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Mark Scheme (Final)
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GCE

GCE Chemistry (6243/01A)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Using the mark scheme

1. / means that the responses are alternatives and either answer should receive full credit.
2. ( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
3. [ ] words inside square brackets are instructions or guidance for examiners.
4. Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
5. ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

In general, an inference should follow an observation.

Apparatus and Materials

Apparatus
Each candidate will require:

1. apparatus for a flame test;
2. spatula;
3. 10 cm^3 measuring cylinder;
4. 50 cm^3 measuring cylinder;
5. 5 test tubes and 1 boiling tube in a rack;
6. 1 stopper to fit a test tube;
7. supply of dropping pipettes;
8. test tube holder;
9. Bunsen burner;
10. 50 cm^3 burette, stand and clamp, with small funnel for filling, white tile and a small beaker for draining burette;
11. 2 × 250 cm^3 conical flasks;
12. 25 cm^3 pipette with safety filler;
13. expanded polystyrene cup held securely in a 250 cm^3 beaker;
14. a thermometer of range from at least room temperature to 50 °C (e.g. 0 to 50 °C or −10 to +110 °C), able to be read to ± 0.5 °C or better;
15. access to a balance reading to at least 2 decimal places.

Materials
Each candidate will require:

(a)* approximately 0.5 g of potassium sulphate, labelled **X**. The identity of this must not be revealed to candidates;
(b)* 3 cm^3 of aqueous silver nitrate: concentration approximately 0.05 mol dm^{-3}, labelled **Y**. The identity of this must not be revealed to candidates;
(c) 2 cm^3 of dilute hydrochloric acid: concentration approximately 2 mol dm^{-3};
(d) 1 cm^3 of aqueous barium chloride: concentration approximately 0.1 mol dm^{-3};
(e) 2 cm^3 of dilute aqueous sodium hydroxide: concentration approximately 2 mol dm^{-3};
(f) aluminium foil, approximately 2 × 2 cm;
(g) red litmus paper;
(h) 1 cm^3 of aqueous potassium iodide: concentration approximately 0.1 mol dm^{-3};
(i)* 200 cm^3 of aqueous sodium hydroxide: concentration 0.150 mol dm^{-3}, labelled **B**;
(j)* 200 cm^3 of aqueous sulphamic acid (NH_2SO_3H): concentration 13.5 g dm^{-3}, labelled **C**. The identity of the solute must not be revealed to candidates;
(k) phenolphthalein indicator;
(l)* specimen tube containing 5.0 ± 0.05 g of sodium nitrate, labelled **D**. The identity of this must not be revealed to candidates;
(m) distilled water.

For home centres (ONLY), the materials identified with an asterisk (*) will be sent by a firm of manufacturing chemists.

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(a)	Obs: Lilac (1) Inf: Potassium/ K^+ (1)	Purple/ mauve	Violet K	2

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(b)(i)	Obs: White precipitate (1) Inf: sulphate/SO_4^{2-} (1)	Cloudy/milky hydrogen sulphate/HSO_4^-	Goes misty SO_4 / HSO_4	2

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(b)(ii)	To **prevent** the precipitation with other ions (1) Any correct ion specified	**Destroy** any ion which would interfere with the test. Any correct ion specified So that only sulphate will precipitate	Dissolve precipitate of ions or compounds	1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(c)	K_2SO_4 Conditional on correct (a) and (b)	$K(HSO_4)_2$	Potassium sulphate No charges allowed	1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(d)(i)	Grey brown **precipitate** [observation only requested]		Brown **solid** Not "just" brown without precipitate	1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(d)(ii)	Obs: Litmus turns blue (1) Inf: Ammonia/ NH_3 (1) Nitrate/ NO_3^-	 Nitrite/NO_2^-		3

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1.(e)	Obs: (Pale) yellow precipitate (1) Inf: Ag^+ (1) AgI (1)	 Silver/Pb^{2+}/lead PbI_2	Cream Ag/Pb	3

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2.(a)	Check subtractions and averaging arithmetic, correcting if necessary All volumes read to 0.05 cm^3 (1) All subtractions complete (1) ✓✓ *top RHS of Table 1* **Mean Titre** For correct averaging of chosen values/ choosing identical values and for recording the average correct to 2 or 3 dps or to the nearest 0.05 cm^3 [unless already penalised] ✓ by the mean titre (1) **Accuracy** If the candidate has made an arithmetical error in Table 1 volumes used in the mean or in averaging, the examiner must calculate a new average. • For an averaging error simply calculate a new value using the candidate's chosen values • If a wrongly subtracted titre has been used in the mean then choose any two identical titres or take an average of the closest two titres Calculate the difference between the candidate's mean titre and that of the examiner or supervisor Record the difference on the scripts as d = ** Examiner's titre 22.80 cm^3 Award marks for accuracy as follows: Difference ±0.20 (6) Difference ±0.30 (5) Difference ± 0.40 (4) Difference ± 0.60 (3) Difference ± 0.80 (2) Difference ± 1.00 (1) Difference >1.00 (0)	Allow 1 slip but withhold this mark if any readings are in the wrong boxes. Accept 0; 0.0; 0.00 as initial reading	Reject 50 as initial reading	12

	Range Award a mark on the range of titres used by the candidate to calculate the mean. The range (r) is the difference between the outermost titres used to calculate the mean. If the examiner has corrected titres because of incorrect subtraction then award the range mark on the corrected titres used by the examiner to calculate the mean. Range ± 0.20 (3) Range ± 0.30 (2) Range ± 0.50 (1) Range > 0.50 (0) Examiner to show the marks awarded for the accuracy and range as d = ✓ 6 *max* r = ✓ 3 *max* then the mark out of 12 written in the margin			

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2.(b)(i)	$\frac{0.150 \times \text{titre}}{1000}$ S.F. i) ii) iii) Penalise rounding to 2 s.f. once unless trailing zero iv) Ignore s.f.			1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2.(b)(ii)	answer (i)			1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2.(b)(iii)	answer (ii) x 40			1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2.(b)(iv)	13.5/ answer (iii)	Ignore unit		1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2.(b)(v)	Titre would be too low/smaller/lower/too small (1) Because some alkali remains in the flask (1) Stand alone marks	No difference because quantity of excess alkali is within experimental error.	Just "small" Just "low" Stops too quickly or too soon	2

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3.(a)	Table 2 Weighings in correct spaces to at least 2 dp (1) Correct subtractions (1) Table 3 Two temps recorded in correct spaces (1) BOTH to 0.5 ° C or better (1) ΔT correct with neg. sign (1) EXPECTED VALUE TO BE -6.2 for [4.95 – 5.05]g ± 0.8°C (3) ± 1.2°C (2) ± 1.6°C (1) > 1.6°C (0)			8

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3.(b)(i)	For correct substitution and evaluation (1) positive sign (1) Answer to 2 sig figs (1)			3

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3.(b)(ii)	No because it has the same systematic errors/same errors with measuring cylinder/thermometer/heat loss/impure sample (1)		Same error in balance	1

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4.	Weigh crucible (1) ✓m1 Weigh with sample (1) ✓m2 Heat (1) ✓m3 to **constant** weight (1) ✓m4 Either Calculate mass (of gas) lost (1) ✓c1 Moles CO_2 = mass lost / 44 = moles $MgCO_3$ / Mr (1) ✓c2 Mass $MgCO_3$ = moles x 84 Mr (hence %) (1) ✓c3	Take known mass/stated mass (1)		7