

Carbon and its compounds: 30 important questions with answers (Class 10)

Ten one-mark (MCQ and assertion-reason), eight two-mark, seven three-mark and five five-mark questions on the CBSE Class 10 chapter, with answers written to the marking scheme. Subscripts are written plain (C₂H₆) on this sheet.

Questions

1. Covalent bonds in a molecule of ethane (C₂H₆): (A) 5 (B) 6 (C) 7 (D) 8
2. Not an allotrope of carbon: (A) diamond (B) graphite (C) fullerene (D) carborundum
3. The functional group -CHO belongs to: (A) alcohols (B) aldehydes (C) ketones (D) acids
4. Successive members of a homologous series differ by: (A) CH₂ and 14 u (B) CH₃ (C) C₂H₄ (D) 12 u
5. The IUPAC name of CH₃-CH₂-CH₂-OH: (A) propanal (B) propan-1-ol (C) propanone (D) propanoic acid
6. Gas evolved when ethanoic acid reacts with sodium carbonate: (A) H₂ (B) O₂ (C) CO₂ (D) CO
7. Reagent that oxidises ethanol to ethanoic acid: (A) alkaline KMnO₄ (B) Na (C) conc. H₂SO₄ (D) Ni
8. Butanone has the functional group: (A) -OH (B) -CHO (C) ketone (D) -COOH
9. Assertion: carbon forms a very large number of compounds. Reason: carbon shows catenation and tetravalency.
10. Assertion: soap does not lather well in hard water. Reason: soap forms insoluble calcium and magnesium salts (scum).
11. Why does carbon form covalent bonds rather than ionic bonds?
12. What is catenation? Why does carbon show it more than any other element?
13. Draw the electron-dot structure of methane and of ethene.
14. Define a homologous series and give two characteristics.
15. IUPAC names of (a) CH₃-CH₂-CHO (b) CH₃-CO-CH₃ (c) CH₃-CH₂-COOH (d) CH₃-CH₂-CH₂-CH₂-Br.
16. Why does ethanol dissolve in water but hexane does not?
17. Why do diamond and graphite have such different properties?
18. What happens when ethanol is heated with conc. sulphuric acid at 443 K? Equation.
19. Two tests to distinguish a saturated hydrocarbon from an unsaturated one.
20. The substitution reaction of methane with chlorine: equation and condition.
21. What is hydrogenation? Equation and industrial use.
22. Reactions of ethanoic acid with (a) NaOH (b) Na₂CO₃ (c) ethanol, with conditions.
23. Why is ethanol to ethanoic acid an oxidation? Equation and reagent.
24. What is a micelle? How does soap remove an oily stain?
25. Soaps vs detergents; why detergents suit hard water but harm the environment.
26. A (C₂H₆O) + Na gives gas B; A + alkaline KMnO₄ gives C (C₂H₄O₂); A + C with conc. H₂SO₄ gives sweet-smelling D. Identify A, B, C, D with equations.
27. (a) Why is CO₂ a gas but SiO₂ a solid? (b) Why are covalent compounds poor conductors with low melting points? (c) Three allotropes of carbon and a use of each.
28. Structures of the first five alkanes and first three alcohols; general formulas of alkanes, alkenes, alkynes.
29. The cleansing action of soap in five steps; why it fails in hard water; the soap molecule with its two parts.
30. Physical properties and two uses each of ethanol and ethanoic acid, and the reaction of each with sodium.

Answers, as they are marked

Q	Answer
1-10	1 C 2 D 3 B 4 A 5 B 6 C 7 A 8 C 9 A (R explains A) 10 A (R explains A)
11	Four outer electrons: gaining or losing four needs too much energy and gives unstable ions; sharing four completes the octet without charge.
12	Self-linking into chains, branches and rings. Carbon's small size makes the C-C bond strong and stable, far more than silicon.
13	Methane: C centre, four H, each C-H a shared pair. Ethene: two C sharing two pairs (double bond), each with two H.
14	Same functional group and similar chemistry, successive members differ by CH ₂ (14 u); a general formula (alkanes C _n H _{2n+2}); physical properties change gradually.
15	(a) propanal (b) propanone (c) propanoic acid (d) 1-bromobutane.
16	Ethanol's polar -OH hydrogen-bonds with water; hexane is non-polar and cannot.
17	Diamond: each C bonded to four in a rigid 3-D network (hardest, no conduction). Graphite: each C bonded to three in sliding layers with a free electron (soft, conducts).
18	Dehydration to ethene: CH ₃ CH ₂ OH $\xrightarrow{\text{(conc. H}_2\text{SO}_4, 443 \text{ K)}}$ CH ₂ =CH ₂ + H ₂ O.
19	Bromine water is decolourised by an unsaturated hydrocarbon only; unsaturated burns with a sooty yellow flame, saturated with a clean blue one.
20	CH ₄ + Cl ₂ $\xrightarrow{\text{(sunlight)}}$ CH ₃ Cl + HCl, continuing to CH ₂ Cl ₂ , CHCl ₃ , CCl ₄ . Substitution; sunlight must be stated.
21	Adding hydrogen across a double bond with Ni or Pd catalyst: CH ₂ =CH ₂ + H ₂ $\xrightarrow{\text{(Ni)}}$ CH ₃ -CH ₃ . Vegetable oils to vegetable ghee.
22	(a) CH ₃ COOH + NaOH $\rightarrow$ CH ₃ COONa + H ₂ O (b) 2CH ₃ COOH + Na ₂ CO ₃ $\rightarrow$ 2CH ₃ COONa + H ₂ O + CO ₂ (c) CH ₃ COOH + C ₂ H ₅ OH $\xrightarrow{\text{(conc. H}_2\text{SO}_4, \text{ warm)}}$ CH ₃ COOC ₂ H ₅ + H ₂ O (ester).
23	Oxygen is added: CH ₃ CH ₂ OH + 2[O] $\xrightarrow{\text{(alkaline KMnO}_4, \text{ heat)}}$ CH ₃ COOH + H ₂ O; KMnO ₄ is the oxidising agent.
24	Soap: hydrocarbon tail (in oil) and ionic head (in water). Tails surround the oil droplet, heads outward: a micelle, suspended as an emulsion, rinsed away.
25	Soaps: Na/K salts of fatty acids, scum with Ca ²⁺ /Mg ²⁺ . Detergents: sulphonic acid salts, soluble Ca/Mg salts so they lather in hard water; many are non-biodegradable.
26	A ethanol; B hydrogen; C ethanoic acid; D ethyl ethanoate. 2C ₂ H ₅ OH + 2Na $\rightarrow$ 2C ₂ H ₅ ONa + H ₂ ; C ₂ H ₅ OH + 2[O] $\rightarrow$ CH ₃ COOH + H ₂ O; CH ₃ COOH + C ₂ H ₅ OH $\rightarrow$ CH ₃ COOC ₂ H ₅ + H ₂ O.
27	(a) CO ₂ : small molecules, weak forces between them; SiO ₂ : giant 3-D network of Si-O bonds. (b) Strong bonds within molecules, weak between; no free electrons or ions. (c) Diamond (cutting tools), graphite (lubricant, pencils), fullerene (research, nanotech).
28	CH ₄ , C ₂ H ₆ , C ₃ H ₈ , C ₄ H ₁₀ , C ₅ H ₁₂ ; CH ₃ OH, C ₂ H ₅ OH, C ₃ H ₇ OH. Alkanes C _n H _{2n+2} , alkenes C _n H _{2n} , alkynes C _n H _{2n-2} .
29	Tails dissolve in the oil; heads stay in water; micelle forms; micelles repel and stay suspended; rinsing removes them. Hard water: Ca/Mg ions form scum, so soap is used up. Draw a long tail and an ionic head.
30	Ethanol: colourless liquid, bp 351 K, miscible, good solvent; medicines, fuel additive; 2C ₂ H ₅ OH + 2Na $\rightarrow$ 2C ₂ H ₅ ONa + H ₂ . Ethanoic acid: pungent liquid, mp 290 K; vinegar, esters; 2CH ₃ COOH + 2Na $\rightarrow$ 2CH ₃ COONa + H ₂ .

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