CHEMISTRY (CODE - 043)

CHAPTER TEST - QUESTION PAPER

Class XI (2026-27) | Chapter 8: Organic Chemistry – Some Basic Principles and Techniques

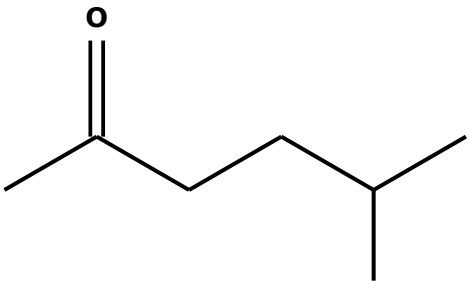
Time: 1 hour 30 minutes | Max. Marks: 35

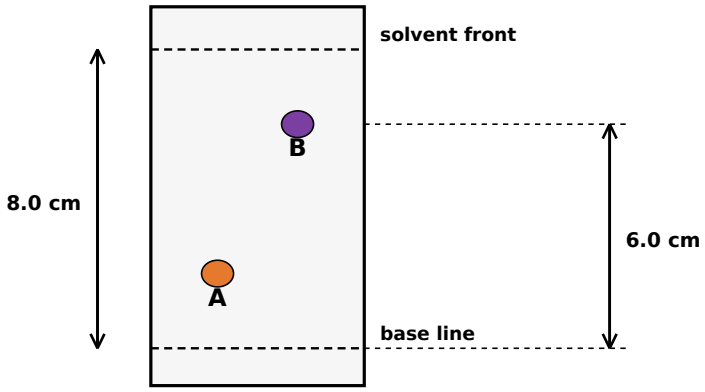
GENERAL INSTRUCTIONS:

1. Read the following instructions carefully.
2. There are 20 questions in this question paper with internal choice.
3. SECTION A consists of 12 questions carrying 1 mark each (Q. 1 to 9 are multiple-choice questions and Q. 10 to 12 are Assertion–Reason questions).
4. SECTION B consists of 4 very short answer questions carrying 2 marks each.
5. SECTION C consists of 2 short answer questions carrying 3 marks each.
6. SECTION D consists of 1 case-based question carrying 4 marks.
7. SECTION E consists of 1 long answer question carrying 5 marks.
8. All questions are compulsory. Internal choice is provided in Q. 16 (Section B) and Q. 20 (Section E).
9. Use of log tables and calculators is not allowed.
10. Atomic masses: H = 1, C = 12, N = 14, O = 16.

SECTION A

Questions 1 to 9 are multiple-choice questions. Only one of the choices is correct. Questions 10 to 12 are Assertion–Reason questions.

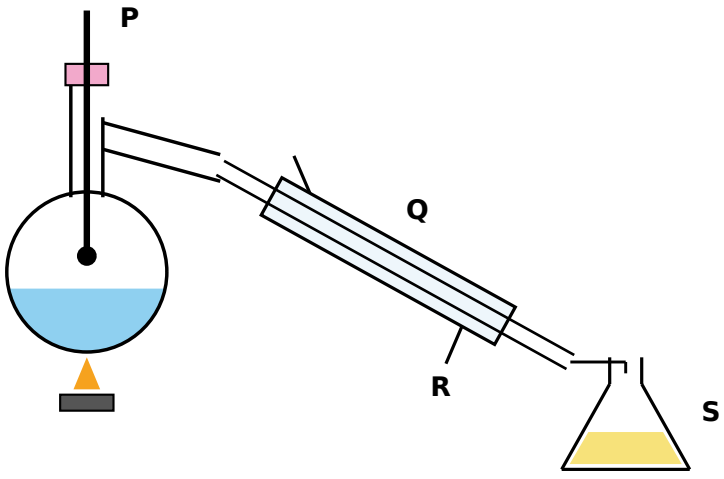
1	The hybridisation states of the two carbon atoms in acetonitrile, CH_3–C≡N, are respectively: A. sp^3, sp^2 B. sp^3, sp C. sp^2, sp D. sp^3, sp^3	1
2	The bond-line structural formula of an organic compound is shown below.  The IUPAC name of the compound is: A. 2-Methylhexan-5-one B. 5-Methylhexan-2-ol C. 5-Methylhexan-2-one D. 2-Methylhexanal	1
3	The number of σ and π bonds in buta-1,3-diene, CH_2=CH–CH=CH_2, is respectively: A. 7 and 2 B. 8 and 3 C. 9 and 3 D. 9 and 2	1

4	A mixture was analysed by thin layer chromatography. The developed chromatogram is shown below. The solvent front and the two spots A and B are marked.  The R_f value of spot B is: A. 0.75 B. 0.67 C. 1.33 D. 6.0	1
5	Which of the following carbocations is the most stable? A. CH_3^+ B. $(CH_3)_3C^+$ C. $CH_3CH_2^+$ D. $(CH_3)_2CH^+$	1
6	Which one of the following species is a nucleophile? A. BF_3 B. NO_2^+ C. $(CH_3)_3N$: D. CH_3^+	1
7	A mixture of calcium sulphate and camphor can be separated by: A. crystallisation B. sublimation C. simple distillation D. steam distillation	1
8	In the Lassaigne's test for nitrogen, the Prussian blue colour is due to the formation of: A. $Na_4[Fe(CN)_6]$ B. $Fe_3[Fe(CN)_6]_4$ C. $Fe_2[Fe(CN)_6]$ D. $Fe_4[Fe(CN)_6]_3$	1
9	Kjeldahl's method is **not** suitable for the estimation of nitrogen in: A. nitrobenzene B. aniline C. acetamide D. methylamine	1
10	Questions 10 to 12 are Assertion (A) and Reason (R) type questions. Select the correct option. **Assertion (A):** The tert-butyl carbocation, $(CH_3)_3C^+$, is more stable than the methyl carbocation, CH_3^+. **Reason (R):** $(CH_3)_3C^+$ has nine C–H bonds available for hyperconjugation, whereas CH_3^+ has none. A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1

11	**Assertion (A):** In steam distillation, an organic liquid boils at a temperature above its normal boiling point. **Reason (R):** In steam distillation, the liquid boils when the sum of the vapour pressures of the organic liquid and of water becomes equal to the atmospheric pressure. A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1
12	**Assertion (A):** Fusion with sodium metal converts the nitrogen, sulphur and halogens of an organic compound into NaCN, Na_2S and NaX. **Reason (R):** Sulphuric acid is used to acidify the sodium fusion extract before testing for sulphur with lead acetate. A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1

SECTION B

Questions 13 to 16 are very short answer questions carrying 2 marks each.

13	The figure shows the apparatus used to separate a mixture of chloroform (b.p. 334 K) and aniline (b.p. 457 K).  (i) Identify the parts P, Q, R and S. [1] (ii) Name the technique. Why is it suitable for this mixture, and which liquid is collected in S first? [1]	2
14	Some functional groups and the classes of organic compounds are given below. Four entries are left blank (A, B, C and D). **Class of compound** / **Functional group** / **IUPAC suffix** / **Example** Aldehyde / A / –al / Butanal Carboxylic acid / –COOH / B / Butanoic acid Ketone / >C=O / –one / Butan-2-one, C Alcohol / –OH / D / Butan-2-ol Fill in A, B, C (condensed formula) and D. [½ each]	2

15	Name the type of structural isomerism shown by each of the following pairs. [½ each] (a) Pentane and 2-methylbutane (b) Propan-1-ol and propan-2-ol (c) Propanone and propanal (d) Methoxypropane and ethoxyethane	2
16	Write the condensed structural formula of: (i) Pent-4-en-2-ol (ii) 6-Hydroxyheptanal. [1 + 1] **OR** Write the IUPAC name of: (i) $(CH_3)_2CHCH_2CH(CH_3)_2$ (ii) $CH_3COCH_2COCH_3$. [1 + 1]	2

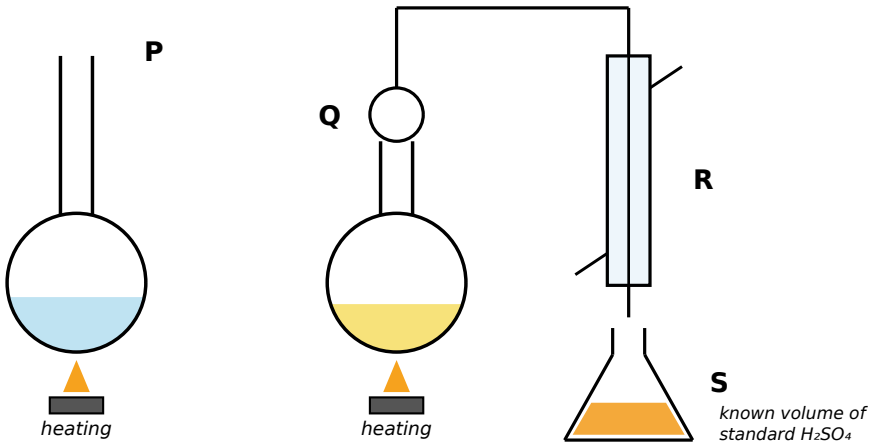
SECTION C

Questions 17 and 18 are short answer questions carrying 3 marks each.

17	An organic compound contains both nitrogen and sulphur. It is analysed by Lassaigne's test. (i) Why is the compound fused with sodium metal? [1] (ii) How is the presence of nitrogen alone confirmed in the sodium fusion extract? Write the equations for the reactions that give the Prussian blue colour. [1] (iii) When both nitrogen and sulphur are present, what is formed instead? Name the colour obtained on adding Fe^{3+} ions and write the equations. [1]	3
18	On complete combustion, 0.40 g of an organic compound gave 0.44 g of carbon dioxide and 0.18 g of water. (Atomic masses: H = 1, C = 12, O = 16) (i) Name the substances used to absorb water and carbon dioxide in the estimation of carbon and hydrogen. [1] (ii) Calculate the percentage of carbon and of hydrogen in the compound. [1] (iii) If the compound contains only C, H and O, find the percentage of oxygen and state how it is obtained. [1]	3

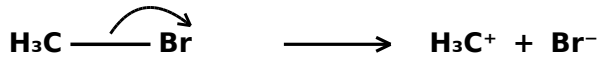
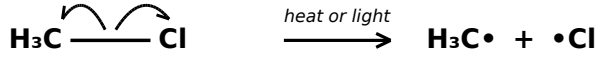
SECTION D

Question 19 is a case-based question carrying 4 marks.

19	**Estimation of nitrogen** A student estimated nitrogen in an organic compound by Kjeldahl's method using the set-up shown. 1.4 g of the compound was heated with concentrated sulphuric acid (flask P). The contents were then distilled with excess sodium hydroxide (flask Q), and the gas evolved was passed through the condenser R into 25 mL of 1 M H_2SO_4 taken in the conical flask S. The gas was completely neutralised by the acid. (1000 mL of 1 M NH_3 solution contains 14 g of nitrogen.)  (i) Name the nitrogen compound formed in P and the gas liberated in Q. [1] (ii) Name two types of compounds for which this method is not applicable. Why does it fail for them? [1] (iii) Calculate the percentage of nitrogen in the compound. [2]	4

SECTION E

Question 20 is a long answer question carrying 5 marks.

20	Electronic effects play an important role in the structure and reactivity of organic compounds. (i) Define the inductive effect. Give one example each of an electron-withdrawing and an electron-donating group. [1] (ii) The acid strengths of the acids decrease in the order $Cl_3CCOOH > Cl_2CHCOOH > ClCH_2COOH$. Explain this order. [1] (iii) The C–C bond lengths in benzene are all 139 pm, an intermediate value between the C–C single (154 pm) and C=C double (134 pm) bonds. How does resonance explain this? [1] (iv) Arrange the carbocations CH_3^+, $CH_3CH_2^+$, $(CH_3)_2CH^+$ and $(CH_3)_3C^+$ in the order of increasing stability and explain it with the help of hyperconjugation. [2] **OR** (i) Classify each of the following reactions as substitution, addition, elimination or rearrangement. [½ each] (a) $CH_3CH_2Br + HS^- \rightarrow CH_3CH_2SH + Br^-$ (b) $(CH_3)_2C{=}CH_2 + HCl \rightarrow (CH_3)_2CCl{-}CH_3$ (c) $CH_3CH_2Br + HO^- \rightarrow CH_2{=}CH_2 + H_2O + Br^-$ (d) $(CH_3)_3C{-}CH_2OH + HBr \rightarrow (CH_3)_2CBrCH_2CH_3 + H_2O$ **P**  **Q**  (ii) The figure shows two ways in which the C–X bond of a halomethane can break. Name the type of bond fission in P and in Q, the species formed in each, and the type of reaction (polar or free-radical) that follows. [2] (iii) Which of HS^- and BF_3 is a nucleophile and which is an electrophile? Give a reason. [1]	5

***** END OF QUESTION PAPER *****