

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel International Advanced Level**Time** 1 hour 20 minutes**Paper****reference****WCH13/01****Chemistry****International Advanced Subsidiary/Advanced Level****UNIT 3: Practical Skills in Chemistry I****You must have:**

Scientific calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- A Periodic Table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Show all your working in calculations and include units where appropriate.
- Try to answer every question.
- Check your answers if you have time at the end.

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Answer ALL the questions. Write your answers in the spaces provided.

1 (a) In the test for sulfate ions, an acid is added, followed by aqueous barium chloride.

(i) Give a reason why the mixture needs to be acidified.

(1)

(ii) Identify, by name or formula, a **suitable** acid. Justify your answer.

(2)

(iii) A student is given a sample of white crystals to test for sulfate ions.

Describe how the test should be carried out, including the positive result.

(2)

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(b) A student is given a solid known to be either sodium bromide or barium chloride.

- (i) State the test you would carry out on separate solid samples of sodium bromide and barium chloride to show the **cations** present. Include the positive result for each cation.

(3)

- (ii) State the test you would carry out on separate solutions of sodium bromide and barium chloride to show the **anions** present. Include the positive result for each anion.

(3)

(Total for Question 1 = 11 marks)



- 2 Some antacid medications to treat acid indigestion contain magnesium carbonate, MgCO_3 .

A student investigates how much magnesium carbonate is in an antacid tablet.

Procedure

- crush a 1.30 g tablet to form a powder
- add the powder to 75.0 cm^3 of $0.200 \text{ mol dm}^{-3}$ sulfuric acid
- stir the mixture until the reaction is complete
- make up to 250.0 cm^3 with distilled water
- titrate 25.0 cm^3 samples of the solution against $0.0250 \text{ mol dm}^{-3}$ NaOH to determine the number of moles of sulfuric acid that did not react.

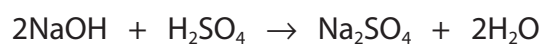
The results are shown.

Burette reading	Rough	1	2	3
Final reading / cm^3	13.45	25.60	37.85	12.35
Initial reading / cm^3	0.00	13.45	25.60	0.15
Titre / cm^3				

- (a) (i) Complete the table. (1)

- (ii) Calculate the mean titre for the titration. (1)

- (b) The equation for the titration reaction is



- (i) Calculate the number of moles of sulfuric acid that reacted with the sodium hydroxide in the mean titre, using your answer from (a)(ii). (2)



- (ii) Calculate the total number of moles of sulfuric acid used at the start of the experiment.

(1)

- (iii) Calculate the percentage of magnesium carbonate in the antacid tablet, using your answers to (b)(i) and (b)(ii). You **must** show all your working.

(4)



[$M_r \text{ MgCO}_3 = 84.3$ Mass of tablet = 1.30 g]

- (c) (i) Give **one** possible reason for carrying out a rough titration.

(1)

- (ii) Phenolphthalein indicator was used in the titration.

State the colour change seen at the end-point.

(2)

From to

(Total for Question 2 = 12 marks)

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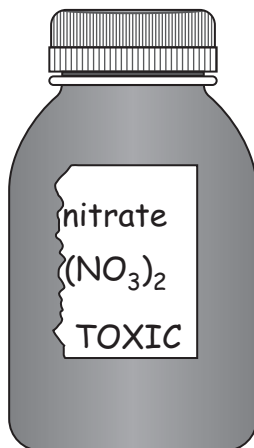
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3 Precipitation reactions can be used to determine the formulae of compounds.

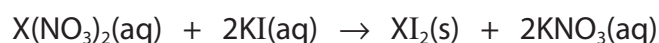
A bottle has a torn label which shows that it contains a nitrate with the formula $X(NO_3)_2$.



Procedure

- a technician dissolved a sample of 12.41 g of the nitrate in deionised water to make 100 cm^3 of solution
- the technician pipetted 5.0 cm^3 of 1.50 mol dm^{-3} potassium iodide into each of a series of test tubes
- each test tube then had a volume of the nitrate solution added to it as shown in the table
- a cloudy yellow solution formed, and the precipitate was allowed to settle
- the height of the precipitate was then measured.

The equation for the reaction is



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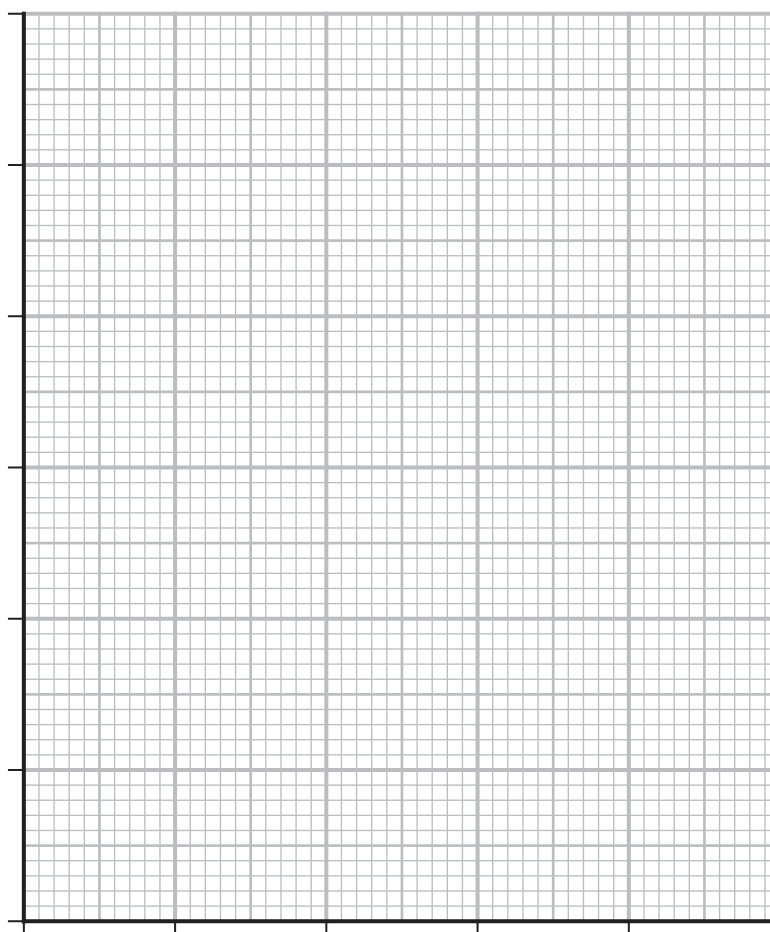


The results of the experiment are shown.

Volume of $X(NO_3)_2$ solution added / cm^3	Height of precipitate / mm
0	0
4	4
8	8
12	10
16	11
20	10

(a) (i) Plot the data on the grid.

(2)



(ii) State why the height of the precipitate becomes approximately constant.

(1)

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(b) (i) Determine the minimum volume of nitrate solution needed to react completely with 5.0 cm^3 of potassium iodide solution.
You must show your working on the graph.

(2)

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(ii) Calculate the number of moles of potassium iodide in each test tube.

(1)

(iii) Calculate the concentration of the metal nitrate solution in g dm^{-3} using the information given in the procedure.

(1)

(iv) Identify X by using your answers to (b)(i), (b)(ii) and (b)(iii) to determine the M_r of the metal nitrate.
You **must** show all your working.

(4)

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- (v) Deduce the **ionic** equation for the formation of XI_2 , using your answer to (b)(iv).

Include state symbols in your answer.

(1)

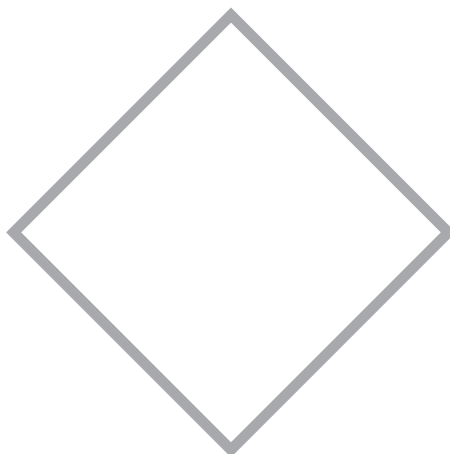
- (c) Suggest why some of the precipitate heights may be above the maximum height expected. Assume there were no measurement errors.

(1)

- (d) The metal nitrate is toxic.

Draw the hazard symbol that should be displayed on the bottle.

(1)



(Total for Question 3 = 14 marks)

- 4 Propan-1-ol, propan-2-ol and 2-methylpropan-2-ol are all alcohols commonly used in school laboratories.

Acidified potassium dichromate(VI) is used to oxidise alcohols.

- (a) State the colour change seen when an alcohol is oxidised with acidified potassium dichromate(VI).

(2)

- (b) Draw a labelled diagram of the apparatus that is required to prepare and collect a sample of propanal by heating propan-1-ol with acidified potassium dichromate(VI).

(4)

- (c) An electric heater may be used to heat a sample of an alcohol with acidified potassium dichromate(VI).

- (i) State why an electric heater should be used rather than a Bunsen burner to heat these reaction mixtures.

(1)

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- (ii) State why there is no reaction when 2-methylpropan-2-ol is heated with acidified potassium dichromate(VI).

(1)

- (iii) Identify, by name or formula, **all** the possible oxidation **products** of propan-1-ol and propan-2-ol.

(1)

- (iv) Give a **further** chemical test and the positive result for each of the oxidation products of **propan-1-ol**.

(4)

(Total for Question 4 = 13 marks)

TOTAL FOR PAPER = 50 MARKS

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