



SAMPLE PAPERS

Chemistry

XII

(3 Sample Papers with Solution)

**These Sample Papers are based on Latest Syllabus
and Blue Print issued by CBSE for the exams in
March, 2019**

Ver.01.1119

PREFACE

These sample papers have been developed by a team highly qualified teachers, with extensive experience in CBSE schools and curriculum teaching.

This set of Chemistry Sample Papers consist of 3 quality full course papers meant for self-assessment of students. Students are advised to solve these papers seriously like a board exam. After solving the papers they can verify their answers with the detailed solution given.

These papers are released by ‘**theclimb.in**’ a proposed educational website which is not active right now due to some technical issues. Interest students, teachers and parents may can contact us at **+91 8959595962** through message or whatsapp or through email id

‘helloclimbfoundation@gmail.com’

Teachers interested to frame quality papers and other contents may also contact at the above number or mail.

Wishing you all the best for the board exams and your cherished future.

Regards

Climb Administrator

1.1.2019

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Chemistry

Class- XII

Time Allowed : 3 Hours

Maximum Marks : 70

GENERAL INSTRUCTION:

- All questions are compulsory; however internal choice is given in some questions.
- Section A: Q.no. 1 to 5 are very short answer questions and carry 1 mark each.
- Section B: Q.no. 6 to 12 are short answer questions and carry 2 marks each.
- Section C: Q.no. 13 to 24 are also short answer questions and carry 3 marks each.
- Section D: Q.no. 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 of log tables is allowed but use of calculators is strictly not allowed.

Section – A

Q.01 In Corundum, O^{2-} ions form hcp and Al^{3+} occupy two third of octahedral voids. Determine the formula of corundum. [1]

OR

Conductivity of silicon increases on doping it with phosphorous. Why?

Q.02 Do the vital functions of the body, such as digestion gets affected during fever? Explain your answer? [1]

Q.03 Arrange the following complexes in increasing order of conductivity of their solution: [1]



OR

Arrange the following complexes ions in increasing order of crystal field splitting energy (Δ_0):



Q.04 Why is it necessary to avoid even traces of moisture during the use of a Grignard reagent? [1]

Q.05 Can nucleic acids, proteins and starch be considered as condensation polymers? [1]

Section – B

- Q.06 An aqueous solution containing 3.12 g of barium chloride in 250 g of water is found to be boil at 100.0832°C. Calculate the degree of dissociation of barium chloride. [2]

[Given molar mass $\text{BaCl}_2 = 208 \text{ g mol}^{-1}$, K_b for water = 0.52 K/m]

OR

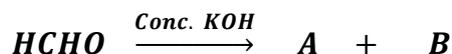
Determine the amount of CaCl_2 ($i = 2.47$) dissolved in 2.5 litre of water such that its osmotic pressure is 0.75 atm at 27 °C. [Given $R = 0.0821 \text{ atm L K}^{-1}$]

- Q.07 Identify A and B in the following: [2]



OR

Identify A and B in the following:



- Q.08 Write complete chemical equations for [2]

(a) Oxidation of Fe^{2+} by $\text{Cr}_2\text{O}_7^{2-}$ in acidic medium.

(b) Oxidation of Mn^{2+} by MnO_4^- in neutral or faintly alkaline medium.

- Q.09 What happens when: [2]

(i) Phenol reacts with zinc metal.

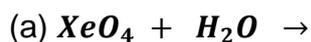
(ii) phenol is treated with aqueous bromine.

- Q.10 Define following: [2]

(a) Rate law

(b) Molecularity of a reaction

- Q.11 Complete the following chemical equation: [2]



- Q.12 Write the name of monomers of following polymers. [2]

(i) Nylon - 66

(ii) Teflon

Section – C

- Q.13 (a) In reference to Freundlich adsorption isotherm, write the expression for adsorption of gases on solids in the form of an equation.
(b) Write any two important characteristics of lyophilic sols.
(c) Based on type of particles of dispersed phase, give one example each of associated colloid and multimolecular colloid. **[3]**
- Q.14. (a) What is the significance of Henry's law constant K_H .
(b) What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar mass of solutes in solutions?
(c) How does sprinkling of salt help in clearing snow covered roads in hilly areas? Explain the phenomenon involved in the process. **[3]**
- Q.15 (a) Explain versatile nature of alcohols?
(b) Write the mechanism of dehydration of ethyl alcohol in the presence of conc. H_2SO_4 at 413 K? **[3]**
- Q.16 (a) Which sugar is called invert sugar? Why is it called so? **[3]**
(b) Why must vitamin C be supplied regularly in diet?
(c) Which amino acid is optical inactive and why?
- OR**
- (a) Coagulation of egg white on boiling is an example of denaturation of protein. Explain in terms of structural changes.
(b) How do you explain the presence of an aldehydic group in a glucose molecule?
(c) Write two important functions of nucleic acids?
- Q.17 (a) Convert: (i) Acetophenone to ethylbenzene (ii) Methyl chloride to ethanoic acid
(b) How will you distinguish between following pairs by suitable chemical tests.
(i) Benzaldehyde and Acetophenone (ii) Ethanal and propanal. **[3]**
- Q.18 (a) Explain why some times foaming is seen in river water near the place where sewage water is poured after treatment?
(b) What is scientific explanation for the feeling of depression?
(c) What is the medicinal use of narcotic drugs? (Any two) **[3]**
- Q.19 (a) An alkyl halide with molecular formula C_4H_9Br is optically active. What is its structure?
(b) Allyl chloride is hydrolysed more readily than *n*-propyl chloride. Why?
(c) *p*-Dichlorobenzene has higher melting point than *o*- and *m*-isomers. Discuss. **[3]**

OR

Write the major product when ethyl bromide reacts with following pairs.

- (a) AgNO_3 and KNO_3
- (b) KCN and AgCN
- (c) Aq. KOH and alc. KOH .

Q.20 The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume. [3]



Experiment	Time/ s^{-1}	Total pressure
1	0	0.5
2	100	0.6

Calculate the rate of the reaction when total pressure is 0.65 atm.

OR

The rate of a reaction quadruples when the temperature changes from 293 K to 313 K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.

- Q.21 An element occurs in *bcc* structure. It has a cell edge length of 250 pm. Calculate the molar mass if its density is 8.0 g/cm^3 . Also, calculate the radius of an atom of this element. [3]
- Q.22 (a) Name the method of refining to obtain low boiling point metals like mercury.
(b) What is the role of pine oil in froth flotation process?
(c) How is cast iron different from pig iron? [3]

OR

- (a) Indicate the principle behind the method used for the refining of nickel.
- (b) What is the role of silica in the extraction of copper?
- (c) Reduction of metal oxide to metal becomes easier if the metal obtained in liquid state. Why?

- Q.23 How would you account for the following: [3]
- (a) The chemistry of actinoids is more complicated as compared to lanthanoids.
 - (b) Transition metals form complex compounds.
 - (c) The enthalpies of atomization of transition metals are quit high.
- Q.24 (a) Define synergic effect. [3]
- (b) Write the hybridization and magnetic behaviour of the complex $[\text{Ni}(\text{CO})_4]$.
 - (c) On the basis of crystal field theory, write the electronic configuration of d^6 if,
(i) $\Delta_o > P$ (ii) $\Delta_o < P$.

Section – D

Q.25 (a) Arrange the following in the order of property indicated against each set: [5]

(i) F_2, Cl_2, Br_2, I_2 (increasing bond dissociation enthalpy)

(ii) H_2O, H_2S, H_2Se, H_2Te (increasing acidic character)

(b) A colourless gas 'A' with a pungent odour is highly soluble in water and its aqueous solution is weakly basic. As a weak base it precipitates the hydroxides of many metals from their salt solution. Gas 'A' finds application in detection of metal ions. It gives a deep blue colouration with copper ions. Identify the gas 'A' and write the chemical equations involved in the following:

(i) Gas 'A' with copper ions

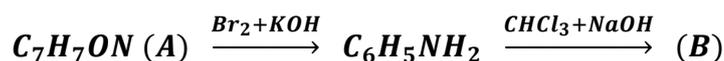
(ii) Solution of gas 'A' with $ZnSO_4$ solution.

OR

Answer the following questions

- (a) Sulphur in vapour state exhibits paramagnetism.
- (b) F_2 is stronger oxidising agent than Cl_2 . Why?
- (c) Nitric acid forms an oxide of nitrogen on reaction with P_4 . Write the formula of the stable molecule formed when this oxide undergoes dimerization.
- (d) Bleaching action of chlorine is permanent. Justify.
- (e) Write the disproportionation reaction of that oxoacid of nitrogen in which nitrogen is in +3 oxidation state.

Q.26 (a) Identify A and B in the following sequence of reaction. [5]



(b) Illustrate the following reaction giving suitable example in each case:

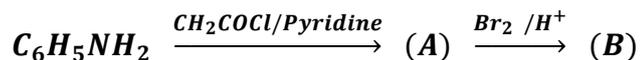
(i) Gabriel phthalimide synthesis

(ii) Diazotization

(c) A compound Z with molecular formula C_3H_9N reacts with $C_6H_5SO_2Cl$ to give a solid, insoluble in alkali. Identify Z.

OR

(a) Identify A and B in the following sequence of reaction.

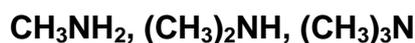


(b) Illustrate the following reaction giving suitable example in each case:

(i) Hoffmann's Bromamide degradation reaction

(ii) Coupling reaction

(c) Arrange the following in the increasing order of their basic character in aqueous solution:



Q.27 (i) Predict the products of electrolysis of the following: [5]

(a) An aqueous solution of $AgNO_3$ with Silver electrodes.

(b) An aqueous solution of $CuCl_2$ with platinum electrodes.

(ii) The conductivity of 0.001 M acetic acid is $4 \times 10^{-5} S cm^{-1}$. Calculate the dissociation constant of an acid, if molar conductivity at infinite dilution for acetic acid is $390 S cm^2 mol^{-1}$.

OR

(i) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch's law.

(ii) A voltaic cell is set up at $25^\circ C$ with the following half cells Al^{3+} (0.001 M) and Ni^{2+} (0.50 M).

Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.



Chemistry

Class- XII

Q.No.	Answers	Marks
Q.01	Al_2O_3 <u>OR</u> It is because silicon forms n-type semiconductor in which electron are free to move.	01 <u>OR</u> 01
Q.02	Yes, because these are condensation polymers involving loss of small molecules like H_2O , NH_3 etc., therefore, these are step growth polymers.	01
Q.03	$[\text{Pt}(\text{NH}_3)_3\text{Cl}_3] < [\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} < [\text{Pt}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2 < [\text{Pt}(\text{NH}_3)_6]\text{Cl}_3$ <u>OR</u> $[\text{Co}(\text{Cl})_6]^{3-} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{CN})_6]^{3-}$	01 <u>OR</u> 01
Q.04	Enzymes help in digestion process which works well at optimum temperature at 298 to 310 K. During fever, enzymatic activity is affected due to increases in temperature (>310 K)	01
Q.05	It is because Grignard reagent reacts with water to give hydrocarbon.	01
Q.06	$\text{BaCl}_2 \rightarrow \text{Ba}^{2+} + 2\text{Cl}^- ; n = 3$ $\Delta T_b = i \times K_b \times m$ $\Delta T_b = 373.0832 \text{ K} - 373.0 \text{ K} = 0.0832 \text{ K}$ $0.0832 = i \times 0.52 \times \frac{3.12 \times 1000}{208.34 \times 250}$ $i = 2.67$ $\alpha = \frac{i - 1}{n - 1}$ $\alpha = \frac{2.67 - 1}{3 - 1} = 0.835 \text{ or } 83.5 \%$ <u>OR</u> $\pi V = i \frac{W_B}{M_B} RT$ $0.75 \text{ atm} \times 2.5 \text{ L} = 2.47 \times \frac{W_B}{111} \times 0.082 \times 300 \text{ K}$	½ ½ 1 1 <u>OR</u> 1 1

	$W_B = 3.425 \text{ g}$	½
	$\text{No. of moles} = \frac{3.425}{111} = 0.03 \text{ mol}$	½
Q.07	$C_6H_5COOH \xrightarrow{PCl_5} C_6H_5COCl \xrightarrow{H_2-pd-BaSO_4} C_6H_5CHO$ <p style="text-align: center;">OR</p> $HCHO \xrightarrow{\text{Conc. KOH}} CH_3OH + HCOOH$	½ + ½ OR ½ + ½
Q.08		
(i)	$Cr_2O_7^{2-} + 6Fe^{+2} + 14H^+ \rightarrow 2Cr^{+3} + 6Fe^{+3} + 7H_2O$	01
(ii)	$2MnO_4^- + 3Mn^{+2} + 2H_2O \rightarrow 5MnO_2 + 4H^+$	01
Q.09		
(i)	Benzene is formed	01
(ii)	Tri bromo phenol is gformed	01
Q.10		
(a)	The sum of powers to which the concentrations terms are raised in a rate law expression is called order of reactions.	01
(b)	It is defined as the number of atoms or molecules or ions which must collide to each other simultaneously as to result in chemical reaction.	01
Q.11		
(a)	$6XeO_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$	01
(b)	$3Cu + 8HNO_3(\text{dilute}) \rightarrow 3Cu(NO_3)_2 + 2NO_2 + 4H_2O$	01
Q.12		
(a)	Adipic acid and hexamethylene diamine	01
(b)	Tetra fluoro ethane	01
Q.13		
(a)	$\log \frac{x}{m} = \log k + \frac{1}{n} \log p \text{ or } \frac{x}{m} = k \cdot P^{\frac{1}{n}}$	01
(b)	Lyophilic sols are stable and reversible.	½ + ½
(c)	Soaps and detergents form associated colloids. Whereas As_2S_3 and gold sol form multimolecular sols.	½ + ½
Q.14		
(a)	The higher the value of K_H , the lower will be the solubility of the gas in the liquid.	01
(b)	Osmotic pressure is determined at room temperature and has appreciable value which can be easily measured.	01
(c)	When salt is spread over snow covered roads, snow starts melting from the surface because of the depression in freezing point of water and it helps in clearing the roads.	01

<p>Q.15</p> <p>(a) Alcohols act as electrophiles as well as Nucleophiles (Explanation)</p> <p>(b) Mechanism of dehydration of ethyl alcohol in the presence of conc. Sulphuric acid at 413 k, it gives the yield of diethyl ether.</p> <p>*Protonation of alcohol</p> $C_2H_5OH + H^+ \rightarrow C_2H_5OH_2^+$ <p>*Nucleophilic attack of alcohol</p> $C_2H_5OH_2^+ + C_2H_5OH \rightarrow C_2H_5O^+C_2H_5$ <p>*Deprotonation</p> $C_2H_5O^+C_2H_5 \rightarrow C_2H_5OC_2H_5 + H^+$		<p>01</p> <p>02</p>
<p>Q.16</p> <p>(a) Sucrose is called invert sugar.</p> <p>Because, sucrose is dextrorotatory but after hydrolysis gives laevorotatory mixtures of glucose and fructose.</p> <p>(b) Vitamin C is water soluble therefore it is readily excreted in urine and cannot be stored in our body.</p> <p>Glycine, because 2 H-atom contains by carbon, or all four atom/group are not different.</p> <p>(a) <u>OR</u></p> <p>The hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity.</p> <p>(b) Glucose reacts with mild oxidant like Br₂ water and gives the Gluconic acid, which indicates the presence of aldehydic group in it.</p> <p>Two functions of nucleic acids are:</p> <p>(c) **Replication</p> <p>**Protein synthesis</p>		<p>½</p> <p>½</p> <p>01</p> <p>½ + ½</p> <p><u>OR</u></p> <p>01</p> <p>01</p> <p>½</p> <p>½</p>
<p>Q.17</p> <p>(a) i.</p> $C_6H_5COCH_3 \xrightarrow{NH_2, KOH, ethylene\ glycol} C_6H_5CH_2CH_3 + H_2O$ <p>ii.</p> $CH_3Cl + KCN \rightarrow CH_3CN + H_2O \xrightarrow{H^+} CH_3COOH$ <p>(b) i.</p> <p>Aceto phenone + I₂ solution + NaOH → yellow ppt of iodoform is formed.</p> <p>Benzaldehyde + I₂ solution + NaOH → No yellow ppt of iodoform is formed.</p> <p>ii.</p> <p>Ethanal + I₂ solution + NaOH → yellow ppt of iodoform is formed.</p> <p>Propanal + I₂ solution + NaOH → No yellow ppt of iodoform is formed.</p>		<p>½</p> <p>½</p> <p>01</p> <p>01</p>

<p>Q.18</p> <p>a)</p> <p>(b)</p> <p>(c)</p>	<p>Detergents persist in water even after sewage treatment and therefore, cause foaming in river water.</p> <p>A person suffers from depression when he has low level of noradrenaline. Low level of noradrenaline lowers the signal-sending activity and make the person suffer from depression.</p> <p>The narcotic drugs relive pain and produce sleep. Therefore, these are commonly used for the relief of postoperative pain, cardiac pain and pain of terminal cancer and in child birth.</p>	<p>01</p> <p>01</p> <p>½</p> <p>½</p>						
<p>Q.19</p> <p>(a)</p> <p>(b)</p> <p>(c)</p> <p>(a)</p> <p>(b)</p> <p>(c)</p>	<p>2-bromo butane (marks awarded for Structure)</p> <p>Due to resonance in allyl chloride it becomes more stable or less reactive towards hydrolysis.</p> <p>p-dichlorobenzen is a symmetrical structure which is better fit in crystal lattice, thus it required more temperature/energy to overcome the lattice energy.</p> <p style="text-align: center;">OR</p> <p>$C_2H_5Br + AgNO_3 \rightarrow C_2H_5NO_2$ $C_2H_5Br + KNO_3 \rightarrow C_2H_5ONO$</p> <p>$C_2H_5Br + KCN \rightarrow C_2H_5CN$ $C_2H_5Br + AgCN \rightarrow C_2H_5NC$</p> <p>$C_2H_5Br + KOH_{(alc)} \rightarrow C_2H_4$ $C_2H_5Br + KOH_{(aq)} \rightarrow C_2H_5OH$</p>	<p>01</p> <p>01</p> <p>01</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p>						
<p>Q.20</p>	$SO_2Cl_{2(g)} \rightarrow SO_{2(g)} + Cl_{2(g)}$ <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Pi</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">Pi - x</td> <td style="text-align: center;">x</td> <td style="text-align: center;">x</td> </tr> </table> <p>Pt = Pi + x + x = Pi + x</p> <p>As we know that from 1st order reaction in gaseous state can be written as,</p> $k = \frac{2.303}{t} \log \frac{p_i}{2p_i - p_t}$ <p>At 100 sec</p> $k = \frac{2.303}{100} \log \frac{0.5}{2 \times 0.5 - 0.6}$ $k = \frac{2.303}{100} \log \frac{0.5}{0.4} = 2.23 \times 10^{-3} s^{-1}$ <p>Pi + x = Pt 0.50 + x = 0.65 x = 0.15</p> <p style="text-align: center;">Rate = k(p_(SO₂Cl₂)) = k (p_i - x)</p> $= 2.23 \times 10^{-3} (0.5 - 0.15) = 7.805 \times 10^{-4} atm s^{-1}$ <p style="text-align: center;">OR</p>	Pi	0	0	Pi - x	x	x	<p>½</p> <p>½</p> <p>01</p> <p>01</p> <p>OR</p>
Pi	0	0						
Pi - x	x	x						

	$\log \frac{k_2}{k_1} = \frac{E_a}{2.303 R} \left(\frac{T_2 - T_1}{T_1 T_2} \right)$ $\log 4 = \frac{E_a}{2.303 \times 8.314} \left(\frac{313 - 293}{293 \times 313} \right)$ $E_a = \frac{19.147 \times 313 \times 293}{20 \times 1000} \times 0.6021$ $E_a = 52.86 \text{ kJ mol}^{-1}$	01 ½ ½ ½ + ½
Q.21	$d = \frac{Z \times M}{a^3 \times N_A}$ $M = \frac{d \times a^3 \times N_A}{Z}$ $M = \frac{8.0 \times (250)^3 \times (10)^{-30} \text{ cm} \times 6.023 \times 10^{23}}{2}$ $M = 37.64 \text{ gm/mol}$ <p>For bcc, $4r = \sqrt{3} a$</p> $r = \frac{\sqrt{3} a}{4}$ $r = \frac{1.732 \times 250}{4} = 108.25 \text{ pm}$	½ 1 ½ ½ ½
Q.22	<p>(a) Distillation</p> <p>(b). It acts as collector.</p> <p>(c) Cast iron is harder than pig iron.</p> <p style="text-align: center;">OR</p> <p>(a) Nickel can refine by vapour phase refining, principle associated with as following. **Metal can convert into volatile substances with a suitable reagent like CO. **Volatile compound can easily decomposable.</p> <p>(b) FeO is gangue. SiO₂ acts as flux to remove FeO by chemical reaction in the form of slag.</p> <p>(c) The entropy is higher if metal is in liquid state. ΔS is more +ve, so the value of ΔG° becomes more –ve and the reduction becomes easier.</p>	01 01 01 OR 01 01 01
Q.23	<p>(a) It is because they are radioactive and some of them have very short half-life.</p> <p>(b) It is due to small size, high charge and availability of vacant <i>d</i> –orbital of suitable energy.</p> <p>(c) It is due to smaller size of transition metals and strong metallic bonds due to the presence of of large number of unpaired electrons.</p>	01 01 01

Q.24		
(a)	The metal carbon bond in metal carbonyls possess both s and p character. The M-C sigma bond is formed by the donation of lone pair of electrons on the carbonyl carbon into a vacant orbital of the metal. The M-C pi bond is formed by the donation of a pair of electron from a filled d orbital of a metal into the vacant antibonding orbital of carbon monoxide. The metal to ligand bonding creates a synergic effect which strengthens the bond between CO and the metal.	1
(b)	Hybridization = sp^3 Magnetic behaviour = Diamagnetic	$\frac{1}{2}$ $\frac{1}{2}$
(c)	$\Delta_o > P, d^7 = t_{2g}^6 e_g^0$ $\Delta_o < P, d^7 = t_{2g}^5 e_g^1$	$\frac{1}{2}$ $\frac{1}{2}$
Q.25		
(a) (i)	$I_2 < F_2 < Br_2 < Cl_2$	01
(ii)	$H_2O < H_2S < H_2Se < H_2Te$	01
(b) (i)	NH_3	01
(ii)	$Cu_{(aq)}^{+2} + 4NH_3 \rightarrow [Cu(NH_3)_4]_{(aq)}^{+2}$	01
(iii)	$ZnSO_4(aq) + 2NH_4OH(aq) \rightarrow Zn(OH)_{2(s)} + (NH_4)_2SO_4(aq)$	01
	<u>OR</u>	<u>OR</u>
(a)	Sulphur has unpaired electron in its antibonding orbitals.	01
(b)	Due to low bond dissociation enthalpy and high hydration enthalpy of F_2 .	01
(c)	N_2O_4	01
(d)	Bleaching action of chlorine is permanent due to oxidation of chlorine. $Cl_2 + H_2O \rightarrow 2HCl + [O]$ Coloured substance + [O] \rightarrow Colourless substance	01 01
(e)	$HNO_2 \rightarrow HNO_3 + H_2O + 2NO$	01
Q.26		
(a)	'A' = $C_6H_5CONH_2$, 'B' = C_6H_5NC	01 + 01
(b)	<u>NCERT PART-II – PAGE NO. – 386 & 396</u>	01 + 01
(c)	$Z = CH_3 - NH - C_2H_5$	01
	<u>OR</u>	<u>OR</u>
(a)	'A' = $C_6H_5NHCOCH_3$, 'B' = $p\text{-Br-C}_6\text{H}_5\text{NH}_2$	01 + 01
(b)	<u>NCERT PART-II – PAGE NO. – 386 & 398</u>	01 + 01
(c)	$(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$	01
Q.27		
(i)	at anode: $[Ag_{(s)} \rightarrow Ag_{(aq)}^+ + e^-]$ Oxidation	$\frac{1}{2}$
(a)	at cathode: $[Ag_{(aq)}^+ + e^- \rightarrow Ag_{(s)}]$ Reduction	$\frac{1}{2}$
	$CuCl_2 \rightarrow Cu^{2+} + 2Cl^{-1}$	

(b)	$H_2O \rightarrow H^+ + OH^{-1}$ at anode: $[2Cl^{-1} \rightarrow Cl_2 + 2e^{-}]$ Oxidation at cathode: $[Cu_{(aq)}^{2+} + 2e^{-} \rightarrow Cu_{(s)}]$ Reduction	$\frac{1}{2}$ $\frac{1}{2}$
(ii)	$\Lambda_m = \frac{1000\kappa}{M} = \frac{1000 \times 4 \times 10^{-5}}{0.001} = 40 \text{ S cm}^2 \text{ mol}^{-1}$ $\alpha = \frac{\Lambda_m}{\Lambda_m^{\circ}} = \frac{40}{390} = 0.1026$ $K_a = \frac{C\alpha^2}{1 - \alpha} = \frac{0.001 \times (0.1026)^2}{1 - 0.1026} = 1.17 \times 10^{-5} \text{ mol L}^{-1}$	01 01 01
(i)	<p style="text-align: center;">OR</p> <p>Kohlrausch's law of independent migration of ions: According to this law, molar conductivity of an electrolyte, at infinite dilution, can be expressed as the sum of the contribution from its individual ions.</p>	01
(ii)	$\Lambda_m^{\circ} CH_3COOH = \lambda_m^{\circ} CH_3COO^{-} + \lambda_m^{\circ} H^{+}$ $[Al_{(s)} \rightarrow Al_{(aq)}^{3+} + 3e^{-}] \times 2$ $[Ni_{(aq)}^{+2} + 2e^{-} \rightarrow Ni_{(s)}] \times 3$ $2 Al_{(s)} + 3 Ni_{(aq)}^{+2} \rightarrow 2 Al_{(aq)}^{3+} + 3 Ni_{(s)} ; n = 6$	01 01
	$E_{cell} = (E_{Ni^{+2}/Ni}^{\circ} - E_{Al^{+3}/Al}^{\circ}) - \frac{0.0591}{n} \log \frac{[Al^{+3}]^2}{[Ni^{+2}]^3}$ $E_{cell} = [-0.25 - (-1.66)] - \frac{0.0591}{6} \log \frac{[10^{-3}]^2}{[0.50]^3}$	$\frac{1}{2}$ 01
	$E_{cell} = 1.41 \text{ V} - \frac{0.0591}{6} \log \frac{8 \times 10^{-6}}{1}$ $E_{cell} = 1.46 \text{ V}$	$\frac{1}{2}$

Chemistry

Class- XII

Time Allowed : 3 Hours

Maximum Marks : 70

GENERAL INSTRUCTION:

- All questions are compulsory; however internal choice is given in some questions.
- Section A: Q.no. 1 to 5 are very short answer questions and carry 1 mark each.
- Section B: Q.no. 6 to 12 are short answer questions and carry 2 marks each.
- Section C: Q.no. 13 to 24 are also short answer questions and carry 3 marks each.
- Section D: Q.no. 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 of log tables is allowed but use of calculators is strictly not allowed.

1. What type of semiconductor is produced when silicon is doped with boron?

OR

What type of stoichiometric defect is shown by AgBr?

- Write the dispersed phase and dispersion medium of butter.
- Draw structure of $\text{H}_2\text{S}_2\text{O}_8$
- Write the IUPAC name of $\text{H}_3\text{C} - \text{CH}=\text{CH} - \text{CH}_2 - \text{Br}$

OR

Write structural formula of 1-bromo-4-sec-butyl-2-methylbenzene

- What is Denatured Alcohol?
- (a) 2g each of two solutes A (sodium chloride) and B (Urea) are dissolved separately in 50g each of the same solvent. Which will show greater elevation in boiling point.
(b) Define isotonic solution.

OR

Calculate molality of sulphuric acid solution in which the mole fraction of water is 0.85

- How many moles of mercury will be produced by electrolyzing 1.0 M $\text{Hg}(\text{NO}_3)_2$ solution with a current of 2.00 A for 3 hours.
- Give reasons:
 - Cu^+ ion is not stable in aqueous solution.
 - Actinoids contraction is greater from element to element than lanthanoid contraction .
- (a) Arrange the following complexes in the increasing order of electrical conductivity

[Co (NH₃)₃Cl₃], [Co (NH₃)₃ Cl] Cl₂ , [Co (NH₃)₃]Cl₃

(b) Give IUPAC name of the following complex [Co (NH₃)₅(CO₃)] Cl

OR

(a) Why is [NiCl₄]²⁻ paramagnetic [Ni (Co₄)] is diamagnetic.

(b) Why are low spin tetrahedral complexes rarely observed?

10. How will you bring about following conversations?

(a) Propanone to propene

(b) Toluene to Benzoic acid

11. The following compounds are given:

2- Bromopentane, 2- Bromo-2- methyl butane, 1- Bromopentane

(a) Write the compound which is most reactive towards S_N² reaction.

(b) Write the compound which is optically active.

12. Write a chemical reaction in which iodine ion replaces the diazonium group in diazonium salt

13. Analysis shows that nickel oxide has the formula Ni_{0.98}O_{1.00}. What fraction of Nickel exists as Ni²⁺ and Ni³⁺ ions?

OR

X-ray diffraction studies show that copper crystallizes in an fcc unit cell with cell edge of 3.608 x 10⁻⁸ cm. In a separate experiment, copper is determined to have a density of 8.92 g/cm³. Calculate the atomic mass of copper.

14. 0.09g of a non-electrolyte was dissolved in 87.90g of benzene. This raised the boiling point of benzene by 0.25^oC, if the molecular mass of non-electrolyte is 103 g/mol. Calculate the molal elevation constant.

15.

(a) Why a solution of [Ni(H₂O)₆]²⁺ is green while solution of [Ni(CN)₄]²⁻ is colorless ? [At. No of Ni = 28]

(b) Write hybridization and magnetic behavior of complex [Ni(CO)₄]

(c) On the basis of crystal field theory, write the electronic configuration of d⁴ ion if Δ₀ > P.

16.

(a) Define antidepressant. Give two examples.

(b) Among the following which drug is an antibiotic.

Morphine, Equanil, Chloramphenicol, Aspirin.

17. Write the names of monomers of the following polymers

(a) Terylene

(b) Neoprene

(c) Buna-S

18. Name the following:

(a) The disease caused by vitamin B₁₂.

(b) What are the products of hydrolysis of sucrose?

(c) The type of bonding which stabilizes α-helix structure in proteins.

19. Blue color copper sulphate is slowly discharged when rod is dipped into it.

Explain this by calculating ΔG^o with the help of following data

$$E^{\circ}_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V} \quad E^{\circ}_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V} \quad 1F = 96500 \text{ coulomb/mole}$$

20. Complete the following equation:

- (a) $\text{MnO}_2 + \text{KOH} + \text{O}_2 \rightarrow$
- (b) $\text{Na}_2\text{CrO}_4 + \text{H}^+ \rightarrow$
- (c) $\text{MnO}_4^- + \text{H}^+ + \text{C}_2\text{O}_4^{2-} \rightarrow$

21.

- (a) Give one chemical test to distinguish between the following pairs of compounds:
 - i. Phenol and benzyl alcohol
 - ii. Pentan-2-one and pentan-3-one
- (b) Phenol is acidic but does not react with sodium –bicarbonate solution. Why?

OR

- (a) Explain the mechanism of acid catalyzed dehydration of an Ethanol forming an Ethene.
- (b) Write the chemical equation to illustrate Reimer-Tiemann reaction.

22.

- (a) In reference to Freundlich absorption isotherm write the expression for absorption of gases on solids in the form of an equation.
- (b) Explain the following term:
 - i. Zeta potential
 - ii. Lyophobic colloids

23. An alkene 'A' (molecular formula C_5H_{10}) on ozonolysis gives a mixture of two compounds 'B' and 'C'. compound 'B' gives positive Fehlings test and form idoform on treatment with I_2 and NaOH . Compound 'C' does not gives Fehlings test but forms idoform. Identify compounds 'A', 'B', 'C' and write the reactions involved

OR

- (a) Write the structures and IUPAC names of the cross aldol condensation products only of ethanal and propanol.
- (b) Why does benzoic acid not undergo Friedel- Crafts reaction?

24.

- (a) You are provided with some impure samples of zinc, copper and germanium which method would you prefer for the purification of each of these metals?
- (b) Write the name of reducing agent used to obtain iron from Fe_2O_3 at higher temperature.

25.

- (a) Give an example of each:
 - i. Zero order reaction
 - ii. Pseudo first order reaction
- (b) A certain reaction is 50% complete in 20 mins at 300K and the same reaction is 50% complete in 5 mins at 350K. Calculate the activation energy if it is a first order reaction. [$R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$, $\log 4 = 0.602$]

OR

- (a) Explain the following:
- Rate Constant
 - Threshold energy
- (b) The time required for 10% completion of first order reaction at 298K is equal to that required for its 25% completion at 308K. If the value of A is $4 \times 10^{10} \text{ s}^{-1}$, calculate k at 318K and E_a .

26.

- (a) Account for the following
- Aniline does not undergo Friedel crafts reaction
 - Although amino group is O-P directing in electrophilic substitution reactions aniline on nitration gives substantial amount of m-nitro anilines
 - Gabriel phthalimide synthesis is preferred for synthesizing primary amine
- (b) What is Hofmann's bromamide reaction
- (c) PK_b for aniline is more than that for methylamine why?

OR

- (a) Complete the following reactions
- $\text{C}_6\text{H}_5 \text{NH}_2 + \text{Br}_2 (\text{aq})$
 - $\text{C}_6\text{H}_5\text{N}_2 \text{Cl} + \text{H}_3\text{PO}_2 + \text{H}_2\text{O}$
- (b) Acetylation of $-\text{NH}_2$ group is done in aniline before preparing its ortho & Para Compound
- (c) Arrange the following in the order of increasing basic strength
- NH_3 , $\text{CH}_3 \text{NH}_2$, $(\text{CH}_3)_2 \text{NH}$, $(\text{CH}_3)_3 \text{N}$

27. Account for the following

- BiH_3 is a stronger reducing agent than SbH_3
- ClF_3 exists but FCl_3 does not
- SF_6 is inert towards hydrolysis
- Nitrogen shows little tendency of catenation than phosphorus
- Of the noble gases only, Xenon is known to form well established compound

OR

- (a) Complete the following chemical equation
- $\text{Cl}_2 + \text{NaOH} (\text{dil})$
 - $\text{XeF}_2 + \text{H}_2\text{O}$
 - $\text{P}_4 + \text{NaOH} + \text{H}_2\text{O}$
- (b) Arrange the following in order of property indicated
- HF, HCl, HBr, HI increasing, bond dissociation energy
 - $\text{H}_2 \text{O}$, H_2S , H_2Se , H_2Te - increasing acidic character

Chemistry

Class- XII

1. P-type

Or

Frenkel defect.

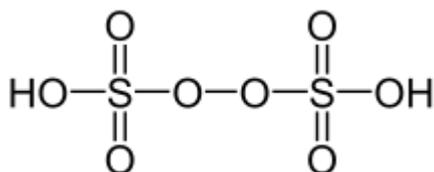
(1)

2. Dispersed phase: liquid, dispersed medium: solid.

(1)

3.

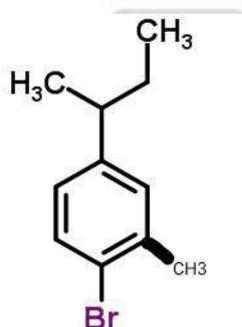
(1)



4. 3-bromo-prop-1-ene or

(1)

OR



theclimb.in

5. An alcohol is made unfit for drinking by adding poisonous compounds like methanol, pyridine, acetone etc. is called denatured alcohol.

(1)

6.

(1x2)

(a) A.

(b) Solutions which have the same osmotic pressure at the same temperature are called isotonic solution.

Or

Mole fraction of water = 0.85

(2)

Mole fraction of H_2SO_4 in solution = $1 - 0.85 = 0.15$

$w_1 = 1000\text{g}$

$n_1 = 1000/18 = 55.55$ moles

$n_2/n_1+n_2 = 0.15$

$n_2 / 55.55+n_2 = 0.15$

$$n_2 = 0.15 n_2 + 8.3325$$

$$0.85 n_2 = 8.3325$$

$$n_2 = 8.3325/0.85 = 9.8 \text{ moles}$$



$$Q = 2A \times 3 \times 3600C$$

$$= 21600C$$

2F produce Hg = 1 mole

$$\text{Therefore } 21600C \text{ will produce Hg} = 1 \times 21600 / 2 \times 96500 \\ = 0.112 \text{ mole}$$



(a) Cu^{2+} (aq) is more stable than Cu^+ (aq) this is because ΔH_{Hyd} for Cu^{2+} is much more negative than that for Cu^+ (aq) although IE_2 for copper is large. The ΔH_{Hyd} value compensate for IE_2 therefore Cu^+ (aq) is unstable.

(b) Due to poor shielding by 5f electron than by 4f electron



(b) pentaamminecarbonate cobalt (III) chloride

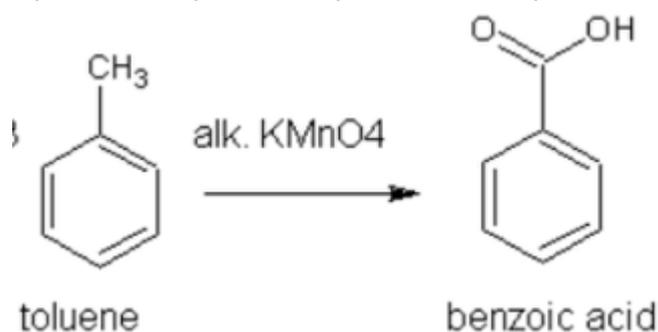
OR

(2)

(a) In $[\text{NiCl}_4]^{2-}$ Ni has +2 oxidation state with E. C., $3d^8 4s^0$ Cl^- being a weak ligand does not allow pairing of electron hence it is paramagnetic.

In $[\text{Ni}(\text{CO})_4]$ oxidation state of Ni is 0 and CO is a strong ligand therefore pairing of electrons occur and the complex is diamagnetic.

(b) $\Delta t = 4/9 \Delta_0$ for tetrahedral complexes. This energy is very small that it is unable to force the electron to pair up.



(b)



(b) 2- Bromo-2- methyl butane



$$Z = d \cdot a^3 N_a / M$$

$$= 10 \cdot (3 \cdot 10^{-8})^3 \times 6.023 \times 10^{23} / 81$$

$$= 27 \cdot 6.023 / 81$$

$$= 2$$

$$\text{In fig } 4r = a \cdot (2^{1/2})$$

$$a = 4 \cdot r / (2)^{1/2}$$

$$a = 2.828 \cdot 127.8$$

$$= 361.4 \text{ pm}$$

$$= 361.4 \cdot 10^{-10} \text{ cm}$$

14. $M_2 = 1000 K_b W_2$ (3)

$$K_b = M_2 \cdot W_1 \cdot \Delta_{Tb} / 1000 W_2$$

$$= 103 \cdot 87.90 \cdot 0.25 / 1000 \cdot 0.98$$

$$= 2.515 \text{ K Kg mol}^{-1}$$

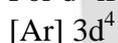
15. (1x3)

(a) In $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ Ni is in +2 oxidation state its E. C. = $3d^8$. It has 2 unpaired electrons which undergo d-d transition. Therefore, it appears green.

In case of $[\text{Ni}(\text{CN})_4]^{2-}$ Ni is in +2 oxidation state configuration $3d^8$ but due to presence of strong ligand e^- pair up no unpaired e^- is present hence it is colorless.

(b) sp^3 hybridization, diamagnetic oxidation state of Ni = 0. EC = $[\text{Ar}] 3d^8 4s^2$

(c) For d^4 if $\Delta > P$



16.

(a) Antidepressant (2)

Eg: phenelzine, iproniazid

(b) Chloramphenicol (1)

17. (3)

Polymer	Name of monomer
Terylene	Teryphaltic acid & ethylene glycol
Nylon6	Caprolactum
Buna-S	Styrene & 1,3- butadiene

18. (3)

(a) No reaction with NaHSO_3

(b) No reaction with $\text{C}_6\text{H}_5\text{NHNH}_2$

(c) No reaction with NH_2OH

OR

(a) Pernicious anaemia (3)

(b) Glucose & fructose

(c) Hydrogen bonding

19. $\Delta G^0 = -nFE^0_{\text{cell}}$ (3)

$$n=2$$

$$E^0_{\text{cell}} = E^0_{\text{Red}} - E^0_{\text{Oxi}}$$

$$= 0.34 - (-0.44)$$

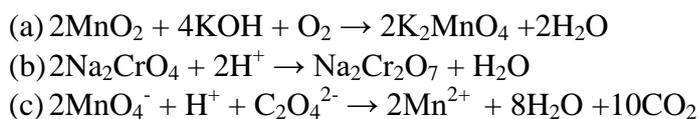
$$= + 0.78 \text{ V}$$

$$\Delta G^\circ = -2 \times 96500 \times (0.78)$$

$$= -150540$$

As ΔG° is -ve reaction is spontaneous

20. (3)



21. (3)

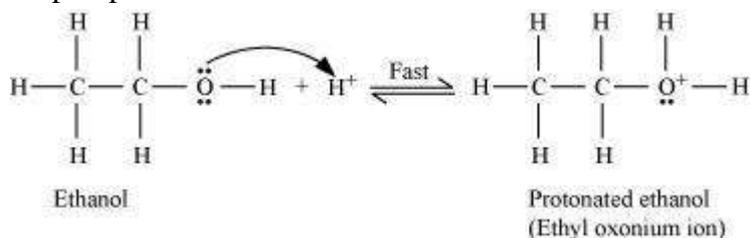
Phenol	Benzyl Alcohol
Gives violet colour with FeCl_3 solution	No reaction
Pentan-2-one	Pentan-3-one
Gives iodoform test and gives yellow colour iodoform	No reaction

OR

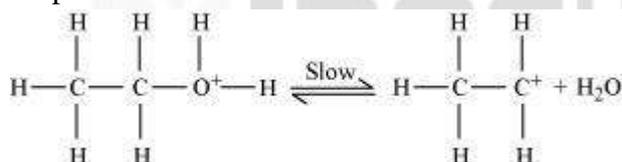
(3)

(a) Acid catalyzed dehydration of alcohol

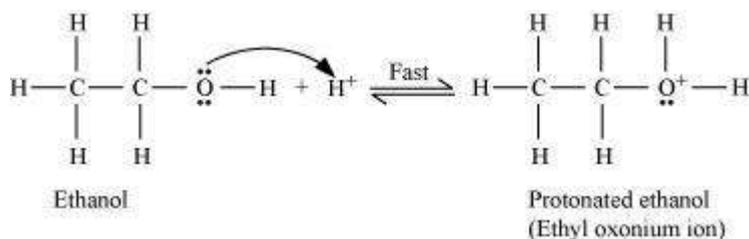
Step 1 :protonation of alcohol



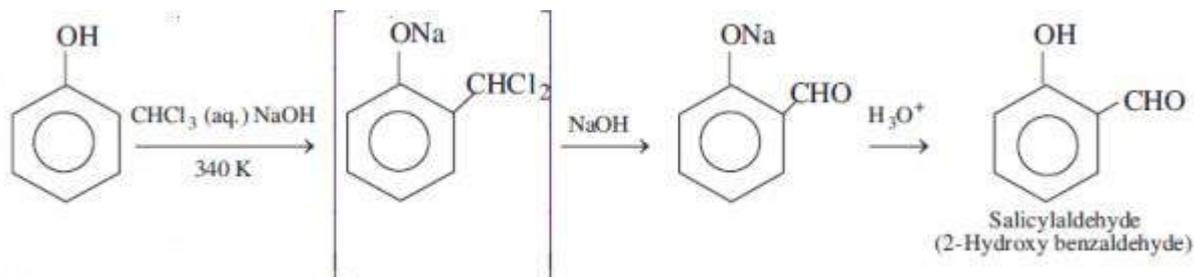
Step 2: formation of carbocation



Step 3: deprotonation



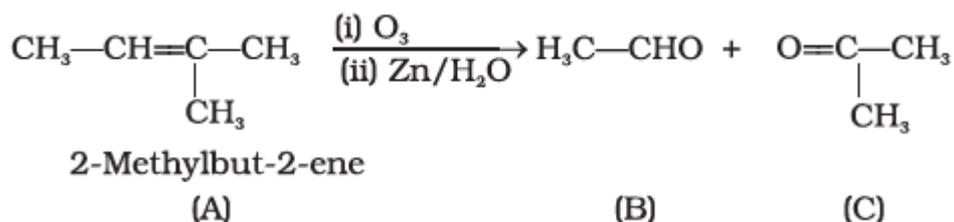
(b)



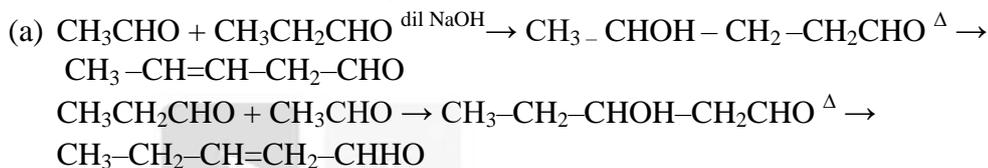
22. (3)

- a) $x/m = KP^n$
- b) i) Zeta Potential: The potential difference between the fixed charge layer and diffuse layer having opposite charges around the colloidal particle is Zeta potential.
- ii) Lyophobic colloid: Based on interaction between dispersed phase and dispersion medium a lyophobic colloid is liquid heating and are reversible in nature.

23. (3)



OR



(b) -COOH group is Electron withdrawing group, it increases e^- density on COOH group. Therefore lewis acid anhydrous HCl_3 gets bonded and does not show Friedel-Crafts reaction

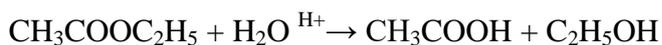
24. (3)

- (a) Zone refining will help in purifying germanium, copper by electrolytic refining, zinc by distillation
- (b) Coke
- $$\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow \text{Fe} + 3\text{CO}$$

25. (1x2)



(ii) Pseudo first order reaction- Hydrolysis of ethyl acetate



(b)

(3)

$$t_{1/2} = 20 \text{ min}$$

$$k_1 = \frac{0.693}{t_{1/2}} = \frac{0.693}{20} \text{ min}^{-1}$$

$$k_2 = \frac{0.693}{t_{1/2}} = \frac{0.693}{5} \text{ min}^{-1}$$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303 R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

or

$$\log \frac{\frac{0.693}{20}}{\frac{0.693}{5}} = \frac{E_a}{2.303 \times 8.314} \left(\frac{1}{300} - \frac{1}{350} \right)$$

or

$$\begin{aligned} E_a &= \frac{19.147 \times 350 \times 300 \times \log 4}{50} \\ &= \frac{19.147 \times 7 \times 300 \times 0.6021}{1000} \\ &= 24.2 \text{ kJ mol}^{-1}. \end{aligned}$$

OR

(a)

(1x2)

(i) Rate constant – the rate of the reaction when molar concentration of each reactant is taken as unity.

(ii) Threshold energy- the minimum energy which the colliding molecules must have in order to make collision effective

(b) For a first order reaction,

(3)

$$t = 2.303 / k \log a / a - x$$

At 298 K,

$$t = 2.303 / k \log 100 / 90$$

$$= 0.1054 / k$$

At 308 K,

$$t' = 2.303 / k' \log 100 / 75$$

$$= 2.2877 / k'$$

According to the question,

$$t = t'$$

$$\Rightarrow 0.1054 / k = 2.2877 / k'$$

$$\Rightarrow k' / k = 2.7296$$

From Arrhenius equation, we obtain

$$\log \frac{k'}{k} = \frac{E_a}{2.303 R} \left(\frac{T' - T}{TT'} \right)$$

$$\log(2.7296) = \frac{E_a}{2.303 \times 8.314} \left(\frac{308 - 298}{298 \times 308} \right)$$

$$E_a = \frac{2.303 \times 8.314 \times 298 \times 308 \times \log(2.7296)}{308 - 298}$$

$$= 76640.096 \text{ J mol}^{-1}$$

$$= 76.64 \text{ kJ mol}^{-1}$$

To calculate k at 318 K,

It is given that, $A = 4 \times 10^{10} \text{ s}^{-1}$, $T = 318\text{K}$

Again, from Arrhenius equation, we obtain

$$\log k = \log A - \frac{E_a}{2.303 R T}$$

$$= \log(4 \times 10^{10}) - \frac{76.64 \times 10^3}{2.303 \times 8.314 \times 318}$$

$$= (0.6021 + 10) - 12.5876$$

$$= -1.9855$$

Therefore, $k = \text{Antilog}(-1.9855)$

$$= 1.034 \times 10^{-2} \text{ s}^{-1}$$

26.

(a)

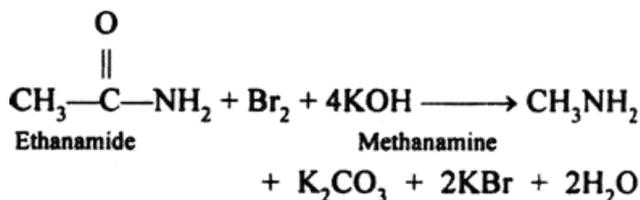
(i) aniline is a lewis base it reacts with lewis acid AlCl_3 to form a salt

(ii) In strongly acidic medium aniline gets protonated to form anilinium ion which is meta directing in nature

(iii) Gabriel phthalimide reaction gives pure one degree amine

(b) Hofmann Bromide Reaction is the conversion of an Amide to an 1° (1)

Amine containing one less carbon atom than the original amide. Thus it is also known as Hofmann Degradation of Amide.

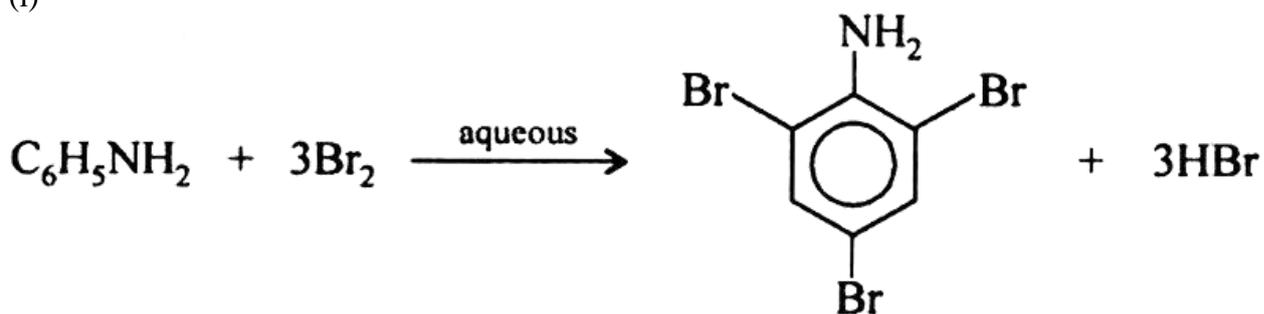


(c) Methylamine shows + I effect as a result electron density on nitrogen increases (1)

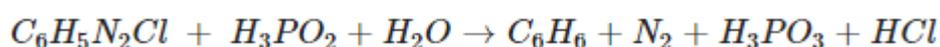
whereas in aniline lone pair of electron on the nitrogen atom gets localized over benzene ring therefore electron density on nitrogen decreases hence PK_b value is higher than methylamine

OR

(a) (i) (1x2)



(ii)



(b) Acetylation is done to deactivate NH_2 group. Acyl group is electron withdrawing group. As a result lone pair is not exclusively available for donation to the benzene ring so activating effect of NH_2 group is reduced (2)

(c) $\text{NH}_3 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$ (1)

27. (1x5)

- As we move from NH_3 to BiH_3 thermal stability of the hydride decreases, tendency to liberate hydrogen increases
- F cannot exhibit valency more than 1 due to absence of d orbital, 3 big size chlorine atom cannot be accommodated around small sized F atom.
- SF_6 is sterically protected by 6 F atoms and hence does not allow water molecule to attack.
- The N-N bond strength is lower than that of P-P.
- Xe has lowest ionization enthalpy and hence forms compound with strong oxidising agent

OR

(a) (1x3)

- $6\text{NaOH} + 3\text{Cl}_2 \rightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$
- $2\text{XeF}_2 + 2\text{H}_2\text{O} \rightarrow \text{O}_2 + 2\text{Xe} + 4\text{HF}$
- $\text{P}_4 + 4\text{NaOH} + 2\text{H}_2\text{O} = 2\text{PH}_3 + 2\text{Na}_2\text{HPO}_3$

(b) (1x2)

- $\text{HI} < \text{HBr} < \text{HCl} < \text{HF}$
- $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

Chemistry

Class- XII

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- Use of log tables is allowed but use of calculators is strictly not allowed.

1. Why does table salt, NaCl, sometimes appear yellow in colour?

OR

What type of stoichiometric defect is shown by AgCl?

2. What happens when persistent dialysis of a colloidal solution is carried out?

3. Lead nitrate on heating gives a brown gas which undergoes dimerization on cooling. Identify the gas?

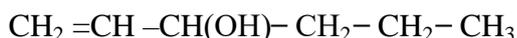
OR

Why is nitrogen less reactive than phosphorus?

4. In the following pair of halogen compounds which is chiral and undergoes faster

SN₂ reaction: CH₃CH₂CH₂CH₂Br or CH₃CH₂CH(Br)CH₃

5. Write the IUPAC name of the following compound.



- 6.
- 2g each of two solutes A(NaCl) and B(urea) are dissolved separately in 50g each of the same solvent which will show greater elevation in boiling point
 - Define isotonic solution.

OR

Calculate the molality of ethanol solution in which the mole fraction of water is 0.88

- 7.
- Predict the products of electrolysis for an aqueous solution of AgNO_3 with platinum electrodes
 - How many coulombs are required to reduce 1 mole $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+} ?
8. Complete the following equations :-
- $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow$
 - $\text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{S} + \text{H}^+ \rightarrow$
9. Explain the following
- $[\text{Fe}(\text{CN})_6]^{3-}$ is an inner orbital complex where as is an outer orbital complex.
 - NH_3 act as complexing agent but does not.

OR

Describe the shape and magnetic behavior of the following complex

- $[\text{CO}(\text{NH}_3)_6]^{3+}$
 - $[\text{Ni}(\text{CN})_4]^{2-}$
10. How will you bring about the following conversions.
- Propanone to propane.
 - Benzoic acid to Benzaldehyde.
11. What happens when
- Ethyl chloride is treated with AgNO_3
 - 2-bromopentane is treated with alcoholic KOH
12. Write a chemical reaction which is given by both aliphatic and aromatic primary amines forming offensive smelling compound.
13. The edge length of NaCl unit cell is 564 pm. What is the density of NaCl ?

OR

Thallium chloride(TlCl) crystallizes in a cubic lattice whose edge length is 385pm. Predict the lattice type if density is found to be 7.0 g/cm

14. 1.00 gm of non-electric solute is dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point of depression constant of benzene is 5.12 K kg mol⁻¹. Find the molar mass of solute.
15. Explain the following
- Nickel does not form low spin complexes.
 - CO^{2+} is easily oxidized to CO^{3+} in presence of a strong ligand.
 - CO is a stronger ligand than NH_3 for many metals.

OR

- Why is a solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green while a solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless?
- Write the hybridization and magnetic behaviour of complex $[\text{Ni}(\text{CO})_4]$?
- On the basis of crystal field theory write the electronic configuration for d4 ion if $\Delta_0 > P$

16.

- Give an example of a pain reliever for relief from severe post operative pain?
- What is the role of bithional in toilet soaps?

17. Arrange the following polymers in the increasing order of their intermolecular forces
Terylene, Polythene, Neoprene.

18.

- What is a peptide bond?
- What happens when protein is denatured?
- What is invert sugar?

OR

Give three reactions of glucose which cannot be explained by its chain structure

19.

- Molar conductance of a 1.5 M solution of electrolyte is found to be $138.9 \text{ siemen cm}^2$. What would be the specific conductance of this solution?
- Define fuel cell

20. Complete the following equations:

- $\text{Cu} + \text{HNO}_3 (\text{dil}) \rightarrow$
- $\text{I}_2 + \text{HNO}_3 \rightarrow$
- $\text{Cl}_2 + \text{NaOH} \rightarrow$

21.

- Give one chemical test to distinguish between the following pairs of compound
 - Phenol and Benzoic Acid
 - Npropyl alcohol to isopropyl alcohol
- Why phenol slowly acquires pink colour on long standing?

OR

- Explain the mechanism of acid catalysed dehydration of an ethanol forming ethene.
- Write the chemical equation to illustrate Reimer-Tiemann reaction.

22.

- How does an increase in temperature affect both physical and chemical adsorption?
- Explain the following term
 - Zeet potential
 - Lyophobic

23. An organic compound with the molecular formula $C_9H_{10}O$ forms 2,4 - DNP derivative, reduces Tollens reagent and undergoes cannizzaro reaction. On vigorous oxidation, it gives 1,2 benzene dicarboxylic acid. Identify the compound. Write the chemical equation involved.

OR

(a) Give one chemical test to distinguish between the following pairs of compound:

- i. Phenol and benzyl alcohol
- ii. Pentan-2-ol and pentan-3-ol

(b) Phenol is acidic but does not react with sodium –bicarbonate solution. Why?

24. Describe the role of the following

- a) NaCN in the extraction of silver from silver ore
- b) Carbon monoxide in the purification of nickel
- c) Iodine in the refining of Zirconium

25.

a) Give an example of a zero order reaction.

Rate of reaction is given by an equation

$$\text{Rate} = k [A]^2[B]$$

b) What is the unit for the rate constant of this reaction?

c) The rate constant of first order reaction is 60 s^{-1} . How much time it will take to reduce to 75% of its original concentration?

OR

a) Define

- i. Rate constant
- ii. Threshold energy

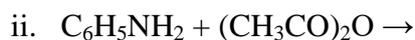
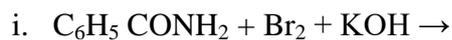
b) A first order reaction is 15% complete in 20 minute. How long will it take to be 60% complete.

26. Account for the following:

- a) Primary amines have higher boiling points than tertiary amines.
- b) Ethylamine is soluble in water where as aniline is not soluble in water.
- c) Why cannot aromatic primary amines be prepared by Gabriel phthalimide synthesis..
- d) What is Diazotization reaction
- e) pK_b for aniline is more than that for methylamine why?

OR

a) Complete the following reactions



b) Write the reaction of

Aromatic and Aliphatic primary amines with nitrous acid

c) Arrange the following in the order of increasing basic strength



27.

a) Why is Bi(v) a stronger oxidant than Sb(v)

b) Fluorine does not exhibit positive oxidation state.

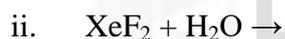
c) What is basicity of H_3PO_3 and why.

d) Noble gases are mostly inert

e) H_2S is a stronger acid than water.

OR

a) Complete the chemical reaction:



b) Arrange the following in order of property indicated:

i. F_2 , Cl_2 , Br_2 , I_2 - increasing order of bond dissociation energy

ii. NH_3 , PH_3 , AsH_3 , SbH_3 , BiH_3 - increasing base strength

Chemistry

Class- XII

1. Due to presence of F-centres

OR

Frenkel defect

2. Leads to coagulation
3. NO₂

OR

Due to very high bond dissociation energy

4. CH₃CH₂CH(Br)CH₃
5. Pent-2-en-3-ol
6.

a. A.

b. Solutions which have the same osmotic pressure at the same temperature are called isotonic solution.

7.

a. Deposition of silver at cathode, O₂ is liberated at anode.

b. 6F

8.

a. $2\text{MnO}_4^- + 5\text{C}_2\text{O}_4^{2-} + 16\text{H}^+ \rightarrow 10\text{CO}_2 + 8\text{H}_2\text{O} + 2\text{Mn}^{2+}$

b. $\text{Cr}_2\text{O}_7^{2-} + 3\text{H}_2\text{S} + 8\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{S} + 7\text{H}_2\text{O}$

9.

a. 3d orbitals involved in hybridization in [Fe(CN)₆]³⁻ therefore is inner orbital complex where as in [FeF₆]³⁻ outer 4d orbitals are involved therefore are outer orbital complex.

b.

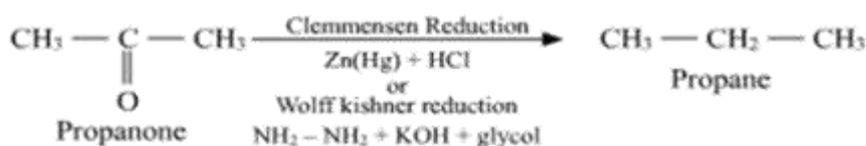
OR

i. Octahedral d²sp³ hybridized, diamagnetic in nature

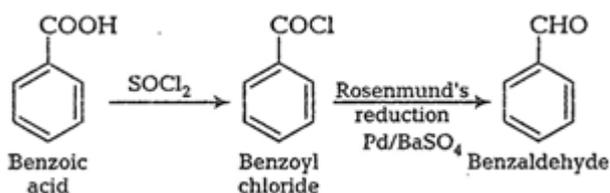
ii. Square Planar, dsp² hybridized, diamagnetic in nature.

10.

a.



b.



11.



12. Carbyl amine reaction



13. $\rho = Z^*M/a^3N_0$
 $= 4*58.5/(564*10^{-10})^3*(6.022*10^{23})$
 $= 2.16*10^6\ gm\ cm^{-3}$

OR

$$\rho = Z^*M/a^3N_0$$

$$Z = \rho * a^3 * N_0 / M$$

$$= 7*(385*10^{-10})^3*6.022*10^{23}/239.5$$

$$= 1.0032$$

14. $M_2 = 1000\ K_f\ w_2/w_1\ \Delta T_f$
 $= 1000x\ 5.12x\ 1.0/50x\ 0.40$
 $= 256\ g\ mol^{-1}$

15.

i. For low spin, electrons should pair up. This will produce only one empty d-orbital. Hence d^2sp^3 hybridization is not possible to form octahedral complexes.

ii. CO(II) has configuration $3d^7$ i.e it has 3 unpaired electron. Water being a weak ligand the electron don't pair up. In presence of strong ligand the two unpaired electrons in 3d pair up and third electron shifts to higher energy shell from where it can be easily lost and hence show the oxidation state of (III).

iii. CO has empty pi-orbital which overlap with filled d- orbitals of transition metals forming pi-bond. These pi-interactions increases the Δ_0 . NH_3 does not form pi-bond by back bonding

16.

a. Morphine

b. Bithional acts as antiseptic agent and reduces odours produced by bacterial decomposition of organic matter on the skin

17. Neoprene < polythene < Terylene

18.

a. The covalent bond formed between $-COOH$ group of one amino acid and $-NH_2$ group of other with the elimination of water is called peptic bond

b. The protein loses its biological activity due to change in its secondary and tertiary structures

c. Equimolar mixture of α -D-glucose and β -D-fructose

19.

- a. $\Delta_m = k \times 1000/\text{Molarity}$
 $138.9 = k \times 1000/1.5$
 $K = 0.208 \text{ S cm}^{-1}$

OR

- b. The devices which convert the energy produced during combustion of fuel like hydrogen, methane methanol directly into electrical energy

20.

- a. $3\text{Cu}_{(\text{excess})} + 8\text{HNO}_3 \rightarrow 3\text{Cu}(\text{NO}_3)_2 + 4\text{H}_2\text{O} + 2\text{NO}$
 b. $\text{I}_2 + 10\text{HNO}_3 \rightarrow 2\text{HIO}_3 + 10\text{NO}_2 + 4\text{H}_2\text{O}$
 c. $3\text{Cl}_2 + 6\text{NaOH} \rightarrow 5\text{NaCl} + \text{NaOCl}_3 + 3\text{H}_2\text{O}$

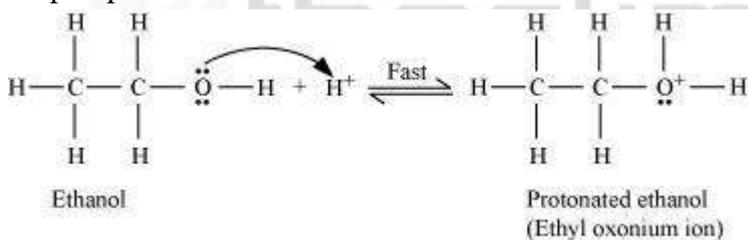
21.

- a. Phenol gives FeCl_3 test
 Benzoic Acid does not
 b. Isopropyl alcohol gives iodoform test to form yellow crystalline iodoform, propyl alcohol no reaction

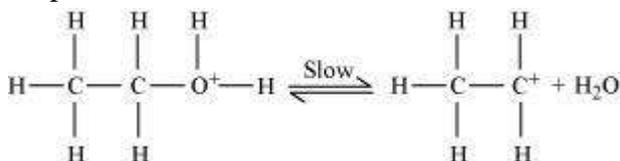
OR

(a) Acid catalyzed dehydration of alcohol

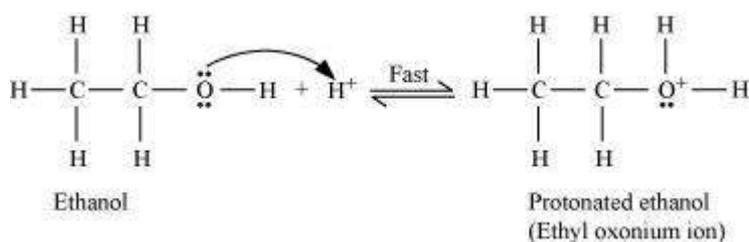
Step 1: protonation of alcohol



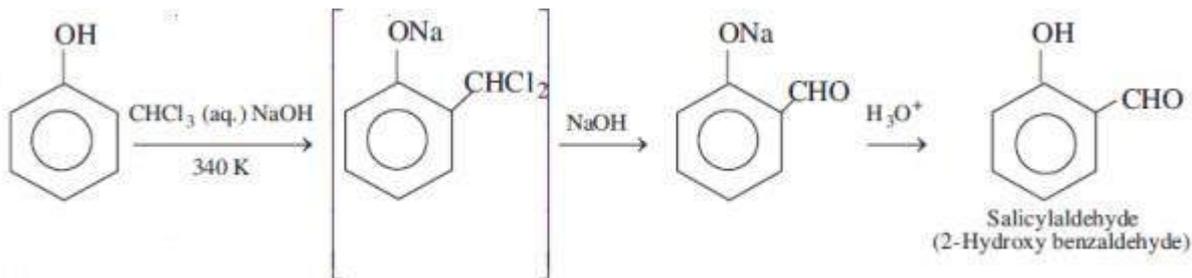
Step 2: formation of carbocation



Step 3: deprotonation



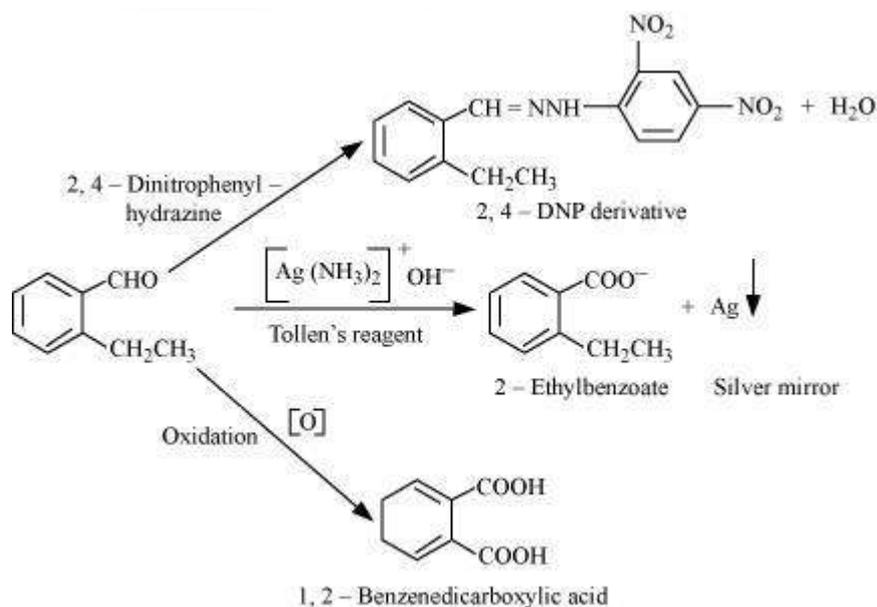
(b)



22.

- a. Physical adsorption increases with temperature, chemical adsorption initially increases then decreases.
- b. i) Zeta Potential: The potential difference between the fixed charge layer and diffuse layer having opposite charges around the colloidal particle is Zeta potential.
ii) Lyophobic colloid: Based on interaction between dispersed phase and dispersion medium a lyophobic colloid is liquid heating and are reversible in nature.

23.



OR

24.

- a. In the leaching of silver ore to convert the silver ore into soluble complex
- b. CO forms volatile complex with Ni which when heated to a higher temperature undergoes thermal decomposition to give pure Ni
- c. Coke prevents oxidation of electrode and loss of heat due to radiation.

25.

- Zero order reaction $2\text{HI} \xrightarrow{\text{Au } \Delta} \text{H}_2 + \text{I}_2$
- $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$
- Order of reaction = 1

Let the initial concentration be $[\text{A}]_0 = 100$

$$[\text{A}]_t = 100 - 75 = 25$$

Rate law for first order reaction

$$K = (2.303/t) \log[\text{A}]_0/[\text{A}]_t$$

Substituting the values we get

$$K = 0.0231$$

26.

- On amount of hydrogen bonding
- Due to intermolecular hydrogen bonding
- Because aromatic halide cannot undergo substitution reaction.
- The process of conversion of aromatic primary amines into arenediazonium salts with $\text{NaNO}_2 \text{HCl}$ at 273-283 K
- Methylamine shows + I effect as a result electron density on nitrogen increases whereas in aniline lone pair of electron on the nitrogen atom gets localized over benzene ring therefore electron density on nitrogen decreases hence PK_b value is higher than methylamine

OR

- $\text{C}_6\text{H}_5 \text{CONH}_2 + \text{Br}_2 + 4\text{KOH} \rightarrow \text{C}_6\text{H}_5\text{NH}_2 + 2 \text{KBr} + \text{K}_2\text{CO}_3 + 2 \text{H}_2\text{O}$
 - $\text{C}_6\text{H}_5\text{NH}_2 + (\text{CH}_3\text{CO})_2\text{O} \rightarrow \text{C}_6\text{H}_5\text{NHCOCH}_3 + \text{CH}_3\text{COOH}$
- $\text{C}_6\text{H}_5\text{COOH} \xrightarrow{\text{NH}_3} \text{C}_6\text{H}_5\text{CONH}_2 \xrightarrow{\text{KOH}} \text{C}_6\text{H}_5\text{NH}_2$

A

27 (i) Due to inert pair effect +3 oxidation state of Bi is more stable than its +5 oxidation state while +5 oxidation state of Sb is more stable than +3 oxidation state. Therefore Bi(V) can easily accept a pair of electron to get reduced to more stable Bi (III)

(ii) due to absence of d orbital

(iii) H_3PO_3 contains only two ionizable H atom which are present as OH group it has basicity two.

(iv) They have completely filled ns²np⁶ configuration and have ionization energy

(v) S-H bond is weaker than O-H bond because of size of Sulphur atom is bigger than oxygen atom, hence H₂S dissociate to give H⁺ ion more easily than H₂O

OR

a.

- i. $2\text{Fe}^{3+} + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Fe}^{2+} + \text{SO}_4^{2-} + 4\text{H}^+$
- ii. $2\text{XeF}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Xe} + 4\text{HF} + \text{O}_2$
- iii. $\text{P}_4 + 3\text{NaOH} + 3\text{H}_2\text{O} \rightarrow 3\text{NaH}_2\text{PO}_2 + \text{PH}_3$

b.

- i. $\text{I}_2 < \text{F}_2 < \text{Br}_2 < \text{Cl}_2$
- ii. $\text{BiH}_3 < \text{SbH}_3 < \text{AsH}_3 < \text{PH}_3 < \text{NH}_3$



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