



# BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS  
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

First Pre-Board EXAMINATION 2024-25

CHEMISTRY (043)



Class: XII

Date: 13.11.24

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

- Cell potential of mercury cell  
(a) 1.5 V (b) 1.35V (c) 1.45V (d) 12V
- When molten NaCl is electrolysed  
(a) Cl<sub>2</sub> is evolved at cathode (b) H<sub>2</sub> is evolved at cathode (c) Na is deposited at cathode (d) Na appears at anode.
- In a lead storage battery, an anode is made of  
(a) Pb (b) PbO (c) Zn (d) Cu
- When the initial concentration of reactant is doubled in a reaction, then the rate of reaction becomes double. 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) Fe, Ni (b) Zr, Ti (c) Zr, Hf (d) Zn, Hf
- Mohr's salt is  
(a) Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> · (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> · 6H<sub>2</sub>O (b) FeSO<sub>4</sub> (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub> · 6H<sub>2</sub>O (c) MgSO<sub>4</sub> · 7H<sub>2</sub>O (d) FeSO<sub>4</sub> · 7H<sub>2</sub>O
- EDTA is used for the estimation of  
(a) Na<sup>+</sup> and K<sup>+</sup> ions (b) Cl<sup>-</sup> and Br<sup>-</sup> ions (c) Cu<sup>2+</sup> and Cs<sup>+</sup> ions (d) Ca<sup>2+</sup> and Mg<sup>2+</sup> ions
- (CH<sub>3</sub>)<sub>2</sub>CH=CH<sub>2</sub> + HBr → A A (predominantly) is  
(a) CH<sub>3</sub>CH(Br)CH(CH<sub>3</sub>)<sub>2</sub> (b) (CH<sub>3</sub>)<sub>2</sub>CH(Br)CH<sub>3</sub> (c) (CH<sub>3</sub>)<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Br (d) (CH<sub>3</sub>)<sub>2</sub>C(Br)CH<sub>2</sub>CH<sub>3</sub>
- The hybrid state of N in R<sub>2</sub>NH is  
(a) sp<sup>3</sup> (b) sp<sup>2</sup> (c) sp (d) dsp<sup>2</sup>
- Among the following, the weakest base is  
(a) C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>NH<sub>2</sub> (b) C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>NHCH<sub>3</sub> (c) O<sub>2</sub>N-CH<sub>2</sub>NH<sub>2</sub> (d) CH<sub>3</sub>CONH<sub>2</sub>

11. The functional group which is found in amino acids is  
 (a) -COOH            (b) -NH<sub>2</sub>            (c) -CH<sub>3</sub>            (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 the reason is not the 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 KCl is less than 0.1M Glucose 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: -NH<sub>2</sub> group of aniline reacts with AlCl<sub>3</sub> (Lewis acid) to give acid-base reaction.
16. Assertion: D (+) glucose is dextrorotatory in nature.  
 Reason: '+' 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. Define the following terms :(i) Ideal solution (ii) Azeotrope 2
18. What type of cell is fuel cell. Write overall reaction of the cell. 2
- OR
- State and explain Faraday's first law & second law.
19. Define the following: 2  
 (a) Order of a reaction    (b) Molecularity of reaction.
20. Explain the following reactions (a) Sandmeyer reaction (b) Finkelstein reaction 2
21. Account for the following: 2  
 (a) first ionization enthalpy of Sc is lower than that of Zn.  
 (b) Transition elements are coloured in their compounds.

### 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. Write the reactions taking place at cathode and anode in lead storage battery when the battery is in use. What happens on charging the battery? 3
23. The thermal decomposition of HCO<sub>2</sub>H 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<sub>2</sub>H to decompose. ( $\log 0.25 = -0.6021$ ) 3

24. Explain why :

3

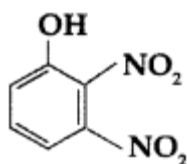
- (a) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
- (b) Alkyl halides, though polar, are immiscible with water.
- (c) Of the two bromo derivatives,  $C_6H_5CH(CH_3)Br$  and  $C_6H_5CH(C_6H_5)Br$ , which one is more reactive in  $S_N1$  substitution reaction and why?

25. Write the IUPAC name of the following compounds:

3



(b)



26. Explain the mechanism of acid catalysed hydration of an Ethene to form ethanol.

3

27. (i) Aldehydes and Ketones have lower boiling points than corresponding alcohols. Why?

3

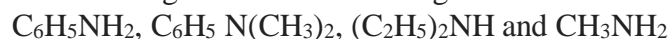
(ii) Formaldehyde does not take part in Aldol condensation. Why?

(iii) Ethanal is soluble in water. Why?

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

3

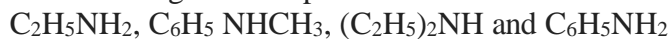
(a) In an increasing order of basic strength :



(b) In a decreasing order of basic strength :



(c) In an increasing order of  $pK_b$  values :



OR

State reasons for the following:

3

(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.

- (a) On what ground can you say that scandium ( $Z = 21$ ) is a transition element but zinc ( $Z = 30$ ) is not? 1
- (b) Silver atom has completely filled d orbitals ( $4d^{10}$ ) in its ground state. How can you say that it is a transition element? 1
- (c) Why do the transition elements exhibit higher enthalpies of atomization? 2

OR

- (c) Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why? 2

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

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  $\alpha$ -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  $\alpha$ ,  $\beta$ , and  $\gamma$ -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

- (a) Define Peptide linkage. Give one example. 2

- (b) (i) Amino acids show amphoteric behaviour. Why? 1

- (a) They have an amino group (b) They have a carboxylic group  
(c) Both (a) and (b) (d) none of the above

- (ii) The name of linkage joining two amino acids 1

- (a) Hydrogen bonding (b) Peptide linkage  
(c) Amino linkage (d) Imino joints

OR

- (ii) What type of bonding helps in stabilizing the  $\alpha$ -helix structure of proteins?

- (a) Peptide linkage (b) Hydrogen bonding  
(c) Amino linkage (d) Van der waals force

### SECTION E

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

- 31.(a) 30 g of urea ( $M = 60 \text{ g mol}^{-1}$ ) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg. 3

- (b) Write two differences between ideal solutions and non-ideal solutions. 2

OR

- (a) Explain why on addition of 1 mol glucose to 1 litre water the boiling point of water increases. 2

- (b) Henry's law constant for  $\text{CO}_2$  in water is  $1.67 \times 10^8 \text{ Pa}$  at 298 K. Calculate the number of moles of  $\text{CO}_2$  in 500 ml of soda water when packed under  $2.53 \times 10^5 \text{ Pa}$  at the same temperature. 3

32. (a) (i) What type of isomerism is shown by the complex  $[\text{Co}(\text{en})_3]\text{Cl}_3$ ? 3

(ii) Write IUPAC name of the following complex:  $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$

(iii) Why is  $[\text{NiCl}_4]^{2-}$  paramagnetic while  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic?

(Atomic numbers of Ni = 28 and Co = 27)

- (b) Write all the Postulates of Werner's Theory. 2

OR

- (a) (i) Which of the following is more stable complex and why? 3  
[Co(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup> and [Co(en)<sub>3</sub>]<sup>3+</sup>  
(ii) What is the IUPAC name of the complex [Ni(NH<sub>3</sub>)<sub>6</sub>]Cl<sub>2</sub>?  
(iii) Give IUPAC name of the ionization isomer of [Ni(NH<sub>3</sub>)<sub>3</sub>NO<sub>3</sub>]Cl.
- (b) What is meant by chelate effect? Explain with an example. 2

- 33.(a) Illustrate the following name reactions by giving an example : 2  
(i) Cannizzaro's reaction      (ii) Clemmensen reduction  
(b) An organic compound A contains 69.77% carbon, 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollen's reagent but forms an addition compound with sodium hydrogen sulphite and gives a positive iodoform test. On vigorous oxidation, it gives ethanoic and propanoic acids. Derive the possible structure of compound A ( atomic Masses of C=12 H=1 and O =16) 3

OR

- (a) Write chemical equations to illustrate the following name-bearing reactions : 2  
(i) Cannizzaro's reaction  
(ii) Hell-Volhard-Zelinsky reaction  
(b) Give chemical tests to distinguish between the following pairs of compounds : 3  
(i) Propanol and Propanone  
(ii) Acetophenone and Benzophenone  
(iii) Phenol and Benzoic acid

\*\*\*\*\*end of paper\*\*\*\*\*