SimpleStudy

PRACTICE MARKING SCHEME

LEAVING CERTIFICATE · ORDINARY LEVEL · SAMPLE PAPER 1 · 2027

Chemistry

Total marks	Duration	Structure
300	2 hr 30 min	7 questions

About this document

A practice marking scheme produced by SimpleStudy to help students and teachers prepare for the Leaving Certificate examination in Chemistry. The State Examinations Commission has published this sample paper without a marking scheme; the mark allocations and answers set out here are indicative.

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Marking Scheme

This marking scheme accompanies the State Examinations Commission's Sample Paper 1 in Leaving Certificate Chemistry, Ordinary Level. It is intended to support candidates and teachers preparing for the examination. It is not an official State Examinations Commission document.

General Marking Guidelines

- Accept all reasonable responses; the lists in this scheme are indicative, not exhaustive.
- Credit content that is correct even where it is poorly expressed.
- No penalty for spelling or grammar unless the meaning is unclear.
- Where a candidate contradicts themselves, award the lower mark.
- Credit accurate labelling on diagrams, and credit a correct answer given as a labelled diagram where the question does not require prose.
- Where a candidate offers more points than the number asked for, mark the first *n* presented, unless a later point is clearly labelled as a replacement.

Six additions for this paper:

- There are seven questions, each worth 50 marks. Candidates answer Question 1 and any five others, so six questions make up the 300 marks. Where a candidate answers all seven, mark all seven and credit the best six.
- **Formulae and Tables.** Candidates have the booklet and are directed to use its data, including atomic numbers and relative atomic masses. Where a part sends them to a particular page — 3(a)(v) to page 81 — the answer must rest on that data, and an answer that reaches the right conclusion without quoting it earns the reasoning marks but not the data marks.
- **Units and significant figures.** The paper warns that marks may be lost where units are omitted. In this scheme a calculated answer carries one mark for the correct unit unless the part states otherwise. Answers given to two or more significant figures are acceptable at this level; where a part states an acceptable range, that range governs.
- **Error carried forward.** Where a candidate uses an incorrect value from an earlier part correctly in a later one, award the later marks in full. An error is penalised once only. This matters particularly in Question 2, where parts (viii) to (x) and parts (xi) to (xii) each form a chain.
- **Chemical equations.** An equation earns its marks first for correct reactants and products and then for balancing; award the formulae marks where the species are right but the coefficients are wrong.
- **Units of volume and concentration.** This scheme follows the paper, which expresses concentrations in M or in moles per litre and volumes in cm^3. Accept any correct equivalent a candidate uses.

How the marks are set

The paper prints a total of 50 marks for each question and no sub-part marks, so every internal split is indicative. The splits reconcile upward to each question total and to the paper total of 300 marks, and follow one set of rates across all seven questions:

- **Tick, matching and completion rows inside a table** — identifying a state of matter, matching an allotrope to its structure, ticking a property or a suggestion — carry **2 marks per row**.
- **A one-word, symbol or single-item answer** — a chemical symbol, a letter from an equation, a metal read off a printed list, a choice between two printed alternatives — carries **2 marks**.

- **A technical term the candidate must supply from their own knowledge**, or a term selected from a printed list of options, carries **3 marks**.
- **Developed points** are priced on the printed answer space, with the command verb as a tie-breaker.

Marking at Ordinary Level

This paper is assessed at Ordinary Level. The specification differentiates the two levels through the learning outcomes themselves: Ordinary level covers only the outcomes presented in normal type, while Higher level covers all of them, including those in bold type. Table 1 of the specification describes Ordinary level students as engaging with a broad range of knowledge, mainly concrete in nature but with some elements of abstraction or theory, and as demonstrating and using a moderate range of cognitive skills and tools. Examiners should therefore credit accurate, simply expressed chemistry, and should not withhold marks because an answer lacks the depth or abstraction expected at Higher Level.

Paper Structure

Question 1	**50 marks**	Compulsory. Solutions and concentration, boiling points of alkanes, states of matter, displacement reactions and addition polymers.
Question 2	**50 marks**	A titration of magnesium hydroxide against hydrochloric acid: apparatus, procedure, pH, burette readings and the concentration calculation.
Question 3	**50 marks**	Ions and ionic compounds, electronegativity and bonding, flame tests and the allotropes of carbon.
Question 4	**50 marks**	Water treatment and pollution, an empirical formula, and exothermic reactions including a calorimetry experiment.
Question 5	**50 marks**	Structural isomers, alcohols, aldehydes and ketones, and the hydrogen-iodine equilibrium.
Question 6	**50 marks**	Rate of reaction between marble chips and hydrochloric acid: graphing, readings and the factors that affect rate.
Question 7	**50 marks**	An organic reaction scheme, reaction types and naming, the preparation of ethene, and combustion calculations.
Total	**300 marks**	Question 1 and any five of Questions 2 to 7.

Only the question numbers are printed on the paper; the descriptions above are supplied by this scheme for navigation only.

Grading Descriptors (all parts carrying a development element)

High (H)	Point accurately named and developed with correct chemical reasoning, applied to the substance, data or context the part supplies. Full marks for the point.
Mid (M)	Relevant point named with partial development, or chemically correct but not applied to the data or context the part supplies. Award the naming marks in full plus roughly half the development marks, rounded up to a whole mark.
Low (L)	Point named or asserted only; vague, or development that does not follow from the point named. Naming marks only.

No criterion grid is used on this paper. *The longer parts — for example 2(ii), 4(b)(iv) and 5(a)(vii) — are marked by required elements rather than holistically.*

Question 1 — 50 marks

Compulsory. Candidates answer all parts.

Indicative mark allocation: (a)(i) 3 · (a)(ii) 3 · (a)(iii) 4 · (a)(iv) 4 · (b)(i) 4 · (b)(ii) 5 · (c)(i) 4 · (c)(ii) 3 · (c)(iii) 2 · (d)(i) 5 · (d)(ii) 2 · (d)(iii) 2 · (e)(i) 4 · (e)(ii) 2 · (e)(iii) 3 = 50 marks.

(a) The sodium hydroxide solution (14 marks)

Part	Acceptable Answer(s)	Marks
(i) More concentrated	Dissolve more sodium hydroxide in the solution, or evaporate some of the water by heating. Either one alone earns full marks.	**3**
(ii) Saturated solution	A solution containing the maximum amount of solute that will dissolve in that solvent at that temperature; no further solute will dissolve.	**3**
(iii) Moles of NaOH	M(NaOH) = 40.0 (2), so n = 1.0 ÷ 40.0 = **0.025 mol** (2).	**4**
(iv) Concentration	250 cm^3 is a quarter of a litre, so 0.025 × 4 = **0.1 moles per litre** (accept 0.1 M). *2 marks for the method, 2 for the answer.*	**4**

(b) Boiling points of alkanes (9 marks)

Part	Acceptable Answer(s)	Marks
(i) Propane or hexane	**Hexane** (2). Its molecules are larger and contain more electrons, so the van der Waals forces between them are stronger and more energy is needed to separate them (2).	**4**
(ii) 2,3-dimethylbutane or hexane	**Hexane** (2). Both have the same molecular formula, but hexane is a straight chain, so its molecules lie close together along their whole length, giving a greater surface area of contact and stronger van der Waals forces; the branched isomer is more compact and spherical, with less contact between molecules (3).	**5**

(c) States of matter (9 marks)

Part	Acceptable Answer(s)	Marks
(i) The table ***2 marks per row***	Particles vibrate around a fixed position: **solid**. Completely fills the container in which it is held: **gas**.	**4**
(ii) Diffusion	The spreading out of particles from a region of higher concentration to one of lower concentration, caused by their random motion, until they are evenly distributed.	**3**
(iii) The letter T	**Temperature** (in kelvin)	**2**

(d) Displacement reaction (9 marks)

Part	Acceptable Answer(s)	Marks
(i) Oxidised or reduced	Magnesium is **oxidised** (2). It loses two electrons, $Mg \rightarrow Mg^{2+} + 2e^-$, and its oxidation number rises from 0 to +2 (3).	**5**
(ii) Another metal that reacts	Any metal above copper in the printed series other than magnesium: **lithium, calcium, zinc or lead**.	**2**
(iii) A metal that will not react	**Silver or gold** — both lie below copper in the series.	**2**

(e) Addition polymers (9 marks)

Part	Acceptable Answer(s)	Marks
(i) Poly(chloroethene)	Three repeating units joined in a chain, each $–CH_2–CHCl–$, with all atoms and bonds shown and open continuation bonds at both ends. *2 marks for the correct repeating unit with one chlorine on alternate carbons, 2 for three units correctly joined with no double bonds remaining.*	**4**
(ii) Everyday use	Poly(ethene): plastic bags, bottles, cling film, buckets. Poly(chloroethene): pipes, window frames, flooring, cable insulation.	**2**
(iii) Why recycle	Any one reason, developed. Both polymers are made from crude oil, a finite resource, so recycling conserves it; both are non-biodegradable, so they persist in landfill and in the environment and break down into microplastics; recycling uses less energy and causes fewer emissions than manufacturing new polymer.	**3**

Question 2 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (i) 6 · (ii) 5 · (iii) 3 · (iv) 3 · (v) 3 · (vi) 3 · (vii) 4 · (viii) 3 · (ix) 3 · (x) 3 · (xi) 4 · (xii) 10 = 50 marks. Parts (viii) to (x), and parts (xi) to (xii), each form a chain; error carried forward applies through both.

Part	Acceptable Answer(s)	Marks
(i) Naming the apparatus ***2 marks each***	A: **conical flask** B: **pipette** (accept volumetric pipette or bulb pipette) C: **burette**	**6**
(ii) Washing and filling the pipette	*1 mark per step, to a maximum of 5.* Rinse with deionised water; rinse with a little of the magnesium hydroxide solution and discard the rinsings, so that no water remains to dilute it; attach a pipette filler and never use the mouth; draw the liquid up above the graduation mark; wipe the outside of the stem; release slowly until the bottom of the meniscus rests on the mark at eye level. The question asks about washing and filling, so the five marks come from those steps. Steps describing the transfer to the conical flask — touching the tip to the inside wall, allowing it to drain, not blowing out the last drop — are creditable only where fewer than five washing and filling steps have been given.	**5**
(iii) Why a strong base	It dissociates fully, or almost fully, in water, releasing hydroxide ions; a strong base is one that is completely dissociated in solution.	**3**
(iv) Weak base	**Sodium carbonate (Na_2CO_3)**	**3**
(v) Checking the pH	Use a pH meter, or use universal indicator solution or paper and match the colour against the chart. Either earns full marks.	**3**
(vi) What pH means	pH is a measure of how acidic or basic a solution is, on a scale from 0 to 14 (1), and it depends on the concentration of hydrogen ions present: a low pH means a high concentration of H^+ and a strongly acidic solution, pH 7 is neutral, and above 7 is basic (2).	**3**
(vii) Knowing the endpoint	The indicator added to the flask changed colour permanently (2) at the point where the last drop of acid had just neutralised the base, and the colour did not revert on swirling (2). Accept a description of the pH meter reading passing through the end point where the candidate describes using one.	**4**
(viii) Initial reading	**0.30 cm^3**. Accept 0.25 to 0.35, and accept the reading written as 0.3.	**3**
(ix) Final reading	**23.60 cm^3**. Accept 23.55 to 23.70, and accept 23.6.	**3**
(x) Volume added	23.60 − 0.30 = **23.30 cm^3**. Accept any value consistent with the candidate's own two readings.	**3**

Part	Acceptable Answer(s)	Marks
(xi) Average volume	(22.7 + 22.8) ÷ 2 = **22.75 cm^3**. *2 marks for the method, 2 for the answer.* The approximate titration is excluded from the average; a candidate who includes it loses 2 marks.	**4**
(xii) Concentration of $Mg(OH)_2$	n(HCl) = 0.15 × 22.75 ÷ 1000 = 3.41×10^{-3} mol (4) The equation shows 2 mol of HCl per mol of $Mg(OH)_2$, so n($Mg(OH)_2$) = $3.41 \times 10^{-3} \div 2 = 1.71 \times 10^{-3}$ mol (3) c = $1.71 \times 10^{-3} \div 0.0250$ = **0.068 moles per litre** (2, plus 1 for the unit). Accept 0.0683 M.	**10**

Examiner note on the burette diagram. *Both scales are graduated in 0.1 cm^3 divisions, with ten divisions to each marked unit, and the drawing can be read only to about half a division, which is why a tolerance is given at (viii) and (ix). The value at (x) need not agree with the two accurate titrations, which are lower: an approximate titration normally overshoots the end point.*

Question 3 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 4 · (a)(ii) 6 · (a)(iii) 6 · (a)(iv) 5 · (a)(v) 5 · (a)(vi) 4 · (b)(i) 4 · (b)(ii) 6 · (c)(i) 6 · (c)(ii) 4 = 50 marks.

(a) Ions and bonding (30 marks)

Part	Acceptable Answer(s)	Marks
(i) What an ion is	A charged particle formed when an atom, or a group of atoms, loses or gains one or more electrons; losing electrons gives a positive ion and gaining them gives a negative ion.	**4**
(ii) Completing the table ***2 marks per cell***	Chlorine atom: arrangement **2, 8, 7** Chloride ion: **18** electrons, arrangement **2, 8, 8**	**6**
(iii) Properties ***2 marks per row***	High melting point: ✓ Conducts electricity when dissolved in water: ✓ Conducts electricity when solid: ✗	**6**
(iv) Electronegativity	The relative attraction that an atom in a molecule has for the shared pair of electrons in a covalent bond.	**5**
(v) Bonding in HCl	**Polar covalent** (2). From page 81 of the booklet, hydrogen is 2.20 and chlorine 3.16, a difference of 0.96 (2); a difference between 0.4 and 1.7 indicates polar covalent bonding, in which the electrons are shared but pulled closer to the more electronegative chlorine atom (1).	**5**
(vi) Lewis diagram of F_2	Two fluorine atoms joined by a single bond drawn as one shared pair of electrons, with three lone pairs shown on each atom, giving each a complete octet. *2 marks for the shared pair, 2 for all six lone pairs.*	**4**

(b) Flame tests (10 marks)

Part	Acceptable Answer(s)	Marks
(i) Improving step 3	Hold the splint *in* the flame rather than above it, using a hot blue flame with the air hole open (2), so that the compound is heated strongly enough to emit its characteristic colour (2). Accept using a clean nichrome or platinum wire moistened with concentrated hydrochloric acid in place of a damp wooden splint, since the splint itself burns with a yellow flame that masks the colour.	**4**
(ii) The table ***2 marks per cell***	P, yellow-orange: **sodium** Q, barium: **green** R, crimson: **lithium**	**6**

(c) Allotropes of carbon (10 marks)

Part	Acceptable Answer(s)	Marks
(i) Matching ***2 marks per arrow***	**Diamond** to the three-dimensional tetrahedral network. **Graphite** to the stacked hexagonal layers. **Fullerene** to the closed spherical cage. The arrow to the single hexagonal sheet is already drawn for graphene and carries no marks.	**6**
(ii) One use	*2 marks for naming the allotrope, 2 for the use.* Diamond in cutting, drilling and grinding tools, or in jewellery; graphite as pencil lead, as a dry lubricant, or as electrodes; graphene in electronics, sensors and composite materials; fullerenes in drug delivery and nanotechnology.	**4**

Question 4 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 2 · (a)(ii) 3 · (a)(iii) 3 · (a)(iv) 3 · (a)(v) 3 · (a)(vi) 6 · (a)(vii) 8 · (b)(i) 2 · (b)(ii) 3 · (b)(iii) 3 · (b)(iv) 10 · (b)(v) 4 = 50 marks.

(a) Water treatment and pollution (28 marks)

Part	Acceptable Answer(s)	Marks
(i) Symbol for iron	**Fe**	**2**
(ii) The term	**Flocculation.** Accept coagulation.	**3**
(iii) A step before	**Screening** — passing the water through a grid or mesh to remove large debris such as branches, litter and leaves.	**3**
(iv) A step after	Any one of **sedimentation, filtration, chlorination, fluoridation** or pH adjustment.	**3**
(v) Reagent for sulfate	**Barium chloride ($BaCl_2$)**	**3**
(vi) Eutrophication	Nutrients such as nitrates and phosphates run off into the water and enrich it (2), causing rapid growth of algae — an algal bloom — which covers the surface and blocks light from the plants below (2). When the algae die, bacteria decompose them and use up the dissolved oxygen, so fish and other aquatic life suffocate (2).	**6**
(vii) Empirical formula	O: 60 ÷ 16 = 3.75 · N: 35 ÷ 14 = 2.5 · H: 5 ÷ 1 = 5 (3) Divide through by the smallest, 2.5: O 1.5 · N 1 · H 2 (3) Multiply by 2 to clear the fraction: O 3 · N 2 · H 4 **Empirical formula: $N_2H_4O_3$** (2) *Accept the formula written as NH_4NO_3. A candidate who stops at the non-integer ratio earns 6.*	**8**

(b) Exothermic reactions (22 marks)

Part	Acceptable Answer(s)	Marks
(i) Temperature	It **increases**.	**2**
(ii) Evidence in the diagram	The products are drawn at a lower energy level than the reactants, so energy has been released to the surroundings.	**3**
(iii) Breaking a bond	It **requires** energy.	**3**

Part	Acceptable Answer(s)	Marks
(iv) Labelled diagram	*2 marks per labelled feature, to a maximum of 10.* A polystyrene cup or calorimeter to insulate the mixture; the cup standing inside a beaker for support; a lid; a thermometer through the lid with its bulb in the liquid; a measured volume of a named acid, for example hydrochloric acid; a measured volume of a named base, for example sodium hydroxide; a stirrer. Accept any workable arrangement that shows an insulated vessel, a thermometer and both named reagents.	**10**
(v) Temperature change	It would **increase**: neutralisation is exothermic and releases heat to the solution.	**4**

Question 5 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 4 · (a)(ii) 5 · (a)(iii) 5 · (a)(iv) 2 · (a)(v) 5 · (a)(vi) 5 · (a)(vii) 9 · (b)(i) 5 · (b)(ii) 4 · (b)(iii) 6 = 50 marks.

(a) Organic compounds (35 marks)

Part	Acceptable Answer(s)	Marks
(i) Shared property	They have the same molecular formula. Accept the same relative molecular mass, or the same percentage composition by mass.	**4**
(ii) Propan-1-ol	$CH_3–CH_2–CH_2–OH$ drawn with all atoms and bonds shown: three carbons in a chain, seven hydrogens, and the OH group on an end carbon. *3 marks for the correct skeleton with the OH in position 1, 2 for all atoms and bonds.*	**5**
(iii) Propan-2-ol	$CH_3–CH(OH)–CH_3$ drawn in full, with the OH group on the middle carbon. *3 marks for the correct skeleton with the OH in position 2, 2 for all atoms and bonds.*	**5**
(iv) Class of compound B	**Secondary**	**2**
(v) Completing butanal	The printed skeleton completed as $CH_3–CH_2–CH_2–CHO$, with the C=O double bond on the end carbon of the chain, that carbon also carrying one hydrogen, and all remaining hydrogens shown. *3 marks for the carbonyl group in the terminal position with its hydrogen, 2 for the remaining hydrogens.*	**5**
(vi) Completing butanone	The printed skeleton completed as $CH_3–CO–CH_2–CH_3$, with the C=O double bond on the second carbon, no hydrogen on that carbon, and all remaining hydrogens shown. *3 marks for the carbonyl group in position 2, 2 for the remaining hydrogens.*	**5**
(vii) Distinguishing C from D	*4 marks for the reagent and conditions, 5 for both observations.* Add **Fehling's solution** to each and warm in a water bath. With butanal, the aldehyde, the blue solution gives a **brick-red precipitate** of copper(I) oxide; with butanone, the ketone, the solution **stays blue** and no precipitate forms. **Also accept:** Tollens' reagent warmed, giving a silver mirror with the aldehyde and no change with the ketone; acidified potassium permanganate, decolourised by the aldehyde and unchanged by the ketone; or acidified potassium dichromate, turning from orange to green with the aldehyde and unchanged with the ketone. Both observations are required: a named reagent with only one observation earns a maximum of 6.	**9**

(b) The hydrogen-iodine equilibrium (15 marks)

Part	Acceptable Answer(s)	Marks
(i) K_c expression	**$K_c = [HI]^2 \div [H_2][I_2]$** *3 marks for the correct fraction, 2 for the square on the HI term.*	**5**
(ii) Le Châtelier's principle	The position of equilibrium shifts to **oppose** the stress. Accept counteract, relieve or minimise.	**4**
(iii) Increasing $[H_2]$	The position of equilibrium shifts to the **right**, towards the products (2). The system acts to oppose the increase by using up some of the added hydrogen (2), so more hydrogen iodide is formed and the purple colour of the iodine fades (2).	**6**

Question 6 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (i) 4 · (ii) 3 · (iii) 9 · (iv) 4 · (v) 4 · (vi) 5 · (vii) 4 · (viii) 4 · (ix) 5 · (x) 8 = 50 marks.

Part	Acceptable Answer(s)	Marks
(i) Rate of reaction	The change in the amount or concentration of a reactant or product per unit time; how quickly reactants are used up or products are formed.	**4**
(ii) Another way of measuring	Collect the gas in a **gas syringe** and read the volume directly. Accept standing the flask on a balance and recording the loss in mass as the gas escapes.	**3**
(iii) Plotting the graph	The axes are printed, labelled and scaled on the paper, so no marks are available for axes, labels or scale. *8 marks for the eight points plotted accurately, 1 mark each, deducting 1 for each point misplotted or omitted; 1 mark for a smooth curve of best fit drawn through them.* The curve rises steeply at first and flattens from about 5 minutes, reaching a plateau at 62 cm^3. Where a candidate joins the points with ruled straight lines, award the accuracy marks in full and withhold the curve mark.	**9**
(iv) Volume at 90 seconds	90 seconds is 1.5 minutes; reading from the curve gives approximately **31 cm^3**. *2 marks for the conversion to 1.5 minutes, 2 for the reading.* Accept 29 to 33 cm^3.	**4**
(v) Time for 40 cm^3	Approximately **2.15 minutes**, which is about 2 minutes 10 seconds. Accept 2.1 to 2.3 minutes, or 125 to 140 seconds.	**4**
(vi) Average rate over 2 minutes	38 ÷ 2 = **19 cm^3 per minute** (accept 0.32 $cm^3\ s^{-1}$). *2 marks for reading the volume at 2 minutes, 2 for dividing by the time, 1 for the unit.*	**5**
(vii) Why 7 minutes was enough	The volume had stopped changing — 62 cm^3 at both 6 and 7 minutes (2) — showing that the reaction was complete and that one of the reactants had been entirely used up, so no further carbon dioxide could be produced (2).	**4**
(viii) How the student knew	The same volume of gas was collected in a shorter time, so the curve rose more steeply at the start and reached its final volume sooner.	**4**
(ix) Why the rate increased	A more concentrated acid contains more acid particles in the same volume (2), so there are more collisions with the surface of the marble chips each second and therefore more effective collisions per second (3).	**5**
(x) Suggestions ***2 marks per row***	A more accurate stopwatch: ✗ The same mass of $CaCO_3$ in powdered form: ✓ The flask in a mixture of ice and water: ✗ A smaller graduated cylinder: ✗	**8**

Question 7 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (i) 6 · (ii) 10 · (iii) 8 · (iv) 3 · (v) 3 · (vi) 3 · (vii) 5 · (viii) 3 · (ix) 4 · (x) 5 = 50 marks.

Part	Acceptable Answer(s)	Marks
(i) Circling three compounds ***2 marks each***	**C_2H_6, C_2H_5Cl and C_2H_5OH.** Each is saturated, with four single bonds and therefore a tetrahedral arrangement around both carbon atoms. C_2H_4 is planar about its double bond and C_2H_2 is linear, so neither is circled. A candidate who circles C_2H_4 or C_2H_2 forfeits 2 marks for each wrong compound circled, to a minimum of zero.	**6**
(ii) Classifying the reactions ***2 marks each***	V, ethene → ethanol: **addition** W, ethene → ethyne: **elimination** X, ethene → ethane: **addition** Y, ethane → chloroethane: **substitution** Z, ethene → chloroethane: **addition**	**10**
(iii) IUPAC names ***2 marks each***	C_2H_4: **ethene** C_2H_5Cl: **chloroethane** C_2H_2: **ethyne** C_2H_5OH: **ethanol**	**8**
(iv) Compound A	**Aluminium oxide** (Al_2O_3). Accept pumice or porous pot where the candidate names it as the catalyst.	**3**
(v) Discarding the first tubes	They contained mostly the air already in the apparatus, displaced ahead of the ethene, so the gas collected would not have been a pure sample.	**3**
(vi) What a hydrocarbon is	A compound containing the elements carbon and hydrogen only.	**3**
(vii) Test for unsaturation	*2 marks for the reagent, 3 for the observation.* Add **bromine water** and shake: the orange-brown colour is **decolourised**, turning colourless, because the bromine adds across the double bond. Accept acidified potassium permanganate, whose purple colour is decolourised.	**5**
(viii) Moles of CO_2	The equation shows 2 mol of CO_2 per mol of C_2H_4, so 0.25 × 2 = **0.5 mol**.	**3**
(ix) Volume at s.t.p.	0.5 × 22.4 litres per mole = **11.2 litres**. *2 marks for the method, 1 for the answer, 1 for the unit.*	**4**
(x) Combustion of C_2H_2	**$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$** *2 marks for correct reactants and products, 3 for balancing.* Accept the equation written with a fractional coefficient, $C_2H_2 + 2.5O_2 \rightarrow 2CO_2 + H_2O$.	**5**

Examiner note on part (ii). *The direction of each arrow in the printed scheme determines the answer, and all three arrows at ethene point away from it. In particular, reaction V runs from ethene to ethanol, so it is the hydration of ethene, an addition reaction — not the dehydration of ethanol, which is the elimination reaction candidates meet more often and which the left-to-right arrangement of the two compounds on the page may suggest.*

This marking scheme is indicative. The paper prints a total of 50 marks for each question and no sub-part marks, so all internal splits are those of this scheme; they reconcile to 50 marks for each question and to 300 marks for the six questions a candidate answers. Examiners should use professional judgement when awarding marks and should credit all reasonable responses not listed here. Prepared by SimpleStudy for study purposes; not an official State Examinations Commission document.