CBSE CLASS X

Science (086)

QUESTION PAPER

AI-generated question paper

Code: 9J5PBM **Questions: 29** **Maximum Marks: 67** **Generated: 2026-06-25 17:44**

SELECTIONS USED

Subject	Science
Lessons	4 Carbon and its Compounds
Level of understanding	Exam-ready
Question selection	CBSE board paper, whole lesson (~80 marks across Sections A-E)
Model	claude-sonnet-4-6

Composition — Difficulty: 4 straightforward · 19 medium · 6 deep | Types: 9 MCQ · 6 Short · 5 Very short · 3 Assertion–reason · 3 Long · 3 Case-based | Sections: A 12Q/12m · B 5Q/10m · C 6Q/18m · D 3Q/15m · E 3Q/12m

Q1. straightforward exam-ready **[1]**

Ethanol reacts with sodium metal to produce hydrogen gas. What is the other product of this reaction?

A Sodium oxide
B Sodium ethoxide
C Sodium carbonate
D Sodium hydroxide

◆ Carbon and its Compounds

Q2. straightforward exam-ready **[1]**

Which of the following hydrocarbons decolourises bromine water and also undergoes hydrogenation in the presence of a nickel catalyst?
((A)) Methane
((B)) Ethane
((C)) Ethene
((D)) Propane

A CH_4
B C_2H_6
C C_3H_8
D C_2H_2

◆ Carbon and its Compounds

Q3. medium exam-ready **[1]**

A carbon compound on reaction with alkaline potassium permanganate gets oxidised to form ethanoic acid. The original compound is:

A Methanol
B Ethanol
C Propanol
D Butanol

◆ Carbon and its Compounds

Q4. medium exam-ready **[1]**

Cyclohexane has the molecular formula C_6H_{12}. Which class of compounds does it belong to?

A Alkene
B Alkyne
C Alkane
D Aromatic hydrocarbon

◆ Carbon and its Compounds

Q5. straightforward exam-ready **[1]**

Which of the following functional groups is present in propanal?
((A)) –OH
((B)) –COOH
((C)) –CHO
((D)) –CO–

A —OH
B —COOH
C —CHO
D >C=O (ketone)

◆ Carbon and its Compounds

Q6. medium exam-ready **[1]**

When soap is added to hard water, a white curdy precipitate is formed. What causes this?

A Soap reacts with dissolved oxygen to form insoluble oxides
B Soap reacts with calcium and magnesium salts in hard water to form insoluble salts
C Soap molecules clump together when cooled by hard water
D Hard water contains chlorine that destroys the soap molecules

◆ Carbon and its Compounds

Q7. medium exam-ready **[1]**

Heating ethanol at 443 K with excess concentrated sulphuric acid produces ethene. The role of concentrated sulphuric acid in this reaction is:

A Oxidising agent
B Reducing agent
C Dehydrating agent
D Catalyst

◆ Carbon and its Compounds

Q8. medium exam-ready **[1]**

In the reaction of methane with chlorine in the presence of sunlight, what type of bond in methane is broken and what type of reaction takes place?
((A)) C–C bond; addition reaction
((B)) C–H bond; substitution reaction
((C)) C–H bond; addition reaction
((D)) C–C bond; substitution reaction

A A C—C bond is broken and chlorine replaces a carbon atom
B A C—H bond is broken and chlorine replaces a hydrogen atom
C Two C—H bonds are broken and a double bond forms
D The entire molecule is decomposed by chlorine

◆ **Carbon and its Compounds**

Q9. medium exam-ready **[1]**

Why do covalent compounds generally not conduct electricity?
((A)) They have high melting points and therefore resist electron flow.
((B)) They exist as molecules with no free ions or electrons to carry charge.
((C)) They dissolve in water to form neutral solutions.
((D)) Their molecules are too large to allow electron movement.

A Their molecules are too large to move in solution
B Electrons are shared between atoms so no charged particles (ions) are formed
C They have very high boiling points so they cannot melt
D They react with water to form non-conducting products

◆ **Carbon and its Compounds**

Q10. medium exam-ready **[1]**

Assertion (A): Saponification is the process used in the preparation of soap.
Reason (R): When an ester is treated with sodium hydroxide, it gives back the alcohol and the sodium salt of the carboxylic acid.

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.

◆ **Carbon and its Compounds**

Q11. medium exam-ready **[1]**

Assertion (A): Carbon forms a very large number of compounds compared to any other element.
Reason (R): Carbon has the unique ability to form bonds with other carbon atoms (catenation) and also has a valency of four (tetravalency).

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.

◆ **Carbon and its Compounds**

Q12. deep exam-ready **[1]**

Assertion (A): Detergents are more effective than soaps in hard water.
Reason (R): Unlike soap molecules, the charged ends of detergent molecules do not form insoluble precipitates with calcium and magnesium ions present in hard water.
((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.

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.

◆ Carbon and its Compounds

Q13. medium exam-ready **[2]**

What is catenation? Why does carbon exhibit catenation to a much greater extent than silicon?

◆ Carbon and its Compounds

Q14. straightforward exam-ready **[2]**

State two characteristics of a homologous series. A compound belonging to the carboxylic acid series has the molecular formula $C_3H_6O_2$. Write the molecular formulae of the next two higher members of this series.

◆ Carbon and its Compounds

Q15. medium exam-ready **[2]**

Ethanoic acid reacts with sodium hydrogencarbonate. Write the balanced chemical equation for this reaction and identify the gas evolved.

◆ Carbon and its Compounds

Q16. deep exam-ready **[2]**

Why does graphite conduct electricity while diamond does not, even though both are allotropes of carbon?

◆ Carbon and its Compounds

Q17. medium exam-ready **[2]**

Name one oxidising agent that can convert ethanol to ethanoic acid. Explain, in terms of the change in the compound, why this conversion is regarded as an oxidation reaction.

◆ Carbon and its Compounds

Q18. medium exam-ready **[3]**

(i) Draw the electron dot structure of ethyne (C_2H_2).
(ii) State whether ethyne is saturated or unsaturated, giving a reason.
(iii) Write the chemical equation for the reaction of ethyne with hydrogen in the presence of a nickel catalyst. Name the product formed.

◆ Carbon and its Compounds

Q19. medium exam-ready **[3]**

Carbon cannot form C^{4+} or C^{4-} ions easily. Explain why, and describe how carbon instead achieves noble gas configuration.

◆ Carbon and its Compounds

Q20. medium exam-ready **[3]**

(i) Write the IUPAC names of the following compounds:
(a) $CH_3CH_2CH_2OH$
(b) CH_3CH_2Br
(c) $CH_3COCH_2CH_3$
(ii) Which of the above compounds belongs to the ketone functional group?

◆ **Carbon and its Compounds**

Q21. medium exam-ready **[3]**

Vegetable oils are hydrogenated industrially to produce vanaspati ghee.
(i) Name the catalyst used.
(ii) Write the chemical equation for the hydrogenation of ethene as an example of this type of reaction.
(iii) Why is it advisable to use oils containing unsaturated fatty acids rather than animal fats for cooking?

◆ **Carbon and its Compounds**

Q22. deep exam-ready **[3]**

Give reasons for the following:
(i) The melting and boiling points of covalent compounds are generally low.
(ii) Unsaturated hydrocarbons burn with a sooty yellow flame.
(iii) Methanol is far more dangerous to consume than ethanol.

◆ **Carbon and its Compounds**

Q23. medium exam-ready **[3]**

Draw the structural formulae of the two possible structural isomers of butane (C_4H_{10}) and write their common names. State one physical property that differs between the two isomers and explain why the difference exists.

◆ **Carbon and its Compounds**

Q24. medium exam-ready **[5]**

(i) A substance 'X' has the molecular formula C_2H_5OH.
(a) Write the IUPAC name of X.
(b) Write the chemical equation for its dehydration using excess concentrated H_2SO_4 at 443 K. Name the product formed.
(c) What type of reaction is this dehydration — addition, substitution or elimination?
(ii) When X reacts with sodium, a gas Y is produced. Identify Y and write the balanced chemical equation for the reaction.
(iii) State any one industrial or medical use of X.

◆ **Carbon and its Compounds**

Q25. deep exam-ready **[5]**

(i) Explain in detail the cleansing action of soap. In your answer, include:
(a) the structure of a soap molecule with reference to its hydrophilic and hydrophobic ends.
(b) how a micelle forms and what it traps.
(c) why the micelle stays suspended in water without precipitating.
(ii) Why does soap fail to clean clothes effectively in hard water? How do detergents overcome this problem?
(iii) Write a chemical reaction to show what happens when the ester ethyl ethanoate is treated with sodium hydroxide solution.

◆ **Carbon and its Compounds**

Q26. deep exam-ready **[5]**

(i) Draw the structures of all possible structural isomers of pentane (C_5H_{12}). How many structural isomers are possible?
(ii) State the two characteristic properties of carbon responsible for forming such a large number of compounds.
(iii) Among the homologous series of alkanes, how do the following properties change as the molecular mass increases? Give a reason.
(a) Boiling point
(b) Chemical properties
(iv) Write the general formula for alkanes and use it to find the molecular formula of the alkane with 7 carbon atoms.

◆ **Carbon and its Compounds**

Q27. medium exam-ready **[4]**

Read the following and answer the questions that follow:

Rahim noticed that the bottom of his cooking vessel was turning black on the outside. His science teacher explained that the colour of the flame from a gas stove depends on the air supply. When sufficient air enters through the inlets of the burner, the fuel burns completely giving a clean blue flame. If the air holes are blocked, the flame becomes yellow and sooty, and unburnt carbon is deposited. The teacher also told him that fuels such as coal and petroleum contain small amounts of nitrogen and sulphur, and their combustion produces additional harmful gases.

(i) Why does a yellow sooty flame form when air supply is limited? (1 mark)
(ii) Name the two additional harmful gases released when coal or petroleum containing nitrogen and sulphur burns. (1 mark)
(iii) Write a balanced chemical equation for the complete combustion of methane. (1 mark)
(iv) What should Rahim do to fix the sooty flame problem in his stove? (1 mark)

◆ **Carbon and its Compounds**

Q28. medium exam-ready **[4]**

Read the following and answer the questions that follow:

Preeti carried out an experiment in the school laboratory. She took some ethanol in a test tube and warmed it gently in a water bath. She then added alkaline potassium permanganate solution drop by drop. She noted that the purple colour disappeared initially. When she added excess potassium permanganate, the colour persisted. Her teacher told her that the product formed has a sharp smell and turns blue litmus red. The teacher further demonstrated that when this product is added to a solution of sodium carbonate, brisk effervescence is observed.

(i) Name the product formed when ethanol is oxidised by alkaline potassium permanganate. (1 mark)
(ii) Why does the purple colour of potassium permanganate disappear when added initially, but persist when added in excess? (1 mark)
(iii) Write the balanced chemical equation for the reaction of this product with sodium carbonate solution. (1 mark)
(iv) Name the class of organic compound to which the product belongs and write its functional group. (1 mark)

◆ **Carbon and its Compounds**

Q29. deep exam-ready **[4]**

Read the following and answer the questions that follow:

A chemistry teacher showed students two test tubes — one containing distilled water and another containing hard water collected from a hand pump. To each test tube, she added a few drops of soap solution and shook them vigorously. The distilled water produced a large, stable lather, while the hard water produced very little lather and instead formed a white curdy precipitate. She then repeated the experiment using detergent solution instead of soap. This time, both test tubes produced good lather and no curdy precipitate was observed.

(i) What is the chemical nature of the white curdy precipitate formed when soap is used with hard water? (1 mark)
(ii) Why does distilled water produce lather easily with soap but hard water does not? (1 mark)
(iii) Explain why detergent is effective in hard water but soap is not. (1 mark)
(iv) A student suggests using soap solution (instead of detergent) to test whether a given water sample is hard. Is this a valid test? Give a reason. (1 mark)

◆ **Carbon and its Compounds**

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