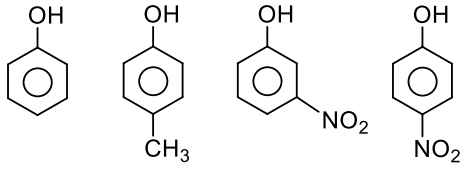
SECTION A

The following questions are multiple- choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

Q 1.	The molal elevation constant depends upon (a) Nature of solute (b) Nature of solvent (c) Vapour pressure of the solution (d) Enthalpy change	1
Q 2.	A device that converts energy of combustion of fuels like hydrogen and methane directly into electrical energy is known as: (a) dynamo (b) Ni-Cd cell (c) fuel cell (d) electrolytic cell	1
Q 3.	The half life of the first order reaction having rate constant K = 0.01 s^{-1} is (a) 69.3 sec. (b) 0.693 sec. (c) 6.93 sec. (d) 0.0693 sec.	1
Q 4.	Which of the following are d-block elements but not regarded as transition elements? (a) Cu, Ag, Au (b) Zn, Cd, Hg (c) Fe, Co, Ni (d) Ru, Rh, Pd	1
Q 5.	The correct IUPAC name of $[Pt(NH_3)_2Cl_2]$ is (a) diamminedichloridoplatinum (IV)	1

	(b) dichloridodiammineplatinum (IV) (c) dichloridodiammineplatinum (II) (d) diamminedichloridoplatinum (II)	
Q 6.	The main difference between C – X bond of a haloalkane and a haloarene is (a) C – X bond in haloalkanes is shorter than haloarenes. (b) In haloalkanes the C attached to halogen in C – X bond is sp^3 hybridised while in haloarenes it is sp^2 hybridised. (c) The C–X bond in haloalkanes acquires a double bond character due to higher electronegativity of X than haloarenes. (d) Haloalkanes are less reactive than haloarenes due to difficulty in C – X cleavage in haloalkanes.	1
Q7.	Match the given column I with column II **Column I** / **Column II** (i) SN^1 reaction — (A) vic- dihalides (ii) Chemical in fire extinguisher — (B) gem- dihalides (iii) Halogenation of alkenes — (C) Racemisation (iv) Alkylidene halides — (D) Saytzeff rule (v) Elimination of HX from alkyl halides — (E) Chlorofluorocarbons (a) (i) C (ii) E (iii) A (iv) B (v) D (b) (b) (i) A (ii) B (iii) C (iv) D (v) E (c) (i) B (ii) C (iii) E (iv) D (v) A (d) (i) A (ii) C (iii) E (iv) D (v) B	1
Q8.	In the following compounds,  (I) (II) (III) (IV) The order of acidity is: (a) III > IV > I > II (b) I > IV > III > II (c) II > I > III > IV (d) IV > III > I > II	1

Q9.	The process of converting alkyl halides into alcohols involves (a) addition reaction (b) dehydrohalogenation reaction (c) substitution reaction (d) rearrangement reaction	1
Q10.	The correct order of increasing acidic strength is _____. (a) Ethanol < Phenol < Acetic acid < Chloroacetic acid (b) Phenol < Ethanol < Chloroacetic acid < Acetic acid (c) Ethanol < Phenol < Chloroacetic acid < Acetic acid (d) Chloroacetic acid < Acetic acid < Phenol < Ethanol	1
Q11.	Benzoic acid is treated with $SOCl_2$ and the product (X) formed is reacted with ammonia to give (Y). (Y) on reaction with Br_2 and KOH gives (Z). (Z) in the reaction is (a) chlorobenzene (b) benzamide (c) benzoyl chloride (d) aniline	1
Q12.	The sugar present in milk is (a) Glucose (b) Sucrose (c) Lactose (d) Maltose	1
Q13.	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion (A):** Hydrolysis of ethyl ethanoate is a pseudo-first-order reaction. **Reason (R):** Water is present in large excess and therefore its concentration remained constant throughout the reaction. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	1
Q14.	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion (A):** $[Fe(CN)_6]^{3-}$ ion shows magnetic moment corresponding to two unpaired electrons. **Reason (R):** Because it has d^2sp^3 type hybridization. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	1

Q15.	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion (A):** Alkyl halides are insoluble in water. **Reason (R):** Alkyl halides have halogen attached to sp^3 hybrid carbon. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	1
Q16.	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion (A):** The C-O-H bond angle in alcohols is slightly less than the tetrahedral angle. **Reason (R):** This is due to the repulsive interaction between the two lone electron pairs on oxygen. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	1
	SECTION B **This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.**	
Q17.	A solution is made by dissolving 30 g of a non-volatile solute in 90 g of water. It has a vapour pressure of 2.8 kPa at 298 K. At 298 K, the vapour pressure of pure water is 3.64 kPa. Calculate the molar mss of solute. **OR** Calculate the mass of compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K. (K_f = 5.12 K kg mol^{-1}).	2
Q18.	Define each of the following: (a) Elementary reaction (b) Energy of activation of a reaction.	1+1
Q19.	Give simple chemical tests to distinguish between the following pairs of compounds. (a) Propanal and Propanone (b) Phenol and Benzoic acid	1+1

Q20.	Write the chemical equations involved when aniline is treated with the following reagents: (a) Br_2 water (b) $CHCl_3$ + KOH	1+1
Q21.	Give any two differences between DNA and RNA.	2
	SECTION C **This section contains 7 questions with internal choice in one question.** **The following questions are short answer type and carry 3 marks each.**	
Q22.	Calculate the emf for the cell reaction at 298 K for the cell : $Mg(s)\|Mg^{2+}(0.001M) \parallel Cu^{2+}(0.0001M)\|Cu(s)$ E° values at 298 K: $Mg^{2+}/Mg = -2.37$ V $Cu^{2+}/Cu = +0.34$ V	3
Q23.	A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed. (Given: log 2= 0.3010, log 3= 0.4771, log 4= 0.6020) OR A reaction is first order in A and second order in B. (a) Write differential rate equation. (b) How is the rate affected when concentration of B is tripled? (c) How is the rate affected when concentration of both A and B is doubled?	3
Q24.	Account for the following (a) Cu^+ ion is not stable in aqueous solutions. (b) Most of the transition metals and their compounds act as good catalysts. (c) Enthalpies of atomization of transition metals are quite high.	1+1+1
Q25.	What is lanthanoid contraction? Mention its any two consequences.	3
Q26.	Give the reasons for the following: (a) Haloalkanes are more reactive than haloarenes. (b) An alkyl halide is treated with ethanolic solution of KCN, the major product is alkyl cyanide where as if alkyl halide is treated with AgCN, the major product is alkyl isocyanide. (c) Chloroform is stored in closed dark coloured bottles completely filled so that air is kept out.	1+1+1

Q27.	Write the mechanism of acid catalyzed dehydration of ethanol to yield ethene at 443 K.	3
Q28.	How will you convert the following? (a) Aniline to chlorobenzene. (b) Benzene diazonium chloride to benzene (c) Ethanoic acid to methanamine	1+1+1
	SECTION D **The following questions are case-based questions. Each question has an internal choice and carries 4(1+1+2) marks each. Read the passage carefully and answer the questions that follow.**	
Q29.	The spontaneous flow of the solvent through a semi-permeable membrane from a pure solvent to a solution or from a dilute solution to a concentrated solution is called osmosis. The phenomenon of osmosis can be demonstrated by taking two eggs of the same size. In an egg, the membrane below the shell and around the egg material is semi-permeable. The outer hard shell can be removed by putting the egg in dilute hydrochloric acid. After removing the hard shell, one egg is placed in distilled water and the other in saturated salt solution. After some time, the egg placed in distilled water swells- up while the egg placed in salt solution shrinks. The external pressure applied to stop the osmosis is termed as osmotic pressure. Reverse osmosis takes place when the applied external pressure becomes larger than the osmotic pressure. (a) Give an example of a substance that can be used as a SPM. (b) Give importance of reverse osmosis. **Note:- The option is available for Q.No. 29 part (c) only.** (c)200 ml of an aqueous solution of protein containing 1.26 g of the protein. The osmotic pressure of such a solution at 300 K is found to be **$2.57\ x10^{-3}$** atm. Calculate the molar mass of the protein. ($R = 0.0821$ L atm K^{-1} mol^{-1}) **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 300 K. ($R = 0.0821$ L atm K^{-1} mol^{-1}) (molar mass of $CaCl_2$ = 111 g mol^{-1})	1+1+2
Q30.	Vitamins are vital for life. A, D, E, K are fat soluble vitamins whereas B1, B2, B3, B5, B6, B7, B9, C are water soluble vitamins. Vitamin A helps in	

	improving eye sight. Vitamin C prevents scurvy and increases immunity. Vitamin D helps in strong bones and teeth. We get vitamin D from sunlight, eggs, dairy products, orange, oats and mushroom etc. Citrus fruits. contain vitamin C. Carrot contains vitamin A. We should include chick pea flour in our diet to prevent inflammation. It has fibres which have anti-inflammatory properties. It prevents accumulation of fats. It contains Fe, Cu, Mg, fibres, K which are essential to control our wait. It increases our immune system. Pomegranates are good source of vitamin C which our body needs to make collagen. It is rich source of vitamin B-complex. It contains essential minerals like Ca, Cu, Mg and Mn. Pomegranates are rich source of insoluble fibres. Answer the following questions: (a) Why should vitamin B and C must be taken regularly in diet? (b) Which vitamin deficiency causes pernicious anemia? **Note:- The option is available for Q.No. 30 part (c) only.** (c) (i) What is meant by vitamin B-complex? (ii) What is deficiency disease and source of vitamin C? **OR** (c) (i) Which vitamin deficiency leads to bleeding for long time? What is its source? (ii) What is the role of fibres in our body?	1+1+2
	SECTION E **The following questions are long answer type and carry 5 marks each. All questions have an internal choice.**	
Q31.	(a) State two advantages of $H_2 – O_2$ fuel cell. (b) Unlike dry cell, the mercury cell has a constant cell potential throughout its useful life. Why? (c) What is galvanization? (d) How much electricity in terms of Faraday is required to produce (i) 20 g of Ca from molten $CaCl_2$? (Atomic mass of Ca = 40) (ii) 40 g of Al from molten Al_2O_3 ? (Atomic mass of Al = 27) **OR**	1+1+1+2

	(a) Give any two application of salt bridge. (b) Write the chemical formula of rust. (c)Define Kohlrausch's law. (d)The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω. What is the cell constant if conductivity of 0.001M KCl solution at 298 K is **0.146 x10^{-3} S cm^{-1}**?	
Q32.	(a) Draw the geometrical isomers of the complex $[Pt(NH_3)_2Cl_2]$. (b) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$. (c) Write the hybridization and shape of $[CoF_6]^{3-}$. (Atomic number of Co = 27) (d) When a coordination compound $CoCl_3.6NH_3$ is mixed with $AgNO_3$, 3 moles of AgCl are precipitated per mole of the compound. Write (i) Structural formula of the complex. (ii) IUPAC name of the complex. **OR** (a) What is ambidentate ligand? (b) $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral. Why? (Atomic number of Ni = 28) (c) What type of isomerism is shown by the complex $[Cr(H_2O)_6]Cl_3$? (d) Draw figure to show the splitting of d-orbitals in an octahedral crystal field.	1+1+1+2

Q33.	(a) Why does benzoic acid not undergo Friedel-Craft reaction? (b) There are two – NH2 groups in semicarbazide. However, only one is involved in the formation of semicarbazones. Why? (c) Formaldehyde does not undergo aldol condensation reaction. Why? . (d) Write the chemical reactions involved in following name reactions (i) Aldol Condensation (ii) Rosenmund reaction **OR** (a) Write the chemical reactions involved in following name reactions (i) Cannizzaro reaction (ii) Clemmensen reaction (b) (A), (B) and (C) are three non-cyclic functional isomers of a carbonyl compound with molecular formula C_4H_8O. Isomers (A) and (C) give positive Tollens' test whereas isomer (B) does not give Tollens' test but gives positive Iodoform test. Isomers (A) and (B) on reduction with Zn-Hg /conc. HCl give the same product (D). (i) Write the structures of (A), (B), (C) and (D). (ii) Out of (A), (B) and (C) isomers, which one is least reactive towards addition of HCN?	1+1+1+2 2+3