



THE VILLAGE  
INTERNATIONAL SCHOOL  
"We Nurture Dreams"

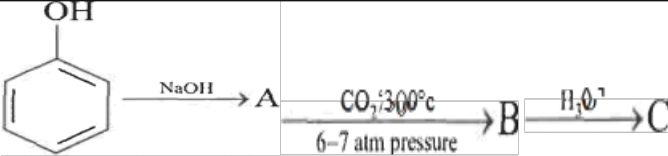
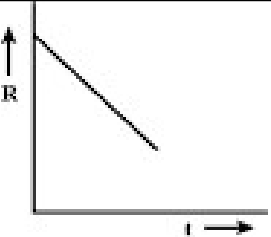
DATE :2/12/2024  
GRADE:12

MODEL EXAM 1  
CHEMISTRY(043)

TIME : 3 HOURS  
MARKS:70

- a) There are 35 questions with internal choice.
- b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- c)SECTION B consists of 5 short answer questions carrying 2 marks each.
- d)SECTION C consists 7 short answer questions carrying 3 marks.
- e) SECTION D consists of 2 case-based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each
- g) All questions are compulsory.

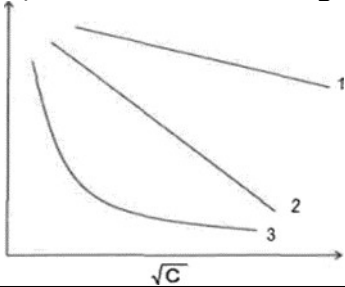
Q NO	SECTION A	MARK
1.	Choose the correct statement. a)vapour pressure of solution is greater than vapour pressure of solvent b)vapour pressure of solvent is greater than that of solution c)boiling point of solvent is higher than that of solution. d)freezing point increases when a solute is added to a solvent.	1
2.	The common name for pentanedioic acid is: a) Succinic acid    b) Pimelic acid    c) Oxalic acid    d) Glutaric acid	1
3.	If 75% of a first order reaction was completed in 32 min, then 50% of the reaction was completed in a) 24 min    b) 4 min    c) 16 min    d) 8 min	1
4.	Among the following, which bivalent ion of the first transition series shows a maximum magnetic moment? a) $\text{Co}^{2+}$ b) $\text{Ni}^{2+}$ c) $\text{Mn}^{2+}$ d) $\text{Fe}^{2+}$	1
5.		

	 <p>Identify C:</p> <p>(a) Benzoquinone (c) Salicylic acid</p> <p>(b) Salicylaldehyde (d) Aspirin</p>											
6.	 <p>The slope of the graph will be</p> <p>a) <math>-k/2.303</math>      b) <math>-k</math>      c) <math>-2.303/k</math>      d) <math>k</math></p>	1										
7.	<p>Match the items of column I with appropriate entries of column II.</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Column I</th> <th style="text-align: left;">Column II</th> </tr> </thead> <tbody> <tr> <td>(a) <math>\Delta P/p^0</math></td> <td>(i) <math>\Delta T_b/m</math></td> </tr> <tr> <td>(b) <math>K_b</math></td> <td>(ii) mol fraction of solute</td> </tr> <tr> <td>(c) <math>i</math></td> <td>(iii) <math>\Delta T_f /m</math></td> </tr> <tr> <td>(d) <math>K_f</math></td> <td>(iv) ratio of normal molecular mass to abnormal molecular mass</td> </tr> </tbody> </table> <p>a) (a)-(ii), (b)- (i), (c)-(iv), (d) -(iii)      b) (a)- (iv), (b) - (i) (c) - (ii), (d)-(iii)  c) (a)- (ii), (b)- (iv) (c)-(i), (d) -(iii)      d) (a)- (iv), (b)- (iii), (c) -(ii), (d)- (i)</p>	Column I	Column II	(a) $\Delta P/p^0$	(i) $\Delta T_b/m$	(b) $K_b$	(ii) mol fraction of solute	(c) $i$	(iii) $\Delta T_f /m$	(d) $K_f$	(iv) ratio of normal molecular mass to abnormal molecular mass	1
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8.	<p>When diethyl ether is heated with excess of HI, it produces :</p> <p>a) ethyl iodide      b) ethanol c) methyl iodide      d) iodoform</p>	1										
9.	<p style="text-align: center;">Pt</p> <p>For a reaction <math>2\text{NH}_3(\text{g}) \xrightarrow{\text{Pt}} \text{N}_2 + 3\text{H}_2</math></p> <p>What is the order and molecularity of this reaction?</p> <p>a) 0, 2      b) 2, 2      c) 0, 0      d) cannot find out</p>	1										
10.	<p>Which of the following pairs will not form ideal solution?</p> <p>a) benzene and toluene      b) nitric acid and water c) chloroethane and bromoethane      d) hexane and heptane</p>	1										
11.	<p>Which of the following does not undergo aldol condensation?</p> <p>a) <math>\text{CH}_3\text{-CHO}</math>      b) <math>\text{CH}_3\text{-CO-CH}_3</math>      c) <math>\text{C}_6\text{H}_5\text{CHO}</math>      d) <math>\text{CH}_3\text{-CH}_2\text{-CHO}</math></p>	1										

12.	In a coordination compound the central metal atom act as a: a)Bronsted Lowry acid      b)Lewis base c)Lewis acid                      d)Bronsted Lowry base	1
	Questions 13 to 16 are assertion reason type. a. Both A and R are true and R is the correct explanation. b. Both A and R are true but R is not the correct explanation. c. A is true but R is false. d. A is false but R is true.	
13.	Assertion (A): Isopropyl chloride is less reactive than CH <sub>3</sub> Br in SN <sup>2</sup> reactions. Reason (R): SN <sup>2</sup> reactions are always accompanied by inversion of configuration.	1
14.	Assertion (A): Glucose and fructose are reducing sugars. Reason (R): Glucose and fructose contain a free aldehydic and ketonic group adjacent to a >CHOH group respectively.	1
15.	Assertion (A): The oxygen of OH group in alcohols is attached to sp <sup>3</sup> hybridised carbon. Reason (R): The bond angle in alcohols C – O – H is 109°28'.	1
16.	Assertion(A):Bromination of benzoic acid gives m-bromo benzoic acid. Reason(R):Carboxyl group increases the electron density at meta position.	1
	<b>SECTION B</b>	
17.	Using the valence bond approach, deduce the shape and magnetic behaviour of [Co(NH <sub>3</sub> ) <sub>6</sub> ] <sup>3+</sup> ion. [Atomic number of Co = 27]	2
18.	Why are Fe <sup>2+</sup> compounds easily oxidises to Fe <sup>3+</sup> as compared to Mn <sup>2+</sup> compounds.	2
19.	Explain why dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?	2
20.	Answer the following: a)Write the mathematical relation between rate constant and half-life of a first order reaction. b.What is collision frequency? <b>OR</b> a)If the rate equation is given below: Rate = k[A] <sup>2</sup> [B] then what will be the unit of its rate and rate constant?	2
21.	Write the name reactions with equation. (a)Hell-Volhard-Zelinsky reaction. (b)Wolff-Kischner reduction.	2
	<b>SECTION C</b>	
22.	Give reason for the following. (a)Aniline cannot be prepared by ammonolysis of chlorobenzene under normal conditions. b)Acetylation of aniline is carried out in the presence of pyridine.	3

	c)N-ethyl ethanamine boils at 329 K while butanamine boils at 350 K although both are isomers.	
23.	What are fuel cells? Explain the electrode reactions involved in the working of H <sub>2</sub> - O <sub>2</sub> fuel cell.	3
24.	a)When a coordination compound PtCl <sub>4</sub> 6 NH <sub>3</sub> is mixed with AgNO <sub>3</sub> , 4 moles of AgCl was precipitated per mole of the compound. Find the structural formula and IUPAC name of the compound. b)Write the electronic configuration of d <sup>4</sup> in terms of crystal field theory when Δ <sub>o</sub> >P.  <b>OR</b> a)Draw the geometrical isomers of [Co(en) <sub>2</sub> ] <sup>2+</sup> Which geometrical isomer is optically active and why? b)Draw the crystal field splitting diagram for a tetrahedral complex.	3
25.	How would you bring about the following conversions? i.Ethanal to 3-hydroxy butanal ii.Benzaldehyde to benzene. iii.Ethanoic acid to 2-hydroxy ethanoic acid	3
26.	Give equations of the following reactions: (a)Sodium tert-butoxide is treated with CH <sub>3</sub> Cl. (b)Methanal on reaction with ethylmagnesium bromide followed by acid hydrolysis. (c)Bromine in CS <sub>2</sub> with phenol.	3
27.	.Among all the isomers of molecular formula C <sub>4</sub> H <sub>9</sub> Br, identify (a)the one isomer which is optically active. (b)the one isomer which is highly reactive towards S <sub>N</sub> 2. (c)the two isomers which give same product on dehydrohalogenation with alcoholic KOH.	3
28.	Write the Nernst equation and calculate the the emf of the following cell at 298 K. Zn/Zn <sup>2+</sup> (.001M)// H <sup>+</sup> (.01M)/H <sub>2</sub> (g)(1 bar)/Pt Given :E <sup>0</sup> Zn <sup>2+</sup> /Zn =-0.76 V E <sup>0</sup> H <sup>+</sup> /H <sub>2</sub> =0.00 V( log 10 =1)	3
	<b>SECTION D</b>	
29.	.Read the following text carefully and answer the questions that follow: Transition metal oxides are generally formed by the reaction of metals with oxygen at high temperatures. The highest oxidation number in the oxides coincides with the group number. In vanadium, there is a gradual change from the basic V <sub>2</sub> O <sub>3</sub> to less basic V <sub>2</sub> O <sub>4</sub> and to amphoteric V <sub>2</sub> O <sub>5</sub> .	1+1+2

	<p>V<sub>2</sub>O<sub>4</sub> dissolves in acids to give VO<sub>2</sub><sup>+</sup> salts. Potassium dichromate is a very important chemical used in the leather industry and as an oxidant for the preparation of many azo compounds. Dichromates are generally prepared from chromate. Sodium dichromate is more soluble than potassium dichromate. The latter is, therefore, prepared by treating the solution of sodium dichromate with potassium chloride. Sodium and potassium dichromates are strong oxidising agents; sodium salt has a greater solubility in water and is extensively used as an oxidising agent in organic chemistry. Potassium dichromate is used as a primary standard in volumetric analysis.</p> <p>i. Which of the 3d series of the transition metals exhibits the largest number of oxidation and why?  ii. A transition metal exhibits highest oxidation state in oxides and fluorides. Give reason.  iii) How would you account for the increasing oxidising power in the series: V O<sub>2</sub><sup>+</sup> &lt; Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup> &lt; MnO<sub>4</sub><sup>-</sup>?</p> <p><b>OR</b></p> <p>iii) MnO is basic whereas Mn<sub>2</sub>O<sub>7</sub> is acidic in nature. Give reason.</p>	
30.	<p>Metallic conductance involves the movement of electrons throughout a metal. Electronic conductance consists of the movement of ions throughout a pure liquid or result. The measurement of electrolytic conductivity is widely applied as a control parameter and its relevance is continuously increasing, not only in industrial applications but also in the environmental monitoring domain. Electrochemistry plays a very important part in our daily life. Primary cells like dry cell is used in torches, wall clock, mercury cell is used in hearing aids, watches. Secondary cells Ni—Cd cell is used in cordless phones, lithium battery is used in mobiles, lead storage battery is used in vehicle and inverter. Fuel cells like H<sub>2</sub>-O<sub>2</sub> cell was used in Apollo space programme. A 38% solution of sulphuric acid is used in lead storage battery. Its density is 1.30 g/ mL. The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H<sub>2</sub>SO<sub>4</sub> falls to 1.14 g/ mL .</p> <p>Answer the following :</p> <p>(a) Calculate the potential of hydrogen electrode in contact with a solution having pH value 10  (b) Write the overall cell reaction in lead storage battery during recharging?  (c) The conductivity of 0.001M CH<sub>3</sub>COOH is 4.95 x 10<sup>-5</sup> S/cm. Calculate its degree of dissociation, if limiting molar conductivity of acetic acid is , 390.5 S cm<sup>2</sup> mol<sup>-1</sup> .</p> <p><b>OR</b></p>	4

	<p>(i) Calculate the time required to deposit 1.27g of copper at cathode when a current of 2A was passed through the solution of <math>\text{CuSO}_4</math>. (Molar mass of <math>\text{Cu} = 63.5 \text{ g mol}^{-1}</math>, <math>1 \text{ F} = 96500 \text{ C}</math>)</p> <p>(ii) The molar conductivity vs <math>\sqrt{c}</math> curve for <math>\text{NaCl}</math>, <math>\text{HCl}</math>, and <math>\text{NH}_4\text{OH}</math> are shown below in random order. Identify which graph corresponds to <math>\text{HCl}</math>, <math>\text{NaCl}</math>, and <math>\text{NH}_4\text{OH}</math> and give reason.</p> 	
<b>SECTION E</b>		
31.	<p>(a) An aromatic compound A on treatment with aqueous ammonia and heating forms compound B which on heating with <math>\text{Br}_2</math> and <math>\text{KOH}</math> forms a compound C of molecular formula <math>\text{C}_6\text{H}_7\text{N}</math>. Write the structures of A, B and C.</p> <p>(b) Give reasons for the following :</p> <p>(i) Reduction with iron scrap and <math>\text{HCl}</math> is preferred for the preparation of amines from nitro compounds.</p> <p>(ii) Although amino group is o- and p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives substantial amount of m-nitroaniline.</p> <p><b>OR</b></p> <p>a) A hydrocarbon A (<math>\text{C}_4\text{H}_8</math>) on reaction with <math>\text{HCl}</math> gives a compound B (<math>\text{C}_4\text{H}_9\text{Cl}</math>) which on reaction with 1 mole of <math>\text{NH}_3</math> gives a compound (<math>\text{C}_4\text{H}_{11}\text{N}</math>). On reacting with <math>\text{NaNO}_2</math> and <math>\text{HCl}</math> at low temperature followed by hydrolysis, compound C yields optically active alcohol. Ozonolysis of A gives 2 moles of ethanal. Identify the compounds and write the equations.</p>	5
32	<p>The minimum pressure which can be applied to a solution for stopping the flow of solvent through a semipermeable membrane is known as osmotic pressure.</p> <p>On the basis of the data answer the following questions.</p> <p>a) Give reason :</p> <p>i) Osmotic pressure method is considered to be the best method for determining the molecular mass of biomolecules and polymers.</p> <p>ii) Oxygen is mixed with helium for use by deep sea divers.</p> <p>b) Define isotonic solution.</p> <p>c) Calculate the molarity of a solution when 18 gm glucose (<math>\text{C}_6\text{H}_{12}\text{O}_6</math>) is mixed with water to form 250ml solution.</p>	5

	<p><b>OR</b></p> <p>a) Give reason.</p> <p>i) Patients having sore throats are advised saline gargles.</p> <p>ii) Salt is added to water to get hard boiled eggs.</p> <p>b) The molar mass of a solute is 120 gm/mol and its vant hoff factor is 4. What is its abnormal molecular mass?</p> <p>c) Calculate the mole fraction of benzene in solution containing 30% by mass of it in CCl<sub>4</sub>.</p> <p>(Molar mass of benzene=78 gm/mol and that of CCl<sub>4</sub> =154gm/mol)</p>	
33.	<p>31. Attempt any five of the following:</p> <p>(a) Explain the term denaturation of protein.</p> <p>(b) Define the following terms:</p> <p>i). Polysaccharides</p> <p>ii). Nucleotides</p> <p>(c) Deficiency of which vitamin causes scurvy?</p> <p>(d) What happens when D-glucose is treated with the following? Give equations to support your answer.</p> <p>i) HI</p> <p>ii) HNO<sub>3</sub></p> <p>(e) Name the disaccharide which on hydrolysis gives glucose and galactose.</p> <p>(f) Explain about the secondary structure of protein.</p> <p>(g) Give the reaction of glucose with hydrogen cyanide. Presence of which group is confirmed by this reaction?</p>	5
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