

CBSE CLASS X
Science (086)

QUESTION PAPER

AI-generated question paper

Code: 040TNW

Questions: 65

Maximum Marks: 177

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SELECTIONS USED

Subject	Science
Lessons	4 Carbon and its Compounds
Level of understanding	Thorough understanding
Question selection	Curated chapter coverage (~5 questions per section + 8 synthesis)
Model	claude-sonnet-4-6

Composition — Difficulty: 4 straightforward · 33 medium · 28 deep | Types: 50 Short · 6 Very short · 5 Long · 4 MCQ

Q1. medium thorough-understanding § Introduction [3]

When an organic compound is subjected to complete combustion in excess oxygen, name the products formed that confirm the presence of (i) carbon and (ii) hydrogen in the compound. Describe the chemical test used to detect each product, and write the general equation for the complete combustion of a hydrocarbon.

◆ Carbon and its Compounds

Q2. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

Why does carbon form covalent bonds rather than losing or gaining electrons to form ions?

◆ Carbon and its Compounds

Q3. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

Using the formation of a hydrogen molecule (H₂) as an example, explain how sharing a pair of electrons in a covalent bond allows each hydrogen atom to achieve the electronic configuration of a noble gas.

◆ Carbon and its Compounds

Q4. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [1]

Which of the following correctly describes why covalent compounds generally have low melting and boiling points?

- (A) The covalent bonds within each molecule are weak.
- (B) The inter-molecular forces between covalent molecules are weak, even though intra-molecular bonds are strong.
- (C) Covalent compounds do not contain any bonds, only loosely associated atoms.
- (D) The electrons in covalent compounds are free to move, reducing the energy needed to separate molecules.

◆ Carbon and its Compounds

Q5. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

A student dips two electrodes into liquid ethanol and finds that no current flows, but when the same electrodes are placed in molten sodium chloride, current flows readily. Explain, in terms of the nature of bonding and the particles present in each substance, why this difference is observed.

◆ Carbon and its Compounds

Q6. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

Oxygen forms a double bond in O_2 , but hydrogen forms only a single bond in H_2 . Using the concept of valence electrons and octet/duplet completion, explain why this difference exists.

♦ Carbon and its Compounds

Q7. straightforward thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [1]

Nitrogen (N_2) forms a triple bond between its two atoms. State how many shared pairs of electrons are present and explain why nitrogen needs to share three pairs rather than one to achieve a stable configuration.

♦ Carbon and its Compounds

Q8. deep thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

A student argues that a water molecule (H_2O) must contain double bonds because oxygen needs two more electrons to complete its octet. Is the student correct? Explain your reasoning.

♦ Carbon and its Compounds

Q9. deep thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [2]

In methane (CH_4), carbon forms four single bonds with four hydrogen atoms. A student suggests that carbon could instead form two double bonds, each shared with two hydrogen atoms. Explain why this is not possible, using the electronic configuration of hydrogen in your answer.

♦ Carbon and its Compounds

Q10. deep thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

In diamond, each carbon atom is bonded to four other carbon atoms in a three-dimensional structure, whereas in graphite, each carbon atom is bonded to only three others in layered planes. Using the properties of covalent bonds, explain why diamond is the hardest known substance while graphite is smooth and slippery.

♦ Carbon and its Compounds

Q11. deep thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

Graphite conducts electricity, yet it is a non-metal made entirely of carbon atoms joined by covalent bonds. How can this be explained given that covalent compounds are generally poor conductors?

♦ Carbon and its Compounds

Q12. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [2]

Both carbon and silicon belong to Group 14 of the periodic table and have a valency of 4, yet carbon shows extensive catenation while silicon does not. Explain the property of the carbon atom that accounts for this difference, and state what this means for the stability of C–C chains compared to Si–Si chains.

♦ Carbon and its Compounds

Q13. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [3]

The melting point of ethanol is 156 K and its boiling point is 351 K, while sodium chloride (an ionic compound) melts above 1000 K. What does this large difference in melting points tell us about the relative strengths of the forces operating between the particles in each compound?

♦ Carbon and its Compounds

Q14. medium thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [2]

If carbon were to form a C^{4+} ion by losing all four of its valence electrons, which shell would become its outermost shell, and how many electrons would it contain? Explain why such an arrangement makes ionic bonding energetically unfavourable for carbon compared to covalent bonding.

♦ Carbon and its Compounds

Q15. deep thorough-understanding § 4.1 BONDING IN CARBON – THE COVALENT BOND [5]

A student claims that because N_2 has a triple bond and H_2 has a single bond, nitrogen gas should be three times more reactive than hydrogen gas. Do you agree? Compare the bonding in N_2 and H_2 in terms of shared electron pairs and bond strength, and use this to explain the relative chemical reactivity of the two molecules.

♦ Carbon and its Compounds

Q16. medium thorough-understanding § 4.2 VERSATILE NATURE OF CARBON [3]

Carbon and silicon both belong to the same group of the periodic table, yet the number of known carbon compounds far exceeds the number of known silicon compounds. Give two reasons why carbon's catenation leads to a vastly greater variety of stable compounds compared to silicon.

♦ Carbon and its Compounds

Q17. medium thorough-understanding § 4.2 VERSATILE NATURE OF CARBON [3]

Ethyne (C_2H_2) decolourises bromine water while ethane (C_2H_6) does not. Based on the nature of bonding in each compound, explain this difference in reactivity.

♦ Carbon and its Compounds

Q18. straightforward thorough-understanding § 4.2 VERSATILE NATURE OF CARBON [1]

Which of the following pairs are structural isomers of each other?

- (A) n-Butane (C_4H_{10}) and 2-methylpropane (C_4H_{10})
- (B) C_3H_8 and C_3H_6
- (C) C_5H_{12} and C_4H_{10}
- (D) C_2H_6 and C_2H_4

A C_4H_{10} (straight chain) and C_4H_{10} (branched chain)

B C_3H_8 and C_3H_6

C C_5H_{12} and C_4H_{10}

D C_2H_6 and C_2H_4

♦ Carbon and its Compounds

Q19. deep thorough-understanding § 4.2 VERSATILE NATURE OF CARBON [5]

A student claims that CH_3OH , C_2H_5OH and C_3H_7OH belong to a homologous series. (i) State two pieces of evidence from their formulae and properties that support this claim. (ii) Predict one physical property that will differ between methanol and propanol, and explain why.

♦ Carbon and its Compounds

Q20. deep thorough-understanding § 4.2 VERSATILE NATURE OF CARBON [3]

Cyclohexane (C_6H_{12}) and cyclohexene (C_6H_{10}) both have carbon atoms arranged in a ring, yet they show different chemical behaviour with bromine water. Identify the class each belongs to (saturated or unsaturated hydrocarbon) and justify your answer using their molecular formulae and the result of the bromine water test.

♦ Carbon and its Compounds

- Q21.** medium thorough-understanding § 4.2.1 Saturated and Unsaturated Carbon Compounds [3]
Ethyne (C_2H_2) is described as an unsaturated compound, while ethane (C_2H_6) is saturated. What structural feature makes ethyne unsaturated, and why does this make it more reactive than ethane?
♦ Carbon and its Compounds
- Q22.** medium thorough-understanding § 4.2.1 Saturated and Unsaturated Carbon Compounds [3]
A student is given two unlabelled compounds with molecular formulas C_3H_8 and C_3H_6 . (i) Using the general formula for alkanes and alkenes, determine which compound is saturated and which is unsaturated. (ii) Describe one chemical test the student could perform to confirm this, stating the expected observation for each compound.
♦ Carbon and its Compounds
- Q23.** medium thorough-understanding § 4.2.2 Chains, Branches and Rings [3]
Two compounds, n-butane and isobutane, share the molecular formula C_4H_{10} . (i) Draw the structural formulae of both compounds. (ii) What term is used for such pairs of compounds? (iii) Compare any two physical or chemical properties that would differ between these two compounds as a result of their different structures.
♦ Carbon and its Compounds
- Q24.** medium thorough-understanding § 4.2.2 Chains, Branches and Rings [1]
Hexane and cyclohexane both contain six carbon atoms. Write their molecular formulae and explain why the two formulae differ, relating your answer to the structural difference between the two compounds.
♦ Carbon and its Compounds
- Q25.** medium thorough-understanding § 4.2.3 Will you be my Friend? [3]
In an organic compound, all hydrogen atoms bonded to carbon are replaced one by one with chlorine atoms. (i) What is the term used for the $-Cl$ group in organic chemistry? (ii) A chemist states that whether the compound has 2 carbon atoms or 10 carbon atoms in its chain, the chemical reactions it undergoes will remain largely the same. Explain why the chemist's statement is correct.
♦ Carbon and its Compounds
- Q26.** deep thorough-understanding § 4.2.3 Will you be my Friend? [3]
Two organic compounds — one with the structure CH_3CH_2OH and another with the structure $CH_3CH_2CH_2CH_2OH$ — both belong to the same class of compounds. Despite having different carbon chain lengths, a chemist predicts their chemical properties will be very similar, but expects their boiling points to differ. Justify both parts of the chemist's prediction.
♦ Carbon and its Compounds
- Q27.** medium thorough-understanding § 4.2.4 Homologous Series [2]
Two successive members of a homologous series always differ by a $-CH_2-$ unit. What is the corresponding difference in their molecular masses, and why is this value constant throughout the series?
♦ Carbon and its Compounds
- Q28.** deep thorough-understanding § 4.2.4 Homologous Series [3]
Pentanol ($C_5H_{11}OH$) and methanol (CH_3OH) belong to the same homologous series but have very different boiling points, whereas their chemical behaviour with sodium metal is essentially the same. What principle of homologous series explains each of these observations?
♦ Carbon and its Compounds

Q29. deep thorough-understanding § 4.2.4 Homologous Series [3]

A student argues: 'Butanol and ethanol belong to the same homologous series, so they must have identical boiling points and identical solubility in water.' Is this argument correct? Justify your answer by explaining what properties actually remain similar across a homologous series and what properties change, giving reasons for each.

♦ Carbon and its Compounds

Q30. medium thorough-understanding § 4.2.5 Nomenclature of Carbon Compounds [2]

A carbon compound has three carbon atoms in its chain and contains a ketone functional group. What is its IUPAC name? Show the reasoning steps you used to arrive at the name.

♦ Carbon and its Compounds

Q31. deep thorough-understanding § 4.2.5 Nomenclature of Carbon Compounds [3]

A student is given two compounds: 'butane' and 'but-1-yne'. (i) Draw their structural formulae and identify the type of bond(s) present in each. (ii) Predict the key differences in their chemical reactivity. (iii) Name the homologous series to which each compound belongs and state one characteristic property of a homologous series.

♦ Carbon and its Compounds

Q32. deep thorough-understanding § 4.3 CHEMICAL PROPERTIES OF CARBON COMPOUNDS [3]

Ethyne (C_2H_2) is used as fuel in oxy-acetylene welding, where it is burnt with pure oxygen rather than air. (i) Explain why burning ethyne in air produces a sooty, less hot flame compared to burning it in pure oxygen. (ii) Unsaturated hydrocarbons generally require more oxygen per carbon atom for complete combustion than saturated hydrocarbons. Justify this statement with reference to the molecular formulae of ethane (C_2H_6) and ethyne (C_2H_2), and write balanced chemical equations for the complete combustion of each.

♦ Carbon and its Compounds

Q33. medium thorough-understanding § 4.3.1 Combustion [3]

A student burns two different hydrocarbons — one saturated and one unsaturated — and holds a metal plate above each flame. What difference would she observe on the metal plate, and why does this difference occur?

♦ Carbon and its Compounds

Q34. medium thorough-understanding § 4.3.1 Combustion [3]

A gas stove flame that was previously blue has turned yellow and the bottom of the cooking vessel is getting covered with a black deposit. Identify the cause of this change and explain what the black deposit is.

♦ Carbon and its Compounds

Q35. medium thorough-understanding § 4.3.1 Combustion [1]

Combustion of ethanol is classified as an oxidation reaction. Give one reason to justify this classification.

♦ Carbon and its Compounds

Q36. deep thorough-understanding § 4.3.1 Combustion [3]

Ethyne (C_2H_2) is used as fuel in welding torches where it is burned with pure oxygen rather than air. Using your understanding of combustion of carbon compounds, explain: (i) why pure oxygen is preferred over air, and (ii) what type of combustion occurs when sufficient oxygen is available versus when it is insufficient, and what the observable difference would be.

♦ Carbon and its Compounds

Q37. deep thorough-understanding § 4.3.1 Combustion [5]

Diamond, graphite, and fullerene are all allotropes of carbon. (i) Briefly describe the structural arrangement of carbon atoms in diamond and graphite, and explain how this accounts for the difference in their electrical conductivity and hardness. (ii) Despite these structural differences, what would you expect about their chemical behaviour during combustion, and why? (iii) A student argues that since diamond is much harder than graphite, it must also produce a different product on combustion. Do you agree? Justify.

♦ Carbon and its Compounds

Q38. deep thorough-understanding § 4.3.2 Oxidation [3]

Ethanol is treated separately with (i) alkaline potassium permanganate and (ii) excess concentrated sulphuric acid at 443 K. In each case, identify the organic product formed and explain why the two reactions belong to different categories of chemical reactions.

♦ Carbon and its Compounds

Q39. medium thorough-understanding § 4.3.3 Addition Reaction [3]

Vegetable oils and vanaspati ghee both contain long carbon chains, yet doctors advise against regular consumption of vanaspati ghee. (i) How does the chemical nature of the carbon chains differ between vegetable oil and vanaspati ghee? (ii) Explain what happens to vegetable oil during hydrogenation and why this change makes the product less healthy. (iii) Name the catalyst used in this process and state its role.

♦ Carbon and its Compounds

Q40. deep thorough-understanding § 4.3.4 Substitution Reaction [3]

Methane reacts with chlorine in sunlight to give chloromethane (CH_3Cl) and HCl, but the same reaction does not occur in the dark. Given that saturated hydrocarbons are generally described as 'inert', how do you explain the fact that this reaction occurs at all, and why does sunlight play a crucial role in making it happen?

♦ Carbon and its Compounds

Q41. deep thorough-understanding § 4.4 SOME IMPORTANT CARBON COMPOUNDS – ETHANOL AND ETHANOIC ACID [3]

When ethanol is heated with concentrated sulphuric acid at 443 K, ethene is produced. When the same ethanol is warmed with glacial acetic acid in the presence of concentrated sulphuric acid, an ester is formed instead. What determines which product forms, and what role does concentrated sulphuric acid play in each case?

♦ Carbon and its Compounds

Q42. medium thorough-understanding § 4.4.1 Properties of Ethanol [3]

When ethanol reacts with sodium metal, hydrogen gas is evolved. What does this observation tell you about the nature of the O–H bond in ethanol compared to the C–H bonds in the same molecule?

♦ Carbon and its Compounds

Q43. medium thorough-understanding § 4.4.1 Properties of Ethanol [2]

Ethanol, when heated with concentrated sulphuric acid at 443 K, undergoes a chemical change. (i) What role does the concentrated sulphuric acid play in this reaction? (ii) Name the product formed and classify it as saturated or unsaturated. Write the chemical equation for the reaction.

♦ Carbon and its Compounds

Q44. deep thorough-understanding § 4.4.1 Properties of Ethanol [3]

Methanol and ethanol are both alcohols, yet ingesting methanol in very small amounts can be fatal while ethanol, though harmful in excess, is not immediately lethal in dilute amounts. What accounts for the difference in their toxicity to humans?

♦ Carbon and its Compounds

Q45. medium thorough-understanding § 4.4.1 Properties of Ethanol [1]

Industrial ethanol is often mixed with small amounts of poisonous substances such as methanol before being sold. (i) What is this process called, and what is the mixture termed? (ii) Why is this done, and which government or industrial body mandates it? (iii) Name one harmful effect of the substance added to ethanol.

A Ethanol is mixed with water to reduce its concentration, making it taste unpleasant.

B Methanol and dyes are added to industrial ethanol to make it poisonous and identifiable, a product called denatured alcohol.

C Industrial ethanol is heated to high temperatures so that it decomposes before it can be consumed.

D Concentrated sulphuric acid is added to industrial ethanol, converting it entirely to ethene gas.

♦ Carbon and its Compounds

Q46. deep thorough-understanding § 4.4.1 Properties of Ethanol [3]

Ethanol is used as a solvent in many medicines such as tincture iodine, and it is also completely miscible with water. Using your knowledge of ethanol's structure, explain why ethanol can (i) mix with water in all proportions, and (ii) dissolve many organic substances that water cannot dissolve.

♦ Carbon and its Compounds

Q47. deep thorough-understanding § 4.4.1 Properties of Ethanol [3]

Ethanol reacts with ethanoic acid in the presence of a few drops of concentrated sulphuric acid on gentle heating. (i) Name the type of reaction and the product formed. (ii) What is the role of concentrated H_2SO_4 here, and how does it differ from its role when ethanol alone is heated with excess concentrated H_2SO_4 at 443 K? (iii) How would you identify the product formed, and what happens when this product is treated with NaOH solution?

♦ Carbon and its Compounds

Q48. medium thorough-understanding § 4.4.2 Properties of Ethanoic Acid [2]

When ethanoic acid is tested with both litmus paper and a universal indicator, litmus turns red but the universal indicator shows a colour corresponding to a weak acid — not as strong as hydrochloric acid of the same concentration. Why does ethanoic acid behave as a weaker acid than HCl even though both release H^+ ions in solution?

♦ Carbon and its Compounds

Q49. medium thorough-understanding § 4.4.2 Properties of Ethanoic Acid [3]

[short_answer] Ethanol is warmed with ethanoic acid in the presence of a few drops of concentrated sulphuric acid. A sweet-smelling compound 'P' is formed. 'P' is then treated with sodium hydroxide solution to give compound 'Q' and ethanol. (i) Identify 'P' and 'Q', and name the type of reaction that forms each of them. (ii) Write balanced chemical equations for both reactions. (iii) State one industrial application of the reaction that produces 'Q'.

♦ Carbon and its Compounds

Q50. deep thorough-understanding § 4.4.2 Properties of Ethanoic Acid [3]

[short answer] Ethanoic acid reacts with both sodium carbonate solution and sodium hydroxide solution to form salts. (i) Write the name and formula of the salt produced in each reaction, and write balanced chemical equations for both. (ii) A student argues that because ethanoic acid reacts with sodium carbonate — a reaction that mineral acids also undergo — ethanoic acid must be equally strong as hydrochloric acid. Evaluate this claim and describe one experimental observation that would clearly demonstrate the difference in acid strength between ethanoic acid and hydrochloric acid.

♦ Carbon and its Compounds

Q51. medium thorough-understanding § 4.5 SOAPS AND DETERGENTS [3]

When soap is added to water containing dissolved calcium and magnesium salts, a white curdy precipitate forms instead of lather. Explain why this happens and how detergents overcome this problem.

♦ Carbon and its Compounds

Q52. straightforward thorough-understanding § 4.5 SOAPS AND DETERGENTS [1]

A student prepares soap solution in water and shines a beam of light through it. The path of the light beam becomes visible inside the solution. (i) What phenomenon is responsible for this observation? (ii) What does this tell you about the nature of the soap solution?

♦ Carbon and its Compounds

Q53. deep thorough-understanding § 4.5 SOAPS AND DETERGENTS [3]

If you dissolve soap in a hydrocarbon solvent instead of water, what orientation would the soap molecules adopt in a micelle, and what kind of substance could be cleaned using such a micelle?

♦ Carbon and its Compounds

Q54. medium thorough-understanding § 4.5 SOAPS AND DETERGENTS [1]

Soap micelles remain permanently suspended in water without settling. What property of the outer surface of a micelle is responsible for this colloidal stability?

♦ Carbon and its Compounds

Q55. deep thorough-understanding § 4.5 SOAPS AND DETERGENTS [5]

When testing two samples of water — one distilled and one from a tubewell — with the same amount of soap solution and shaking equally, one produces abundant lather while the other forms a white precipitate with very little lather. (i) Identify which sample produces which result and explain why. (ii) If the tubewell water is instead tested with a detergent solution under identical conditions, predict and explain the result.

♦ Carbon and its Compounds

Q56. straightforward thorough-understanding § 4.5 SOAPS AND DETERGENTS [1]

A soap molecule has two structurally different ends. (i) Name each end and identify the part of the molecule responsible for its character. (ii) How does each end interact differently with water and oily substances?

♦ Carbon and its Compounds

Q57. medium thorough-understanding § 4.5 SOAPS AND DETERGENTS [2]

After adding soap to a mixture of oil and water, vigorous agitation is needed to clean effectively, whereas simply letting the soap sit in the mixture is not enough. Using your understanding of micelle formation, explain why mechanical agitation plays a crucial role in the cleaning process.

♦ Carbon and its Compounds

Q58. deep thorough-understanding § (whole-chapter synthesis) [3]

Carbon forms millions of stable compounds, whereas silicon — also a tetravalent element — forms far fewer. Explain TWO reasons why carbon's covalent compounds are so much more numerous and stable than silicon's, drawing on both the nature of the carbon–carbon bond and carbon's atomic size.

◆ Carbon and its Compounds

Q59. deep thorough-understanding § (whole-chapter synthesis) [5]

Ethanol can be converted to ethene, or it can be converted to ethanoic acid. (i) State the reagent and condition used for each conversion. (ii) One conversion is a dehydration and the other is an oxidation — explain what each term means in the context of these specific reactions. (iii) Why is the product of oxidation classified as belonging to a different homologous series than ethanol?

◆ Carbon and its Compounds

Q60. medium thorough-understanding § (whole-chapter synthesis) [3]

A student burns two gases: one produces a clean blue flame and the other a yellow, sooty flame. She also finds that the second gas decolourises bromine water while the first does not. (i) Identify whether each gas is a saturated or an unsaturated hydrocarbon, giving one reason for each identification. (ii) Explain, in terms of the types of bonds present, why unsaturated hydrocarbons decolourise bromine water while saturated hydrocarbons do not.

◆ Carbon and its Compounds

Q61. deep thorough-understanding § (whole-chapter synthesis) [3]

Covalent compounds are generally poor conductors of electricity and have low melting points, yet graphite — a covalent form of carbon — conducts electricity well. Explain why most covalent carbon compounds have low melting points, and then account for why graphite is an exception despite being made entirely of covalent bonds.

◆ Carbon and its Compounds

Q62. medium thorough-understanding § (whole-chapter synthesis) [1]

Which of the following statements correctly explains why soap fails to clean effectively in hard water but a detergent does not?

- (A) Soap molecules are too large to form micelles in hard water, whereas detergent molecules are smaller.
- (B) Soap reacts with calcium and magnesium ions in hard water to form insoluble salts, while the charged ends of detergent molecules do not form such precipitates.
- (C) Soap is hydrophobic in hard water, so it cannot interact with water, whereas detergent remains hydrophilic.
- (D) Hard water destroys the hydrocarbon tail of soap molecules but not that of detergent molecules.

A Soap molecules are too large to form micelles in hard water, whereas detergent molecules are smaller.

B Soap reacts with calcium and magnesium ions in hard water to form insoluble salts, while the charged ends of detergent molecules do not form such precipitates.

C Soap is hydrophobic in hard water, so it cannot interact with water, whereas detergent remains hydrophilic.

D Hard water destroys the hydrocarbon tail of soap molecules but not that of detergent molecules.

◆ Carbon and its Compounds

Q63. medium thorough-understanding § (whole-chapter synthesis) [3]

Ethanoic acid and ethanol both contain oxygen, yet their behaviours with sodium hydrogencarbonate and with sodium metal are very different. (i) State what you would observe when each compound is separately treated with sodium hydrogencarbonate. (ii) Explain, in terms of their functional groups, why the two compounds behave differently with sodium hydrogencarbonate even though both react with sodium metal to produce hydrogen.

◆ Carbon and its Compounds

Q64. deep thorough-understanding § (whole-chapter synthesis) **[3]**

Natural fats and oils are esters formed from long-chain carboxylic acids and glycerol. (i) Name the type of reaction used to convert a fat or oil into soap, and state the reagent required. (ii) Identify the other organic product formed alongside soap in this reaction. (iii) The reverse reaction — forming an ester from an acid and an alcohol — is called esterification. State the reagent and condition used and explain why this reaction is described as reversible.

◆ Carbon and its Compounds

Q65. deep thorough-understanding § (whole-chapter synthesis) **[3]**

Consider the homologous series of alkanes and the homologous series of alcohols. (i) Boiling points increase steadily as you move from methane to butane, and from methanol to butanol. Explain why this gradation in boiling points occurs, and why the chemical properties within each series remain similar despite this physical change. (ii) A student claims that ethane and ethanol belong to the same homologous series because they differ by only one atom. Identify the error in the student's reasoning and explain what conditions must be satisfied for two compounds to belong to the same homologous series.

◆ Carbon and its Compounds

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