

Roll No. _____

Please check that this question
paper contains 33 Questions
and 7 Printed pages

D.A.V. INSTITUTIONS, CHHATTISGARH

SAMPLE QUESTION PAPER -2023-24

CHEMISTRY

Class – XII

Maximum Marks: 70

Time allowed: 3 hours

General Instructions:

Read the following instructions carefully.

- 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 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. There is no internal choice in this section.

- Rate law for the reaction $A + 2B \longrightarrow C$ is found to be $\text{Rate} = k [A][B]$. Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of rate constant will be _____.
 (a) the same (b) doubled (c) quadrupled (d) halved **1**
- For a complex reaction _____.
 (a) order of overall reaction is same as molecularity of the slowest step.
 (b) order of overall reaction is less than the molecularity of the slowest step.
 (c) order of overall reaction is greater than molecularity of the slowest step.
 (d) none of the these. **1**
- Which one of the following ions exhibit colour in aqueous solution:
 (a) Sc^{3+} (b) Ni^{2+} (c) Ti^{4+} (d) Zn^{2+} **1**
- Which is the correct IUPAC name for:

$$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{Br} \\ | \\ \text{C}_2\text{H}_5 \end{array}$$
 (a) 1-Bromo-2-ethylpropane (b) 1-Bromo-2-ethyl-2-methylethane **1**

- (c) 1-Bromo-2-methylbutane (d) 2-Methyl-1-bromobutane
5. Which one of the following compound is obtained by dehydrogenation of secondary alcohols? 1
 (a) Ketone (b) Aldehyde
 (c) Carboxylic acid (d) Amine
6. Cannizaro's reaction is not given by _____. 1
 (a) Cyclohexanone (b) C₆H₅-CHO
 (c) HCHO (d) CH₃CHO
7. Amongst the following, the strongest base in aqueous medium is _____. 1
 (a) CH₃NH₂ (b) NCCH₂NH₂
 (c) (CH₃)₂NH (d) C₆H₅NHCH₃
8. The correct IUPAC name for CH₂=CHCH₂NHCH₃ is---- 1
 (a) Allylmethylamine (b) 2-amino-4-pentene
 (c) 4-aminopent-1-ene (d) N-methylprop-2-en-1-amine
9. Cellulose is a straight chain polysaccharide composed of only – 1
 (a) D-glucose units joined by α - glycosidic linkage
 (b) D – glucose units joined by β - glycosidic linkage
 (c) D – galactose units joined by α - glycosidic linkage
 (d) D – galactose units joined by β - glycosidic linkage
10. In both DNA and RNA, heterocyclic base and phosphate ester linkages are at – 1
 (a) C5' and C2' respectively of the sugar molecule
 (b) C2' and C5' respectively of the sugar molecule
 (c) C1' and C5' respectively of the sugar molecule
 (d) C5' and C1' respectively of the sugar molecule
11. Which chemical is used to distinguish between phenol and benzyl alcohol. 1
 (a) NaHCO₃ (b) FeCl₃
 (c) Iodoform test (d) none of the above
12. Hoffmann Bromamide Degradation reaction is shown by _____.
 (a) ArNH₂ (b) ArCONH₂
 (c) ArNO₂ (d) ArCH₂NH₂

ASSERTION - REASONING MCQs-

Directions : In the following questions (Q. No. 13-16) a statement of assertion followed by a statement of Reason is given. Choose the correct answer out of the following choices-

- (a) Both Assertion and Reason both are correct statements and Reason is the correct explanation of the Assertion.
 (b) Both Assertion and Reason both are correct statements but Reason is not the correct explanation of the Assertion.
 (c) Assertion is correct but Reason is incorrect statement
 (d) Assertion is incorrect but Reason is correct statement.
13. **Assertion:** Cuprous ion (Cu⁺) is colourless whereas cupric ion (Cu⁺⁺) is blue in the aqueous solution.
Reason: Cuprous ion (Cu⁺) has unpaired electrons while cupric ion (Cu⁺⁺) does not. 1
14. **Assertion:** O-nitro-phenol is less volatile than p-nitro-phenol.
Reason: There is inter-molecular hydrogen bonding in o- nitro-phenol and intra-molecular hydrogen bonding in p-nitro-phenol. 1
15. **Assertion:** Primary allylic halides show higher reactivity in SN¹ reactions than other primary alkyl halides.

- Reason:** Intermediate carbocation is stabilised by resonance. 1
16. **Assertion:** All naturally occurring amino acids are optically active. 1
- Reason:** Most naturally occurring amino acids have L- configuration. 1

SECTION – B

This section contains five questions with internal choice in one question.

17. State Raoult's Law for a solution containing volatile components. How does Raoult's law become a special case of Henry's Law? 2
18. State Faraday's laws. How much charge is required for the reduction of 1 mole of Cu^{2+} to Cu? 2
19. Give two important differences between order of reaction molecularity of reaction. 2

OR

Account for the following:

- (a) A reaction is 50% complete in 2 hours and 75% completes in 4 hours. What is the order of the reaction?
- (b) Calculate the overall order of a reaction which has the rate expression. Rate = $k [A]^{1/2} [B]^{3/2}$
20. Write chemical equations to illustrate each of the following reactions. 2
- (a) Cannizaro reaction (b) Rosenmund reduction
21. Account for the following: 2
- (a) What is difference between reducing and non reducing sugars or carbohydrates?
- (b) Define glycosidic linkage?

SECTION – C

This section contains seven questions with internal choice in one question.

22. Write the cell reaction and calculate the emf of the following cell at 25°C 3
- $\text{Sn}_{(s)} / \text{Sn}^{2+}(0.004\text{m}) // \text{H}^{+}(0.20\text{m}) / \text{H}_{2(g)} 1 \text{ bar} / \text{Pt}_{(s)}$ (Given $E^{\circ} \text{Sn}^{2+}/\text{Sn} = -0.14\text{V}$)
23. Show that in a first order reaction, time required for completion of 99.9% is 10 times of ($t_{1/2}$) half life of the reaction. 3
- OR
- The rate constants of a reaction at 500K and 700K are 0.02S^{-1} and 0.07S^{-1} respectively. Calculate the values of E_a and A.
24. Account for the following: 3
- (a) A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{+2}$ is green, but a solution of $[\text{Ni}(\text{CN})_4]^{-2}$ is colourless. Explain.
- (b) Give an example of a coordination compound which shows both geometrical and optical isomerism.
25. Account for the following: 3
- (a) What are enantiomers?
- (b) Why chlorobenzene is less reactive than chloroethane towards nucleophilic substitution reaction?
26. Give reasons for the following. 3
- (a) Although amino group is o, p- directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline.
- (b) Aniline does not undergo Friedel-Crafts reaction.
- © Why are aliphatic amines stronger bases than aromatic amines?

27. Account for the following: 3
 (a) Why is sucrose called invert sugar?
 (b) Write the Zwitter ionic form of amino acetic acid. ($\text{H}_2\text{NCH}_2\text{COOH}$).
 © How many asymmetric carbon atoms are present in D (+) glucose?
28. Account for the following: 3
 (a) Write down the mechanism involved in dehydration of ethane to ethyl alcohol.
 (b) Phenol react with bromine in the presence of carbon disulphide gives monobromo phenol where as with water gives tribromophenol. Explain.

SECTION – D

This section contains two case based questions. Each question has an internal choice.

29. Read the passage carefully given below and answer the following questions: 4

The colour of light is determined by the amount of valence electron present in a compound's outermost orbit. These electrons absorb a certain wavelength of visible light and emit a colour that is complementary to the wavelength absorbed. The colour for a coordination complex can be predicted using the Crystal Field Theory (CFT). The table given below shows the different wavelength absorbed by the coloured complexes.

Coordination entity	Wavelength of light absorbed (nm)
A. $[\text{CoCl}(\text{NH}_3)_5]^{2+}$	535
B. $[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$	500
C. $[\text{Co}(\text{NH}_3)_3]^{3+}$	475
D. $[\text{Co}(\text{CN})_6]^{3-}$	310
E. $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$	600
F. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$	498

Answer the following questions.

- (a) Among the given complexes, which have the strong field ligand and give the IUPAC name of that complex?

OR

Out of the ligands attached to the given complexes which will cause maximum splitting and why?

- (b) Which of the given compounds is pale yellow in colour?
 (c) What is spectrochemical series and arrange the mentioned ligands in the table according to spectrochemical series?

30. Read the passage given below and answer the following questions: 4

The cell constant is usually determined by measuring the resistance of the cell containing a solution whose conductivity is already known. For this purpose, we generally use KCl solutions whose conductivity is known accurately at various concentrations at 298 K temperature as mentioned in given table.

• Concentration/ Molarity		Conductivity		Molar conductivity	
• mol L ⁻¹	• mol m ⁻³	S cm ⁻¹	S m ⁻¹	S cm ² mol L ⁻¹	S m ² mol ⁻¹
• 1.000	• 1000	0.1113	11.13	111.3	111.310 ⁻⁴
• 0.100	• 100.0	0.0129	1.29	129.0	120.010 ⁻⁴
• 0.010	• 10.00	0.0041	0.141	141.0	141.010 ⁻⁴

Answer the following questions

(a) Express the relation for the conductivity of a solution in the cell, the cell constant and the resistance of solution in the cell. Or

How does the conductivity of solutions of different electrolytes in the same solvent and at a given temperature differs?

(b) Why does the conductivity of the solution decreases with dilution?

(c) Explain with the graph, the variation of molar conductivity of KCl with dilution with respect to given table.

SECTION – E

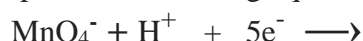
This section contains long answer type questions. All questions have an internal choice.

31. Attempt any five of the following. 5

(a) Why is the E^0 value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Fe^{3+}/Fe^{2+} ?

(b) Why orange colour of $Cr_2O_7^{2-}$ ion changes to yellow when treated with an alkali?

(c) Complete the following equation?



(d) Explain why transition elements acts as catalyst?

(e) What is the lanthanoid contraction?

(f) Why Zn^{2+} salts are white, while Cu^{2+} salts are coloured?

(g) Why transition elements show variable oxidation states?

32. Account for the following 5

(A) An organic compound (A) molecular formula ($C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid also produces (B). Or On dehydration (C) gives but-1-ene. Write the equations for the reactions involved.

(a) Identify A,B and C.

(b) Write all the chemical reactions involved.

(c) Write down the reaction to prepare C from ethanol.

(B) Account for the following:

(a) Aromatic carboxylic acid do not undergo Friedel-Crafts reaction.

(b) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid.

OR

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 Tollen's or Fehling test. 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.

Write the chemical equation involved in the formation of A, B and C. Explain which one is more acidic among A or C. Also write one method of preparation of A from benzene

33. Account for the following

5

(A) Gas (A) is more soluble in water than gas (B) at the same temperature. Which one of the two gases will have the higher value of K_H (Henry's constant) and why?

(B) In non-ideal solution, what type of deviation shows the formation of maximum boiling azeotropes?

(C) What type of azeotropic mixture will be formed by a solution of acetone and chloroform? Justify on the basis of strength of intermolecular interactions that develop in the solution.

OR

(A) How is the vapour pressure of a solvent affected when a non-volatile solute is dissolved in it?

(B) When 2.56 g of sulphur was dissolved in 100 g of CS_2 , the freezing point gets lowered by 0.383 K. Calculate the formula of sulphur (S_x). (K_f for CS_2 3.83 K kg mol⁻¹, Atomic mass of sulphur-32 g mol⁻¹)
