



BK BIRLA CENTRE FOR EDUCATION
SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY/CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL



First Pre-Board EXAMINATION 2023-24

CHEMISTRY (043)

Class :XII
Date :11.12.23
Admission No.:

Duration : 3 Hrs
Max. Marks : 70
Roll No.:

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 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

- Which of the following aqueous solutions has the highest boiling point?
(a) 0.1M KNO₃ (b) 0.1 M Na₃PO₄ (c) 0.1M BaCl₂ (d) 0.1 M K₂SO₄
- When aqueous solution of NaCl is electrolysed
(a) Cl₂ is evolved at cathode (b) H₂ is evolved at cathode (c) Na is deposited at cathode (d) Na appears at anode.
- In lead storage battery, the concentration of electrolyte H₂SO₄
(a) 38% (b) 48% (c) 32% (d) 80%
- When initial concentration of reactant is doubled in a reaction, the half-life period is not affected. The order of reaction is
(a) second (b) zero (c) first (d) more than zero but less than first.
- Which of the following pairs have the same size?
(a) Fe²⁺, Ni²⁺ (b) Zr⁴⁺, Ti⁴⁺ (c) Zr⁴⁺, Hf⁴⁺ (d) Zn²⁺, Hf⁴⁺
- The most stable complex is
(a) [Fe(H₂O)₆]³⁺ (b) [Fe(NH₃)₆]³⁺ (c) [Fe(C₂O₄)₃]³⁻ (d) [FeCl₆]³⁻
- When one mole of CoCl₃.5NH₃ was treated with excess silver nitrate solution, 2 mole of AgCl was precipitated. The formula of the compound is
(a) [Co(NH₃)₅Cl₂]Cl (b) [Co(NH₃)₅Cl]Cl₂ (c) [Co(NH₃)₄Cl₂] (NH₃) Cl (d) [Co(NH₃)₃Cl₃] (NH₃)₂
- (CH₃)₂CH=CH₂ + HBr → A A (predominantly) is
(a) CH₃CH(Br)CH(CH₃)₂ (b) (CH₃)₂CH(Br)CH₃ (c) (CH₃)₂CH₂CH₂Br (d) (CH₃)₂C(Br)CH₂CH₃
- The hybrid state of N in R₂NH is
(a) sp³ (b) sp² (c) sp (d) dsp²
- Among the following, weakest base is
(a) C₆H₅CH₂NH₂ (b) C₆H₅CH₂NHCH₃ (c) O₂N-CH₂NH₂ (d) CH₃CONH₂
- The functional group which is found in amino acids is
(a) -COOH (b) -NH₂ (c) -CH₃ (d) both (a) and (b)

12. Amino acids are the building blocks of
(a) Carbohydrates (b) Vitamins (c) Fats (d) Proteins

Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.
(a) If both assertion and reason are correct and reason is the correct explanation for assertion.
(b) If both assertion and reason are correct but reason is not correct explanation for assertion.
(c) the assertion is correct but the reason is incorrect.
(d) the assertion is incorrect but the reason is correct.

13. Assertion: The boiling point of 0.1M urea is less than 0.1M KCl solution.
Reason: Elevation of boiling point is directly proportional to the number of particles present in the solution.
14. Assertion: All collisions of reactant molecules lead to product formation
Reason: Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation.
15. Assertion: Aniline does not undergo Friedel-Crafts reaction.
Reason: $-\text{NH}_2$ group of aniline reacts with AlCl_3 (Lewis acid) to give acid-base reaction.
16. Assertion: D (+) glucose is dextrorotatory in nature.
Reason: 'D' represents its dextrorotatory nature.

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.

17. Write two differences between a solution showing positive deviation and a solution showing negative deviation. 2

18. What type of battery is Lead storage battery? Write the cathode and anode reactions and the overall cell reaction occurring in the operation of a lead storage battery. 2

OR

State and explain Faraday's first law & second law.

19. Define the following: 2

- (a) Order of a reaction (b) Activation energy of a reaction

20. Explain the following reactions (a) Swarts reaction (b) Finkelstein reaction 2

21. Account for the following: 2

- (a) first ionisation enthalpy of Cr is lower than that of Zn.
(b) Transition elements show high melting points.

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.

22. 100 mg of a protein is dissolved in just enough water to make 10.0 mL of solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25°C , what is the molar mass of the protein?
($R = 0.0821 \text{ L atm mol}^{-1} \text{ K}^{-1}$ and $760 \text{ mm Hg} = 1 \text{ atm}$.) 3

23. The thermal decomposition of HCO_2H is a first order reaction with a rate constant of $2.4 \times 10^{-3} \text{ s}^{-1}$ at a certain temperature. Calculate how long will it take for three-fourth of initial quantity of HCO_2H to decompose. ($\log 0.25 = -0.6021$) 3

24. Explain why: 3

- (a) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
(b) Alkyl halides, though polar, are immiscible with water.

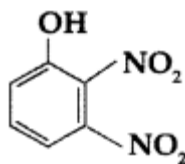
(c) Of the two bromo derivatives, $C_6H_5CH(CH_3)Br$ and $C_6H_5CH(C_6H_5)Br$, which one is more reactive in S_N1 substitution reaction and why?

25. Write the IUPAC name of the following compounds:

3

(a) $CH_3OCH_2CH_2CH_3$

(b)



(c) CH_2OHCH_2OH

26. Explain the mechanism of acid catalysed hydration of an alkene to form corresponding alcohol.

3

27.(a) Write chemical equations to illustrate the following name bearing reactions :

3

(i) Cannizzaro's reaction (ii) Hell-Volhard-Zelinsky reaction

(b) Give chemical tests to distinguish between the following pairs of compounds :

(i) Propanal and Propanone .

28. In the following cases rearrange the compounds as directed:

3

(a) In an increasing order of basic strength :

$C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$ and CH_3NH_2

(b) In a decreasing order of basic strength :

Aniline, p-nitroaniline and p-toluidine

(c) In an increasing order of pK_b values :

$C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$

OR

State reasons for the following:

(a) pK_b value for aniline is more than that for methylamine.

(b) Ethylamine is soluble in water whereas aniline is not soluble in water.

(c) Primary amines have higher boiling points than tertiary amines.

SECTION D

The following questions are case -based questions. Each question carries 4 marks. Read the passage carefully and answer the questions that follow

29. The transition metals (with the exception of Zn, Cd and Hg) are very hard and have low volatility. Their melting and boiling points are high. Fig. 8.1 depicts the melting points of transition metals belonging to 3d, 4d and 5d series. The high melting points of these metals are attributed to the involvement of greater number of electrons from $(n-1)d$ in addition to the ns electrons in the interatomic metallic bonding. In any row the melting points of these metals rise to a maximum at d 5 except for anomalous values of Mn and Tc and fall regularly as the atomic number increases.

4

(a) On what ground can you say that scandium ($Z = 21$) is a transition element but zinc ($Z = 30$) is not?

(b) Silver atom has completely filled d orbitals ($4d^{10}$) in its ground state. How can you say that it is a transition element?

(c) Why do the transition elements exhibit higher enthalpies of atomisation?

(d) Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why?

30. Read the given passage and answer the questions that follow

4

Proteins are the most abundant biomolecules of the living system. The chief sources of proteins are milk, cheese, pulses, fish, meat, peanuts, etc. They are found in every part of the body and form a fundamental basis of the structure and functions of life. These are also required for the growth and maintenance of the body. The word protein is derived from the Greek word, 'proteios' meaning 'primary' or of 'prime importance'. Chemically, proteins are the polymers in which the monomeric units are the α -amino acids. Amino acids contain an amino ($-\text{NH}_2$) and carboxylic ($-\text{COOH}$) functional groups. Depending upon the relative position of the amino group with respect to the carboxylic group, the amino acids can be classified as α , β , and γ -amino acids. Amino acids which are synthesised by the body are called non-essential amino acids. On the other hand, those amino acids which cannot be synthesized in the human body and are supplied in the form of diet (because they are required for proper health and growth) are called essential amino acids

(i) Amino acids show amphoteric behaviour. Why?

- (a) They have an amino group
- (c) Both (a) and (b)

- (b) They have a carboxylic group
- (d) none of the above

(ii) The name of linkage joining two amino acids

- (a) Hydrogen bonding
- (c) Amino linkage

- (b) Peptide linkage
- (d) Imino joints

(iii) What are polypeptides?

- (a) 10 α -amino acids joined together
- (c) 20 β -amino acids joined together

- (b) amino acids joined together
- (d) None of the above

(iv) What type of bonding helps in stabilizing the α -helix structure of proteins?

- (a) Peptide linkage
- (c) Amino linkage

- (b) Hydrogen bonding
- (d) Vanderwaals force

SECTION E

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

31. Predict the products of electrolysis in each of the following:

5

- (i) An aqueous solution of AgNO_3 with silver electrodes.
- (ii) An aqueous solution of AgNO_3 with platinum electrodes.
- (iii) A dilute solution of H_2SO_4 with platinum electrodes.
- (iv) An aqueous solution of CuCl_2 with platinum electrodes.
- (v) An aqueous solution of NaCl with platinum electrodes.

OR

(a). Explain the mechanism of rusting.

3+2

(b) A solution of $\text{Ca}(\text{NO}_3)_2$ is electrolyzed between platinum electrodes using a current of 10 amperes for 30 minutes. What mass of Ca is deposited at the cathode? (Atomic mass of Ca = 40g)

32.(a) How is a double salts different from a complex salts?

5

(b) Write IUPAC names of the following :

- (i) $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$
- (ii) $[\text{Pt}(\text{NH}_3)_6]\text{Cl}_4$.

(c) Draw the structure of cis isomer of $[\text{CO}(\text{NH}_3)_4\text{Cl}_2]^+$

OR

- (a) Using Valence bond theory explain the geometry and magnetic behaviour by $[\text{Cr}(\text{NH}_3)_6]^{3+}$
(At. no. Cr = 24)
- (b) Write the IUPAC name of ionization isomer of $[\text{Ni}(\text{NH}_3)_3\text{NO}_3]\text{Cl}$.

33. Give plausible explanation for each of the following:

5

- (i) (a) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.
(b) There are two $-\text{NH}_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazones.
(c) During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester should be removed as soon as it is formed.
- (ii) (a) Clemmenson reduction reaction (b) Etard reaction

OR

An organic compound contains 69.77% carbon, 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollens' reagent but forms an addition compound with sodium hydrogensulphite and give positive iodoform test. On vigorous oxidation it gives ethanoic and propanoic acid. Write the possible structure of the compound. (At. Masses of C= 12 H=1 O=16)

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