Chem!stry

Name: …………………… ( )

Class: ………………

Date: …… / …… / ……

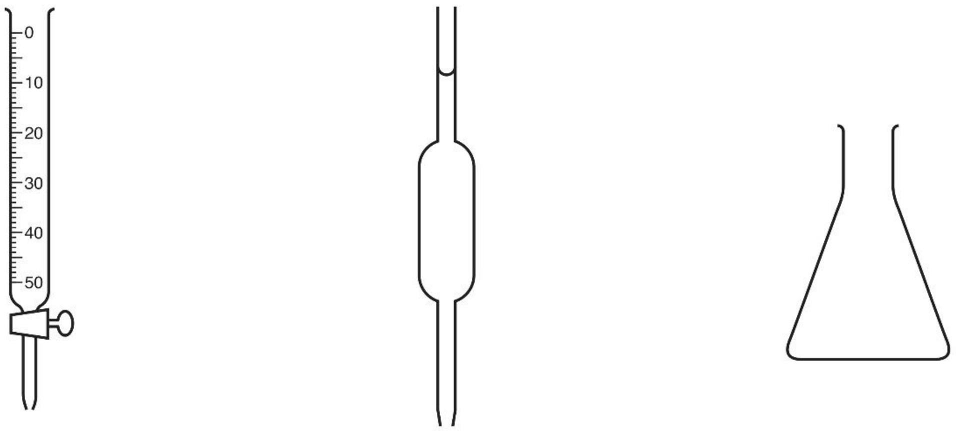
Theory Questions for Practical Exam – Part Two

1. A student determines the concentration of aqueous potassium manganate(VII), $KMnO_4$, by titration with a solution of ethanedioic acid, $H_2C_2O_4$.

An equation to represent this reaction is shown.

$$2KMnO_4 + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O + 2K^+$$

(a) Diagrams of some of the pieces of apparatus the student uses are shown.



A B C

Name the three pieces of apparatus.

A ……………………………………………………………………………………………

B ……………………………………………………………………………………………

C ……………………………………………………………………………………………

(b) The student:

- Records the mass of a sample of solid ethanedioic acid.
- Dissolves the solid in distilled water and makes the solution up to 250 cm^3.
- Uses apparatus **B** to transfer 25.0cm^3 of the solution of $H_2C_2O_4$ into apparatus **C**.
- Adds 10.0 cm^3 of dilute sulfuric acid to apparatus **C**.
- Fills apparatus **A** with the solution of $KMnO_4$.
- Titrates the colourless solution of $H_2C_2O_4$ with the solution of $KMnO_4$ until the end-point is reached.
- Repeats the titration three more times.

(i) Suggest why sulfuric acid is added to apparatus **C**.

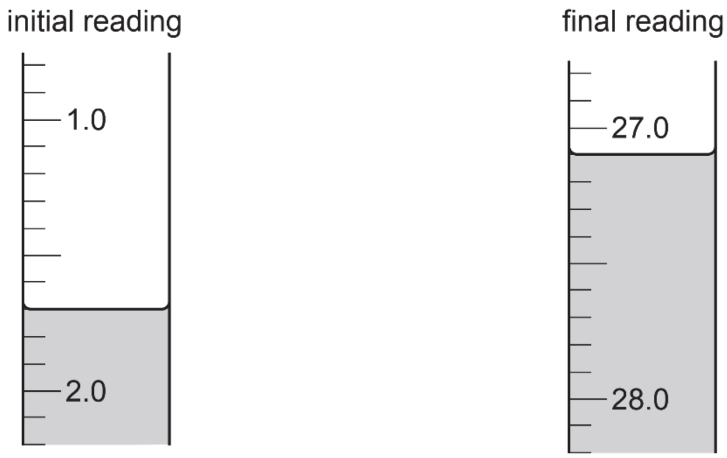
……………………………………………………………………………………………………

(ii) State the colour change at the end-point.

From ………………………………………… To …………………………………………

(iii) The diagrams show parts of apparatus **A** with the liquid levels at the beginning and the end of titration **1**.

titration **1**



Record the values in the results table.

Complete the results table.

titration	1	2	3	4
final reading / cm^3		24.80	25.90	24.90
initial reading / cm^3		0.00	0.80	
volume used / cm^3		24.80		24.60
best titration results (✓)				

(iv) Tick (✓) the best titration results in the table.

Use the ticked values to calculate the average volume of $KMnO_4$(aq) added in cm^3.

Average volume of $KMnO_4$(aq) added ………………………… cm^3

(c) Another student repeats the experiment using the same method.

This student uses 1.08g of ethanedioic acid to make up the 250 cm^3 solution of $H_2C_2O_4$.

The student obtains an average titration volume of 24.55 cm^3.

(i) Calculate the number of moles of ethanedioic acid in 25.0 cm^3 of the $H_2C_2O_4(aq)$.

Show your working.

[M_r: $H_2C_2O_4$ = 90]

………………………… mol

(ii) During the reaction, two moles of $KMnO_4$ react with five moles of $H_2C_2O_4$.

Calculate the number of moles of $KMnO_4$ in 24.55 cm^3 of the aqueous potassium manganate(VII).

………………………… mol

(iii) Calculate the concentration, in mol dm^{-3}, of the $KMnO_4(aq)$.

………………………… mol dm^{-3}

(iv) Calculate the concentration, in g dm^{-3}, of the $KMnO_4(aq)$.

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

[M_r: $KMnO_4$ = 158]

………………………… g dm^{-3}

2. A student was given a sample of an organic acid, **T**, and asked to

- Determine its relative molecular mass.
- Suggest its molecular formula.

A sample of the acid was placed in a previously weighed container and reweighed.

Mass of the container and the acid	= 8.25 g
Mass of container	= 6.74 g

(a) Calculate the mass of the acid used in the experiment.

………………………… g

The student transferred the sample to a beaker and added 50.0 cm^3 of 1.00 mol dm^{-3} sodium hydroxide. The contents of the beaker were allowed to react and then transferred to a volumetric flask. The solution was made up to 250 cm^3 with distilled water. This was labelled solution **S**.

25.0 cm^3 of **S** was transferred into a conical flask.

(b) What piece of apparatus was used to measure this volume of **S**?

……………………………………………………………………………………………...

A few drops of phenolphthalein indicator were added to the conical flask.

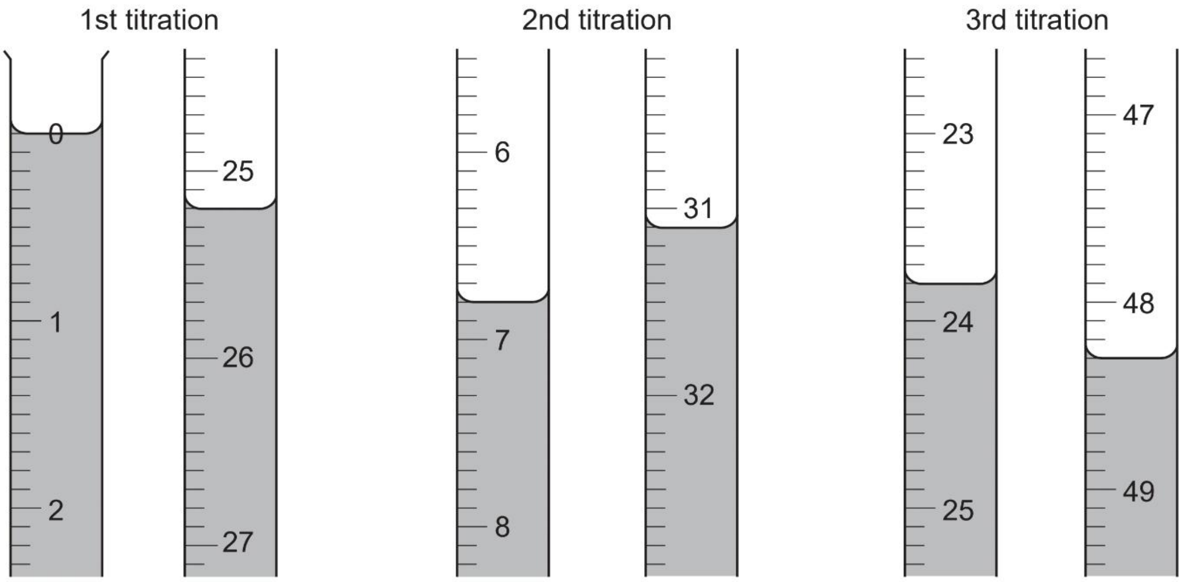
0.100 mol dm^{-3} hydrochloric acid was placed in a burette and added to the solution in the conical flask until an end-point was reached.

Phenolphthalein is colourless in acidic solution and pink in alkaline solution.

(c) What was the colour of the solution in the conical flask

- Before the acid was added? ………………………………………………………………
- At the end-point? ………………………………………………………………

Three titrations were done. The diagrams below show parts of the burette with the solution levels at the beginning and the end of each titration.



(d) Use the diagrams to complete the following table.

titration	1	2	3
final burette reading / cm^3			
initial burette reading / cm^3			
volume of solution used / cm^3			
best titration results (✓)			

Summary

Tick (✓) the best titration results.

Using these results, calculate the average volume of hydrochloric acid used.

………………………… cm^3

(e) Calculate the number of moles of hydrochloric acid in the average volume of 0.100 mol dm^{-3} hydrochloric acid calculated in **(d)**.

………………………… moles

(f) Hydrochloric acid reacts with sodium hydroxide according to the following equation.

$$HCl + NaOH \rightarrow NaCl + H_2O$$

Deduce the number of moles of sodium hydroxide present in 25.0 cm^3 of solution **S**.

………………………… moles

(g) Using your answer in **(f)**, calculate the number of moles of sodium hydroxide in 250 cm^3 of solution **S**.

………………………… moles

(h) Calculate the number of moles of sodium hydroxide in 50.0 cm^3 of 1.00 mol dm^{-3} sodium hydroxide.

………………………… moles

(i) By subtracting your answer in **(g)** from your answer in **(h)**, calculate the number of moles of sodium hydroxide that reacted with the original sample of the organic acid, **T**.

………………………… moles

(j) Given that **one** mole of **T** reacted with **two** moles of sodium hydroxide, calculate the number of moles of **T** in the sample.

………………………… moles

(k) Using your answers to **(a)** and **(j)** calculate the relative molecular mass of the acid **T**.

Relative molecular mass = …………………………

The acid **T** contains two carboxylic acid groups and has the formula

$$HOOCC_{\mathbf{x}}H_{\mathbf{y}}COOH$$

Where **x** and **y** are whole numbers.

(l) Deduce the values of **x** and **y** in the formula.
[A_r: C = 12, O = 16, H = 1]

x …………………………
y …………………………

(m) A sample of the acid **T** was reacted with an excess of ethanol in the presence of a small volume of sulphuric acid.

(i) Give the formula of the organic product.

………………………………………………………………………………………………

(ii) To which group of compounds does the product belong?

………………………………………………………………………………………………

3. A student was given a sample of a carbonate, $\mathbf{M}_2CO_3$, where **M** is a metal. She was asked to determine the relative atomic mass of **M** and to suggest its identity.

A sample of the carbonate was added to a previously weighed container which was then reweighed.

Mass of container + $\mathbf{M}_2CO_3$ = 5.12 g

Mass of container = 3.42 g

(a) Calculate the mass of $\mathbf{M}_2CO_3$

.... g

The sample was placed in a volumetric flask and 50.0 cm^3 of 1.00 mol dm^{-3} hydrochloric acid (an excess) was added. A gas was produced.

(b) Name the gas and give a test to confirm its presence.

Gas ....

Test ....

When the reaction had finished, the solution was made up to 250 cm^3 with distilled water. This was solution **G**.

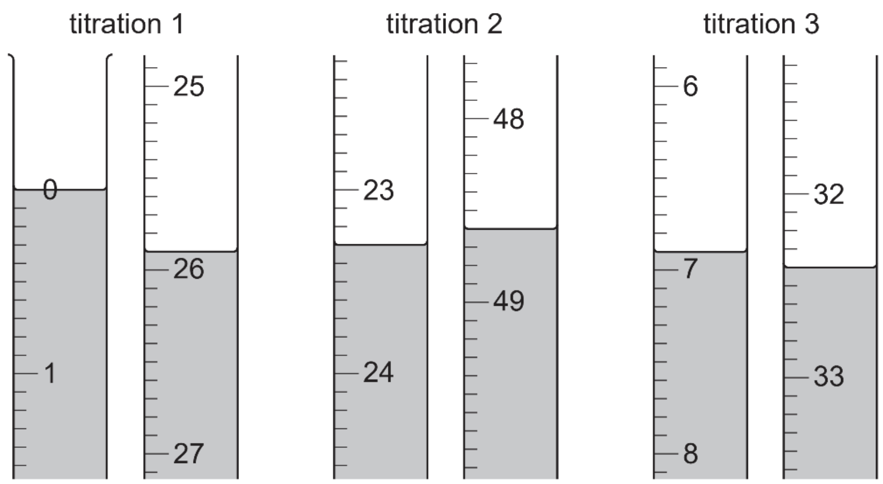
Using a pipette, 25.0 cm^3 of **G** was transferred to a conical flask and a few drops of methyl orange indicator were added.

A burette was filled with 0.100 mol dm^3 aqueous sodium hydroxide. Aqueous sodium hydroxide was run into the titration flask until the end-point was reached.

(c) What was the colour change of the methyl orange during the titration?

The colour changed from .... to ....

Three titrations were done. The diagrams below show parts of the burette with the liquid levels at the beginning and end of each titration.



(d) Use the diagrams to complete the following table.

titration	1	2	3
final burette reading / cm^3			
initial burette reading / cm^3			
volume of 0.100 mol dm^{-3} NaOH(aq) used / cm^3			
best titration results (✓)			

Summary:

Tick (✓) the best titration results.

Using these results, calculate the average volume of 0.100 mol dm^{-3} sodium hydroxide used.

Average volume of sodium hydroxide was ………………………… cm^3

(e) Calculate the number of moles of sodium hydroxide in the average volume of 0.100 mol dm^{-3} sodium hydroxide in **(d)**.

………………………… moles

(f) Using the equation, calculate the number of moles of hydrochloric acid in 25.0 cm^3 of **G**.

$$NaOH + HCl \rightarrow NaCl + H_2O$$

.... moles

(g) Calculate the number of moles of hydrochloric acid in 250 cm^3 of **G**.

.... moles

(h) Calculate the number of moles of hydrochloric acid contained in the original 50.0 cm^3 of 1.00 mol dm^{-3} hydrochloric acid.

.... moles

(i) By subtracting your answer in **(g)** from your answer in **(h)**, calculate the number of moles of hydrochloric acid that reacted with the sample of $\mathbf{M}_2CO_3$.

.... moles

(j) Using the equation, calculate the number of moles of $\mathbf{M}_2CO_3$ that reacted with the number of moles of hydrochloric acid in your answer **(i)**.

$$\mathbf{M}_2CO_3 + 2HCl \rightarrow \mathbf{M}Cl_2 + CO_2 + H_2O$$

.... moles

(k) Using your answers in **(a)** and **(j)** calculate the relative formula mass of $\mathbf{M}_2CO_3$ and hence the relative atomic mass of **M**.

[A_r: C = 12, O = 16]

Relative formula mass of $\mathbf{M}_2CO_3$ …………………………

Relative atomic mass of **M** is …………………………

(l) Given that the relative atomic mass of sodium is 23 suggest the identity of **M**, giving a reason for your choice.

M is ………………………………………………………………………………………

Reason ………………………………………………………………………………………

4. Copper(II) sulfate crystals contain water of crystallisation which may be removed by heating.

(a) You are to plan an experiment to find the percentage, by mass, of water in copper(II) sulfate crystals.

You should:

- Describe or draw a diagram of the apparatus that may be used to remove the water.
- Suggest all the weighings that should be done.
- Show how they may be used to calculate the percentage, by mass, of water.

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(b) The formula for copper(II) sulfate crystals is $CuSO_4 \cdot \mathbf{y}H_2O$ where **y** is the number of moles of water of crystallisation in one mole of crystals.

A student does an experiment and finds that **y** = 4.

The correct value of **y** for her sample is 5.

Suggest an error in her experiment that would result in this difference. Explain how this error would lead to the lower value of **y** and suggest how the experiment could be improved to result in a correct value for **y**.

You can assume that all her weighings were read and recorded correctly and that her calculation was correct.

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5. Metal **A** and metal **B** both react with dilute sulfuric acid to produce hydrogen.

Plan an investigation to show which metal, **A** or **B**, is the more reactive metal. You may include a diagram as part of your answer.

You are provided with:

- Standard laboratory equipment.
- Powdered metals, **A** and **B**.
- Dilute sulfuric acid.

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6. Lead is a soft, bluish-grey metal that is found in between iron and copper in the reactivity series of metals. The most common use of lead in the early 21st century is the manufacture of lead-acid batteries which are often used in motor-vehicles.

In nature, lead is found in the ore cerussite, which is lead(II) carbonate, $PbCO_3$.

Plan an investigation to obtain a sample of pure lead from a 100 g sample of cerussite.

You are provided with common laboratory apparatus and chemicals.

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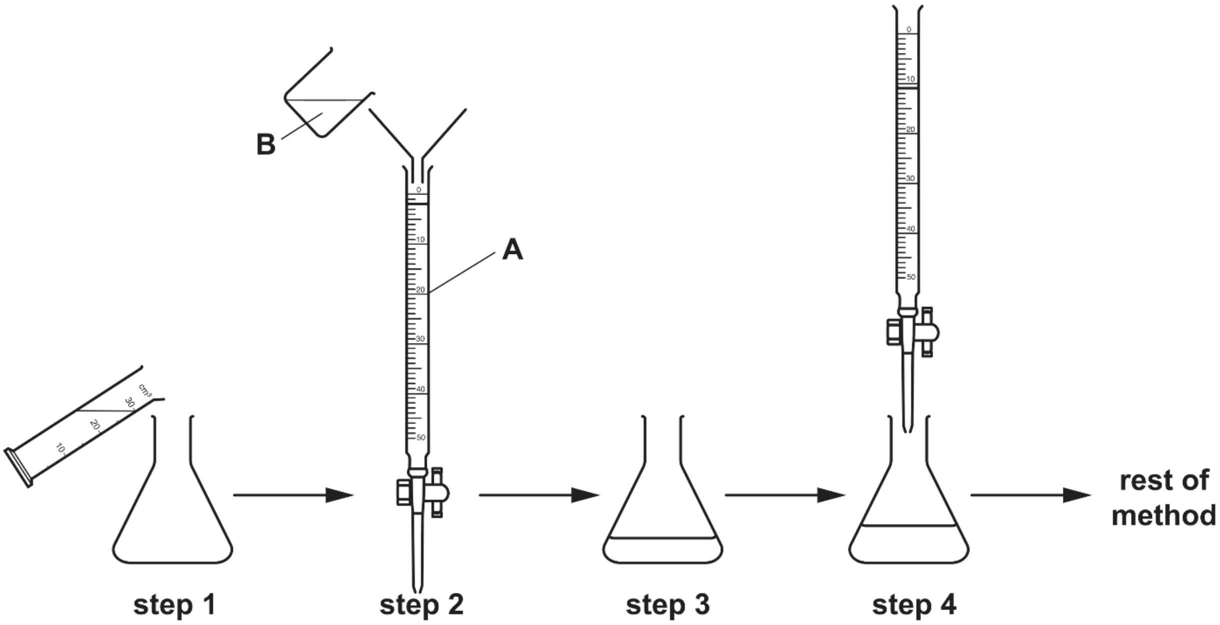
7. A titration method can be used to make soluble salts.

A student does an experiment to prepare a pure sample of sodium chloride. Part of the method is shown in the diagram.



(a) In **step 1** the student uses a measuring cylinder to add 25 cm^3 of aqueous sodium hydroxide to the conical flask.

State how the accuracy of the experiment could be improved in **step 1**.

……………………………………………………………………………………………………...

(b) Describe what the student does in **step 2** of the method.

Include the names of apparatus **A** and solution **B**.

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(c) Identify what is added to the flask in **step 3** before starting the titration.

……………………………………………………………………………………………………...

(d) In **step 4** the student adds solution **B** to the aqueous sodium hydroxide in the conical flask until the end-point is reached.

The student records the volume of solution **B** added.

State how the student knows when the end-point is reached.

……..

(e) The rest of the method involves adding the recorded volume of solution **B** to another 25 cm^3 of aqueous sodium hydroxide.

The substance added in **step 3** of the first titration is not added.

(i) State why this substance is not added.

……

……

(ii) Describe how the student obtains pure crystals of sodium chloride from the solution in the conical flask.

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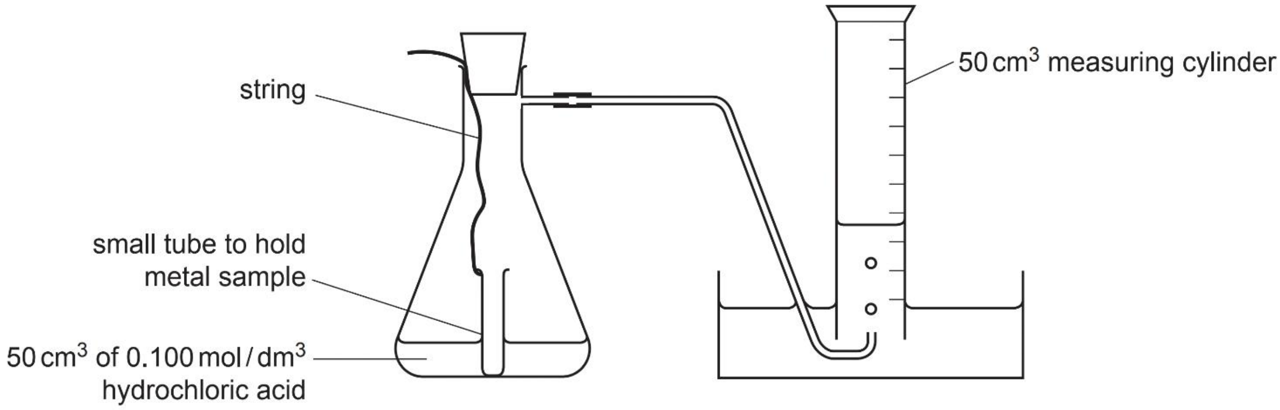
8. The apparatus shown is used to compare the rates of reaction of different metals with hydrochloric acid.



The metals used and the mass of each are shown.

metal used	calcium	iron	magnesium	zinc
mass / g	0.080	0.112	0.048	0.130

(a) The student:

- Places a sample of one of the metals in the small tube.
- Transfers 50 cm^3 of 0.100 mol dm^{-3} hydrochloric acid into the conical flask.
- Places the small tube into the apparatus as shown in the diagram.
- Tips the flask so that the small tube falls over and the metal and acid come into contact.
- Immediately starts a timer.
- Records the volume of gas formed at regular time intervals until the reaction finishes.
- Repeats the method with each metal.

(i) Name an alternative piece of apparatus that could be used, instead of the measuring cylinder, to collect the gas and measure its volume.

....

(ii) The gas collected in the measuring cylinder is hydrogen.

Give a test and its result to show that this gas is hydrogen.

Test ....

Result ....

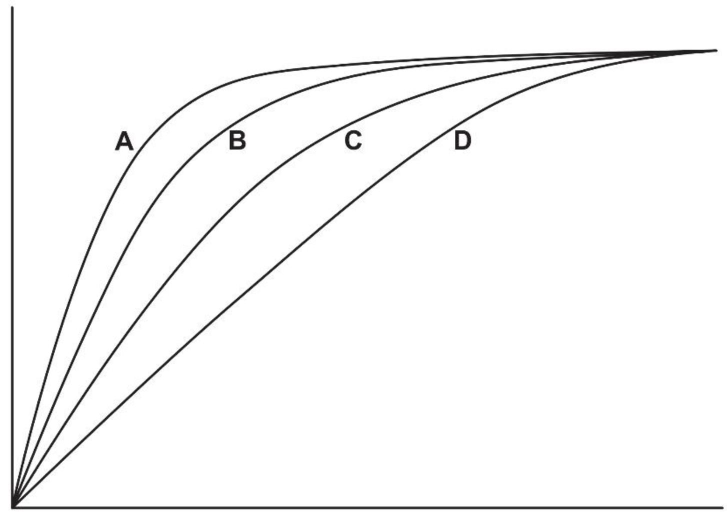
(b) Another student thinks it would be easier to remove the bung from the flask, add the metal directly to the acid and then replace the bung.

State **two** disadvantages of this method compared with the one described.

1 ……………………………………………………………………………………………………

2 ……………………………………………………………………………………………………

(c) A graph representing the results is shown.



(i) Give the correct labels for each axis of the graph.

x-axis ………………………………………………………………………………………..

y-axis ………………………………………………………………………………………..

(ii) State why curve **A** starts steep, gradually levels off and then becomes horizontal.

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

(iii) Identify which of the metals gives each of the curves **A**, **B**, **C** and **D**.

A ………………………………

B ………………………………

C ………………………………

D ………………………………

(iv) Different masses of each metal are used for the four experiments.

State **three** variables that must be kept constant for the experiments.

....

....

....

....

....

....

(v) Suggest why different masses of each metal are used for the four experiments.

....

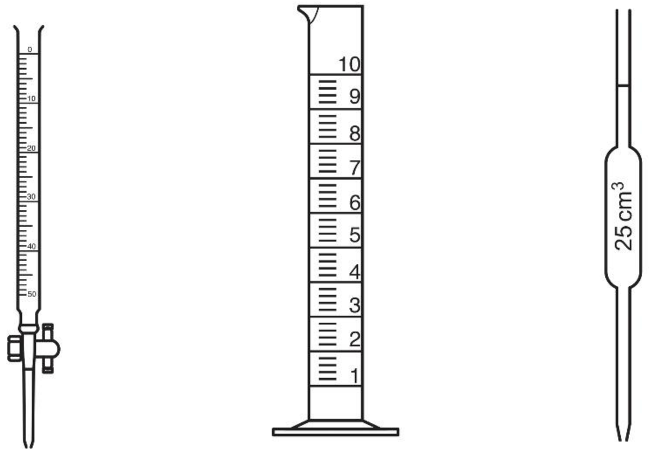
....

9. Iron tablets are used to treat iron deficiency in the body.

Iron tablets contain iron(II) ions, Fe^{2+}.

A student does a series of titrations with aqueous potassium manganate(VII), $KMnO_4$, to determine the percentage of iron in some iron tablets.

Diagrams of some of the apparatus the student uses are shown.



A **B** **C**

(a) Name the three pieces of apparatus.

A ....

B ....

C ....

(b) The student:

- Records the total mass of **five** iron tablets.
- Crushes the tablets, dissolves them in distilled water and makes the solution up to 250 cm^3.
- Uses apparatus **C** to transfer 25.0 cm^3 of the solution of Fe^{2+} ions into a conical flask.
- Uses apparatus **B** to add 10.0 cm^3 of dilute sulfuric acid to the conical flask.
- Fills apparatus **A** with 0.00500 mol dm^{-3} $KMnO_4$(aq).
- Titrates the solution of Fe^{2+} with the 0.00500 mol dm^{-3} $KMnO_4$(aq) until the first permanent pink colour is seen in the conical flask.
- Repeats the titration three times.

The equation for the reaction is shown.

$$MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

(i) Suggest why dilute sulfuric acid is added to the conical flask.

....

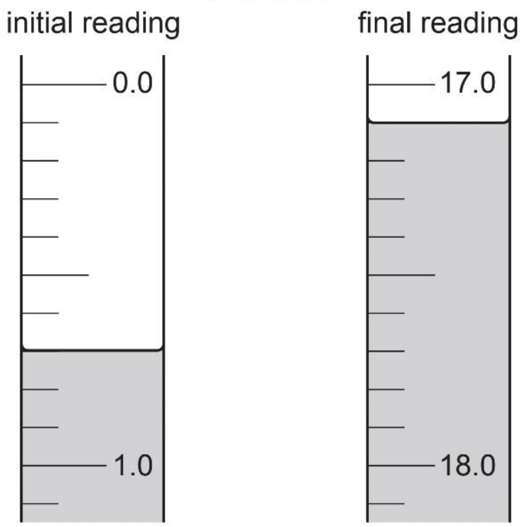
....

(ii) Give the formula of the ion responsible for the pink colour seen at the end-point.

....

(iii) The diagrams show parts of apparatus **A** with the solution levels at the beginning and the end of titration **3**.

titration **3**



Record the values in the results table.

Complete the results table for each of titrations **1**, **3** and **4**.

titration	1	2	3	4
final reading / cm^3	17.20	34.10		16.90
initial reading / cm^3	0.00	17.20		
volume used / cm^3		16.90		16.70
best titration results (✓)				

(iv) Tick (✓) the best titration results in the table.

Use the ticked values to calculate the average volume of 0.00500 mol dm^{-3} $KMnO_4$(aq) used.

Average volume .... cm^3

(c) A second student does another series of titrations using the same method and 0.00500 mol dm^{-3} $KMnO_4$(aq).

This student obtains an average volume of 16.90 cm^3. The equation for the reaction is shown.

$$MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

(i) Calculate the number of moles of MnO_4^- used by the second student.

.... mol

(ii) Calculate the number of moles of Fe^{2+} ions present in the 25.0 cm^3 sample of solution.

.... mol

(iii) Calculate the total mass of Fe^{2+} ions in the five tablets.

[A_r: Fe = 56]

.... g

(iv) The total mass of the five tablets is 1.83 g.

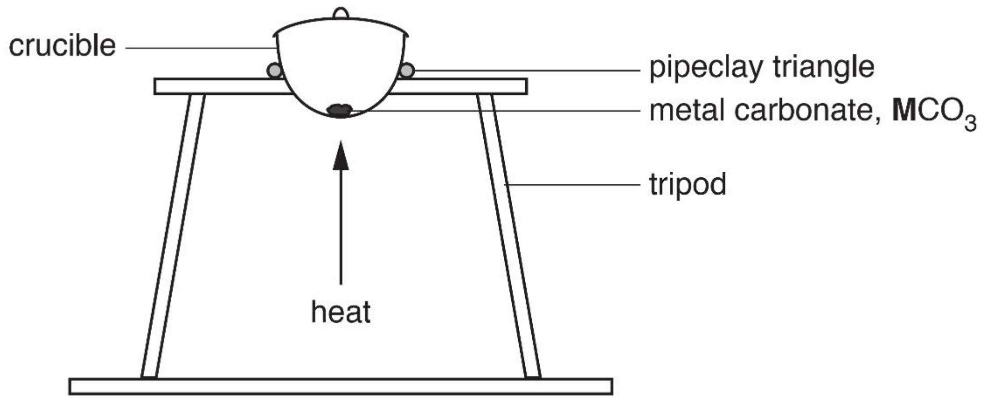
Calculate the percentage, by mass, of iron in the tablets.

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

.... %

10. A scientist needs to identify the metal ion in a metal carbonate, $\mathbf{M}CO_3$.

$\mathbf{M}CO_3$ is heated in a crucible for three minutes. The $\mathbf{M}CO_3$ decomposes to form the solid metal oxide, **M**O, and carbon dioxide gas.



(a) Give **two** reasons why it is important that a lid is placed loosely on the crucible.

1 ....

2 ....

(b) Complete the table of results.

mass of crucible and lid / g	mass of crucible, lid and $\mathbf{M}CO_3$ before heating / g	mass of crucible, lid and contents after heating / g	mass of $\mathbf{M}CO_3$ before heating / g	mass of carbon dioxide gas formed / g
10.1	12.6	11.7		

(c) The crucible is heated for another three minutes. The mass of the crucible, lid and contents is 11.5 g.

Explain why this is different from the value in the table.

....

....

....

....

(d) The total mass of carbon dioxide, CO_2, formed is 1.1 g.

Calculate the number of moles of CO_2 formed.

[M_r: CO_2 = 44]

………………………… moles

(e) The equation for the decomposition of the metal carbonate is shown.

$$\mathbf{M}CO_3 \rightarrow \mathbf{M}O + CO_2$$

Using the equation and your answers to **(b)** and **(d)**, calculate the relative formula mass of **M**CO_3.

Relative formula mass …………………………

(f) Calculate the relative atomic mass, A_r, of metal **M**.

[A_r: C = 12, O = 16]

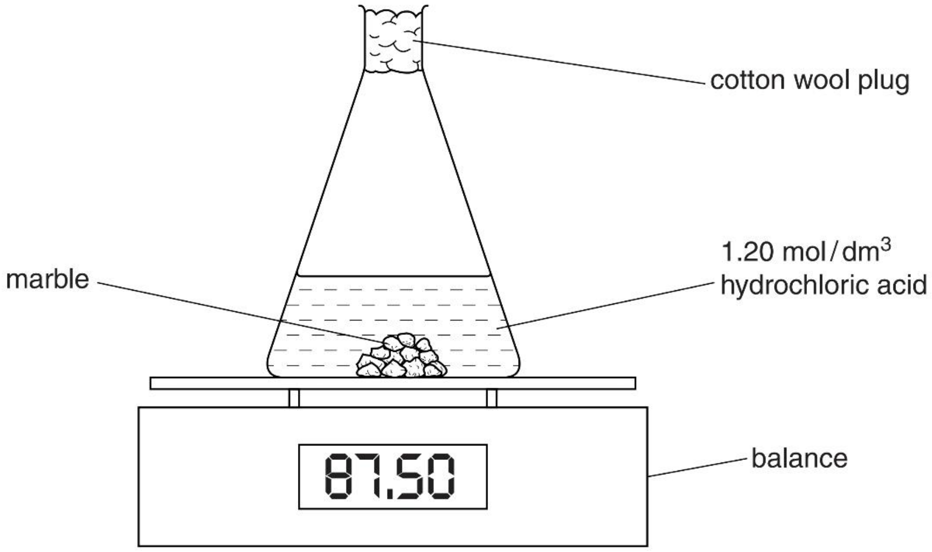
A_r of metal **M** …………………………

11. A student uses the apparatus shown to investigate the reaction between marble ($CaCO_3$) and hydrochloric acid.

10.0 g of marble lumps (an excess) are added to 30.0 cm^3 of 1.20 mol dm^{-3} hydrochloric acid contained in a flask.

The mass of the flask and contents is recorded every 30 seconds. This is experiment **1**.

The experiment is repeated using the same mass of marble but finely powdered instead of lumps. The volume and concentration of the hydrochloric acid used is unchanged. This is experiment **2**.



(a) The results of the two experiments are recorded in the table.

Complete the table by calculating the total change in mass at each time for both experiments.

time / s	Experiment **1** (lumps)		experiment **2** (powder)	
	mass of flask and contents / g	total change in mass / g	mass of flask and contents / g	total change in mass / g
0	87.50	0.00	87.50	0.00
30	87.22	0.28	87.02	0.48
60	87.02	0.48	86.83	0.67
90	86.87		86.74	
120	86.77		86.69	
150	86.69		86.69	
180	86.69		86.69	

(b) Construct the balanced chemical equation for the reaction between calcium carbonate and hydrochloric acid.

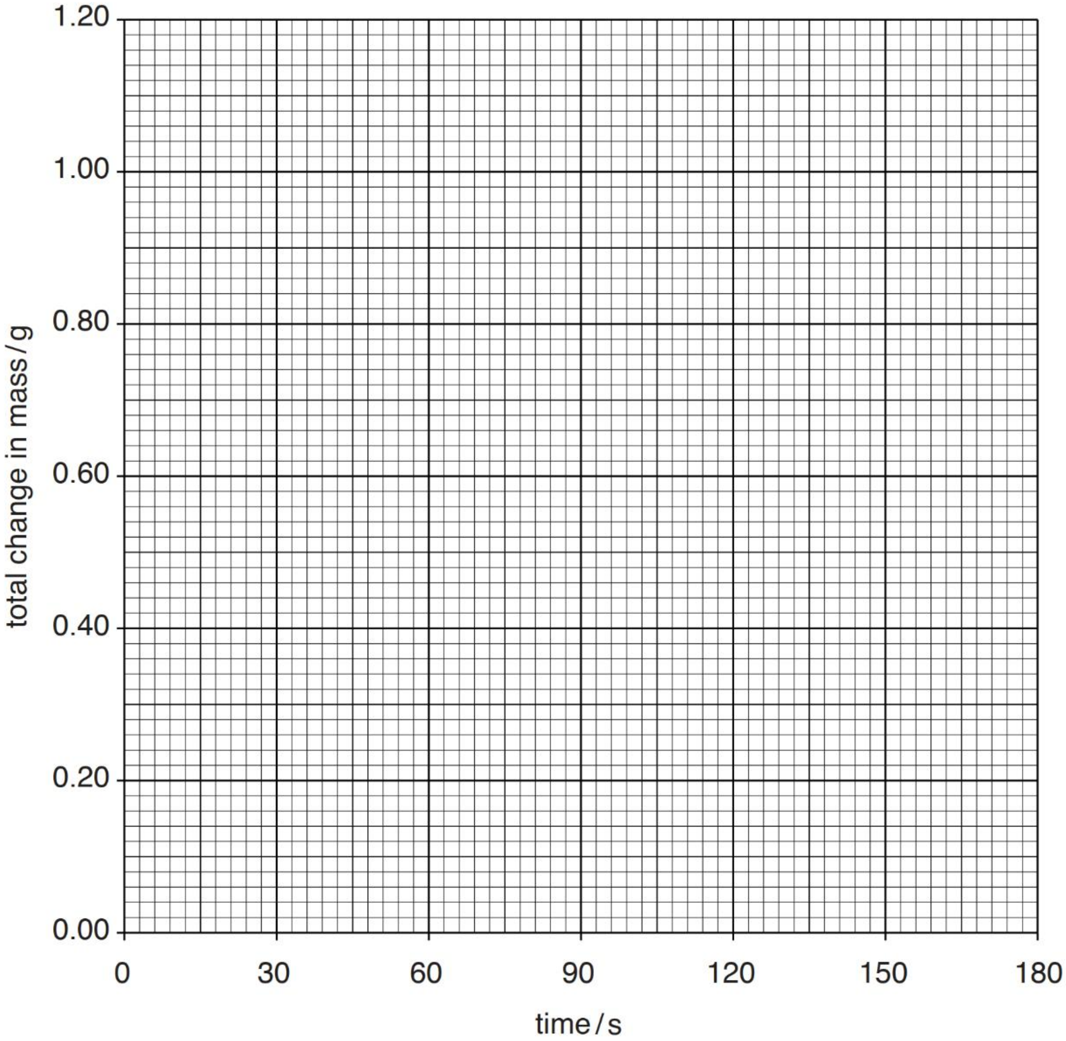
……………………………………………………………………………………………………...

(c) Suggest why the mass of the flask and contents decreases as the reaction progresses.

……………………………………………………………………………………………………...

(d) Plot the points for each experiment on the grid.

Draw a smooth curve through each set of points. Label the curves ‘experiment **1**’ and ‘experiment **2**’.



(e) Using your graph,

(i) What is the total change in mass in experiment **1** after 75 seconds,

………………………… g

(ii) What is the mass of the flask and contents in experiment **2** after 45 seconds?

………………………… g

(f) State and explain how the use of powdered marble rather than marble lumps in experiment **2** affects the rate of the reaction.

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(g) Using your equation in **(b)**, calculate the mass of marble that remains after reaction with 30 cm^3 of 1.20 mol dm^{-3} hydrochloric acid.

[A_r: Ca = 40, C = 12, O = 16]

………………………… g

12. A student is asked to determine the percentage purity of a sample of impure magnesium carbonate.

(a) The sample is added to a previously weighed container, which is then reweighed.

Mass of container + impure magnesium carbonate	= 8.20g
Mass of container	= 6.98g

Calculate the mass of impure magnesium carbonate used in the experiment.

………………………… g

(b) The sample is placed in a beaker and 50.0 cm^3 of 1.00 mol dm^{-3} hydrochloric acid, an excess, is added.

The mixture is allowed to react. Carbon dioxide is produced. What is observed in the flask as the reaction takes place?

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(c) When the reaction has finished the solution is made up to 250 cm^3 with distilled water. This is solution **V**.

(i) In which apparatus should solution **V** be prepared?

…………………………………………………………………………………………………

(ii) Using a pipette, 25.0 cm^3 of solution **V** is transferred into a conical flask.

Name a safety item that the student should attach to the pipette and suggest why it is used.

Safety item ……………………………………………………………………………...

Why it is used ……………………………………………………………………………...

……………………………………………………………………………...

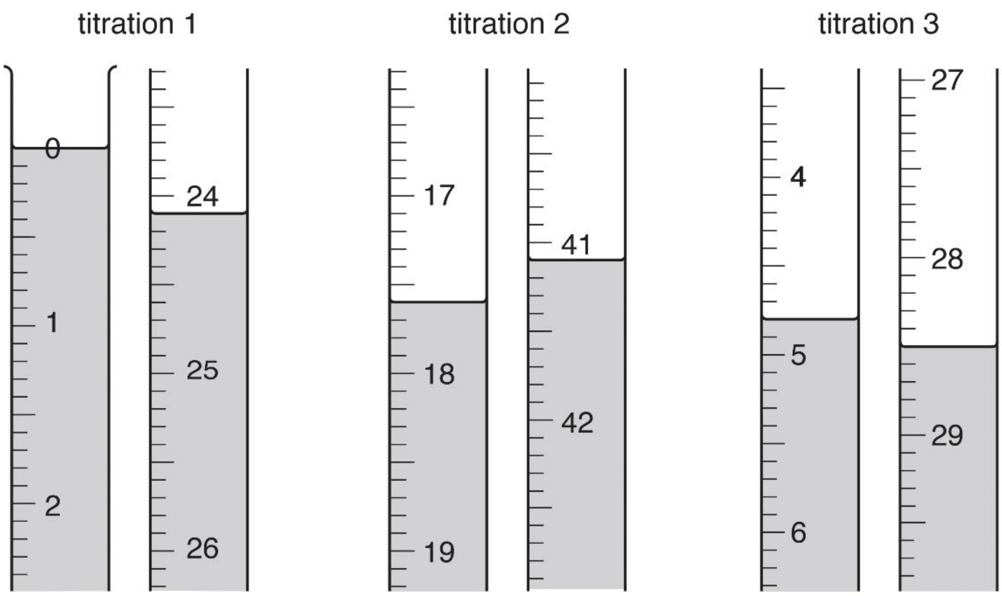
(d) A few drops of methyl orange indicator are added to the conical flask.

0.100 mol dm^{-3} sodium hydroxide is added to the solution from a burette until an end-point is reached.

What is the colour change of the methyl orange at the end-point?

The colour changes from ………………………… to …………………………

(e) The student does three titrations. The diagrams show parts of the burette with the solution levels at the beginning and end of each titration.



Use the diagrams to complete the results table.

titration number	1	2	3
final burette reading / cm^3			
initial burette reading / cm^3			
volume of 0.100 mol dm^{-3} NaOH(aq) used / cm^3			
best titration results (✓)			

Summary

Tick (✓) the best titration results.

Using these results, calculate the average volume of 0.100mol dm^{-3} sodium hydroxide required.

………………………… cm^3

(f) Calculate the number of moles of sodium hydroxide in the average volume 0.100 mol dm^{-3} sodium hydroxide.

………………………… moles

(g) Using the equation and your answer to **(f)**, deduce the number of moles of hydrochloric acid in 25.0 cm^3 of **V**.

$$NaOH + HCl \rightarrow NaCl + H_2O$$

.... moles

(h) Calculate the number of moles of hydrochloric acid in 250 cm^3 of **V**.

.... moles

(i) 50.0 cm^3 of 1.00 mol dm^{-3} hydrochloric acid contains 0.0500 moles of hydrochloric acid. Subtract your answer to **(h)** from 0.0500 to determine the number of moles of hydrochloric acid that react with the sample of magnesium carbonate.

.... moles

(j) The equation for the reaction between magnesium carbonate and hydrochloric acid is shown.

$$MgCO_3 + 2HCl \rightarrow MgCl_2 + H_2O + CO_2$$

Using the equation and your answer to **(i)**, deduce the number of moles of magnesium carbonate in the sample.

.... moles

(k) **(i)** Calculate the mass of magnesium carbonate in the sample.
[M_r $MgCO_3$ = 84]

.... g

(ii) Using your answers to **(a)** and **(k)(i)**, calculate the percentage purity of the magnesium carbonate.

.... %

13. The diagram shows two bottles of liquid oven cleaner.

The oven cleaners both contain an aqueous solution of sodium hydroxide. Plan an investigation to show which oven cleaner contains the highest concentration of sodium hydroxide. You can assume that all common laboratory apparatus and reagents are available to you for the investigation.

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14. The following table shows the tests that a student performed on substance **V**, and the conclusions made from the observations. Complete the table by describing these observations and suggest the test and observation which led to the conclusion in test **(d)**.

test	observation	conclusion
(a) **V** was dissolved in water and the solution divided into three parts for tests **(b)**, **(c)** and **(d)**.		**V** does not contain a transition metal.
(b) **(i)** To the first part, aqueous sodium hydroxide was added until a change was seen. **(ii)** An excess of sodium hydroxide was added to the mixture from **(i)**.		**V** may contain Zn^{2+} ions, Pb^{2+} ions or Al^{3+} ions.
(c) **(i)** To the second part, aqueous ammonia was added until a change was seen. **(ii)** An excess of aqueous ammonia was added to the mixture from **(i)**.		The presence of Zn^{2+} ions in **V** is confirmed.
(d)		**V** contains I^- ions.

(e) Give the name and formula of compound **V**.

……………………………………………………………………………………………………...

(f) Write the balanced chemical equation for the reaction that takes place in test **(b) (i)**.

……………………………………………………………………………………………………...

(g) Write the ionic equation for the reaction that takes place in test **(d)**.

……………………………………………………………………………………………………...

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http://www.