Captivate
EDUCATION

Given name/s	
Family name	
Teacher	

Trial 1 external assessment 2027

Question and response book

Chemistry

Paper 1

SAMPLE

Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator permitted.
- QCAA formula and data book provided.
- Planning paper will not be marked.

Section 1 (20 marks)

- 20 multiple choice questions

Section 2 (35 marks)

- 9 short response questions

Practice material in the layout of the 2025 QCAA external assessment. Not a QCAA assessment.

Sample pages only. Full paper and marking guide: captivateeducation.com.au/trial-exams/qce/chemistry

Section 1

Instructions

- This section has 20 questions and is worth 20 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- Choose the best answer for Questions 1–20.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○
11.	○	○	○	○
12.	○	○	○	○
13.	○	○	○	○
14.	○	○	○	○
15.	○	○	○	○
16.	○	○	○	○
17.	○	○	○	○
18.	○	○	○	○
19.	○	○	○	○
20.	○	○	○	○

Ensure you have filled an answer bubble for each question.

SAMPLE

Do not write outside this box.

Section 2

Instructions

- Write using black or blue pen.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.
- This section has nine questions and is worth 35 marks.

DO NOT WRITE ON THIS PAGE
THIS PAGE WILL NOT BE MARKED

SAMPLE

Do not write outside this box.

QUESTION 21 (2 marks)

Consider the organic compound CH_3CH_2CHO.

a) Identify the class of the compound. *[1 mark]*

Class: _____

b) Identify the functional group present in the compound. *[1 mark]*

Functional group: _____

SAMPLE

Do not write outside this box.

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Chemistry marking guide and response

Trial 1 external assessment 2027 · Paper 1 · 55 marks

Teacher copy – not for distribution to students.

Where a response does not meet any of the descriptors for a question or a criterion, a mark of '0' will be recorded.

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Marking guide

Multiple choice

Question	Response	Explanation
1	**B**	A closed system exchanges energy but not matter with the surroundings — the sealed flask can gain or lose heat while no gas escapes. (A) describes an isolated system; (C) reverses the definition; (D) describes an open system.
2	**D**	H_2SO_4 can donate two protons per molecule. (A) and (B) are monoprotic strong acids — students conflate "strong" with "more protons"; (C) CH_3COOH has four hydrogens but only the carboxyl hydrogen is acidic, the classic error of counting all H atoms.
3	**C**	O is −2; 3 × (−2) = −6; overall charge −1, so N = +5. (A) +3 comes from forgetting the ion's charge (−6 + 3 = −3? mis-set equation); (B) +4 is the oxidation state of N in NO_2; (D) −3 is nitrogen's state in NH_3, chosen by students who recall nitrogen's "usual" state.
4	**C**	Per the syllabus distinction, OH is the hydroxyl *functional group*; alcohol is the *class*. (B) reverses the two terms — the targeted misconception; (A) confuses OH with alkyl substituents; (D) homologous series describes the family of alcohols differing by CH_2, not the OH group itself.
5	**B**	$[OH^-]$ = 0.025 M → pOH = −log(0.025) = 1.6 → pH = 14 − 1.6 = 12.4. (A) stops at the pOH; (C) 12.6 comes from rounding −log(0.025) to 1.4 by sign error on log 2.5; (D) 13.4 treats the solution as 0.025 = $10^{-0.6}$? — commonly produced by using −log(0.0025), a factor-of-10 slip.

6	**C**	C_4H_8 fits C_nH_{2n} (alkene, one double bond — unsaturated). (A), (B) and (D) all fit C_nH_{2n+2} (saturated alkanes); (D) is chosen by students who think a longer chain means unsaturated.
7	**B**	$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, an equilibrium reaction. (A) is balanced but uses a one-way arrow, missing the reversibility that defines the Haber process; (C) shows atomic nitrogen; (D) is unbalanced in hydrogen.
8	**D**	At pH = pK_a, [HIn] = [In^-] and the colour is mid-change. (A) assumes all indicators change at neutrality; (B) confuses end point with equivalence point — the indicator is chosen so they coincide, but the colour change is a property of the indicator, not the titration; (C) misstates the [HIn] : [In^-] ratio at the end point (it is 1 : 1).
9	**B**	Carbon 2 is bonded to four different groups: CH_3, OH, H and CH_2CH_3. Carbons 1 and 4 (A, D) carry three identical H atoms; carbon 3 (C) carries two identical H atoms — students who pick C often count the two different chain ends but miss the duplicated hydrogens.
10	**A**	In a molten salt only K^+ and Br^- are present: K^+ is reduced at the cathode, Br^- oxidised at the anode. (B) and (D) import water electrolysis products, the classic molten/aqueous confusion; (C) reverses the electrode processes.
11	**D**	Butan-1-ol hydrogen bonds (O–H), giving the strongest intermolecular forces of the four. (C) butanal has dipole–dipole forces only — no O–H bond; (A) and (B) rely on dispersion forces alone. Students choosing (C) know polarity matters but rank dipole–dipole above hydrogen bonding.
12	**A**	A buffer is conjugate in nature — appreciable amounts of both members of a conjugate pair let it consume added H^+ or OH^-. (B) a strong acid–strong base mixture simply neutralises; (C) buffers hold their own pH, not necessarily 7; (D) buffers resist, not eliminate, pH change — and are exhausted by large additions.
13	**C**	Polyester forms by condensation, eliminating water at each ester linkage. (A), (B) and (D) are all addition polymers of alkene monomers; (D) tempts because Teflon seems "exotic", but PTFE is simply poly(tetrafluoroethene).
14	**A**	$Q = [HI]^2/([H_2][I_2]) = (0.30)^2/(0.10 \times 0.10) = 9.0$. Since Q (9.0) < K_c (49), the forward reaction proceeds to increase [HI]. (B) pairs the right comparison with the wrong direction; (C) pairs the right direction with an inverted comparison; (D) is chosen by students who compute Q incorrectly as $0.30/(0.10 \times 0.10) \times \ldots$ or assume any stated mixture is at equilibrium.
15	**C**	The object to be plated is always the cathode, connected to the negative terminal so that Cu^{2+} ions are reduced onto it. (A) reverses the electrodes; (B) the copper electrode is the anode (it dissolves to replenish Cu^{2+}); (D) electrons never flow through the electrolyte — ions carry the charge in solution.
16	**A**	The copper anode oxidises: $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$, replenishing the electrolyte. (B) is the cathode reaction; (C) the steel ring does not dissolve — it is the cathode; (D) water oxidation occurs only with an inert anode, not an active copper anode.

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17	**B**	The equivalence point of a conductometric titration is the minimum of the curve — here 20.0 mL. (A) reads the mid-point of the falling branch; (C) and (D) are points on the rising branch chosen by students who expect conductivity to peak at equivalence.
18	**B**	Before equivalence, each added OH^- removes an H^+ (forming water) and leaves a Na^+ in its place; H^+ has a far higher ionic conductivity than Na^+, so conductivity falls. (A) dilution is minor and would not produce the sharp V; (C) Cl^- is a spectator and stays in solution; (D) NaCl is soluble — no precipitate forms.
19	**D**	The molecular ion peak (highest m/z) at 100 gives the molar mass: $C_6H_{12}O$ = 100 g mol^{-1}. (A), (B) and (C) are fragment peaks — (B) is tempting because it is the base (tallest) peak, the classic confusion between base peak and molecular ion.
20	**A**	$CH_3CH_2CO^+$ = 24 + 5 + 28 = 57, formed by cleavage on the propyl side of the carbonyl. (B) $CH_3CH_2CH_2CO^+$ = 71; (C) $CH_3CH_2^+$ = 29; (D) $CH_3CH_2CH_2^+$ = 43. Distractors are the paper's other peaks, so each is "seen" in the spectrum.

Short response

Question 21 (2 marks)

a) Identify the class of the compound. [1 mark]

Sample response	The response:
Class: aldehyde	• identifies the class as aldehyde **[1 mark]**

b) Identify the functional group present in the compound. [1 mark]

Sample response	The response:
Functional group: carbonyl (C=O)	• identifies the carbonyl functional group **[1 mark]**

SAMPLE