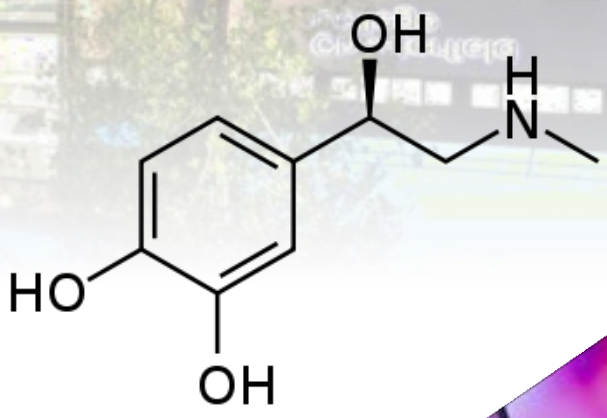
A level Chemistry

TRANSITION PACK
GCSE to A level

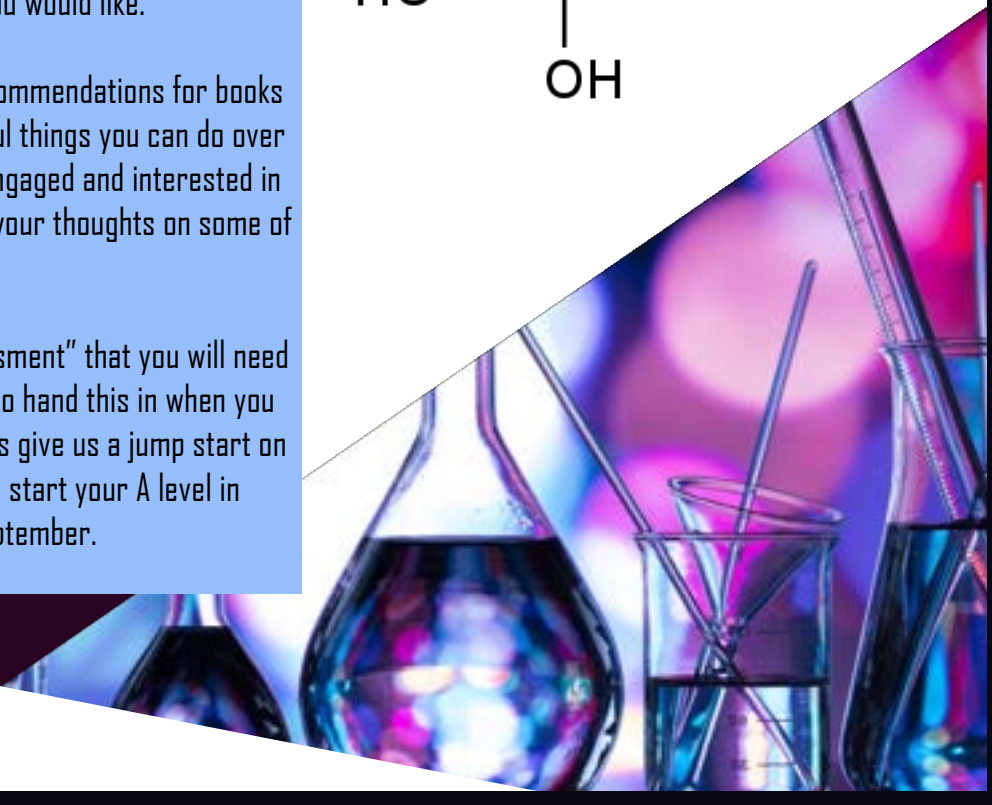
So you're interested in Chemistry?



This pack contains some information about the course, including the textbooks that we recommend so that you can get a head start if you would like.

We have also included some recommendations for books and movies as the most impactful things you can do over your summer break is to stay engaged and interested in physics – we would love to hear your thoughts on some of them.

Lastly there is a "baseline assessment" that you will need to complete, we would like you to hand this in when you arrive in class in September. This give us a jump start on knowing where are when you start your A level in Chemistry in September.



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Chemistry TRANSITION PACK GCSE to A level

Course Information

Your A Level chemistry will be brought to you in various lectures, workshops and practical laboratory sessions by a chemist:
Tom Hogg (hoggt@chesterfield.ac.uk , S220)

The A level is taught as a series of modules which are all examined at the end of year one (for AS level qualifications) or at the end of year 2 (for A level qualifications). The modules will fit into one of three general categories:

Organic Chemistry

The chemistry of carbon-based molecules. This includes hydrocarbons, alcohols, and even proteins and enzymes. This category involves a lot of practical work and requires an understanding of how reactions happen. You will be introduced to a new way of representing reactions known as mechanisms.

Inorganic Chemistry

The Chemistry of everything else. This category is wide ranging and diverse. It involves a look at many different reactions and strange chemistry often involving dramatic colour changes. You will look at transition metals, the halogens and catalysis.

Physical Chemistry

The chemistry of energy and how atoms and molecules interact with each other. In these modules you will gain an understanding of factors effecting the speed and energy of reactions. This category features a significant amount of maths.

We recommend the following text book and revision guides →

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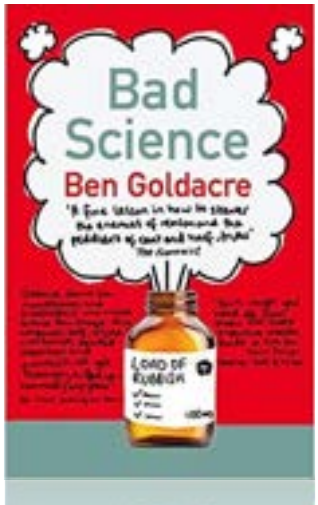
book recommendations

The Disappearing spoon – Sam Kean

An interesting look at the stories behind the elements on the periodic table.



Bad Science – Ben Goldacre

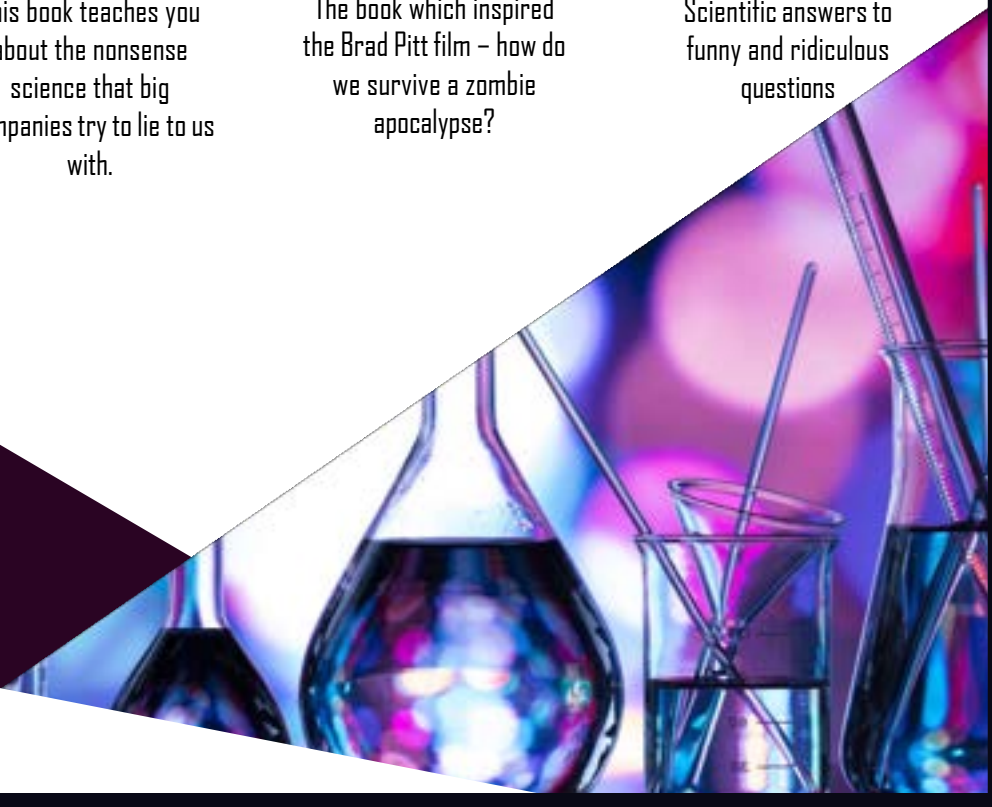
This book teaches you about the nonsense science that big companies try to lie to us with.

World War Z – Max Brooks

The book which inspired the Brad Pitt film – how do we survive a zombie apocalypse?

What if? – Randall Munroe

Scientific answers to funny and ridiculous questions



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film recommendations

The Martian – 2015

How do you survive as the only person on a planet with no food or oxygen?

Dark Waters – 2019

A man takes a stand against a chemical company that is poisoning a local town.

Erin Brockovich– 2000

A legal drama about a woman who finds out about a poisoned water supply and takes action.

Hollow Man – 2000

How would turning invisible change you?

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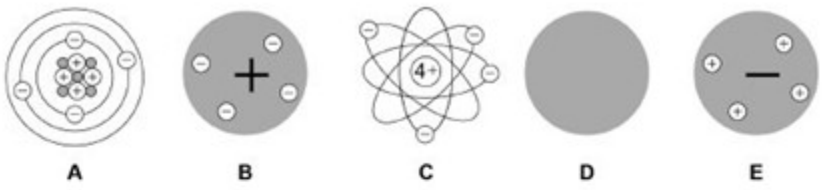
baseline assessment

Please complete this baseline assessment. You can use the internet and any resources to help you. You will need a calculator.

Q1. The diagram below represents different models of the atom.



A B C D E

(a) Which diagram shows the plum pudding model of the atom?

Tick **one** box.

A		B		C		D		E	

(1)

(b) Which diagram shows the model of the atom developed from the alpha particle scattering experiment?

Tick **one** box.

A		B		C		D		E	

(1)

(c) Which diagram shows the model of the atom resulting from Bohr's work?

Tick **one** box.

A		B		C		D		E	

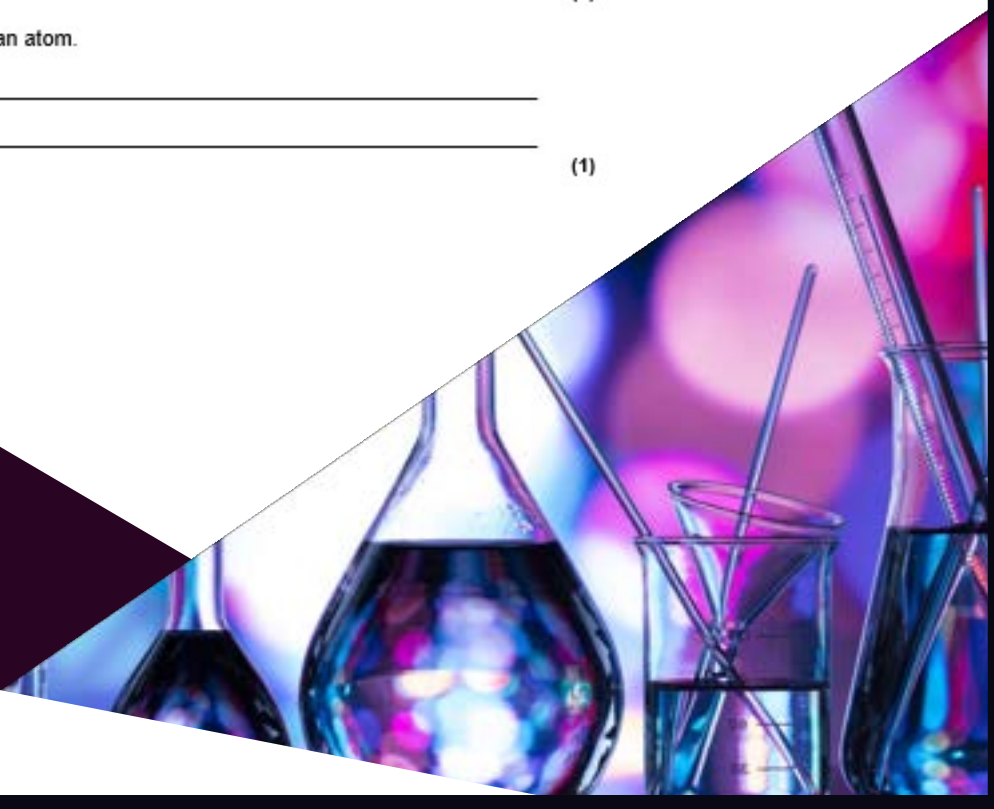
(1)

(d) Define the mass number of an atom.

_____

_____

(1)



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baseline assessment

(e) Element **X** has two isotopes. Their mass numbers are 69 and 71

The percentage abundance of each isotope is:

- 60% of ^{69}**X**
- 40% of ^{71}**X**

Estimate the relative atomic mass of element **X**.

Tick **one** box.

< 69.5	☐
Between 69.5 and 70.0	☐
Between 69.5 and 70.0	☐
Between 70.0 and 70.5	☐
> 70.5	☐

(1)

(f) Chadwick's experimental work on the atom led to a better understanding of isotopes.

Explain how his work led to this understanding.

_____

_____

_____

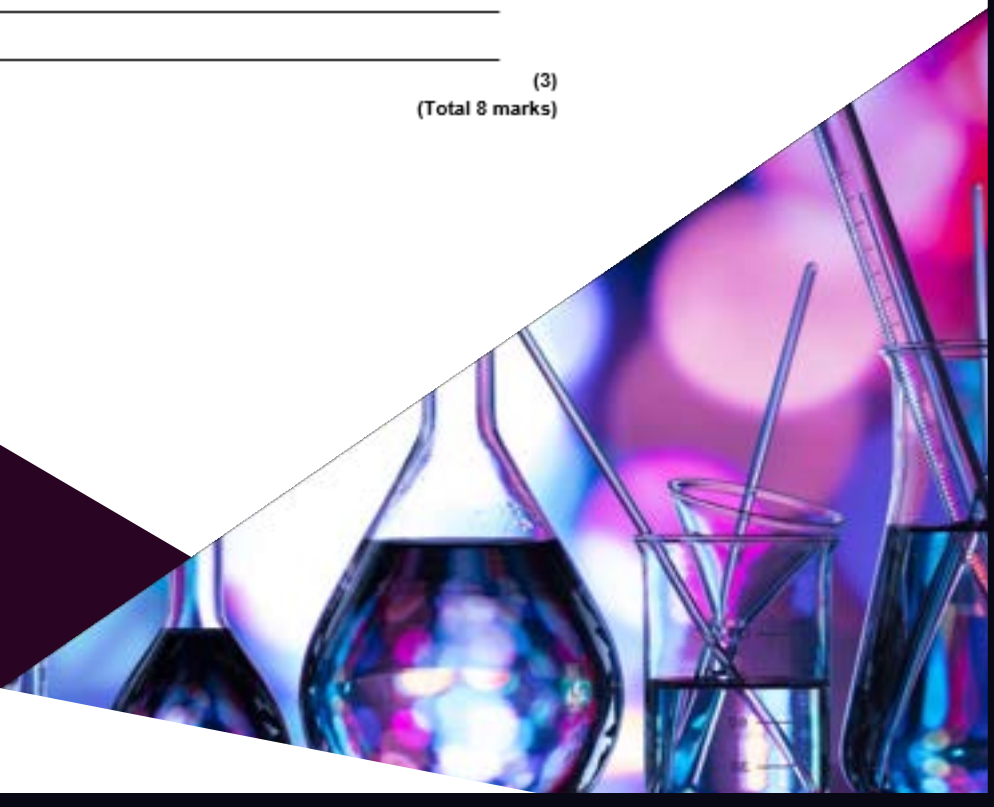
_____

_____

_____

(3)

(Total 8 marks)



baseline assessment

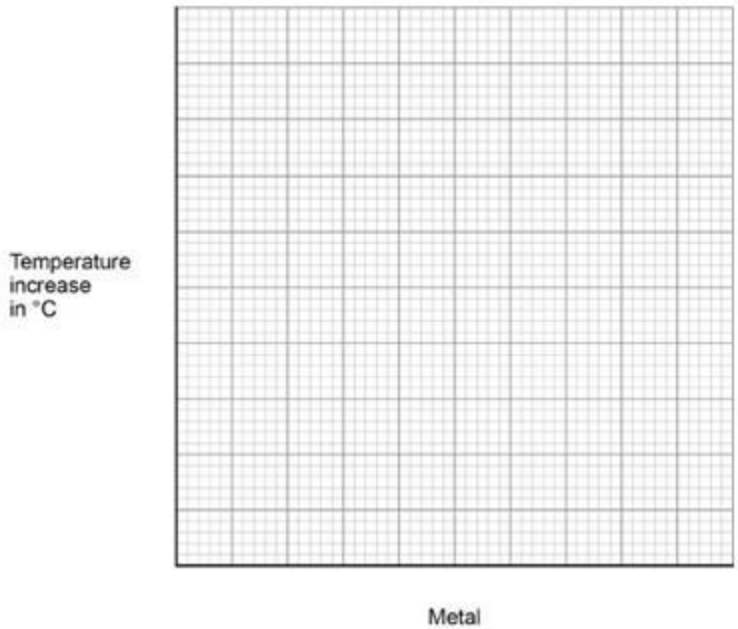
Q2. A student investigated the temperature change in displacement reactions between metals and copper sulfate solution.

The table below shows the student's results.

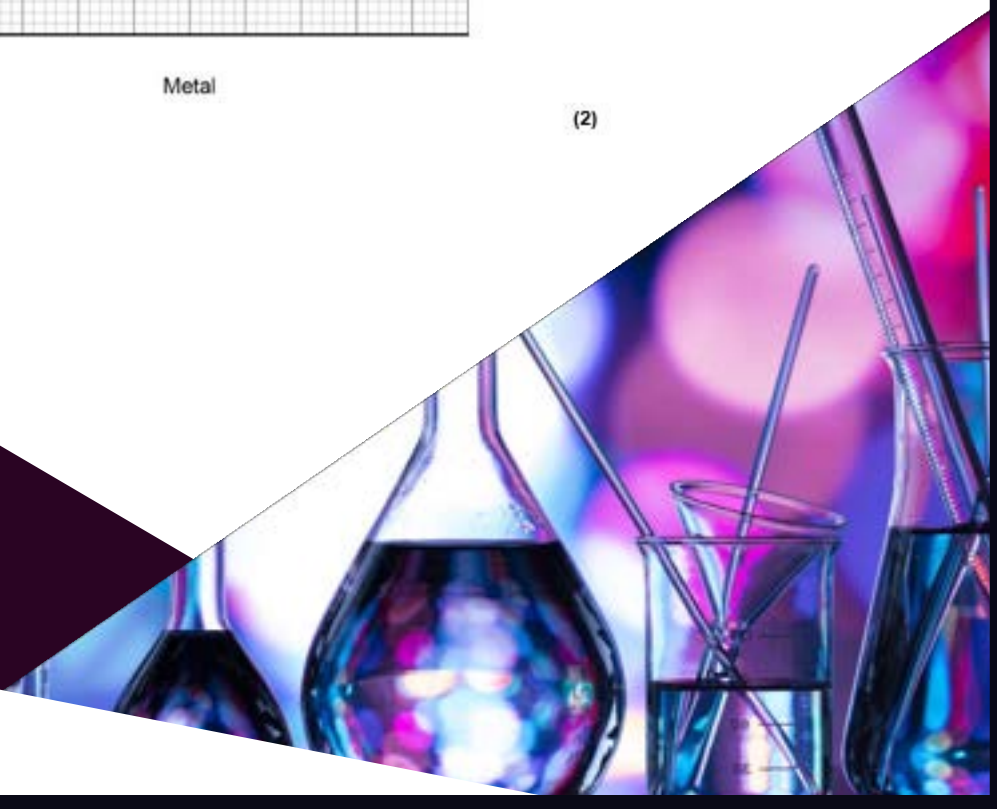
Metal	Temperature increase in °C
Copper	0
Iron	13
Magnesium	43
Zinc	17

(a) Plot the data from the table above on **Figure 1** as a bar chart.

Figure 1



(2)



baseline assessment

(b) The student concluded that the reactions between the metals and copper sulfate solution are endothermic. Give **one** reason why this conclusion is **not** correct.

_____

_____

(1)

(c) The temperature change depends on the reactivity of the metal.

The student's results are used to place copper, iron, magnesium and zinc in order of their reactivity.

Describe a method to find the position of an unknown metal in this reactivity series.

Your method should give valid results.

_____

_____

_____

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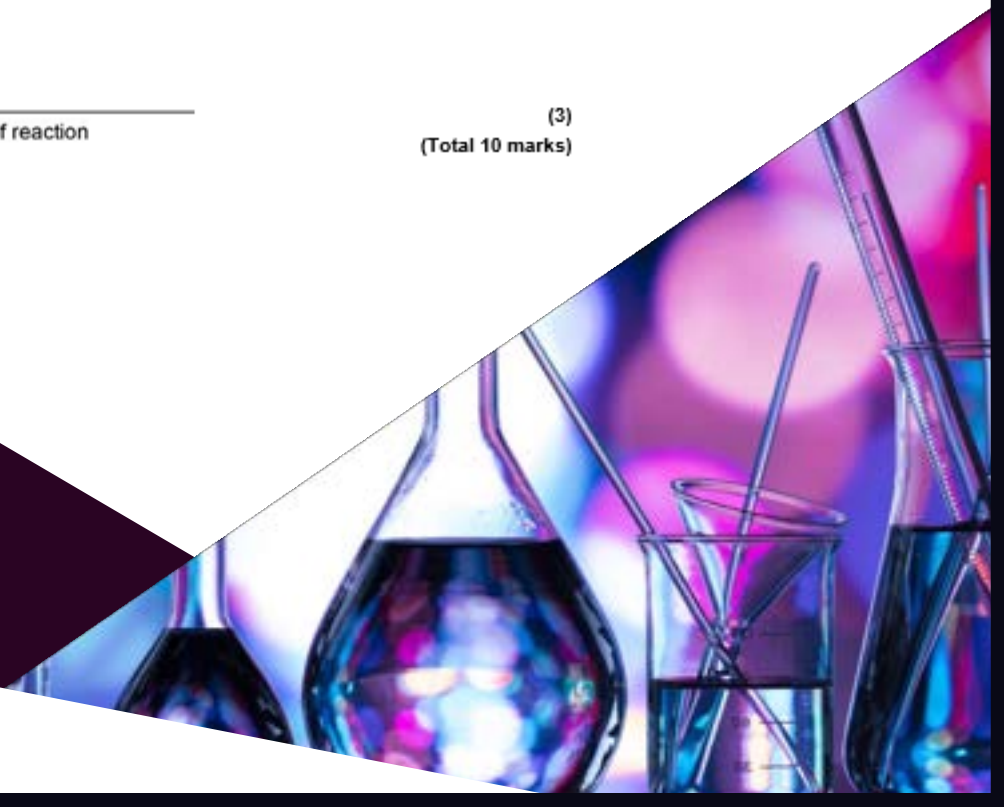
(4)

(d) Draw a fully labelled reaction profile for the reaction between zinc and copper sulfate solution.

(3)

(Total 10 marks)

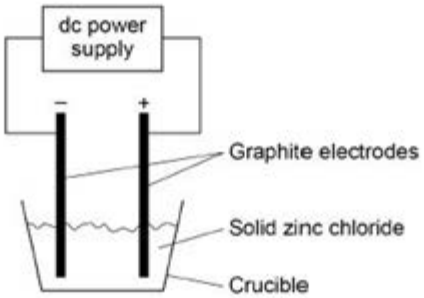


baseline assessment

Q3. A student investigated the electrolysis of different substances.

Figure 1 shows the apparatus.

Figure 1



(a) Explain why electrolysis would not take place in the apparatus shown in **Figure 1**.

_____

_____

_____

_____

(2)

(b) Explain why graphite conducts electricity.

Answer in terms of the structure and bonding in graphite.

_____

_____

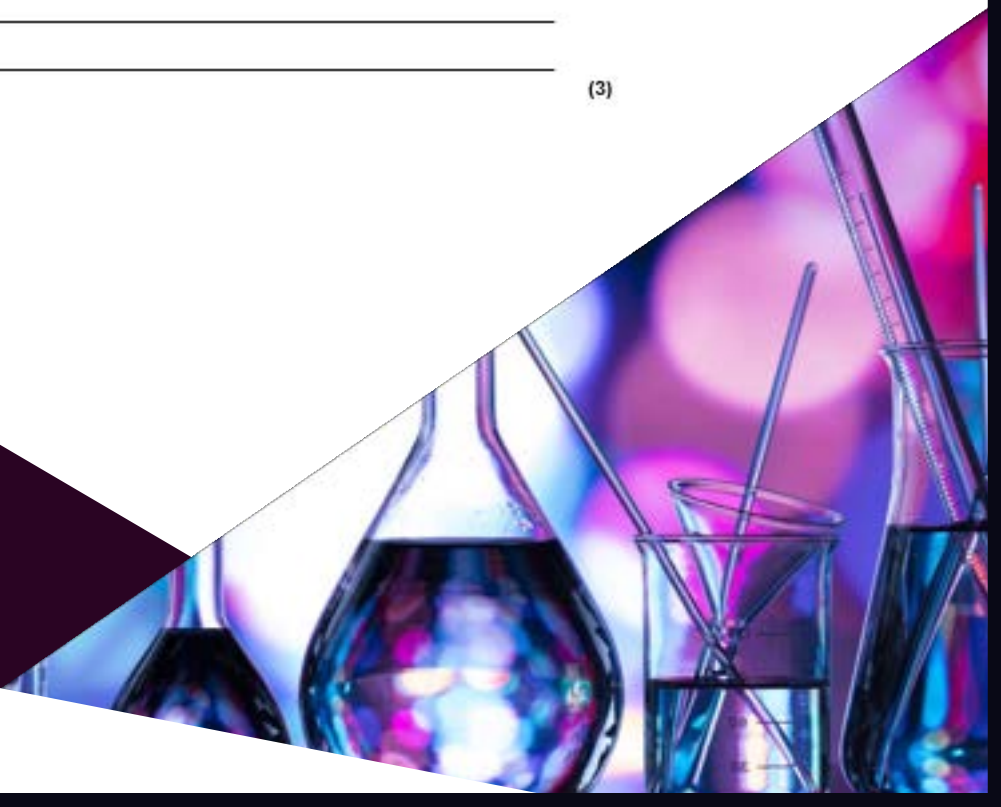
_____

_____

_____

_____

(3)

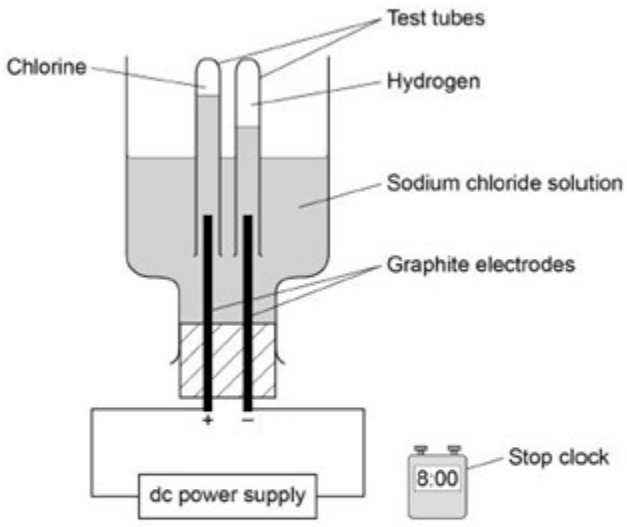


baseline assessment

The student investigated how the volume of gases produced changes with time in the electrolysis of sodium chloride solution.

Figure 2 shows the apparatus.

Figure 2



(c) The student made an error in selecting the apparatus for this investigation.

How should the apparatus be changed?

Give **one** reason for your answer.

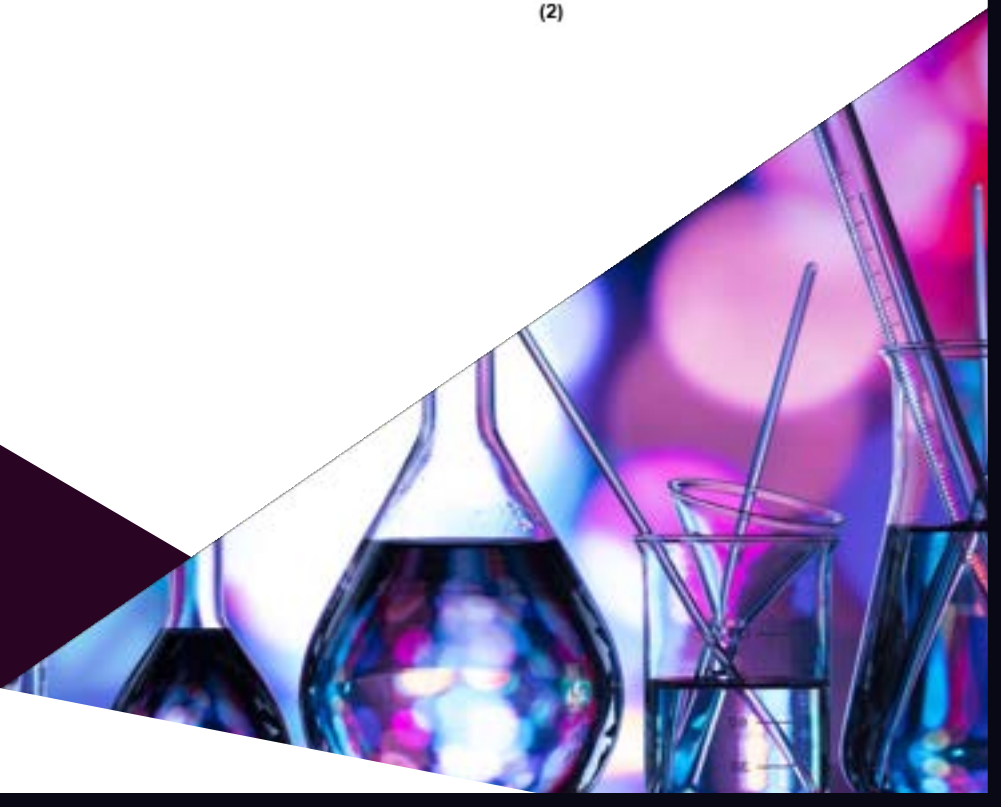
_____

_____

_____

_____

(2)

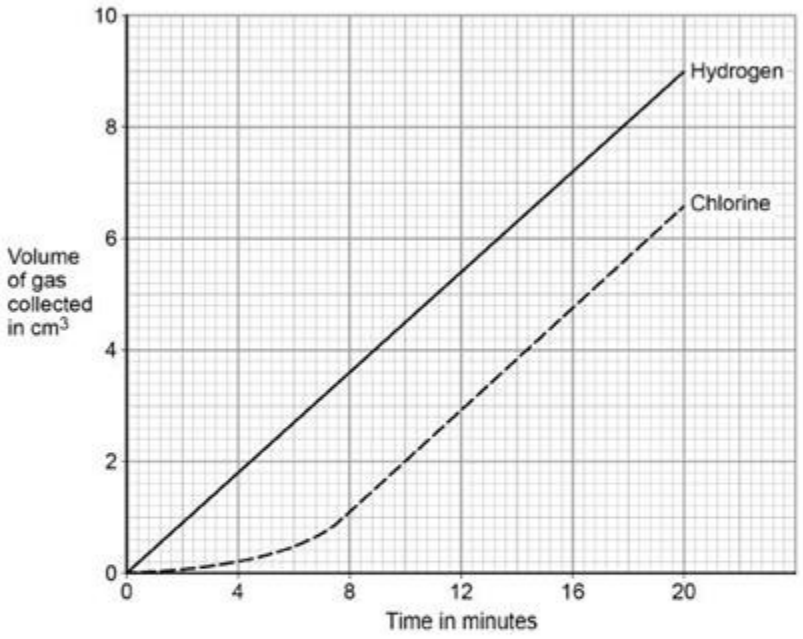


Another student used the correct apparatus.

This student measured the volumes of gases collected every minute for 20 minutes.

Figure 3 shows the student's results.

Figure 3



(d) Describe the trends shown in the results.

Use values from **Figure 3**.

_____

_____

_____

_____

_____

(3)

(e) The number of moles of each gas produced at the electrodes is the same.

No gas escapes from the apparatus.

Suggest **one** reason for the difference in volume of each gas collected.

_____

_____

(1)

(f) Calculate the amount in moles of chlorine collected after 20 minutes.

Use **Figure 3**.

The volume of one mole of any gas at room temperature and pressure is 24.0 dm^3

Give your answer in standard form.

_____

_____

_____

_____

Moles of chlorine = _____ mol

(3)

(Total 14 marks)

Q4.

This question is about acids and alkalis.

(a) Dilute hydrochloric acid is a strong acid.

Explain why an acid can be described as both strong and dilute.

_____

_____

_____

_____

(2)

(b) A 1.0×10^{-3} mol/dm^3 solution of hydrochloric acid has a pH of 3.0

What is the pH of a 1.0×10^{-5} mol/dm^3 solution of hydrochloric acid?

pH = _____

(1)

A student titrated 25.0 cm^3 portions of dilute sulfuric acid with a 0.105 mol/dm^3 sodium hydroxide solution.

(c) The table below shows the student's results.

	Titration 1	Titration 2	Titration 3	Titration 4	Titration 5
Volume of sodium hydroxide solution in cm^3	23.50	21.10	22.10	22.15	22.15

The equation for the reaction is:

$$2\ NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2\ H_2O$$

Calculate the concentration of the sulfuric acid in mol/dm^3

Use only the student's concordant results.

Concordant results are those within 0.10 cm^3 of each other.

_____

_____

_____

_____

_____

_____

_____

_____

Concentration of sulfuric acid = _____ mol/dm^3 **(5)**

baseline assessment

(d) Explain why the student should use a pipette to measure the dilute sulfuric acid and a burette to measure the sodium hydroxide solution.

_____

_____

_____

_____

(2)

(e) Calculate the mass of sodium hydroxide in 30.0 cm^3 of a 0.105 mol/dm^3 solution.

Relative formula mass (M_r): NaOH = 40

_____

_____

_____

_____

Mass of sodium hydroxide = _____ g

(2)

(Total 12 marks)