



GCSE Science

GCSE BIOLOGY, CHEMISTRY & PHYSICS

GCSE COMBINED SCIENCE

MRS R HOY SCIENCE CURRICULUM LEADER

AQA Triple Science

GCSE Biology- 2x 100 mark exam papers (105 mins)

GCSE Chemistry- 2x 100 mark exam papers (105 mins)

GCSE Physics- 2x 100 mark exam papers (105 mins)

Each subject is awarded a separate grade

Each subject can be sat at higher or foundation level

AQA (Triology) Combined Science

Biology- 2x 70 mark exam papers (75 mins)

Chemistry- 2x 70 mark exam papers (75 mins)

Physics- 2x 1 70 mark exam papers (75 mins)

The subject is awarded two grade which are an average of all papers, e.g. 5,5 or 4,3

All 6 paper to be sat at higher or foundation level

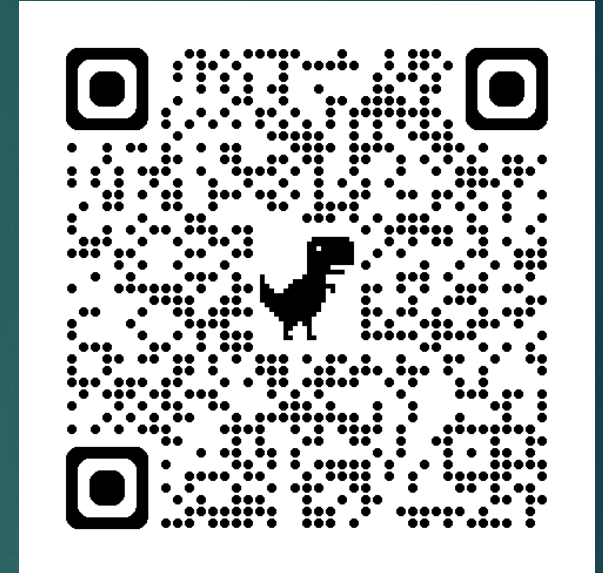
Question types

- Multiple choice
- Structured
- Closed short answer
- Open response (maximum 6 marks)

Biology

- 1. [Cell biology](#)
- 2. [Organisation](#)
- 3. [Infection and response](#)
- 4. [Bioenergetics](#)
- 5. [Homeostasis and response](#)
- 6. [Inheritance, variation and evolution](#)
- 7. [Ecology](#)
- 8. [Key ideas](#)

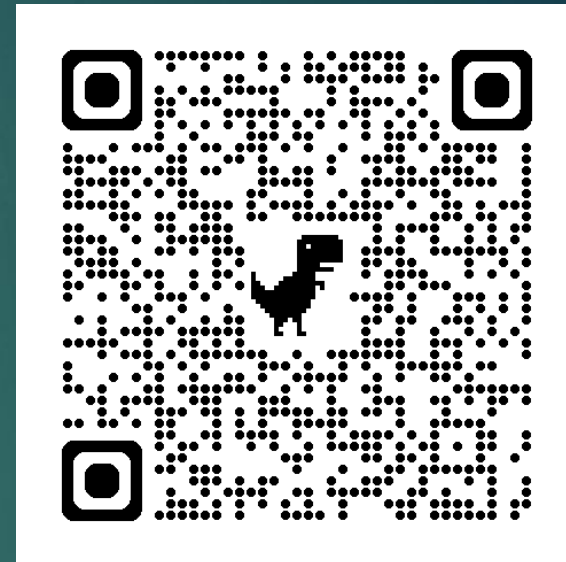
<https://www.aqa.org.uk/subjects/biology/gcse/biology-8461/specification/specification-at-a-glance>



Chemistry

- 1. Atomic structure and the periodic table
- 2. Bonding, structure, and the properties of matter
- 3. Quantitative chemistry
- 4. Chemical changes
- 5. Energy changes
- 6. The rate and extent of chemical change
- 7. Organic chemistry
- 8. Chemical analysis
- 9. Chemistry of the atmosphere
- 10. Using resources
- 11. Key ideas

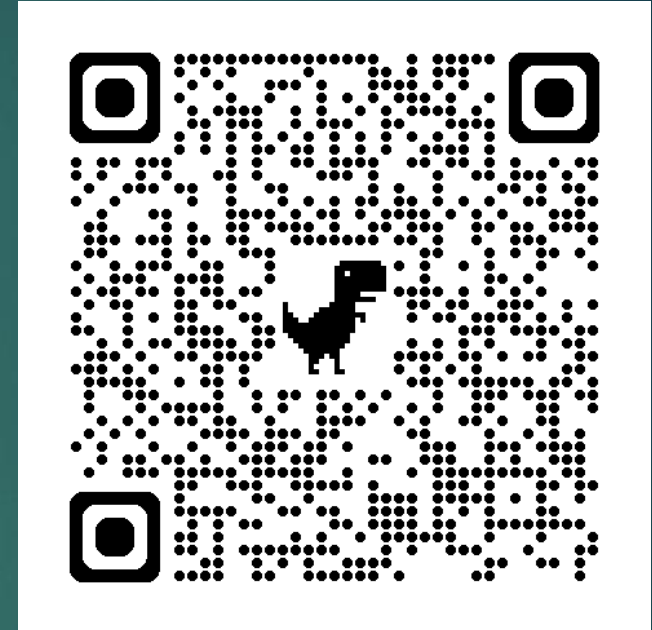
<https://www.aqa.org.uk/subjects/chemistry/gcse/chemistry-8462/specification/specification-at-a-glance>



Physics

- 1. Energy
- 2. Electricity
- 3. Particle model of matter
- 4. Atomic structure
- 5. Forces
- 6. Waves
- 7. Magnetism and electromagnetism
- 8. Space physics (physics only)

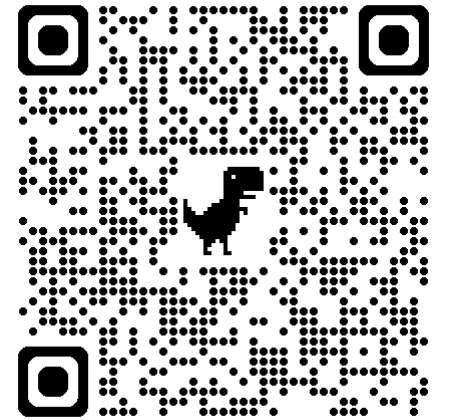
<https://www.aqa.org.uk/subjects/physics/gcse/physics-8463/specification/specification-at-a-glance>



Combined Science

- 1. Cell biology
- 2. Organisation
- 3. Infection and response
- 4. Bioenergetics
- 5. Homeostasis and response
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- 12. Energy changes
- 13. The rate and extent of chemical change
- 14. Organic chemistry
- 15. Chemical analysis
- 16. Chemistry of the atmosphere
- 17. Using resources
- 18. Energy
- 19. Electricity
- 20. Particle model of matter
- 21. Atomic structure
- 22. Forces
- 23. Waves
- 24. Magnetism and electromagnetism

<https://www.aqa.org.uk/subjects/science/gcse/science-8464/specification/specification-at-a-glance>



Periodic tables are provided in chemistry

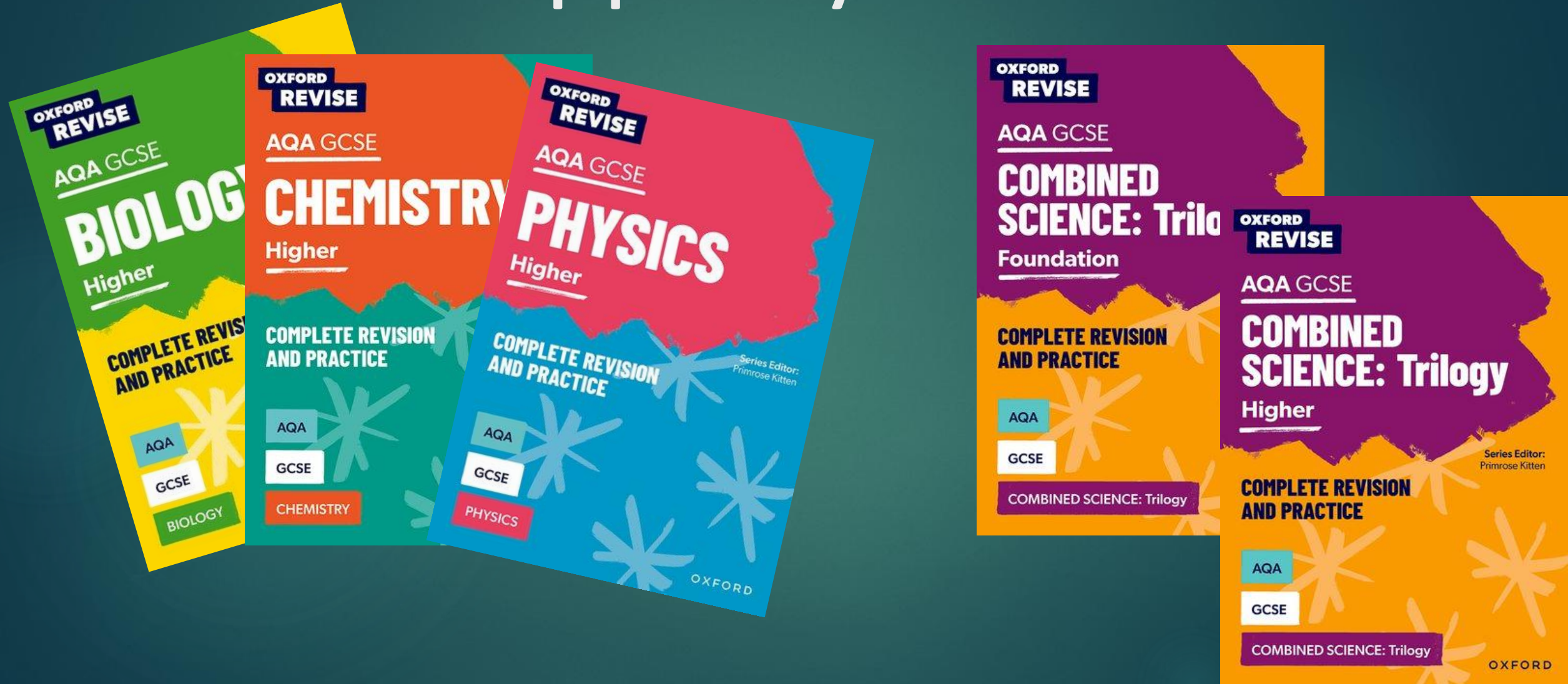
Equation sheets are provide in physics

AQA

The Periodic Table of Elements

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How to support your child





B2 Cell transport

Comparing diffusion, osmosis, and active transport

Diffusion

The spreading out of particles, resulting in a net movement from an area of higher **concentration** to an area of lower concentration.

Osmosis

The diffusion of water from a **dilute** solution to a concentrated solution through a **partially permeable membrane**.

Active transport

The movement of particles from a more dilute solution to a more concentrated solution using energy from respiration.

Definition

Movement of particles

Particles move down the concentration **gradient** – from an area of **high** concentration to an area of **low** concentration.

Water moves from an area of **lower** solute concentration to an area of **higher** solute concentration.

Particles move against the concentration gradient – from an area of **low** concentration to an area of **high** concentration.

Energy required?

no – **passive process**

no – passive process

yes – using energy released during respiration

Examples

Humans

- Nutrients in the small intestine diffuse into the blood in the **capillaries** through the **villi**.
- Oxygen diffuses from the air in the **alveoli** into the blood in the capillaries. Carbon dioxide diffuses from the blood in the capillaries into the air in the alveoli.
- Urea** diffuses from cells into the blood for excretion by the kidneys.

Fish

- Oxygen from water passing over the gills diffuses into the blood in the **gill filaments**.
- Carbon dioxide diffuses from the blood in the gill filaments into the water.

Plants

- Carbon dioxide used for photosynthesis diffuses into leaves through the **stomata**.
- Oxygen produced during photosynthesis diffuses out of the leaves through the stomata.

Plants

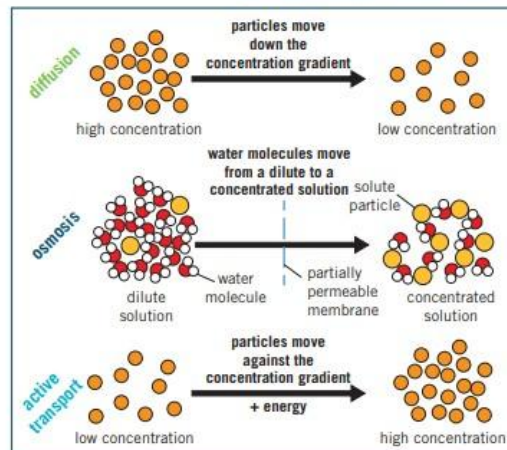
Water moves by osmosis from a dilute solution in the soil to a concentrated solution in the **root hair cell**.

Humans

Active transport allows sugar molecules to be absorbed from the small intestine when the sugar concentration is higher in the blood than in the small intestine.

Plants

Active transport is used to absorb mineral ions into the root hair cells from more dilute solutions in the soil.



Factors that affect the rate of diffusion

① Difference in concentration

The steeper the concentration gradient, the faster the rate of diffusion.

② Temperature

The higher the temperature, the faster the rate of diffusion.

③ Surface area of the membrane

The larger the membrane surface area, the faster the rate of diffusion.

Adaptations for exchanging substances

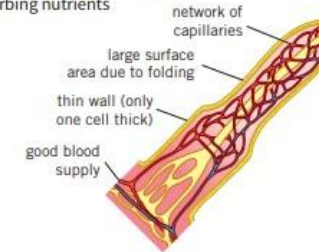
Single-celled organisms have a large surface area-to-volume ratio. This allows enough molecules to be transported across their cell membranes to meet their needs.

Multicellular organisms have a small surface area-to-volume ratio. This means they need specialised organ systems and cells to allow enough molecules to be transported into and out of their cells.

Exchange surfaces work most efficiently when they have a large surface area, a thin membrane, and a good blood supply.

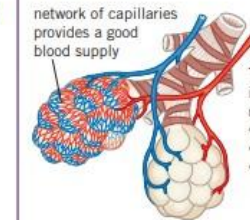
Villi in the small intestine

for absorbing nutrients



Alveoli in the lungs

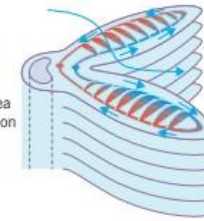
for gas exchange



Fish gills

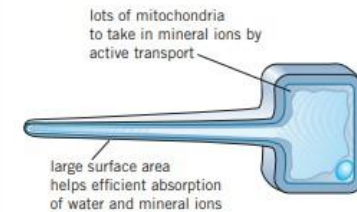
for gas exchange

- Fish gills are made up of stacks of thin filaments with
- a large surface area to increase diffusion
 - a network of capillaries (good blood supply).



Root hair cells

for uptake of water and minerals



Key terms

Make sure you can write a definition for these key terms.

active transport

alveoli

capillaries

concentration

diffusion

dilute

gill filament

gradient

osmosis

partially permeable membrane

passive process

root hair cell

stomata

urea

villi



Learn the answers to the questions below, then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

B2 questions

Answers

1	What is diffusion?	net movement of particles from an area of high concentration to an area of low concentration along a concentration gradient – this is a passive process (does not require energy from respiration)
2	Name three factors that affect the rate of diffusion.	concentration gradient, temperature, membrane surface area
3	How are villi adapted for exchanging substances?	- long and thin – increases surface area - one-cell-thick membrane – short diffusion distance - good blood supply – maintains a steep concentration gradient
4	How are the lungs adapted for efficient gas exchange?	- alveoli – large surface area - moist membranes – increases rate of diffusion - one-cell-thick membranes – short diffusion distance - good blood supply – maintains a steep concentration gradient
5	How are fish gills adapted for efficient gas exchange?	- large surface area for gases to diffuse across - thin layer of cells – short diffusion distance - good blood supply – maintains a steep concentration gradient
6	What is osmosis?	diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane
7	Give one example of osmosis in a plant.	water moves from the soil into the root hair cell
8	What is active transport?	movement of particles against a concentration gradient – from a dilute solution to a more concentrated solution – using energy from respiration
9	Why is active transport needed in plant roots?	concentration of mineral ions in the soil is lower than inside the root hair cells – the mineral ions must move against the concentration gradient to enter the root hair cells
10	What is the purpose of active transport in the small intestine?	sugars can be absorbed into the blood when the concentration of sugar in the small intestine is lower than the concentration of sugar in the blood

Now go back and use the questions below to check your knowledge from previous chapters.

Previous questions

Answers

1	Give two adaptations of a root hair cell.	long projection, lots of mitochondria
2	What is the function of a red blood cell?	carries oxygen around the body
3	What type of cell are bacteria?	prokaryotic
4	What is the function of ribosomes?	enable production of proteins (protein synthesis)
5	Give two adaptations of a nerve cell.	branched endings, myelin sheath insulates the axon
6	What is the function of a sperm cell?	fertilises an ovum (egg)
7	Give two adaptations of a sperm cell.	tail, contains lots of mitochondria
8	How are electron microscopes different to light microscopes?	electron microscopes use beams of electrons instead of light, cannot be used to view living samples, are much more expensive, and have a much higher magnification and resolution



Required practical skills

Practise answering questions on the required practicals using the example below. You need to be able to apply your skills and knowledge to other practicals too.

Osmosis in cells	Worked example	Practice
Different concentrations of sugar and salt solutions both affect the movement of water by osmosis, causing cells to lose or gain water, and changing the mass of a tissue sample. For this practical you need to be able to accurately measure length, mass, and volume to measure osmosis in cells. You will need to be comfortable applying this knowledge to a range of samples, not just to the typical example of potato tissue, as osmosis happens in all cells.	A sample of carrot was placed into a 0.75 mol/dm³ sugar solution for 30 minutes. The mass of the carrot was recorded before and after this. Initial mass = 6.02 g Final mass = 3.91 g 1 Determine the percentage change in mass of the sample. Change in mass = 3.91 – 6.02 = –2.11 g Percentage change in mass = $\frac{-2.11}{6.02} \times 100 = -35\%$ (a minus sign is used because the sample has lost mass) 2 Explain why this experiment should be repeated, and give one other variable that should be controlled. The experiment should be repeated to give a more reliable result, and to allow calculation of a mean loss in mass for the sample. The dimensions of the carrot samples need to be controlled between repeats.	1 Give one reason why it is important to dry the samples of carrot cores before they are weighed. 2 When repeating this experiment using different concentrations of sugar solution, a student found that one sample did not change mass. Suggest what this tells you about the concentration of the solution. Assume no error in the experiment. 3 Two students set up this experiment. Student A said that each sample of carrot must have the same starting mass. Student B argued that each sample must have the same length and width. Explain which student is correct.

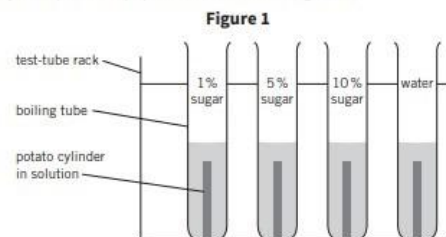


Exam-style questions

- 01** A group of students investigated how the mass of a potato sample changed over time, when placed into sugar solutions of varying concentrations.



They set up their equipment as shown in **Figure 1**.



- 01.1** Identify the independent variable in their investigation. **[1 mark]**

Tick **one** box.

mass of potato sample ☐

concentration of sugar solution ☐

time potato placed in sugar solution ☐

- 01.2** Use **Figure 1** to identify **two** variables that the students controlled. **[2 marks]**

Tick **two** boxes.

mass of potato sample at start ☐

volume of sugar solution ☐

change in mass of potato sample ☐

light intensity ☐

- 01.3** The students' results are shown in **Table 1**.

Table 1

Solution	0% sugar solution	1% sugar solution	5% sugar solution	10% sugar solution
Starting mass in g	3.1	3.3	3.1	3.4
Final mass in g	3.4	3.5	2.9	2.7
Change in mass in g	+0.3	+0.2	-0.2	_____

Complete the results table by calculating the change in mass for the 10% sugar solution. **[1 mark]**

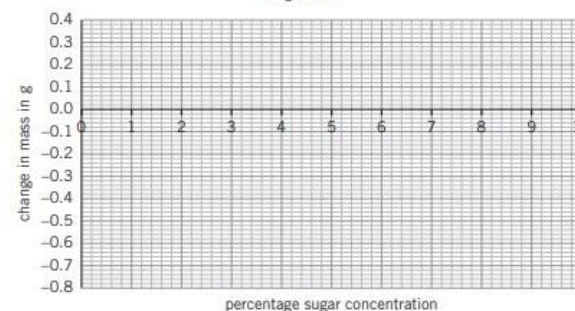
Exam Tip

If you're not sure how to calculate the change in mass, use the 1% or 5% as practice calculations where you've already been given the answer.

Change in mass = _____ g

- 01.4** Plot the students' results of sugar concentration against change in mass on **Figure 2**. Draw a line of best fit. **[2 marks]**

Figure 2



Exam Tip

Always plot points on graphs using crosses, dots are not clear enough and can get hidden under lines of best fit, and dots within circles are not specific enough.

- 01.5** Use the graph to determine the concentration of sugar present in the potato. **[1 mark]**

- 02** Many substances move into and out of cells by diffusion.



- 02.1** Choose the appropriate bold words to complete this description of diffusion. **[4 marks]**

Diffusion is the **spreading out** / **clumping together** of particles in a gas or **solid** / **liquid**.

Particles move from an area of **low** / **high** concentration to an area of **low** / **high** concentration.

Practice Papers

Triple Science

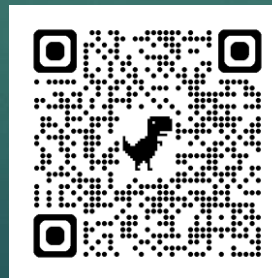
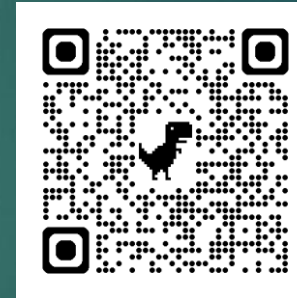
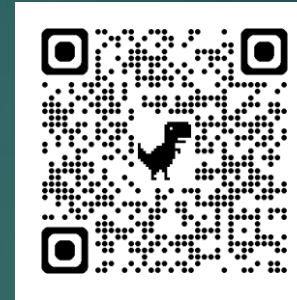
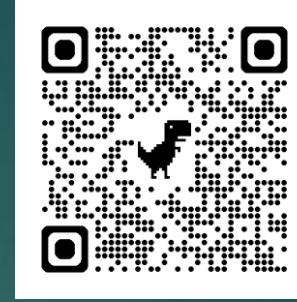
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<https://www.aqa.org.uk/subjects/chemistry/gcse/chemistry-8462/assessment-resources>

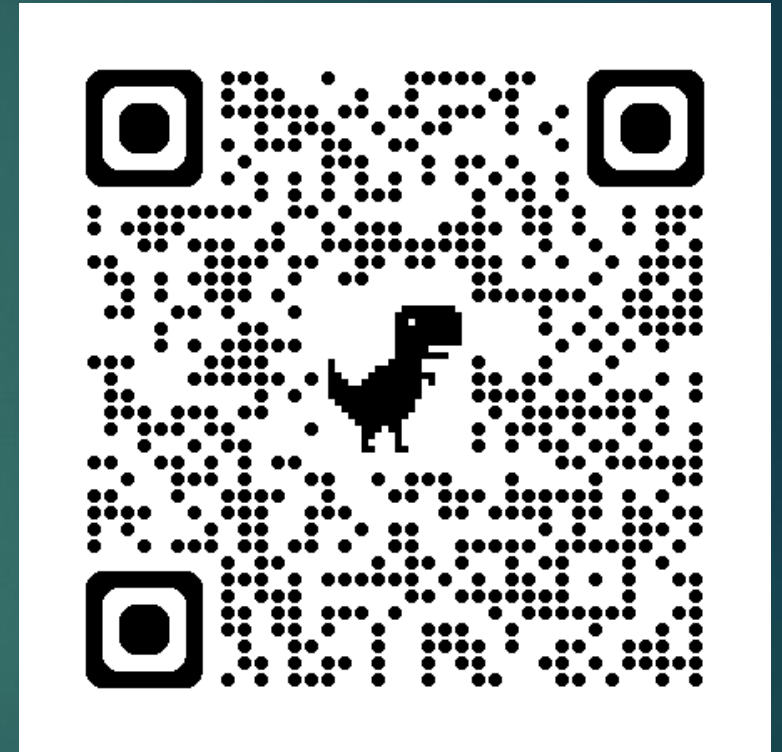
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Combined Science

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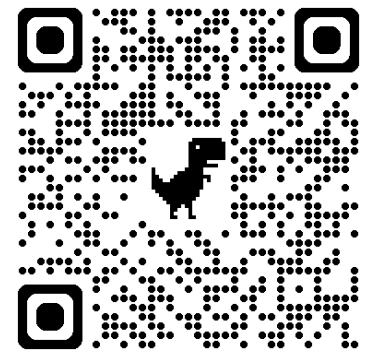
Practical Videos



https://www.youtube.com/playlist?list=PLAd0MSIZBSsF3vV_uxzbcNHuDrQ6Hc-UI

Revision techniques that work:

- ▶ Don't just read the revision guide
- ▶ Make notes
- ▶ Make mind maps
- ▶ Talk about your revision- say it out loud
- ▶ Complete quizzes and online tests (e.g. SENECA)
- ▶ Get someone to test you



BBC Bitesize

- ▶ **Biology** <https://www.bbc.co.uk/bitesize/examspecs/zpgcbk7>
- ▶ **Chemistry** <https://www.bbc.co.uk/bitesize/examspecs/z8xtmnb>
- ▶ **Physics** <https://www.bbc.co.uk/bitesize/subjects/zpm6fg8>
- ▶ **Combined Science** <https://www.bbc.co.uk/bitesize/examspecs/z8r997h>

Rate of a reaction is the speed at which reactants are turned into products.
Iron rusting is slow
Explosions are fast

For a reaction to occur particles need to collide with enough energy to react = activation energy



Investigating exothermic reactions

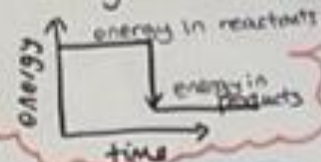


reaction carried out in polystyrene cup as it is an insulator

Calc. rate from a tangent
= $\frac{\text{change in mass or volume}}{\text{change in time}}$

Exothermic - releases energy so temp. increases
eg combustion

energy stored in chemical bonds is transferred to the surroundings



Endothermic - takes in energy so temp. decreases

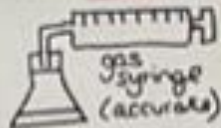
energy transferred from surroundings and stored in chemical bonds



This is a reaction profile

Measuring Rates:

The rate of reactions can be shown by
- the volume of gas being made



- loss of mass
- colour change

$$\text{Rate} = \frac{\text{change}}{\text{time}}$$

4 Factors !!

① Concentration - the higher the conc. the more particles there are so there are more collisions and a higher rate



③ Temperature - at higher temps particles have more energy, there are more collisions so the rate of reaction is higher.



② Surface Area - higher surface area means more collisions and a faster rate



④ Pressure - the higher the pressure the closer the particles so collisions are more frequent + rate is faster

Speed up chemical reactions
are NOT permanently changed in the reaction



used in industry to make products more quickly and at low temp or pressure (which saves money)

don't alter the products (yield)

reduce the amount of activation energy needed

eg. enzymes
catalytic converters
Iron in the Haber process



Top Tips:

- ▶ Learn key words and their meanings
- ▶ Calculations (showing working out)
- ▶ Underline key words in questions
- ▶ Get started with revision NOW!