Mn(H_2O)_6]SO_4$

1

[CBSE Marking Scheme 2019]

11. (a) Although both $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ have sp^3 hybridisation yet $[NiCl_4]^{2-}$ is paramagnetic and $[Ni(CO)_4]$ is diamagnetic. Give reason. (Atomic no. of Ni = 28)

(b) Write the electronic configuration of d^5 on the basis of crystal field theory when.

(i) $\Delta_o < P$ and

(ii) $\Delta_o > P$ [2]

Ans. (a) In $[\text{NiCl}_4]^{2-}$, Cl^- is a weak field ligand due to which there are two unpaired electrons in 3d-orbital whereas in $[\text{Ni}(\text{CN})_4]^{2-}$, CN^- is a strong field ligand due to which pairing leads to no unpaired electron in 3d-orbital/ or structural representation.

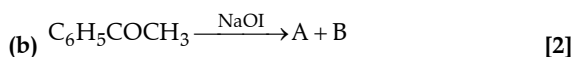
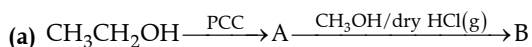
(b) (i) $t_{2g}^3 e_g^2$ (ii) $t_{2g}^5 e_g^0$ $\frac{1}{2} + \frac{1}{2}$
 $\frac{1}{2} + \frac{1}{2}$
 [CBSE Marking Scheme 2019]

Detailed Answer:

(a) In $[\text{NiCl}_4]^{2-}$, Ni is in +2 oxidation state and each Cl^- donates a pair of electron. So, Cl^- acts as a weak ligand and does, not cause any forced pairing. Thus, electrons remain unpaired making it paramagnetic.

In $[\text{Ni}(\text{CO})_4]$, Ni is in zero oxidation state and CO acts as a strong ligand causing forced pairing. Thus, no electron remains unpaired making it diamagnetic.

12. Write structures of main compounds A and B in each to the following reactions:



Ans. (a) A = CH_3CHO B = $\text{CH}_3\text{CH}(\text{OH})\text{OCH}_3$

(b) A and B = $\text{CHI}_3, \text{C}_6\text{H}_5\text{COONa}$ $\frac{1}{2} \times 4$

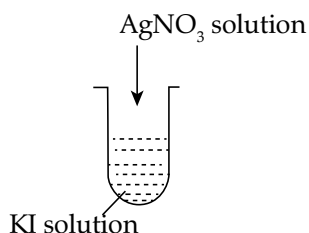
[CBSE Marking Scheme 2019]

SECTION - C

*14. (a) Write the dispersed phase and dispersion medium of butter.

(b) Why does physisorption decrease with increase in temperature?

(c) A colloidal sol is prepared by the method given in the figure. What is the charge on AgI colloidal particles formed in the test tube? How is this sol represented? [3]



*17. Write the principle of the following:

(a) Hydraulic washing

(b) Chromatography

(c) Froth-floatation process [3]

18. Give reasons for the following:

(a) Transition metals have high enthalpies of atomization.

(b) Manganese has lower melting point even though it has a higher number of unpaired electrons for bonding.

(c) Ce^{4+} is a strong oxidizing agent. [3]

Ans. (a) Because of strong interatomic interactions / Strong metallic bonding between atoms.

(b) Due to stable $3d^5$ configuration, interatomic interaction is poor between unpaired electrons.

(c) Because Ce is more stable in +3 oxidation state.

[CBSE Marking Scheme 2019]

*19. Write the structures of monomers used for getting the following polymers:

(a) Novolac

(b) Neoprene

(c) Buna-S [3]

OR

* (a) Write one example each of:

(i) Cross-linked polymer

(ii) Natural polymer

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

Terylene, Buna-N, Polystyrene

(c) Define biodegradable polymers with an example. [3]

20. (a) Write the product when D-glucose reacts with Br_2 (aq).

(b) What type of bonding provides stability to α -helix structure of protein?

(c) Name the vitamin whose deficiency causes pernicious anaemia. [3]

OR

Define the following terms:

(a) Invert sugar

(b) Native protein

(c) Nucleotide [3]

Ans. (a) Gluconic acid

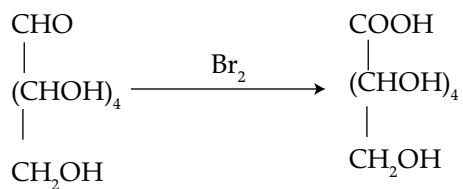
(b) Hydrogen bonding

(c) Vitamin $-\text{B}_{12}$

[CBSE Marking Scheme 2019] 1 + 1 + 1

Detailed Answer:

(a)



D - Glucose

D - Gluconic acid

D-Gluconic acid is formed

(b) Intramolecular hydrogen bonding.

(c) Vitamin B₁₂.**OR**

- (i) Hydrolysis of sucrose brings a change of sign of rotation from dextro(+) to laevo(-) and the product is named as invert sugar. **1**
- (ii) Protein found in biological system with unique three dimensional structure and biological activity is called native protein. **1**
- (iii) A unit formed by the combination of nitrogenous base, pentose sugar and phosphate.

[CBSE Marking Scheme 2019]