CHENNAI SAHODAYA SCHOOLS COMPLEX

(General Instructions)

1. This question paper contains 8 printed pages.
2. Write down the question number before attempting.
3. An additional reading time of 15minutes.
4. There are 35 questions in this question paper with internal choice.
5. SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
6. SECTION B consists of 7 very short answer questions carrying 2 marks each.
7. SECTION C consists of 5 short answer questions carrying 3 marks each.
8. SECTION D consists of 2 case- based questions carrying 4 marks each.
9. SECTION E consists of 3 long answer questions carrying 5 marks each.
10. All questions are compulsory.
11. Use of log tables and calculators is not allowed.

COMMON EXAMINATION
Class – 12
(Chemistry - 043)

Time Allowed: 3 hours   ***SET A***   *Maximum Marks: 70*

Roll No.   *Date:*

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. Daniel cell has an E^0 =1.1 V. If an external voltage greater than 1.1 V is passed through the cell, then

a) Electrons flow from Cu to Zn and current flows from Zn to Cu

b) Electrons flow from Zn to Cu and current flows from Cu to Zn

c) Electrons and the current flow from Cu to Zn

d) Electrons flow from Cu to Zn and no current flows

2. The minimum energy required for molecules to enter into a chemical reaction is called

a) Kinetic energy   b) Potential energy   c) Threshold energy   d) Activation energy

3. A quantitative relationship between the temperature and rate constant of a reaction is given by

a) Nernst equation   b) Arrhenius equation   c) van't Hoff equation   d) Henderson equation

4. Molecularity and order will be equal for

a) reversible reactions   b) complex reactions   c) elementary reactions   d) spontaneous reactions

5. The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$, Which of the following correct in aqueous medium?

    a) Cu(II) is more stable   b) Cu(II) is less stable

    c) Cu(I) and Cu(II) are equally stable   d) Cu(I) and Cu(II) unstable

6. In the formation of $K_4[Fe(CN)_6]$, the hybridization involved is

a) sp^2 b) d^2sp^3 c) d^3sp^2 d) sp^3

7. When 1 mole $CrCl_3.6H_2O$ is treated with excess of $AgNO_3$, 3 mole of $AgCl$ are obtained. The formula of the complex is

a) $[CrCl_3(H_2O)_3] 3H_2O$ b) $[CrCl_2(H_2O)_4] Cl.2H_2O$

c) $[CrCl(H_2O)_5] Cl_2 H_2O$ d) $[Cr(H_2O)_6] Cl_3$

8. Which of the following is an example of vic- dihalide?

a) Dichloromethane   b) 1,2-dichloroethane   c) Ethylidene chloride   d) Allyl chloride

9. During dehydration of alcohol molecules to alkene by heating with conc.H_2SO_4 the initial step is

 a) Formation of an ester   b) Protonation of alcohol molecule

 c) Formation of carbocation   d) Elimination of water

10. What will be the bond angle C-O-H in alcohol if C and O atom possess sp^3 hybridization?

 a) $114^028'$ b) $111^042'$ c) 109^0 d) 120^0

11. Acetaldehyde will not show

a) Iodoformtest   b) Lucas test   c) Benedict's test   d) Tollen's test

12. The reagent that can be used to distinguish acetophenone and benzophenone is

a) 2,4-DNP   b) aq.$NaHSO_3$ c) Benedict reagent   d) I_2 and Na_2CO_3

13. The reagent used to convert ethylchloride into propylamine will be:

a) $NaNH_2$ b) AgCN followed by H_2 / Pt c)KCN followed by H_2 / Pt   d) KCN followed by H_3O^+

14. Nitrobenzene is converted to aniline using ____

a) Sn/HCl   b) Sn/NH_4OH c) HCl/NH_4OH d) $KMnO_4$

15. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: Zn, Cd and Hg cannot be regarded as transition elements

Reason: These elements do not belong to the d-block of the periodic table.

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.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: Phenol undergoes Kolbe's reaction but propanol does not.

Reason: Phenol is more acidic than propanol.

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.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: Aniline is more reactive than benzene.

Reason: Amino group which activates the benzene ring and directs the incoming group at ortho and para position.

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.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: Vitamin C cannot be stored in our body.

Reason: Vitamin C is water soluble

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.

SECTION – B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each

19. Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

20. A first order reaction takes 69.3 minutes for 50 % completion. What is the time needed for 80 % of the reaction to get completed?

(log 5 = 0.6990, log 8 = 0.9030, log 2 = 0.3010)

21. The rate constant of a first order reaction is given by, log k = 14.2 – 1.0 x 10^4K / T. Calculate activation energy and rate constant if the half-life for the reaction is 200 minutes.
[R = 8.314J/Kmol]

22. $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic, though both are tetrahedral. Why?

23. a) Which would undergo S_N2 reaction faster in the following pair and why?

   Ethyl bromide and ethyl iodide

   b) Which would undergo S_N1 reaction faster in the following pair and why?

   Ethyl bromide and tert-butyl bromide

         (or)

   Write the chemical equations when

   a) Ethyl chloride is treated with aqueous KOH

   b) Chlorobenzene is treated with CH_3COCl in presence of anhydrous $AlCl_3$?

24. Name the reagent/s used in the following reactions.

   a) Acetone ----------> isopropyl alcohol

   b) Benzoyl chloride ---------->benzaldehyde

25. What are the products of hydrolysis of sucrose and maltose?

                 (or)

   Define the following terms

   a) Peptide linkage

   b) Primary structure of protein

SECTION – C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. a) Why are aquatic species more comfortable in cold water than in warm water?

   b) Why is ethylene glycol added to water in car radiators at sub-zero conditions?

   c) What is the effect of temperature in solubility of solid in liquid?

27. a) Predict the possible hybridization, geometry, magnetic nature and spin of the complex. $[CoF_6]^{3-}$

b) Write down the oxidation state of the central metal ion in the following complex $[Mn(H_2O)_6]$ SO_4.

28. a) Write the chemical equation involved in Sandmeyer's reaction and Swartz reaction.
b) Write the structural formula for 1- chloro-4-ethyl cyclohexane.
(or)
a) Write the chemical equation involved in Fittig reaction and Finkelstein reaction.
b) Write the structural formula for 1-bromo-2,2-dimethylpropane.

29. Write the mechanism of hydration of ethene to yield ethanol.

30. How will you convert the following compounds?

   a) Aniline to nitrobenzene

   b) Ethanoic acid into methanamine

   c) Aniline into N-Phenylethanamide

            (or)

   Write the chemical equations involved when aniline is treated with the following reagents.

   a) Br_2 water

   b) $CHCl_3$ and KOH

   c) HCl

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.

31. The particles in nucleus of the cell responsible for heredity which are made up of proteins and another type of biomolecules called nucleic acids. These are mainly of two types DNA and RNA. Nucleic acid on hydrolysis gives a pentose sugar, phosphoric acid and nitrogen containing heterocyclic compound. Nucleic acids found in all cells and have a very diverse set of functions, such as cell creation, the storage and processing of genetic information, protein building, and the generation of energy cells. Although their functions may differ, the structures of DNA and RNA are very similar, with only a few fundamental differences in their molecular make-up differentiating them.

Answer the following questions:

a) Mention any two functions of DNA.

b) What are nucleotides?

c) List out all possible products got on hydrolysis of a RNA sample?

(or)

Give one similarity and one difference between RNA and DNA.

32. The cause for deviations in colligative properties of non-ideal solutions, lie in the nature of interactions at the molecular level. These properties show deviations from Raoult's law due to difference between solute – solvent interactions, solute – solute interactions and solvent – solvent interactions. Some liquids on mixing, form azeotropes which are binary mixtures having the same composition in liquid and vapour phase boil at a constant temperature. In such cases, it is not possible to separate the components by fractional distillation. There are two types of azeotropes called minimum boiling azeotrope and maximum boiling azeotrope.

Answer the following questions:

a) What is minimum boiling azeotropes?

b) Pure ethanol cannot be prepared from fractional distillation of ethanol – water mixture. Why?

c) Why is a mixture of phenol and aniline shows deviations from ideal behavior? Comment.

(Or)

The vapour pressure of pure benzene at certain temperature is 1.25 atm. When 1.2 g of non-volatile, non-electrolyte solute is added to 50 g of benzene, the vapour pressure of solution is lowered by 0.013 atm. What is the molar mass of the non-volatile solute?

SECTION – E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. a) The electrical resistance of a column of 0.05 mol L^{-1} NaOH solution of diameter 1 cm and length 50 cm is 5.55 x 10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.

   b) How many moles of mercury will be produced by electrolysing 1.0 M $Hg(NO_3)_2$ solution with a current of 2.00 A in 3 hours? (Atomic mass of Hg = 200.6 g mol^{-1})

         (or)

   a) Conductivity of 2.5 x 10^{-4} M methanoic acid is 5.25 x 10^{-5} S cm^{-1}. Calculate its molar conductivity and degree of dissociation.

[Given : λ^0 (H^+) = 349.5 S cm^2 mol^{-1} and λ^0 ($HCOO^-$) = 50.5 S cm^2 mol^{-1}]

   b) State Kohlrausch law.

c) Why is lead storage battery called a secondary cell?

34. a) Calculate the spin only magnetic moment of M^{2+} (aq) ion. (Z = 27)

   b) What is lanthanoid contraction?

   c) Why are Mn^{2+} compounds more stable than Fe^{2+} towards oxidation to their +3 state?

   d) Which trivalent ion of the 3 d series does not exhibit colour? Why?

          (or)

Account for the following

a) Eu^{2+} is strong reducing agent.

b) Transition metals form coloured compounds.

c) Zn has lowest enthalpy of atomisation.

d) Complete the following equations.

   i. $KMnO_4$ + heat -----------$\rightarrow$?

   ii. $Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+}$ --------$\rightarrow$?

35. a) A compound 'A' on oxidation gives 'B' ($C_2H_4O_2$). 'A' reacts with dil.NaOH and on subsequent heating forms 'C' which on catalytic hydrogenation gives 'D'. Identify A to D with the chemical reactions involved.

   b) Give simple chemical test to distinguish between the following pairs of compounds.

   i. Benzaldehyde and Acetophenone   ii. Ethanal and Propanal

   c) Write the IUPAC name of oxalic acid.

End of Paper