CHEMISTRY (CODE - 043)
SAMPLE QUESTION PAPER - 1
CLASS XII

Time: 3 hours **Max. Marks: 70**

General Instructions:
- There are 33 questions in this question paper with internal choice.
- **SECTION A** consists of 16 multiple-choice questions carrying 1 mark each.
- **SECTION B** consists of 5 very short answer questions carrying 2 marks each.
- **SECTION C** consists of 7 short answer questions carrying 3 marks each.
- **SECTION D** consists of 2 case- based questions carrying 4 marks each.
- **SECTION E** consists of 3 long answer questions carrying 5 marks each
- All questions are compulsory.
- Use of log tables and calculators is not allowed.

	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.
1	The correct IUPAC name of the coordination compound $[PtCl_2(en)_2](NO_3)_2$ is (a) dichloridobis(ethane-1,2-diammine)platinum(II) nitrate (b) dichloridobis(ethane-1,2-diammine)platinate(IV) nitrate (c) dichloridobis(ethane-1,2-diammine)platinum(IV) nitrate (d) dichloridobis(ethane-1,2-diammine)platinate(II) nitrate
2	When $KMnO_4$ is added to oxalic acid solution, the decolouration is slow in the beginning but become instantaneous after some time because (a) CO_2 is formed as a product (b) Reaction is exothermic (c) MnO_4^- catalyse the reaction (d) Mn^{+2} act as auto catalyst
3	Which of the following is the right temperature coefficient (η) expressions? (a) η = Rate constant at T + 10°c/ Rate constant at T^{o}C (b) η = Rate constant at T + 20°c/ Rate constant at T^{o}C (c) η = Rate constant at T + 30°c/ Rate constant at T^{o}C (d) η = Rate constant at T + 40°c/ Rate constant at T^{o}C
4	Which of the following statements concerning methylamine is correct? (a) Methylamine is stronger base than NH_3 (b) Methylamine is weaker base than NH_3 (c) Methylamine is slightly acidic (d) Methylamine forms salt with alkali
5	What would be the reactant and reagent used to obtain 2, 4-dimethyl pentan-3-ol? (a) Propanal and propyl magnesium bromide (b) 3-methylbutanal and 2-methyl magnesium iodide (c) 2,2- dimethyl propanone and methyl magnesium iodide

	(d) 2- methylpropanal and isopropyl magnesium iodide
6	The reaction of toluene with chlorine in the presence of $FeCl_3$ gives predominantly (a) a mixture of o - and p-chlorotoluene (b) benzyl chloride (c) m - chlorotoluene (d) benzoyl chloride
7	Which of the following solutions of KCl will have the highest value of molar conductivity? (a) 0.01 M (b) 1 M (c) 0.5 M (d) 0.1 M
8	Consider a first order gas phase decomposition reaction given below : $A(g) \rightarrow B(g) + C(g)$ The initial pressure of the system before decomposition of A was p_i . After the lapse of time 't', total pressure of the system increased by x units and became 'p_t ' The rate constant k for the reaction is given as _____. (a) $k = \dfrac{2.303}{t} \log \dfrac{p_i}{p_i - x}$ (b) $k = \dfrac{2.303}{t} \log \dfrac{p_i}{2p_i - p_t}$ (c) $k = \dfrac{2.303}{t} \log \dfrac{p_i}{2p_i + p_t}$ (d) $k = \dfrac{2.303}{t} \log \dfrac{p_i}{p_i + x}$
9	A first order reaction is 50% completed in 1.26×10^{14} s. How much time would it take for 100% completion? (a) 1.26×10^{15} s (b) 2.52×10^{14} s (c) 2.52×10^{28} s (d) infinite
10	Secondary amines can be prepared by (a) Reduction of nitro compounds (b) Oxidation of N- substituted amides (c) Reduction of isonitriles (d) Reduction of nitriles
11	The oxidation of toluene to benzaldehyde by chromyl chloride is called (a) Etard's reaction (b) Riemer- Tiemann reaction (c) Wurtz reaction (d) Cannizzaro reaction
12	The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes, $[Co(NH_3)_6]^{3+}$, $[Co(CN)_6]^{3-}$, $[Co(H_2O)_6]^{3+}$ (a) $[Co(CN)_6]^{3-} > [Co(NH_3)_6]^{3+} > [Co(H_2O)_6]^{3+}$ (b) $[Co(NH_3)_6]^{3+} > [Co(H_2O)_6]^{3+} > [Co(CN)_6]^{3-}$ (c) $[Co(H_2O)_6]^{3+} > [Co(NH_3)_6]^{3+} > [Co(CN)_6]^{3-}$ (d) $[Co(CN)_6]^{3-} > [Co(H_2O)_6]^{3+} > [Co(NH_3)_6]^{3+}$
	Q no 13 to 16 are Assertion and Reason Type question **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**
13	**Assertion (A)**: Aromatic primary amines can be prepared by Gabriel phthalimide synthesis **Reason (R)**: Aryl halides don't undergo nucleophilic substitution with the anion formed by phthalimide
14	**Assertion (A)**: Hydrolysis of sucrose brings about a change in sign of rotation from dextro to laevo. **Reason (R)**: Hydrolysis always changes the optical rotation of a compound

15	**Assertion (A)**: The aqueous solution of $FeCl_3$ is basic in nature. **Reason (R)**: $FeCl_3$ hydrolyses in water
16	**Assertion (A)**: p-nitrophenol is more acidic than phenol. **Reason (R)**: Nitro group helps in the stabilisation of the phenoxide ion by dispersal of negative charge due to resonance.

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SECTION - B

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Question No. 17 to 21 are very short answer questions carrying 2 marks each

17	(a) How do you explain the presence of all the six carbon atoms in glucose in a straight chain? (b) Name the linkage connecting monosaccharide units in polysaccharides. **OR** (a) Predict whether the following compound has 'D' or 'L' configuration. CHO HO———H H———OH HO———H HO———H CH_2OH (b) Explain amphoteric behaviour of amino acids.
18	Write all the geometrical isomers of $[Pt(NH_3)BrCl(py)]$ and how many of these will exhibit optical isomers?
19	A reaction is second order with respect to a reactant. How will the rate of reaction be affected if the concentration of the reactant is (a) doubled (b) reduced to half
20	The rate constant for a reaction of zero order in A is 0.0030 $molL^{-1}s^{-1}$. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075M?
21	Give reason for the following. (a) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride. (b) Alkyl Halides , though polar, are immiscible in water.

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SECTION - C

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Question No. 22 to 28 are short answer questions, carrying 3 marks each.

22	The air is a mixture of a number of gases. The major components are oxygen and nitrogen with an approximate proportion of 20% and 79% by volume at 298 K respectively. The water is in equilibrium with air at a pressure of 10 atm. At 298 K if the Henry's law constant for oxygen and nitrogen are 3.30 x 10^7 mm and 6.51 x 10^7 mm respectively, calculate the composition of these gases in water.

23	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 does the current flow? Calculate the mass of Zn deposited at the cathode of cell Y. [Molar mass of Fe = 56 gmol^{-1} , Zn = 65.3 gmol^{-1} , 1F = 96500 C mol^{-1}].
24	Carry out the following conversions. **(Attempt any 3)** (i) Sodium phenoxide to o-hydroxybenzoic acid (ii) Acetone to propene (iii) Phenol to chlorobenzene (iv) Anisole to 4-Methoxytoluene
25	(a) Identify the major product formed when phenol reacts with carbon dioxide , Name the reagent which is used to carry out the reaction. Also, write the name of the reaction involved . (b) Name the reactant that yields benzoquinone on oxidation with $Na_2Cr_2O_7/H_2SO_4$.
26	For the complex $[Fe(en)_2Cl_2]Cl$. Identify (a) The oxidation number of iron (b) The hybridization and the shape of the complex (c) The magnetic behaviour of the complex. (d) IUPAC name of the compound.
27	Give reasons for the following observations: (a) Aniline is a weaker base than cyclohexylamine. (b) It is difficult to prepare pure amines by ammonolysis of alkyl halides. (c) Electrophilic substitution in aromatic amines takes place more readily than benzene.
28	Give reason for the following (a) The presence of the $-NO_2$ group at ortho and para position increases reactivity of haloarenes towards nucleophilic substitution reactions. (b) p- dichlorobenzene has a higher melting point than the ortho or meta isomer. (c) Thionyl chloride method is preferred for preparing alkyl chloride from alcohols.
	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.
29	The properties of the solutions which depend on the number of the solute particles but not on the nature of the solute particles are called colligative properties. Relative lowering in vapour pressure is also an example of colligative properties. Meena has performed an experiment in which she prepared a sugar solution and inferred the data given in the below table . <table><tr><td>Lowering in Vapour pressure</td><td>0.061 mm of Hg</td></tr><tr><td>Vapour pressure of water at 20°c</td><td>17.5 mm of Hg</td></tr></table> **Answer the following questions** (a) What will be the relative lowering of Vapour pressure for the given solution? **OR**

	(a) Find the vapour pressure (mm of Hg) of solution.
	(b) What will be the mole fraction of sugar in the solution ?
	(c) What will be the vapour pressure (mm of Hg) of water at 293 K when 25 gram of glucose is dissolved in 450 grams of water.
30	**Strengthening the Foundation: Chargaff Formulates His "Rules"** : Many people believe that James Watson and Francis Crick discovered DNA in the 1950s. In reality, this is not the case. Rather, DNA was first identified in the late 1860s by Swiss chemist Friedrich Miescher. Then, in the decades following Miescher's discovery, other scientists--notably, Phoebus Levene and Erwin Chargaff--carried out a series of research efforts that revealed additional details about the DNA molecule, including its primary chemical components and the ways in which they joined with one another. Without the scientific foundation provided by these pioneers, Watson and Crick may never have reached their groundbreaking conclusion of 1953: that the DNA molecule exists in the form of a three-dimensional double helix. Chargaff, an Austrian biochemist, as his first step in this DNA research, set out to see whether there were any differences in DNA among different species. After developing a new paper chromatography method for separating and identifying small amounts of organic material, Chargaff reached two major conclusions: (i) the nucleotide composition of DNA varies among species. (ii) Almost all DNA, no matter what organism or tissue type it comes from maintains certain properties, even as its composition varies. In particular, the amount of adenine (A) is similar to the amount of thymine (T), and the amount of guanine (G) approximates the amount of cytosine (C). In other words, the total amount of purines (A + G) and the total amount of pyrimidines (C + T) are usually nearly equal. This conclusion is now known as "Chargaff's rule." Chargaff's rule is not obeyed in some viruses. These either have single- stranded DNA or RNA as their genetic material.

Answer the following questions:
(a) A segment of DNA has 100 adenine and 150 cytosine bases. What is the total number of nucleotides present in this segment of DNA?
(b) A sample of hair and blood was found at two sites. Scientists claim that the samples belong to the same species. How did the scientists arrive at this conclusion?
(c) The sample of a virus was tested and it was found to contain 20% adenine, 20% thymine, 20 % guanine and the rest cytosine. Is the genetic material of this virus (a) DNA- double helix (b) DNA-single helix (c) RNA? What do you infer from this data?
<div align="center">**OR**</div>
(c) How can Chargaff's rule be used to infer that the genetic material of an organism is double- helix or single- helix? |
| | <div align="center">**SECTION E**</div> |
| | **Question No. 31 to 33 are long answer type questions carrying 5 marks each.** |
| 31 | **Attempt either A or B**
A: Answer the following questions:
(a) Explain the nature of bonding in La_2O_3 and Lu_2O_3.
(b) What is the trend in the stability of oxo salts of Lanthanoids from La to Lu?
(c) Actinoid contraction is greater from element to element than lanthanoid contraction. Why?
(d) Why are the radii of 4d and 5 d -block elements almost the same ?
(e) Why does the orange colour of $Cr_2O_7^{2-}$ ion change to yellow when treated with an alkali?
<div align="center">**OR**</div> |

	B: Answer the following questions: (a) Complete the following equation. $MnO_4^- + 8H^+ + 5e^- \longrightarrow$ (b) Out of Cr^{+3} and Mn^{+3} which is a stronger oxidising agent and why? (c) Are the enthalpies of atomisation of Zinc and Copper matched correctly? Justify your answer

Element	Enthalpy of atomization (KJ/mol)
Zinc	339
Copper	130

	(d) Out of sulphuric acid and hydrochloric acid, which acid will you prefer for permanganate titrations and why? (e) Which of the following elements will exhibit similar magnetic behaviour Magnesium (Atomic No. 12), Chromium (Atomic No. 24), Iron (Atomic No. 26) and Molybdenum (Atomic No. 42). **OR** (e) Why does the orange colour of $Cr_2O_7^{2-}$ ion change to yellow when treated with an alkali?
32	**Attempt either A or B** **A:** (a) Conductivity of 2.5×10^{-4} M methanoic acid is 5.25×10^{-5} Scm^{-1}. Calculate its molar conductivity and degree of dissociation. Given $\Lambda^o_{(H+)} = 349.5$ Scm^2mol^{-1} and $\Lambda^o_{(HCOO^-)} = 50.5$ Scm^2mol^{-1}. (b) Write the name of the cell which is generally used in transistors. Write the reactions taking place at the anode and the cathode of this cell. **OR** **B:** (a) Define molar conductivity of a substance and describe how for weak and strong electrolytes , molar conductivity changes with concentration of solute . (b) A voltaic cell is set up at 25 ^{o}C : Ag^+ (0.001 M)	Ag and Cu^{2+} (0.10 M)	Cu What would be the voltage of this cell? (E^o cell = 0.46 V).
33	**Attempt either A or B** **A:** (a) An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dil. Sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid also produces (B). On dehydration (C) gives but-1-ene. Identify A ,B , and C. Write all chemical reactions involved . (b) Account for the following (i) Aromatic carboxylic acids do not undergo Friedel- Craft reaction. (ii) pKa value of 4-nitrobenzoic acid is lower than that of benzoic acid. **OR** **B:** (a) An aromatic compound (A) (molecular formula C_8H_8O) gives a positive 2,4 - DNP test.. It gives a yellow precipitate of compound (B) on treatment with iodine and sodium hydroxide solution. Compound (A) does not give Tollens or Fehling tests. On severe oxidation with potassium permanganate forms a carboxylic acid (C) (Molecular formula $C_7H_6O_2$), which is also formed along with the yellow compound in the above reaction. Identify A, B and C .Write down the chemical reactions involved. (b) In the above reaction explain which one is more acidic A or C? (c) Write down the method of preparation of A from benzene.