



*Rewarding Learning*

**ADVANCED**  
**General Certificate of Education**  
**2012**

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## **Chemistry**

Assessment Unit A2 3

Internal Assessment  
Practical Examination 2

**[AC232]**

**THURSDAY 10 MAY, MORNING**

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# **MARK SCHEME**

## Annotation

1. Please do all marking in **red** ink.
2. All scripts should be checked for mathematical errors. Please adopt a system of one tick (✓) equals 1 mark, e.g. if you have awarded 4 marks for part of a question then 4 ticks (✓) should be on this candidate's answer.
3. The total mark for each question should be recorded in a circle placed opposite the question number in the teacher mark column.
4. As candidates have access to scripts please do not write any inappropriate comments on their scripts.

## General points

- All calculations are marked according to the number of errors made.
- Errors can be carried through. If the wrong calculation is carried out then the incorrect answer can be carried through. One mistake at the start of a question does not always mean that all marks are lost.
- Listing is when more than one answer is given for a question that only requires one answer, e.g. the precipitate from a chloride with silver nitrate is a white solid; if the candidate states a white or a cream solid, one answer is correct and one answer is wrong. Hence they cancel out.
- Although names might be in the mark scheme it is generally accepted that formulae can replace them. Formulae and names are often interchangeable in chemistry.
- The marking of colours is defined in the 'CCEA GCE Chemistry Acceptable Colours' document.

## MARKING GUIDELINES

### Interpretation of the Mark Scheme

- **Carry error through**  
This is where mistakes/wrong answers are penalised when made, but if carried into further steps of the question, then no further penalty is applied. This pertains to calculations and observational/deduction exercises. Please annotate candidates' answers by writing the letters c.e.t. on the appropriate place in the candidates' answers.
- **Oblique/forward slash**  
This indicates an acceptable alternative answer(s).
- **Brackets**  
Where an answer is given in the mark scheme and is followed by a word/words in brackets, this indicates that the information within the brackets is non-essential for awarding the mark(s).

Section A

- 1 (a) Weigh 1.2 g of sample [1]  
 Dissolve sample in (minimum) volume of deionised water with stirring [1]  
 pour solution into (250 cm<sup>3</sup>) volumetric flask (through funnel) [1]  
 indication of thorough rinsing of apparatus (container, glass rod) [1]  
 rinsings added to the volumetric flask [1]  
 make up volume to 250 cm<sup>3</sup> using deionised water until bottom of meniscus is on the line [1]  
 invert/shake (to mix thoroughly) [1]  
 To a maximum of [6] [6]

(b) Table [3]

The Table should be drawn as a table. It should be labelled with the following: initial (burette) reading, final (burette) reading and the titre. It is not necessary to use exactly these words but there should be appropriate columns and rows [1]. Units, i.e. cm<sup>3</sup>, should be stated [1].

The rough titration value should not be the same as the accurate values [1].

Use of decimal places [2]

All burette readings should be to at least one decimal place – each mistake is penalised by one mark.

(However initial burette readings of 0 are penalised once only.)

If used, the second decimal place position should be 0 or 5 only – other values will be penalised by 1 mark for each.

Average titre [2]

Accurate titrations only should be used. The use of a rough value is [-1]. The average value can be calculated to two decimal places or more, e.g. 25.15 and 25.20 average to 25.175.

If three accurate titres are recorded, then the average titre must be calculated using all three accurate titres.

Any error is [-1]. This might be an incorrect calculation or the omission of units. If the average titre is included in the table then the units indicated on the table apply.

Titration consistency [1]

This is the difference within the accurate titrations. If three accurate values are given then the difference between highest and lowest is used.

Difference	Mark
±0.1	[1]
>0.1	[0]

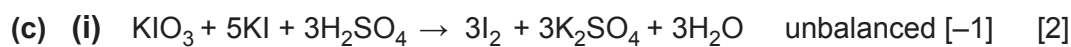
Titration agreement [2]

The correct average titre is used. If the incorrect average has been calculated the correct one is calculated and used.

±0.1	[2]
±0.2	[1]
>0.2	[0]

The difference should be rounded to one decimal place. Please note that the supervisor's titre should be recorded after the candidate's table on their script in **red** ink.

The marks for table, decimal places etc. should be recorded at the candidate's table of results.



(d) (i) moles of  $\text{Na}_2\text{S}_2\text{O}_3 = \frac{\text{average titre} \times 0.1}{1000}$

moles of  $\text{I}_2 = \frac{\text{moles of Na}_2\text{S}_2\text{O}_3}{2}$

moles of  $\text{KIO}_3$  in  $25.0 \text{ cm}^3 = \frac{\text{moles of I}_2}{3}$

moles of  $\text{KIO}_3$  in sample

= moles of  $\text{KIO}_3$  in  $25.0 \text{ cm}^3 \times 10$

mass of  $\text{KIO}_3$  in sample

= moles of  $\text{KIO}_3$  in sample  $\times$  RMM of  $\text{KIO}_3$  (214) [5]

(ii) percentage purity =  $\frac{\text{mass of KIO}_3}{1.2} \times 100$  [1]  
error [-1]

Alternative methods accepted

25

2 (a) You are provided with a sample of an inorganic compound labelled B.

(i) You are required to carry out the following tests on the compound and record your observations in the table.

Test	Observations
1 Describe the appearance of B.	<i>brown/red/pink [1] solid/crystals [1]</i> [2]
2 Dissolve 3 spatula measures of B in 15 cm <sup>3</sup> of deionised water.  Keep this solution for tests 3(a), 4(a), 5(a) and 6.	<i>red/pink [1] solution</i> [1]
3 (a) Place 3 cm <sup>3</sup> of the solution from test 2 in a test tube and add 5 drops of sodium hydroxide solution.  (b) Add a further 5 cm <sup>3</sup> of sodium hydroxide solution to the test tube.	<i>blue [1] ppt [1] solid</i>  <i>does not dissolve [1]</i> [3]
4 (a) In a fume cupboard place 2 cm <sup>3</sup> of the solution from test 2 in a test tube and add 3 drops of concentrated ammonia solution.  (b) Add a further 5 cm <sup>3</sup> of concentrated ammonia solution to the test tube.	<i>(blue) ppt [1]</i>  <i>brown/yellow solution [1] (accept shades)</i> [2]
5 (a) Place 3 cm <sup>3</sup> of the solution from test 2 in a test tube and add 5 cm <sup>3</sup> of concentrated hydrochloric acid.  (b) Place 3 cm <sup>3</sup> of the solution from test 5(a) in another test tube and add 5 cm <sup>3</sup> of edta solution.	<i>blue solution [1] accept purple/violet solution</i>  <i>pink [1] solution</i> [2]
6 Place 3 cm <sup>3</sup> of the solution from test 2 in another test tube and add 3 cm <sup>3</sup> of barium chloride solution.	<i>white [1] ppt [1]</i> [2]

[12]

(ii) (hydrated) cobalt [1] sulfate [1] or  $\text{CoSO}_4$  [2]

(iii) Test 4(b):  $[\text{Co}(\text{NH}_3)_6]^{2+}$   
 Test 5(a):  $[\text{CoCl}_4]^{2-}$   
 Test 5(b):  $[\text{Co}(\text{edta})]^{2-}$  [3]  
 square brackets needed

(iv) more particles in solution/one edta replaces four  $\text{Cl}^-$ /hexadentate replaces monodentate [1]  
 increase in disorder/entropy increases [1] [2]

(b) (i)

Test	Observations
1 Describe the appearance of Z. Cautiously smell Z and give a description of its smell.	<i>colourless [1] solution descriptive, e.g. sharp [1] smell</i> [2]
2 Place 3 cm <sup>3</sup> of Z in a test tube and add 10 drops of acidified potassium dichromate solution. Warm in a water bath.	<i>remains orange [1]</i> [1]
3 Place 3 cm <sup>3</sup> of Z in another test tube and add half a spatula measure of sodium hydrogencarbonate.	<i>fizzing/bubbles/ effervescence [1] solid disappears [1] solution (remains) colourless [1] temperature change (down) [1] to maximum of [3]</i> [3]

[6]

(ii) ketone [1]/ester/amide  
(carboxylic) acid [1]

[2]

Maximum [25]

25

**General:**

**Further observations**

Candidates may record observations not recorded in the mark scheme, but credit should only be given to those observations recorded in the mark scheme.

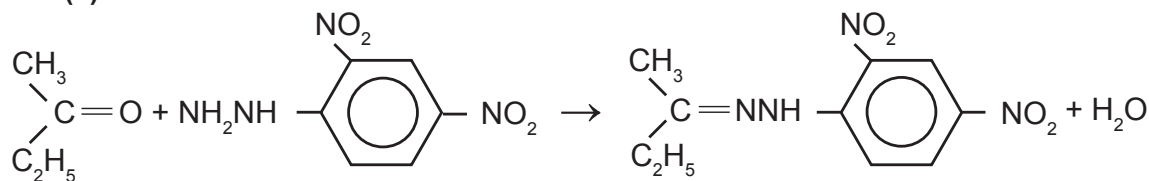
**Section A**

**50**

Section B

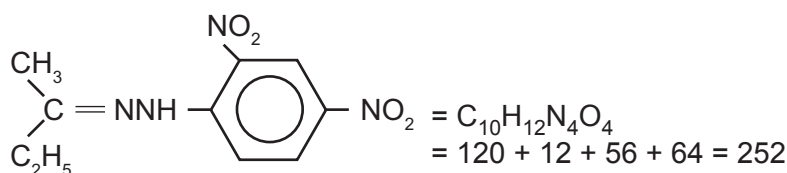
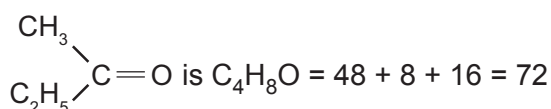
3 Planning Exercise

(a)



Molecular equation acceptable [2]

(b)



252 g 2,4 DNP needs 72 g butanone

$$5.4 \text{ g } \frac{5.4 \times 72}{252} = 1.54 \text{ g}$$

$$d = m/v \quad 0.80 = 1.54/v$$

$$v = 1.54/0.80 = 1.93 \text{ cm}^3 \quad [4]$$

further step for 90% yield – 2.14 cm<sup>3</sup>

(c) Fume cupboard [1]

(d) (i) funnel placed into Buchner flask  
place filter paper into Buchner funnel  
suck the air through/attached to pump maximum [3]

(ii) Faster [1]  
drier [1] [2]

(e) (i) Recognise that hydrazone and methanol are both polar/hydrazone  
can form H-bonds with methanol [1]  
octane is non-polar/cannot form H-bonds with hydrazone [1] [2]

(ii) Minimum volume [1]  
hot methanol [1]  
filter [1]  
allow (to cool) and form crystals [1] [4]

Quality of written communication [2]

**Quality of written communication**

2 marks The candidate expresses ideas clearly and fluently through well-linked sentences and paragraphs. Arguments are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.

1 mark The candidate expresses ideas clearly, if not always fluently. Arguments may sometimes stray from the point. There may be some errors of grammar, punctuation and spelling, but not such as to suggest a weakness in these areas.

0 marks The candidate expresses ideas satisfactorily, but without precision. Arguments may be of doubtful relevance or obscurely presented. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the passage.

**Section B**

20

**20**

**Total**

**70**