

Half Yearly Examination 2025 – 2026

Time - 3:00 Hrs.

M.M. 70

General Instructions: Read the following instructions carefully and follow them:

- (i) This question paper contains 33 questions. All questions are compulsory.
- (ii) This question paper is divided into five sections Section A, B, C, D and E.
- (iii) Section A questions number 1 to 16 are multiple choice type questions.
Each question carries **1 mark**.
- (iv) Section B questions number 17 to 21 are very short answer type questions.
Each question carries **2 marks**.
- (v) Section C questions number 22 to 28 are short answer type questions.
Each question carries **3 marks**.
- (vi) Section D questions number 29 and 30 are case-based questions.
Each question carries **4 marks**.
- (vii) Section E questions number 31 to 33 are long answer type questions.
Each question carries **5 marks**.
- (viii) There is no overall choice given in the question paper. However, an internal choice has been provided in few questions in all the sections except Section A.
- (ix) Kindly note that there is a separate question paper for Visually Impaired candidates.
- (x) Use of calculators is not allowed.

SECTION – A

Questions no. 1 to 16 are Multiple Choice Type Questions, carrying 1 mark each.

16×1=16

Q.1 In Which of the compounds sulphur will have an oxidation state of +6?

- (a) Na_2S (b) $\text{Na}_2\text{S}_4\text{O}_6$ (c) Na_2SO_3 (d) Na_2SO_4

Q.2 The reaction $3\text{ClO}^- \longrightarrow \text{ClO}_3^- + 2\text{Cl}^-$ is an example of:

- (a) oxidation reaction (b) reduction reaction
(c) disproportionation reaction (d) decomposition reaction

Q.3 The oxidation number of Mn is maximum in:

- (a) MnO_2 (b) K_2MnO_4 (c) Mn_3O_4 (d) KMnO_4

Q.4 Choose the right option for with respect to stock notation :

- (a) $\text{NaCl} \longrightarrow \text{Na(II)Cl}$ (b) $\text{AlF}_3 \longrightarrow \text{Al(II)F}_3$
(c) $\text{HgCl}_2 \longrightarrow \text{Hg(I)Cl}_2$ (d) $\text{SiCl}_4 \longrightarrow \text{Si(III)Cl}_4$

Q.5 Which of the following compounds contain all carbon atoms in same hybridisation state?

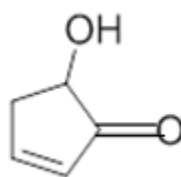
- (a) $\text{HC}\equiv\text{C}-\text{C}\equiv\text{CH}$ (b) $\text{CH}_3-\text{C}\equiv\text{C}=\text{CH}_3$ (c) $\text{CH}_2=\text{C}=\text{CH}_2$ (d) $\text{CH}_2=\text{CH}\equiv\text{CH}$

Q.6 What is the hybridisation of carbon in benzene?

- (a) sp^2 (b) sp (c) sp^3 (d) not known

Q.7 The following molecules' IUPAC name is:

- (a) 5-hydroxycyclopent-2-enone
(b) 2-hydroxycyclopent-4-enone
(c) 5-hydroxycyclopent-4-enone
(d) 2-hydroxycyclopent-2-enone



Q.8 Among the following which one is most reactive towards the electrophilic substitution reaction?

- (a) Benzene (b) Benzoic acid (c) nitrobenzene (d) toluene

Q.9 ----- has highest boiling point.

- (a) n-hexane (b) n-pentane (c) 2-methylbutane (d) 2,2-dimethylpropane

- Q.10 Aromatic hydrocarbons are also known as :
 (a) cyclic compounds (b) Arenes (c) alkynes (d) alkenes
- Q.11 Carcinogenic compounds are toxic because they :
 (a) cause heart failure (b) damage the kidney
 (c) damage the retina (d) damage DNA & cause cancer
- Q.12 Which of the following compound cannot be obtained from single alkane by wurtz reaction?
 (a) ethane (b) propyne (c) but-1-yne (d) pent-1-yne
- For Questions number 13 to 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.
- Q.13 Assertion : The decomposition of hydrogen peroxide to form water and oxygen is an example of disproportionation reaction.
 Reason : The oxygen of peroxide is in -1 oxidation state and it is converted to zero oxidation state in O₂ and -2 oxidation state in H₂O.
- Q.14 Assertion : Tertiary carbocation are generally formed more easily than primary carbocations.
 Reason : Hyper conjugation as well as inductive effect due to additional alkyl groups stabilise tertiary carbocations.
- Q.15 Assertion : Aromatic hydrocarbons are stable.
 Reason : due to resonance hybrid they have more than one structure which lower their energy and thus makes it stable.
- Q.16 Assertion : Benzene reacts with chlorine in the form of light to form BHC.
 Reason : BHC is also called gammexane or 666.

Section – B

- Q.17 Identify the reducing and oxidizing agents in the balanced redox reaction.

$$\text{Cl}_2 + 2\text{Br}^- \longrightarrow 2\text{Cl}^- + \text{Br}_2$$
- OR**
- Identify the reducing and oxidizing agents in the balanced redox reaction.

$$\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$$
- Q.18 Write formula for the following compounds.
 (a) mercury (II) chloride (b) nickel(II)sulphate (c) iron(III)sulphate (d) chromium (III)oxide
- Q.19 Identify the reagents shown in the following equations as nucleophiles or electrophiles -
 (a) $\text{CH}_3\text{COOH} + \text{OH}^- \longrightarrow \text{CH}_3\text{COO}^- + \text{H}_2\text{O}$
 (b) $\text{C}_6\text{H}_6 + \text{CH}_3\text{CO}^+ \longrightarrow \text{C}_6\text{H}_5\text{COCH}_3$
- Q.20 Draw the resonating structures of Benzene.
- Q.21 Write IUPAC name of following:
 (i) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CHO}$ (ii) $\text{CH}_3-\underset{\text{OH}}{\text{CH}}-\text{CH}_2-\text{CH}_3$

Section – C

- Q.22 Calculate the oxidation number of phosphorus in the following species.
(a) HPO_3^{-2} (b) PO_4^{-3}
- Q.23 Balanced in basic medium by any method (oxidation number method or half reaction method)
 $\text{MnO}_4^- + \text{Br}^- + \text{H}_2\text{O} \rightarrow \text{MnO}_2 + \text{BrO}_3^- + 2\text{OH}^-$
- Q.24 Write the structure of given compounds:
(a) But-2-en-1-ol (b) 2,4-Dimethylhexan-3-one (c) 4-Ethyl-2,4-dimethylhexane
- Q.25 Write structure of various carbocation that can be obtained from 2-methylbutane. Arrange all carbocation in order of increasing stability.
- Q.26 Why does benzene undergo electrophilic substitution reactions easily and nucleophilic substitution with difficulty.
- Q.27 An alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one. Write the structure and IUPAC name of 'A'.

OR

Write equation of ozonolysis of 1,2-methylethane.

- Q.28 Write structures of different isomers corresponding to the fifth member of alkyne. Also write the IUPAC names of all the isomers.

OR

Write the names of products obtained by the addition reaction of hydrogen bromide to hex-1-ene.

- (a) in the presence of peroxide (b) in the absence of peroxide

Section – D

- Q.29 The redox reaction that involves simultaneous oxidation or reduction of atoms of the same element from one oxidation state to two different oxidation state is known as a disproportionation reaction. The disproportionation reaction is known as dismutation reaction. The requirement for a disproportionation reaction to occur is, the element undergoing disproportionation reaction to occur is, the element undergoing disproportionation reaction should exhibit a minimum of three different oxidation states and the element must be less stable in a particular oxidation state from which it can be both oxidise as well as reduced to relatively more stable oxidations state.
- (i) MnO_4^{-2} undergoes a disproportionation reaction in an acidic medium but MnO_4^- does not. Give reason.
- (ii) Define disproportionation reaction?
- (iii) Find reducing and oxidising agents in the reaction $3\text{ClO}^- \rightarrow \text{ClO}_3^- + 2\text{Cl}^-$

OR

- (iii) A substance which can be oxidised as well as reduced easily is from following compounds : HCl , Cl_2O_7 , HClO_3 , HClO_4

- Q.30 Hydrocarbons are compounds of carbon and hydrogen only, obtained from coal and petroleum mainly which are major sources of energy. Hydrocarbons are classified as open chain, saturated (alkanes), unsaturated (alkenes and alkynes), cyclic (alicyclic) and aromatic based on structure.

Alkanes show conformational isomerism due to free rotation along C-C bond leading to staggered and eclipsed conformations of ethane. Staggered conformation is more stable. Alkenes show geometrical (Cis-trans) isomerism due to restricted rotation around carbon-carbon double bond. Benzene and benzenoid show aromatic character. They follow Huckel rule: $(4n+2)\pi$ electrons which must be delocalised. The presence of activating and deactivating groups decide the position of electrophile after electrophilic substitution reaction. Polynuclear fused aromatic hydrocarbons have carcinogenic property. Benzene is prepared by polymerisation of ethyne and by heating sodium benzoate with soda lime. 1×4

- (i) Out of 1-butene and 2-butene which will show geometrical isomerism.
- (ii) Why is cis-2-butene has higher boiling point than trans-2-butene?
- (iii) Why is cyclopentadienyl anion is aromatic?
- (iv) Why is $-\text{NO}_2$ group m-directing towards electrophilic substitution?

OR

- (iv) Convert acetylene to benzene .

Section – E

Q.31 Balance the following equations in basic medium by ion-electron method or oxidation number methods and identify the oxidising agent and the reducing agent.

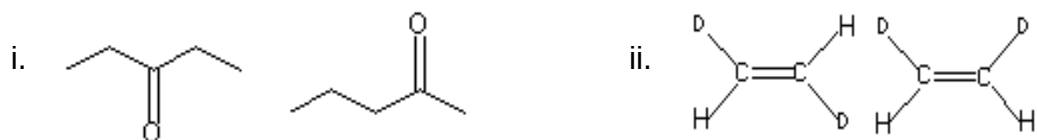
- (a) $\text{P}_{4(\text{s})} + \text{OH}^{-}(\text{aq}) \rightarrow \text{PH}_{3(\text{g})} + \text{HPO}_2^{-}(\text{aq})$ (b) $\text{N}_2\text{H}_{4(\text{l})} + \text{ClO}_3^{-}(\text{aq}) \rightarrow \text{NO}_{(\text{g})} + \text{Cl}^{-}(\text{g})$
 (c) $\text{Cl}_2\text{O}_{7(\text{g})} + \text{H}_2\text{O}_{2(\text{aq})} \rightarrow \text{ClO}_2^{-}(\text{aq}) + \text{O}_{2(\text{g})} + \text{H}^{+}$

OR

Balance the following redox reactions by ion – electron method:

- (a) $\text{MnO}_4^{-}(\text{aq}) + \text{I}^{-}(\text{aq}) \rightarrow \text{MnO}_2(\text{s}) + \text{I}_{2(\text{s})}$ (in basic medium)
 (b) $\text{MnO}_4^{-}(\text{aq}) + \text{SO}_{2(\text{g})} \rightarrow \text{Mn}^{2+}(\text{aq}) + \text{HSO}_4^{-}(\text{aq})$ (in acidic solution)
 (c) $\text{H}_2\text{O}_{2(\text{aq})} + \text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{H}_2\text{O}_{(\text{l})}$ (in acidic solution)

Q.32 (1) What is the relationship between the members of following pairs of structures? Are any structural or geometrical isomers or resonance contributors?



(2) An organic compound contains 69% carbon and 4.8% hydrogen, the remain being oxygen. Calculate the masses of carbon dioxide and water produced when 0.20 g of this substance is subjected to complete combustion.

OR

- (i) Which of the following two: $\text{O}_2\text{NCH}_2\text{CH}_2\text{O}^{-}$ or $\text{CH}_3\text{CH}_2\text{O}^{-}$ is expected to be more stable and why?
- (ii) Give condensed and bond line structural formulas and identify the functional group(s) present, if any, for :
 (a) 2,2,4-Trimethylpentane (b) 2-Hydroxy-1,2,3-propanetricarboxylic acid (c) Hexanedial

Q.33 (i) Why is Wurtz reaction not preferred for the preparation of alkanes containing odd number of carbon atoms? Illustrate your answer by taking one example.

- (ii) How would you convert the following compounds into benzene?
 (a) Ethyne (b) Ethene (c) Hexane.

OR

- (i) How will you convert benzene into :
 (a) p-nitrobromobenzene (b) m- nitrochlorobenzene
 (c) p - nitrotoluene (d) acetophenone
- (ii) What effect does branching of an alkane chain has on its boiling point?
