OCR GCSE GATEWAY CHEMISTRY A · J248

CHEMISTRY



EXAM QUESTION PACK

M2 HANDLING DATA

SCORE	PERCENTAGE
/46	%

STEMUP

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Gateway Chemistry A (9-1)

Maths 2: Handling data

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **46**.
- The total number of marks may take into account some 'either/or' question choices.

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1 Pete is investigating four different washing powders.

He tests the washing powders by washing dirty clothes at 40 °C.

Look at the table. It shows his results.

Washing powder	Cost per wash in pence	Overall stain removal (5 = excellent, 1 = poor)	Whiteness (5 = excellent, 1 = poor)	Prevents colour fading (5 = excellent, 1 = poor)
A	16	5	4	3
B	10	5	5	3
C	12	5	5	4
D	10	3	2	4

Pete thinks that washing powder is the best to use to wash his clothes.

Is he correct? Explain your answer using information from the table.

Explain the advantages of washing clothes at low temperatures.



The quality of written communication will be assessed in your answer to this question.

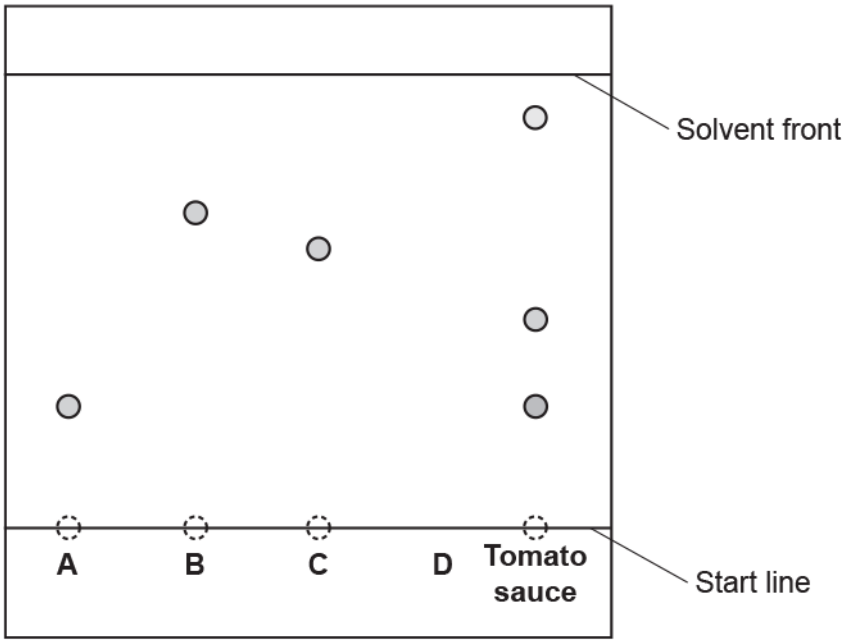
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[6]

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2 A scientist analyses a sample of tomato sauce using chromatography.

The tomato sauce is compared to four known food additives, **A**, **B**, **C** and **D**, as shown in the chromatogram.



Calculate the R_f value for additive **C**.

Use the equation: $R_f = \frac{\text{distance travelled by the substance}}{\text{distance travelled by the solvent}}$

Give your answer to **2** significant figures.

R_f value = ... **[3]**

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3 The accurate relative atomic mass of aluminium is 26.9815385.

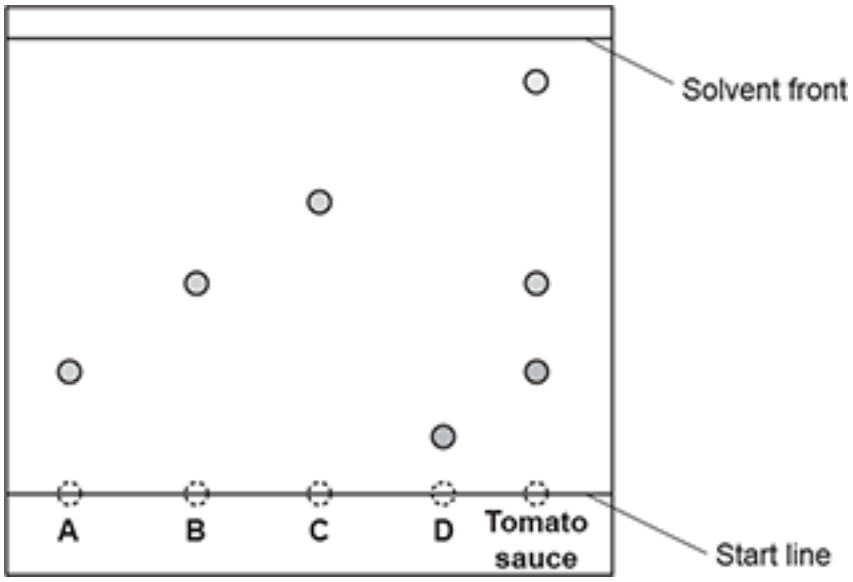
What is this number to **5** significant figures?

A 26.98153
B 26.981
C 26.98154
D 26.982

Your answer [1]

4(a) A student analyses a sample of tomato sauce using thin-layer chromatography.

The tomato sauce was compared to four known food additives, **A**, **B**, **C** and **D**, as shown in the chromatogram.



(i) Calculate the R_f value for **C**.

Give your answer to **2** significant figures.

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R_f value = ... **[3]**

(ii) Which additives are shown to be in the tomato sauce?

Tick (✓) **all the correct** boxes.

A ☐

B ☐

C ☐

D ☐

[1]

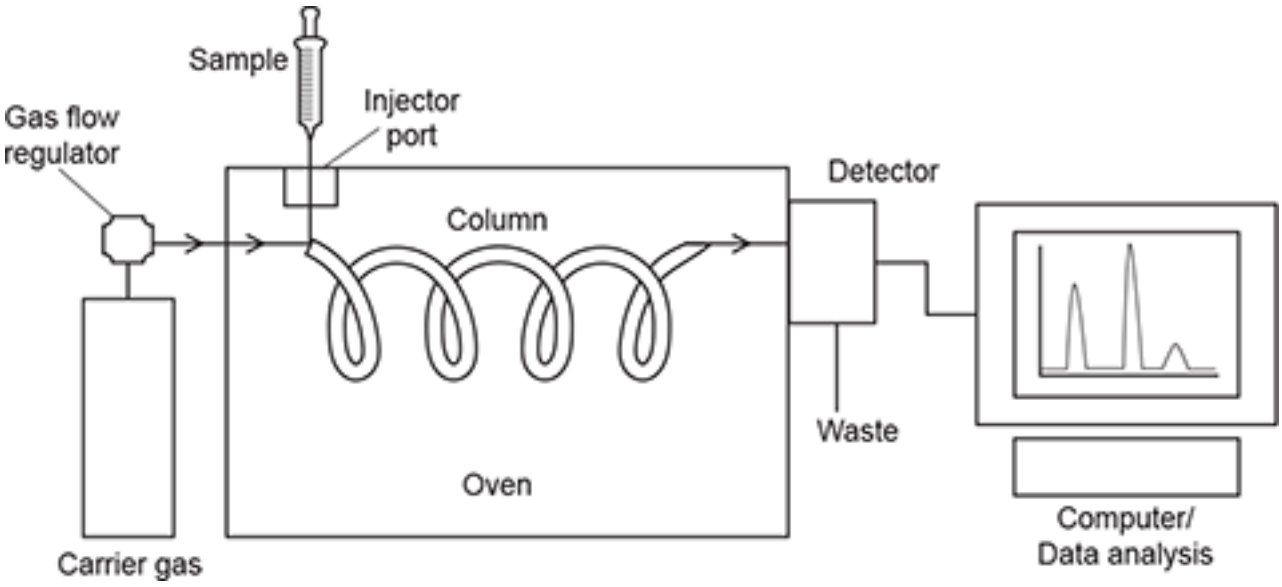
(iii) Suggest why **D** has **not** travelled as far up the plate as **C**.

---

[1]

(b) Gas chromatography is another type of chromatography.

The diagram shows the equipment used for gas chromatography.



(i) State **one similarity** and **one difference** between gas chromatography and thin-layer chromatography.

Similarity ----------

Difference ----------

---

[2]

(ii) Explain why thin-layer chromatography is used instead of gas chromatography to analyse the tomato sauce.

---

[1]

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(i) Sodium oxide reacts with water.

An aqueous solution of sodium hydroxide is made.

Write the **balanced symbol equation** for this reaction, including **state symbols**.

[3]

(ii) Sodium hydroxide neutralises acids. It is an alkali.

Which ion do solutions of alkalis contain?

[1]

(iii) A salt is made when sodium hydroxide neutralises sulfuric acid.

Name this salt.

[1]

(iv) A sample of hydrochloric acid has a pH of 1.04.

A student adds water to the hydrochloric acid until the pH is 3.04.

The concentration of hydrogen ions decreases.

Calculate the factor by which the hydrogen ion concentration has decreased.

Decrease in hydrogen ion concentration = ... **[2]**

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6 Calcium carbonate thermally decomposes to make calcium oxide and carbon dioxide.

$CaCO_3 \rightarrow CaO + CO_2$

Calculate the mass of calcium carbonate needed to make 209g of calcium oxide.

(A_r: Ca = 40.1, C = 12.0, O = 16.0)

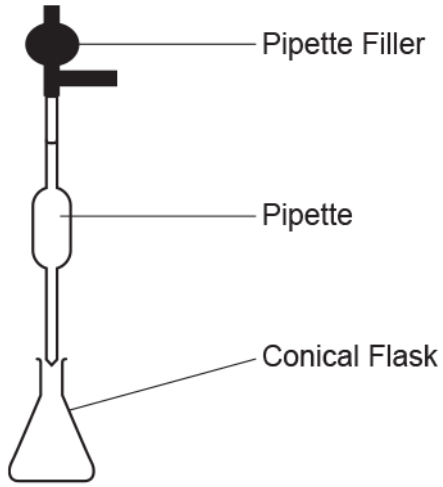
Give your answer to **3** significant figures.

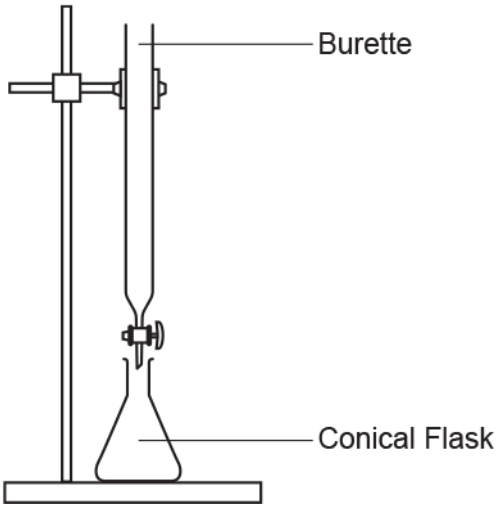
Mass of calcium carbonate = ... g **[4]**

7(a) A student neutralises an alkali with an acid in a titration experiment.

Look at the student's method for her experiment.

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- Measure 25.0 cm^3 of alkali solution into a conical flask using a pipette.
- Add a few drops of universal indicator to the alkali solution.
- Fill the burette to above the 0.0 cm^3 line with acid.
- Quickly add the acid to alkali until the indicator changes colour.
- Repeat the experiment until consistent results are obtained.

Describe and explain **one** improvement the student should make to her method to get a more accurate titration result.

[2]

(b) The student repeats the experiment three times.

Look at the student's results.

Titration number	1	2	3
Volume of acid (cm^3)	25.75	23.60	23.70

Calculate the **accurate** volume of the acid that reacts with the alkali.

Accurate volume of acid = ... cm^3 **[2]**

8(a) Fractional distillation separates crude oil into useful fractions.

Look at the table.

It shows the percentage of each fraction made from crude oil. It also shows the percentage of each fraction needed for everyday uses.

Fraction	Percentage made by fractional distillation	Percentage needed for everyday uses
Gases	4	11
Petrol	11	22
Naphtha	10	18
Paraffin	12	20
Fuel oil	22	10
Waxes and tar	23	4

(i) Which fraction is **made** in the **greatest** percentage?

Tick (✓) **one** box.

Gases ☐

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Petrol ☐

Naphtha ☐

Paraffin ☐

Fuel oil ☐

Waxes and tar ☐

[1]

(ii) Which fraction is **needed** in the **smallest** percentage?

Tick (✓) **one** box.

Gases ☐

Petrol ☐

Naphtha ☐

Paraffin ☐

Fuel oil ☐

Waxes and tar ☐

[1]

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(b) In 2008 the USA produced 4 900 000 barrels of crude oil per day. In 2019 this had increased to 11 000 000 barrels of crude oil per day.

Calculate the percentage increase in the number of barrels of crude oil produced per day from 2008 to 2019.

Use the formula: percentage increase $= \frac{\text{increase}}{\text{original}} \times 100$

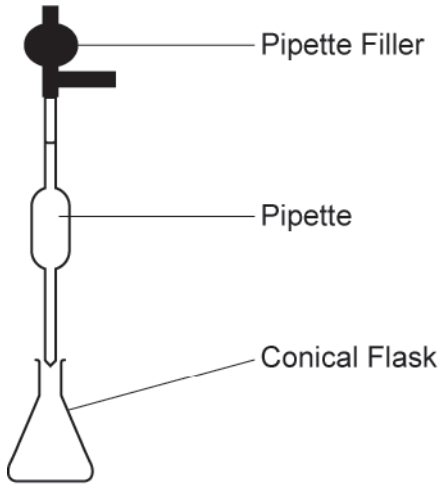
Give your answer to **2** decimal places.

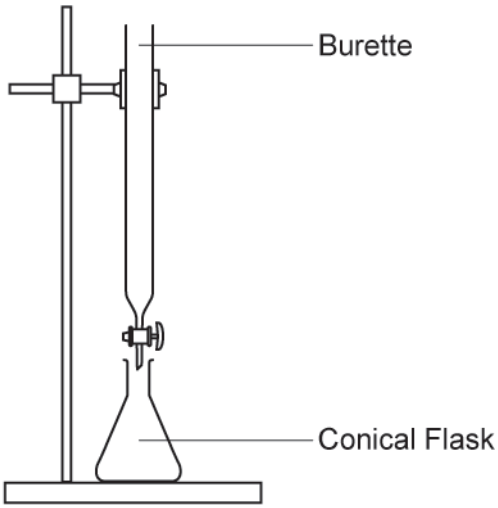
Percentage increase = ... % **[3]**

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9(a) A student neutralises potassium hydroxide with dilute sulfuric acid in a titration experiment.

Look at the student's method for her experiment.





- Measure 25.0 cm^3 of 0.200mol / dm^3 potassium hydroxide into a conical flask using a pipette.
- Add a few drops of universal indicator to the potassium hydroxide.
- Fill the burette to above the 0.00 cm^3 line with dilute sulfuric acid.
- Quickly add the dilute sulfuric acid to the potassium hydroxide until the indicator changes colour.
- Repeat the experiment.

Describe and explain **one** improvement the student should make to her method to get a more accurate titration result.

---

[2]

(b) The student repeats the experiment four times.

Look at the student's results.

Titration number	1	2	3	4
Volume of acid (cm^3)	25.75	23.60	23.70	23.65

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(i) Calculate the **accurate** volume of the acid that reacts with the alkali.

Accurate volume of acid = ... cm^3 **[2]**

(ii) Look at the equation for the reaction between sulfuric acid and potassium hydroxide.

$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

Use your answer from part **(i)** to calculate the concentration of the dilute sulfuric acid, H_2SO_4, that reacted with the 25.0 cm^3 of 0.200mol / dm^3 potassium hydroxide.

Give your answer to **3** significant figures.

Concentration of dilute sulfuric acid = ... mol / dm^3 **[4]**

END OF QUESTION PAPER

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