



PRINCE ACADEMY

OF HIGHER EDUCATION

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SAMPLE PAPER SET - 03 (2024-25)

Time : 03 Hours

CLASS - XII CHEMISTRY (043)

M. M. : 70

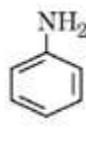
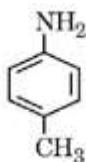
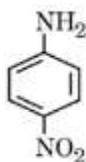
Read the following instructions carefully.

- 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 are the multiple choice questions, each carry one mark

- Choose the compound which is more acidic than phenol :
(a) p-nitrophenol (b) ethanol (c) o-methylphenol (d) o-methoxyphenol
- The most common oxidation state for all lanthanoids is:
(a) +5 (b) +2 (c) +3 (d) +4
- A reaction follows second order kinetics. How is the rate of reaction affected if the concentration of the reactant is reduced to half? Choose the correct value from the following:
(a) four times (b) eight times
(c) 1/4 of the original value (d) three times
- Solutions of two electrolytes X and Y are diluted. Molar conductivity of X increases 25 times whereas that of Y increases 1.5 times. Which one is a stronger electrolyte ?
(a) X (b) Y (c) Both X and Y (d) None of the above
- Unit of rate constant for the zero order reaction is:
(a) s^{-1} (b) $\text{mol}^{-1} \text{L s}^{-1}$ (c) $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$ (d) $\text{mol L}^{-1} \text{s}^{-1}$
- Three compounds are given below:



The correct decreasing order of their basic strength is:

- (a) II>III>I (b) III>II>I (c) III>I > II (d) I>III>II

7. Which type of isomerism is shown by the complexes $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$?

- (a) Linkage (b) Ionisation (c) Optical (d) Solvate

8. What would be the major product of the given reaction?

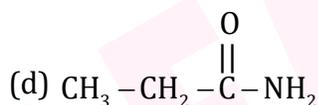
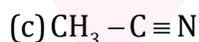
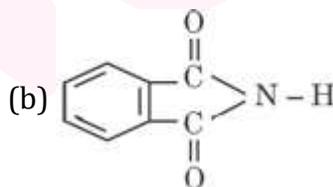
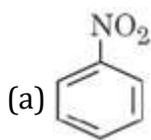


- (a) Ethanal (b) Propanol (c) Ethanol (d) Propanal

9. Pentan-2-one and Pentan-3-one can be distinguished by:

- (a) Fehling's test (b) Sodium bicarbonate test
(c) Tollens' test (d) Iodoform test

10. Hoffmann Bromamide Degradation reaction is given by:



11. Oxidation state of central metal atom in the given complex is :



- (a) +2 (b) +3 (c) +1 (d) +4

12. A galvanic cell can behave as an electrolytic cell when :

- (a) $E_{\text{cell}} = E_{\text{ext}}$ (b) $E_{\text{cell}} > E_{\text{ext}}$ (c) $E_{\text{cell}} = 0$ (d) $E_{\text{ext}} > E_{\text{cell}}$

For Questions number (13-16), two statements are given - one labelled as Assertion (A) and the other labelled as Reason (R) . Select the correct answer to these questions from the codes (A), (B), (C) , and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason(R) is not the correct explanation of the Assertion(A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

13. Assertion (A): Phenol gives mono bromophenol on treatment with Br_2 in presence of CS_2 .

Reason (R): CS_2 is a low polarity solvent .

14. Assertion (A): D-(+)-Glucose is dextrorotatory.

Reason (R): Symbol 'D' represents its dextrorotatory nature.

15. Assertion (A): Iron(III) catalyses the reaction between Iodide and persulphate ions.
Reason (R): Fe^{+3} oxidise iodide ion, Fe^{+2} reduced the persulphate ion.
16. Assertion (A): Benzene diazonium salt is unstable and cannot be stored.
Reason (R): Benzene diazonium fluoroborate stable at room temperature.

SECTION-B

Section B carry 5 question - 2 marks each with internal choice.

17. 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.
($\log 2=0.30$, $\log 4= 0.60$) [$R=8.314 \text{ J K}^{-1} \text{ mol}^{-1}$]
18. (a) DNA fingerprinting is used to determine paternity of an individual. Which property of DNA helps in the procedure ?
(b) Which vitamin deficiency causes:
(1) Bone deformities in children?
(2) Pernicious anaemia?
19. (a) Write reaction involve in Swarts process.
(b) Why is sulphuric acid not used during the reactions of alcohols with KI?
- OR
- (b) (i) Arrange the following in increasing order of their boiling points:
1-chloropropane, 2-chloropropane, 1-chlorobutane
(ii) What is an ambident nucleophile? Give one example.
20. (a) Why is $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ coloured?
(b) Write IUPAC name of the given complex:
 $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$
- OR
- (a) Write any two differences between double salt and complex salt
(b) In the complex $\text{Mn}_2(\text{CO})_{10}$, how many ligand act as Bridge ligand.
21. (a) Why are iron pipes usually coated with zinc?
(b) Why does mercury cell give a constant voltage throughout its life?

SECTION-C

Contain 7 question with 3 marks each with internal choice.

22. (a) Write the mathematical relation between rate constant and half-life period of a zero order reaction.
(b) Define Pseudo first order reaction with an example.
(c) What is the significance of arrhenius equation.
23. (a) Why is pK_a of ClCH_2COOH lower than the pK_a value of CH_3COOH ?
(b) Write the chemical equation for Hell-Volhard-Zelinsky reaction.

SECTION-D

The following questions are case-based questions. Read the case carefully and answer the questions that follow:

29. Carbohydrates are the major components of all living organisms. Sugars are carbohydrates. The major types of sugars include monosaccharides and disaccharides. The main difference between monosaccharides, disaccharides and polysaccharides is that monosaccharides are monomer of sugars and disaccharides are composed of two monomers, whereas polysaccharides are composed of a large number of monomers. Monosaccharides are single sugar molecules which act as the building blocks of disaccharides and polysaccharides. Disaccharides are also simple sugars. Disaccharides are classified into two groups according to their reducing strength: Reducing and Non-reducing sugars. When a polymer is formed from a monomer, a condensation reaction occurs that forms a glycosidic bond and water molecule is lost. Starch, glycogen and cellulose are examples of polysaccharides. Starch is found in many parts of plant cell and consists of amylose and amylopectin. Glycogen is the major carbohydrate storage product found in humans. It is present in liver, muscles and brain.

Cellulose is the most abundant organic molecule on Earth. It makes up around 50% of all organic carbon.

Answer the following questions:

- (a) Name the linkage which connects monosaccharide units in polysaccharides.
(b) Carbohydrates are classified on the basis of their behaviour on hydrolysis. Write the hydrolysis products of sucrose.
(c) Write two differences between Amylose and Amylopectin.

OR

- (c) (i) What are reducing sugars?
(ii) Sucrose is dextrorotatory but the mixture obtained after hydrolysis is laevorotatory. Why?
30. Raoult's law for volatile liquids states that the partial vapour pressure of each component in the solution is directly proportional to its mole fraction, whereas for a non-volatile solute, it states that the vapour pressure of a solution of a non-volatile solute is equal to the vapour pressure of the pure solvent at that temperature multiplied by its mole fraction. Two liquids A and B are mixed with each other to form a solution, the vapour phase consists of both components of the solution. Once the components in the solution have reached equilibrium, the total vapour pressure of the solution can be determined by combining Raoult's law with Dalton's law of partial pressures. If a non-volatile solute B is dissolved into a solvent A to form a solution, the vapour pressure of the solution will be lower than that of the pure solvent. The solutions which obey Raoult's law over the entire range of concentration are ideal solutions, whereas the solutions for which vapour pressure is either higher or lower than that predicted by Raoult's law are called non-ideal solutions. Non-ideal solutions are identified by determining the strength of the intermolecular forces between the different molecules in that particular solution. They can either show positive or negative deviation from Raoult's law

depending on whether the AB interactions in solution are stronger or weaker than A-A and B B interactions.

Answer the following questions:

(a) 20 mL of a liquid A was mixed with 20 mL of liquid B. The volume of resulting solution was found to be less than 40 mL. What do you conclude from the above data?

(b) Which of the following show positive deviation from Raoult's law? Carbon disulphide and Acetone; Phenol and Aniline; Ethanol and Acetone

(c) The vapour pressure of a solution of glucose in water is 750 mm Hg at 100°C. Calculate the mole fraction of solute.

(Vapour pressure of water at 373 K = 760mmHg)

OR

(c) The boiling point of solution increases when 1 mol of NaCl is added to 1 litre of water while addition of 1 mol of methanol to one litre of water decreases its boiling point. Explain the above observations.

SECTION-E

This section carry three question of five marks each.

31. (a) Write detailed note on Fuel Cell

(ii) How is standard Gibbs energy for a reaction related to equilibrium constant ?

(iii) Calculate emf of the given cell:



Given: $E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = +0.34$, $E_{\text{Mg}^{2+}/\text{Mg}}^{\circ} = -2.37\text{V}$

(log 100 = 2)

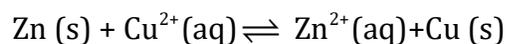
OR

(b) (i) State Kohlrausch's law of independent migration of ions.

(ii) How much electricity in terms of Faraday is required to produce 40 g of Al from molten Al_2O_3 ?

(Given: atomic mass of Al = 27 u)

(iii) Calculate log K_c for the following reaction at 298 K:



Given: $E_{\text{Zn}^{2+}/\text{Zn}}^{\circ} = -0.76 \text{ V}$, $E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = +0.34\text{V}$

32. (a) Give chemical test to distinguish between Acetone and acetaldenycle.

(b) Give reaction involve in Etard reaction.

(c) Complete the reaction : $\text{CH}_3 - \text{CN} \xrightarrow[\text{Hydrolysis}]{\text{Partial}}$

(d) Compound A undergoes Rosenmund reduction to give compound B with molecular formula $\text{C}_7\text{H}_6\text{O}$. Compound B does not give Fehling's test but reacts with conc. NaOH to give C and D.

Identify A, B, C and D.

OR

(a) Compound A with molecular formula (C_2H_6O) on oxidation by PCC gives compound B, which on treatment with dilute alkali forms compound C which is a β -hydroxy aldehyde. B on oxidation by potassium permanganate forms C. Identify A, B, C and D.

(b) Give chemical test to distinguish between Benzoic acid and ethyl Benzoate.

33. Answer the following questions:

(a) The chemistry of the actinoids is more complex as compared to lanthanoids. Why?

(b) Why is E° for Mn^{3+}/Mn^{2+} redox couple more positive?

(c) Why do transition metals form large numbers of complex compounds?

(d) How does acidified potassium permanganate solution react with Fe^{2+} ions? Write ionic equation.

(e) Calculate the 'spin only' magnetic moment of a divalent ion of a metal M in aqueous solution. The atomic number of the metal M is 25.

OR

(a) Write steps involved in preparation of $KMnO_4$.

(b) Complete the reaction $MnO_4^- + Fe^{+2} \xrightarrow{H^+}$

(c) Write any two consequences of Lanthanide contraction.

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