



COMMON PRE-BOARD EXAMINATION :2022-23

Class-XII Subject: CHEMISTRY -043



Date: .../.../2023

General Instructions:

- There are 35 questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 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

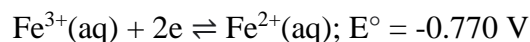
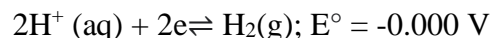
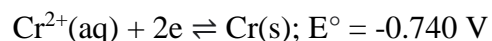
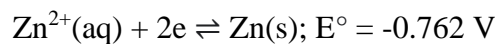
SECTION A

Question number 1 to 14 are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

- Which one of the following can be prepared by Gabriel Phthalimide synthesis?
(a) Aniline (b) o-Toluidine (c) Benzylamine (d) N-Methyl ethanamine
- Methyl bromide is converted into ethane by heating it in ether medium with.
(a) Na (b) Al (c) Cu (d) Zn
- What will occur if a block of copper metal is dropped into a beaker containing a solution of IM ZnSO_4 ?
(a) The copper metal will dissolve and zinc metal will be deposited.
(b) No reaction will occur.
(c) The copper metal will dissolve with evolution of hydrogen gas.
(d) The copper metal will dissolve with evolution of oxygen gas.
- Which one of the following expressions is correct for the rate of reaction given below?
$$5\text{Br}^-(\text{aq}) + \text{BrO}_3^-(\text{aq}) + 6\text{H}^+(\text{aq}) \rightarrow 3\text{Br}_2(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$$

a) $\frac{\Delta[\text{Br}^-]}{\Delta t} = \frac{5}{6} \frac{\Delta[\text{H}^+]}{\Delta t}$	b) $\frac{\Delta[\text{Br}^-]}{\Delta t} = 6 \frac{\Delta[\text{H}^+]}{\Delta t}$
c) $\frac{\Delta[\text{Br}^-]}{\Delta t} = 5 \frac{\Delta[\text{H}^+]}{\Delta t}$	d) $\frac{\Delta[\text{Br}^-]}{\Delta t} = \frac{6}{5} \frac{\Delta[\text{H}^+]}{\Delta t}$
- Gadolinium belongs to 4f series, its atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?
(a) $[\text{Xe}] 4f^8 6d^2$ (b) $[\text{Xe}] 4f^9 5s^1$ (c) $[\text{Xe}] 4f^6 5d^2 6s^2$ (d) $[\text{Xe}] 4f^7 5d^1 6s^2$

6. The standard reduction potentials at 298 K for the following half-reactions are given against each:



which is the strongest reducing agent?

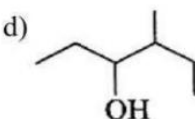
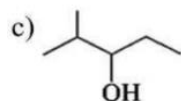
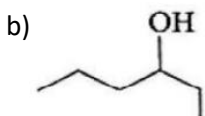
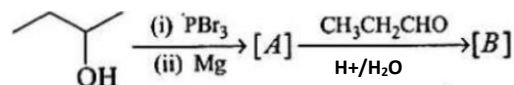
- (a) $\text{H}_2(\text{g})$ (b) $\text{Zn}(\text{s})$ (c) $\text{Fe}^{2+}(\text{aq})$ (d) $\text{Cr}(\text{s})$
7. Which of the following arrangements does not represent the correct order of the property stated against it?

- (a) $\text{V}^{2+} < \text{Cr}^{2+} < \text{Mn}^{2+} < \text{Fe}^{2+}$:
paramagnetic behaviour
- (b) $\text{Sc} < \text{Ti} < \text{Cr} < \text{Mn}$:
no. of oxidation states
- (c) $\text{Co}^{3+} < \text{Fe}^{3+} < \text{Cr}^{3+} < \text{Sc}^{3+}$:
Stability in aqueous solution
- (d) $\text{Ni}^{2+} < \text{Co}^{2+} < \text{Fe}^{2+} < \text{Mn}^{2+}$:
ionic size

8. The best reagent for converting 2-phenylpropanamide into 2-phenylpropanamine is:

- (a) $\text{Br}_2 / \text{NaOH}$ (b) I_2 / P_4 (c) excess of H_2 (d) LiAlH_4 in ether

9. The correct structure for compound B will be:



10. Which one of the following will show optical isomerism?

- (a) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$ (b) cis- $[\text{Co}(\text{en})_2\text{Cl}_2] \text{Cl}$
- (c) trans- $[\text{Co}(\text{en})_2\text{Cl}_2] \text{Cl}$ (d) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2] \text{Cl}$

11. Benzaldehyde and acetone can be best distinguished by using:

- (a) Tollen's reagent (b) Hydrazine
- (c) 2,4-DNP reagent (d) Sodium hydroxide solution

12. Which of the following statement is not correct for the catalyst?

- (a) It is a substance that does not change the equilibrium constant of a reaction.
- (b) It provides an alternate mechanism by reducing activation energy between reactants and products.
- (c) It catalyses the forward and backward
- (d) It alters ΔG of the reaction.

13. The best method for the conversion of an alcohol into an alkyl chloride is by treating the alcohol with:

- (a) SOCl_2 in presence of pyridine (b) PCl_3
(c) PCl_5 (d) Dry HCl in the presence of anhydrous ZnCl_2

14. Which of the following set of compounds constitute only disaccharides?

- (a) Starch, cellulose, glucose (b) Maltose, lactose, sucrose
(c) Maltose, sucrose, galactose (d) Starch, maltose, lactose

Question number 15-18 are Assertion / Reason type. In these questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) Assertion and reason both are correct statements and reason is the correct explanation for assertion.
(b) Assertion and reason both are correct statements and reason is not the correct explanation for assertion.
(c) Assertion is the correct statement but reason is wrong statement.
(d) Assertion is the wrong statement but reason is correct statement.

15. **Assertion (A):** Boiling points of alcohols and ethers are high.

Reason (R) : They can form intermolecular hydrogen bonding.

16. **Assertion (A):** Toxic metal ions are removed by chelating ligands.

Reason (R) : Chelate complexes tend to be more stable.

17. **Assertion (A):** The unit of k is independent of order of reaction.

Reason (R) : The unit of rate is $\text{mol L}^{-1} \text{s}^{-1}$.

18. **Assertion (A):** Acylation of amines gives a monosubstituted product whereas alkylation of amines gives the polysubstituted product.

Reason (R) : Acyl group sterically hinders the approach of further acyl groups.

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. The activation energy of a reaction is 94.14 kJ/mol and the value of rate constant at 40°C is $1.8 \times 10^{-1} \text{ sec}^{-1}$. Calculate the frequency factor A ($\log 2 = 0.3010$, $\log 3 = 0.4771$, $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

20. Define the following and give one example of each:

- (a) Isoelectric point
(b) Enzymes

OR

Write chemical reactions to show that open structure of D-glucose contains the following:

- (a) Straight chain
(b) Aldehyde as carbonyl group

21. (a) Write the structure of the following compound:

2-(2-chlorophenyl)-1-iodoethane.

(b) A solution of KOH hydrolyses $\text{CH}_3\text{CHClCH}_2\text{CH}_3$, and $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$. Which one of these is more easily hydrolysed? Give reason.

OR

Give reason for the following.

- (a) Electrophilic substitution in haloarenes occurs slowly.
 - (b) The presence of nitro group ($-\text{NO}_2$) at o/p positions increases the reactivity of haloarenes towards nucleophilic substitution reactions.
22. Deduce the shape and magnetic behaviour of the complex ion $[\text{Co}(\text{NH}_3)_5\text{NO}_2]^{2+}$.
[Atomic number of Co = 27]
23. (a) Write the overall reaction that occurs during discharging of nickel-cadmium cell. Is it a primary or a secondary cell?
(b) Write the cathode and anode reactions in a $\text{H}_2\text{-O}_2$ fuel cell.
24. The rate of a particular reaction triples when temperature changes from 50°C to 100°C . Calculate the activation energy of the reaction. [Given $\log 3 = 0.4771$; $R = 8.314 \text{ K}^{-1} \text{ mol}^{-1}$]
25. Name the electrophile produced in the reaction of benzene with benzoyl chloride in the presence of anhydrous AlCl_3 . Write the equation for the reaction and also name the reaction.

SECTION C

26. (a) The carbon-oxygen bond in phenol slightly shorter than that in methanol. Why?
(b) Write mechanism for the synthesis of 1-propoxypropane from propan-1-ol.
- OR
- (a) Write the equation of the reaction of hydrogen iodide with methoxy benzene.
(b) Write the equation involved in the acetylation of Salicylic acid.
(c) Write the equation involved in Reimer-Tiemann reaction.
27. (a) Square planar complexes with a coordination number 4 exhibits geometrical isomerism whereas tetrahedral complexes do not why?
(b) What is meant by hexadentate ligand? Give one example. How is such ligand useful for measuring hardness of water.
28. 0.6 mL of acetic acid (CH_3COOH), having density 1.06 g mL^{-1} , is dissolved in 1 litre of water. The depression in freezing point observed for this strength of acid was 0.0205°C . Calculate the van't Hoff factor and the dissociation constant of acid. [Molar mass of acetic acid = 60 g mol^{-1} , $K_f = 1.86 \text{ K kg mol}^{-1}$]
29. (a) Arrange the following substances in increasing order of basic strength in aqueous state:
 $\text{C}_6\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$, $\text{C}_2\text{H}_5\text{NH}_2$
(b) Give a simple chemical test to distinguish between the following pair of compounds:
 $\text{C}_6\text{H}_5\text{-NH}_2$ and $\text{C}_6\text{H}_5\text{-NH-CH}_3$
(c) Complete the following reaction equation.
 $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{H}_3\text{PO}_2 + \text{H}_2\text{O} \rightarrow$
30. Convert the following:
(a) 1-Bromopropane to 2-bromopropane.
(b) Benzene to 4-bromonitrobenzene.
(c) Ethyl chloride to propanoic acid.

SECTION D

31. Read the text carefully and answer the questions:

Many chemical and biological processes depend on osmosis, the selective passage of solvent molecules through the porous membrane from a dilute solution to a more concentrated one. The osmotic pressure π depends on molar concentration of the solution (CRT). If two solutions are of equal solute concentration and, hence, have the same osmotic pressure, they are said to be isotonic. If two solutions are of unequal osmotic pressures, the more concentrated solution is said to be hypertonic and the more diluted solution is described as hypotonic.

Osmosis is the major mechanism, for transporting water upward in the plants. Transpiration in the leaves supports the transport mechanism of water. The osmotic pressure of seawater is about 30 atm; this is the pressure that must be applied to the seawater (separated from pure water using a semi-permeable membrane) to get drinking water.

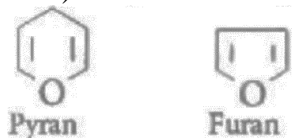
- (a) What will happen if a plant cell is kept in a hypertonic solution?
- (b) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing in 1.2% sodium chloride solution?
- (c) What happens when the external pressure applied becomes more than the osmotic pressure of solution?

OR

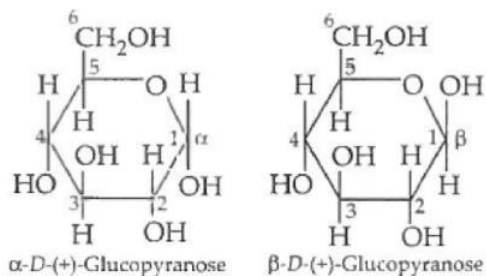
Which mechanisms helps in the transportation of water in a plant?

32. Read the text carefully and answer the questions:

Pentose and hexose undergo intramolecular hemiacetal or hemiketal formation due to combination of the -OH group with the carbonyl group. The actual structure is either of five or six membered rings containing an oxygen atom. In the free state all pentoses and hexoses exist in pyranose form (resembling pyran). However, in the combined state some of them exist as five membered cyclic structures, called furanose (resembling furan).



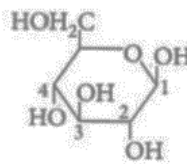
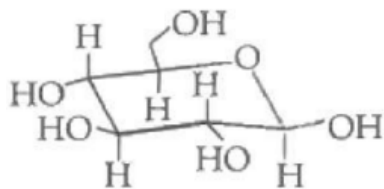
The cyclic structure of glucose is represented by Haworth structure:



α and β -D-glucose have different configurations at anomeric (C-1) carbon atom, hence are called anomers and the C-1 carbon atom is called anomeric carbon (glycosidic carbon).

The six-membered cyclic structure of glucose is called the pyranose structure.

- (i) What percentage of β -D-(+) glucopyranose is found at equilibrium in the aqueous solution?
- (ii) The following carbohydrate is



(iii) In the carbon structure, anomeric carbon is

OR

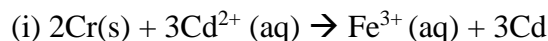
What are α - D(+)-glucose and β -D(+)-glucose.

SECTION E

33. (a) Two students use same stock solution of ZnSO_4 and a solution of CuSO_4 . The emf of one cell is 0.03V higher than the other. The concentration of CuSO_4 in the cells with higher emf value is 0.5M. Find out the concentration of CuSO_4 in the other cell. ($R = 8.314 \text{ K}^{-1} \text{ mol}^{-1}$, $F = 96500 \text{ C}$, $T = 298 \text{ K}$, $\log 5 = 0.6990$)

(b) Calculate the standard cell potentials of galvanic cells in which the following reactions take place:

$$(E^\circ \text{Cr}^{3+}/\text{Cr} = -0.74 \text{ V}, E^\circ \text{Cd}^{2+}/\text{Cd} = -0.40 \text{ V}, F = 96500 \text{ C})$$



Calculate the $\Delta_r G^\circ$.

OR

(a) Conductivity of 0.00241M acetic acid is $7.896 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity and if the limiting molar conductivity of acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$, what is its dissociation constant?

(b) Predict the product of electrolysis of dilute solution of H_2SO_4 with platinum electrodes.

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

34. (a) Write one chemical reaction each to exemplify the following:

(i) Rosenmund reduction

(ii) Tollen's reagent

(b) An alkene A (Mol. formula C_5H_{10}) on ozonolysis gives a mixture of two compounds B and C. Compound B gives positive Fehling's test and also forms iodoform on treatment with I_2 and NaOH . Compound C does not give Fehling's test but forms iodoform. Identify the compounds A, B and C. Write the reaction for ozonolysis.

OR

(a) Write the main product formed when propanal reacts with the following reagents:

(i) 2 moles of CH_3OH in presence of dry HCl

(ii) Dilute NaOH

(iii) $\text{H}_2\text{N-NH}_2$ followed by heating with KOH in ethylene glycol

(b) Arrange the following compounds in increasing order of their property as indicated:

(i) $\text{F-CH}_2\text{COOH}$, $\text{O}_2\text{N-CH}_2\text{COOH}$, CH_3COOH , HCOOH - acidic character

(ii) Acetone, Acetaldehyde, Benzaldehyde, Acetophenone - reactivity towards addition of HCN

35. (a) Give reasons for the following:

(i) Transition metals form complex compounds.

(ii) E° values for $(\text{Zn}^{2+}/\text{Zn})$ and $(\text{Mn}^{2+}/\text{Mn})$ are more negative than expected.

- (b) When a chromite ore(A) is fused with sodium carbonate in free excess of air and the product is dissolved in water, a yellow solution of compound (B) is obtained. After treatment of this yellow solution with sulphuric acid, compound (C) can be crystallised from the solution. When compound (C) is treated with KCl, orange crystals of compound (D) crystallise out. Identify (A) to (D) and give equation for the reaction of $\text{A} \rightarrow \text{B}$ and $\text{B} \rightarrow \text{C}$.