Master Testing Agency
Practice papers, exam-standard · www.mastertestingagency.com

Carbon and its Compounds — CBSE Class 10 Science Chapter Test

FREE CHAPTER TEST · CLASS X · SCIENCE (086) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	20 (A 10 · B 4 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 20 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–14 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q15–17 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q18 is a long answer (LA) type question, carrying 5 marks.
7. In Section E, Q19–20 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class X Science (086) Sample Question Paper 2026-27, at about half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Master Testing Agency is an independent test-prep publisher, not affiliated with, endorsed by or connected to the Central Board of Secondary Education (CBSE) or any other exam-conducting body.

Chapter: Carbon and its Compounds · **Topics:** Covalent bonding · Versatile nature of carbon · Saturated and unsaturated hydrocarbons · Homologous series · Nomenclature · Combustion, oxidation, addition and substitution · Ethanol and ethanoic acid · Soaps and detergents

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. The molecular formula of the alkyne with four carbon atoms is 1

(A) C_4H_6 (B) C_4H_8

(C) C_4H_{10} (D) C_4H_4

2. The number of covalent bonds in a molecule of propane, C_3H_8, is 1

(A) 8 (B) 11

(C) 10 (D) 12

3. The IUPAC name of CH_3CH_2CHO is 1

(A) propanone (B) propanal

(C) propanol (D) propanoic acid

4. CH_3OH and C_2H_5OH are the first two members of a homologous series. The third member is 1

(A) CH_3CHO (B) C_3H_6O

(C) C_2H_5COOH (D) C_3H_7OH

5. Vegetable oils are converted into vegetable ghee by adding hydrogen in the presence of a catalyst. The catalyst is 1

(A) iron (B) copper

(C) aluminium (D) nickel

6. When soap is dissolved in water containing oily dirt, the soap molecules form micelles in which 1

(A) the ionic ends face the water and the hydrocarbon tails point inwards, towards the oil (B) the hydrocarbon tails face the water and the ionic ends point inwards

(C) the ionic ends and tails both point towards the water (D) the ionic ends join the oil and the tails dissolve in the water

7. Which of the following hydrocarbons undergoes an addition reaction? 1

(A) C_2H_6 (B) CH_4

(C) C_3H_6 (D) C_4H_{10}

8. The number of electrons shared between the two carbon atoms in a molecule of ethyne, C_2H_2, is 1

(A) 2 (B) 6

(C) 4 (D) 8

9. **Assertion (A):** Pure ethanoic acid is often called glacial acetic acid. 1
Reason (R): The melting point of pure ethanoic acid is 290 K, so it often freezes during winter in cold climates.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** Unsaturated hydrocarbons generally burn with a yellow, sooty flame. 1
Reason (R): Unsaturated hydrocarbons have only single bonds between their carbon atoms.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 4 very short answer (VSA) type questions of 2 marks each.

11. (a) Describe the electron dot structure of ethene, C_2H_4, stating how many electrons are shared between the two carbon atoms. Why is ethene called an unsaturated hydrocarbon? 2

OR

(b) Describe the electron dot structure of carbon dioxide, CO_2, and show that each atom completes its octet.

12. Why does carbon form covalent bonds and not ionic bonds? Give two reasons why carbon forms a very large number of compounds. 2

13. Give the IUPAC names of (i) CH_3CH_2Br and (ii) CH_3COCH_3, and write the condensed formulas of (iii) butanone and (iv) ethanal. 2

14. Why does soap not work well with hard water? Why are detergents used instead? 2

SECTION C

This section comprises 3 short answer (SA) type questions of 3 marks each.

15. (a) Write the chemical equation for each change and name the reagent or conditions: (i) ethanol to ethene; (ii) ethanol with sodium metal (name the gas and its test); (iii) ethanol to ethanoic acid. 3

OR

(b) (i) Write the equation for the reaction of ethanoic acid with ethanol and name the reaction. (ii) Give one use of the product. (iii) What happens when the product is treated with sodium hydroxide? Write the equation and name the reaction.

16. Diamond and graphite are both made of carbon. (i) How are the carbon atoms bonded in each? (ii) Why is diamond very hard, and why does graphite conduct electricity? (iii) Name another form of carbon and describe its shape. 3

17. (i) Write the condensed structural formulas of the two isomers of butane and name them. (ii) Why does propane have no isomers? (iii) How many structural isomers does pentane have? 3

SECTION D

This section comprises 1 long answer (LA) type questions of 5 marks each.

18. (a) An organic compound X, with molecular formula $C_2H_4O_2$, turns blue litmus red and gives brisk effervescence with sodium carbonate. 5

(i) Identify X and name its functional group.

(ii) Write the equation for its reaction with sodium carbonate.

(iii) Write the equation for its reaction with sodium hydroxide.

(iv) X is warmed with ethanol and a few drops of concentrated sulphuric acid. Write the equation, name the type of product and give one use of it.

(v) What is vinegar?

OR

(b) (i) What is soap? Describe the structure of a soap molecule.

(ii) What is a micelle, and how is it formed?

(iii) Explain how soap removes oily dirt from clothes.

(iv) Why are detergents better than soaps in hard water?

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

19. CNG (compressed natural gas) is used as a fuel in buses and cars, and LPG in kitchens. In one kitchen the bottoms of the vessels were getting blackened and the gas stove was burning with a yellow flame.

(i) Name the main component of CNG. [1]

(ii) Why were the vessels getting blackened, and what should be done? [1]

(iii) Write the balanced equation for the complete combustion of the main component of CNG, and state the colour of its flame in sufficient air. [2]

OR

(iii) The same compound reacts with chlorine in sunlight. Write the equation for the first step and name the type of reaction. [2]

20. The alkanes methane (CH_4), ethane (C_2H_6), propane (C_3H_8) and butane (C_4H_{10}) form a homologous series, and so do the alkenes beginning with ethene (C_2H_4).

(i) By how much do the formula and the molecular mass of successive members of a homologous series differ? [1]

(ii) Write the general formula of the alkenes. [1]

(iii) Write the molecular formula and name of the alkene with five carbon atoms. How do the chemical and physical properties change along a homologous series? [2]

OR

(iii) Write the molecular formulas of the alkane, the alkene and the alkyne with six carbon atoms, and say which of them are unsaturated. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(A)	(C)	(B)	(D)	(D)	(A)	(C)	(B)	(A)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (A). Alkynes have the general formula C_nH_{2n-2}: with n = 4, C_4H_6 (butyne).

Q2. Answer (C). Two C–C bonds and eight C–H bonds: 10. (Total valency (3 × 4 + 8 × 1) = 20, and each bond uses two.)

Q3. Answer (B). Three carbon atoms (prop-) with the aldehyde group –CHO at the end (suffix -al): propanal.

Q4. Answer (D). Successive members differ by $–CH_2–$: $C_2H_5OH + CH_2 = C_3H_7OH$ (propanol), with the same functional group –OH.

Q5. Answer (D). Hydrogenation (an addition reaction) of unsaturated oils is carried out with a nickel catalyst.

Q6. Answer (A). The ionic (hydrophilic) end dissolves in water and the hydrocarbon (hydrophobic) tail dissolves in oil, so the tails gather the oil in the centre.

Q7. Answer (C). C_3H_6 (propene) has fewer than 2n + 2 hydrogen atoms, so it has a double bond and is unsaturated; addition reactions are typical of unsaturated compounds.

Q8. Answer (B). Each carbon uses one of its four valencies for a hydrogen atom, leaving three bonds between the carbon atoms: a triple bond, 3 pairs = 6 electrons.

Q9. Answer (A). Both true; it is called glacial because it freezes in cold weather, which is what R says. Answer (A).

Q10. Answer (C). A is true. R is false: unsaturated hydrocarbons have double or triple bonds between carbon atoms; saturated ones have only single bonds. Answer (C).

Q11. (2 marks) Answer: (a) C=C double bond (4 shared electrons), each C bonded to two H; double bond makes it unsaturated; (b) O=C=O, octets complete.
(a) Each carbon atom shares one pair of electrons with each of two hydrogen atoms, and the two carbon atoms share two pairs (4 electrons) with each other — a double bond: $H_2C=CH_2$. [1]
It has a double bond between carbon atoms (it can take up more hydrogen), so it is unsaturated. [1]
OR (b) The carbon atom shares two pairs of electrons with each oxygen atom: O=C=O, two double bonds. [1]
Each atom then has eight electrons in its outermost shell: carbon 4 of its own + 4 shared; each oxygen 6 of its own + 2 shared. [1]

Q12. (2 marks) Answer: Gaining or losing 4 electrons is too hard, so it shares; catenation and tetravalency.
Carbon has 4 valence electrons; losing 4 (C^{4+}) or gaining 4 (C^{4-}) would need a large amount of energy, and a nucleus of 6 protons could not hold 10 electrons, so it shares electrons. [1]
Catenation (carbon forms bonds with other carbon atoms, giving long chains, branches and rings) and tetravalency (it bonds with four other atoms, of carbon or other elements). [1]

Q13. (2 marks) Answer: (i) bromoethane; (ii) propanone; (iii) $CH_3COCH_2CH_3$; (iv) CH_3CHO.
(i) Bromoethane; (ii) propanone. [1]
(iii) $CH_3COCH_2CH_3$; (iv) CH_3CHO. [1]

Q14. (2 marks) Answer: Ca and Mg salts form scum with soap; detergents do not.
Hard water contains calcium and magnesium salts; soap reacts with them to form an insoluble substance (scum), so much soap is wasted and the clothes are not cleaned. [1]
Detergents (generally sodium salts of sulphonic acids, or ammonium salts with chloride or bromide ions, also with long hydrocarbon chains) do not form insoluble substances with calcium and magnesium ions, so they work in hard water too. [1]

Q15. (3 marks) Answer: (a) conc. H_2SO_4 at 443 K, $CH_3CH_2OH \rightarrow CH_2{=}CH_2 + H_2O$; $2Na + 2CH_3CH_2OH \rightarrow 2CH_3CH_2ONa + H_2$, pop test; alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$; (b) esterification equation; perfumes, flavouring; saponification equation.
(a) (i) Heated at 443 K with excess concentrated sulphuric acid (a dehydrating agent): $CH_3CH_2OH \rightarrow CH_2{=}CH_2 + H_2O$. [1]
(ii) $2Na + 2CH_3CH_2OH \rightarrow 2CH_3CH_2ONa + H_2$; hydrogen, which burns with a pop sound. [1]
(iii) Oxidation with alkaline potassium permanganate (or acidified potassium dichromate): $CH_3CH_2OH \rightarrow CH_3COOH$. [1]
OR (b) (i) Esterification, in the presence of an acid catalyst: $CH_3COOH + CH_3CH_2OH \rightarrow CH_3COOCH_2CH_3 + H_2O$ [1]
(ii) Esters are sweet-smelling, used in perfumes and as flavouring agents. [1]
(iii) Saponification: $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$ (it is used to make soap). [1]

Q16. (3 marks) Answer: (i) diamond: each C to 4, 3-D; graphite: each C to 3, hexagonal layers; (ii) rigid network, conducts; (iii) fullerene C_{60}, football shape.
(i) In diamond each carbon atom is bonded to four other carbon atoms, forming a rigid three-dimensional structure. In graphite each carbon atom is bonded to three others in the same plane, forming hexagonal layers (one of the bonds is a double bond). [1]
(ii) The rigid network of strong bonds makes diamond the hardest substance known; graphite is a very good conductor of electricity (the bonding in its layers leaves electrons free to move). [1]
(iii) Fullerene C_{60}: the atoms are arranged in the shape of a football. [1]

Q17. (3 marks) Answer: (i) butane and 2-methylpropane; (ii) only one chain is possible; (iii) three.
(i) $CH_3CH_2CH_2CH_3$ (butane, a straight chain) and $CH_3CH(CH_3)CH_3$ (2-methylpropane, a branched chain). [1]
(ii) Three carbon atoms can be arranged only in one way, as a chain; a branch on the middle carbon gives the same chain. [1]
(iii) Three: pentane, 2-methylbutane and 2,2-dimethylpropane. [1]

Q18. (5 marks) Answer: (a) ethanoic acid, –COOH; $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$; $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$; ester, perfumes; 5–8% ethanoic acid; (b) structure; micelle; dirt held inside micelles and rinsed away; detergents work in hard water.
(a) (i) X is ethanoic acid (acetic acid), CH_3COOH; carboxylic acid group, –COOH. [1]
(ii) $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$ [1]
(iii) $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$ [1]
(iv) $CH_3COOH + CH_3CH_2OH \rightarrow CH_3COOCH_2CH_3 + H_2O$; the product, ethyl ethanoate, is an ester, used in perfumes and as a flavouring agent. [1]
(v) A 5–8% solution of ethanoic acid in water, used as a preservative in pickles. [1]
OR (b) (i) Soap is the sodium or potassium salt of a long-chain carboxylic acid; its molecule has an ionic (hydrophilic) end and a long hydrocarbon (hydrophobic) tail. [1]
(ii) In water the tails gather inside, away from water, and the ionic ends face the water; this cluster is a micelle. [1]
(iii) Oily dirt collects in the centre of the micelles, which stay in water as an emulsion, so the dirt is washed away. [2]
(iv) Detergents form no scum with calcium and magnesium ions, so they also clean in hard water. [1]

Q19. (4 marks) Answer: (i) methane; (ii) incomplete combustion, clean the air holes; (iii)(a) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$, blue flame; (b) $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$, substitution.
(i) Methane, CH_4. [1]
(ii) The fuel is not burning completely (the air holes of the stove are blocked), giving soot; the air holes should be cleaned. [1]
(iii)(a) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ + heat and light [1]; a clean blue flame. [1]
OR (iii)(b) $CH_4 + Cl_2 \xrightarrow{\text{sunlight}} CH_3Cl + HCl$ [1]; a substitution reaction (a hydrogen atom is replaced by chlorine). [1]

Q20. (4 marks) Answer: (i) CH_2, 14 u; (ii) C_nH_{2n}; (iii)(a) C_5H_{10} pentene; similar chemical, gradually changing physical properties; (b) C_6H_{14}, C_6H_{12}, C_6H_{10}; hexene and hexyne.

(i) By $–CH_2–$, a molecular mass of 14 u. [1]

(ii) C_nH_{2n}. [1]

(iii)(a) C_5H_{10}, pentene. [1]

Chemical properties stay similar (same functional group); physical properties such as melting and boiling points increase gradually with molecular mass. [1]

OR (iii)(b) C_6H_{14} (hexane), C_6H_{12} (hexene), C_6H_{10} (hexyne). [1]

Hexene and hexyne are unsaturated. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer: every equation balanced by counting atoms, formulas from the general formulas of each series, bonds counted from valencies and isomers counted by listing every carbon skeleton.