ICSE CLASS 10 CHEMISTRY – PRACTICE PAPER

STEP-BY-STEP SOLUTIONS AND MARKING SCHEME

Chapter 12: Organic Chemistry | Maximum Marks: 40

SECTION A (20 Marks)

Question 1 [8 × 1 = 8]

Part	Ans	Step-by-step reasoning
(i)	(b)	Alkenes: C_nH_{2n} (alkanes C_nH_{2n+2}, alkynes C_nH_{2n-2}, alkyl group C_nH_{2n+1}).
(ii)	(b)	The longest chain has 3 carbons (propane) with a methyl group on carbon 2: 2-methylpropane (iso-butane).
(iii)	(c)	$CH_3COONa + NaOH \rightarrow Na_2CO_3 + CH_4$ (CaO, heat). Sodium propionate gives ethane.
(iv)	(b)	Ethene adds bromine across the double bond: $C_2H_4 + Br_2 \rightarrow C_2H_4Br_2$. The others are substitution or combustion.
(v)	(b)	$CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$. Aluminium carbide gives methane.
(vi)	(c)	Both are true; the double bond is the reason for the higher reactivity (R explains A).
(vii)	(c)	Aldehyde = –CHO; alcohol = –OH; carboxylic acid = –COOH; ketone = >C=O.
(viii)	(b)	Pure ethanoic acid melts at 17 °C and on cooling forms an ice-like crystalline mass.

Question 2 [3 + 3 = 6]

(i) **[3 × 1]**

(a) **substitution** – all valencies of carbon are satisfied by single bonds, so atoms are replaced, e.g. $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$.

(b) **ethanoic acid** – $C_2H_5OH \rightarrow CH_3CHO \rightarrow CH_3COOH$.

(c) **saturated, unsaturated** – ethane has only single bonds; ethene has a double bond.

(ii) **[3 × 1]**

(a) $C_2H_5OH \rightarrow$ **2** (ethanol).

(b) $CH_3COOH \rightarrow$ **3** (ethanoic acid).

(c) $CH \equiv CH \rightarrow$ **1** (ethyne).

Statement 4 (ethanal, CH_3CHO) is the extra option.

Question 3 [3 + 3 = 6]

(i) **[3 × 1]**

(a) P is a mixture of **sodium ethanoate (sodium acetate) and soda lime**. **$CH_3COONa + NaOH \rightarrow Na_2CO_3 + CH_4$** (CaO, heat).

(b) **Downward displacement of water**; methane is only slightly soluble in water (so it can be collected over water).

(c) Soda lime is a mixture of sodium hydroxide and calcium oxide. CaO keeps the NaOH dry (it is deliquescent), and prevents the NaOH from attacking the glass tube.

(ii) **[3 × 1]**

(a) Carbon shows catenation (it links to itself in chains and rings) and has a valency of four, so it forms an enormous number of compounds.

(b) Ethyne has a high percentage of carbon; the carbon is not completely oxidised, so unburnt carbon particles give a sooty flame.

(c) Ethyne has a triple bond, which breaks easily to give addition products, whereas ethane has only single bonds.

SECTION B (20 Marks)

Question 4 [4 + 3 + 3 = 10]

(i) **[4 × 1]**

(a) P is **ethanol and concentrated sulphuric acid**. $\mathbf{C_2H_5OH \rightarrow C_2H_4 + H_2O}$ (conc. H_2SO_4, 170 °C). The thermometer Q reads **170 °C**.

(b) Concentrated H_2SO_4 acts as a **dehydrating agent**; it removes a molecule of water from ethanol.

(c) **Downward displacement of water**; ethene is almost insoluble in water.

(d) **Bromine in carbon tetrachloride** – the orange colour is decolourised (or acidified $KMnO_4$ – purple colour disappears).

(ii) **[3 × 1]**

(a) $\mathbf{C_2H_4 + Br_2 \rightarrow C_2H_4Br_2}$ (1,2-dibromoethane)

(b) $\mathbf{C_2H_4 + H_2 \rightarrow C_2H_6}$ (Ni catalyst)

(c) $\mathbf{C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O}$

(iii) **[3 × 1]**

(a) Alcoholic potassium hydroxide (KOH) on heating: $\mathbf{C_2H_5Br + KOH\ (alc.) \rightarrow C_2H_4 + KBr + H_2O}$.

(b) **Dehydrohalogenation** (elimination of HBr).

(c) **Polyethene (polythene)**: $nCH_2{=}CH_2 \rightarrow [–CH_2–CH_2–]_n$.

Question 5 [4 + 3 + 3 = 10]

(i) **[4 × 1]**

(a) **Alkenes**.

(b) **Triple bond** (C ≡ C).

(c) **Ethene** (C_2H_4).

(d) **Substitution**.

(ii) **[3 × 1]**

(a) n-Butane: $CH_3–CH_2–CH_2–CH_3$ (straight chain of four carbon atoms with all hydrogens shown).

(b) Isobutane: $CH_3–CH(CH_3)–CH_3$; IUPAC name **2-methylpropane**.

(c) **Chain isomerism** (structural isomerism).

(iii) **[3 × 1]**

(a) **$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$**

(b) **$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$** (sunlight); a **substitution** reaction.

(c) **$Al_4C_3 + 12H_2O \rightarrow 3CH_4 + 4Al(OH)_3$**

Question 6 [4 + 3 + 3 = 10]

(i) **[4 × 1]**

(a) **Aqueous potassium hydroxide** (hydrolysis of the alkyl halide): $C_2H_5Br + KOH \rightarrow C_2H_5OH + KBr$.

(b) **Acidified potassium dichromate** ($K_2Cr_2O_7 / H_2SO_4$).

(c) **Esterification**; **ethanol** with concentrated sulphuric acid as catalyst.

(d) **$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$** (conc. H_2SO_4, heat).

(ii) **[3 × 1]**

(a) **$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$**

(b) **$2CH_3COOH + Mg \rightarrow (CH_3COO)_2Mg + H_2$**

(c) **$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$** (ethyl ethanoate, a sweet-smelling ester).

(iii) **[3 × 1]**

(a) **$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$**

(b) **$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$** (burns with a pale blue flame).

(c) Ethanol made unfit for drinking by adding poisonous substances such as methanol or pyridine (and a dye); it is sold cheaply for industrial use.

Marks summary	Section A: Q1 = 8, Q2 = 6, Q3 = 6 → **20** | Section B: any two of Q4, Q5, Q6 at 10 each → **20** | Total = **40**