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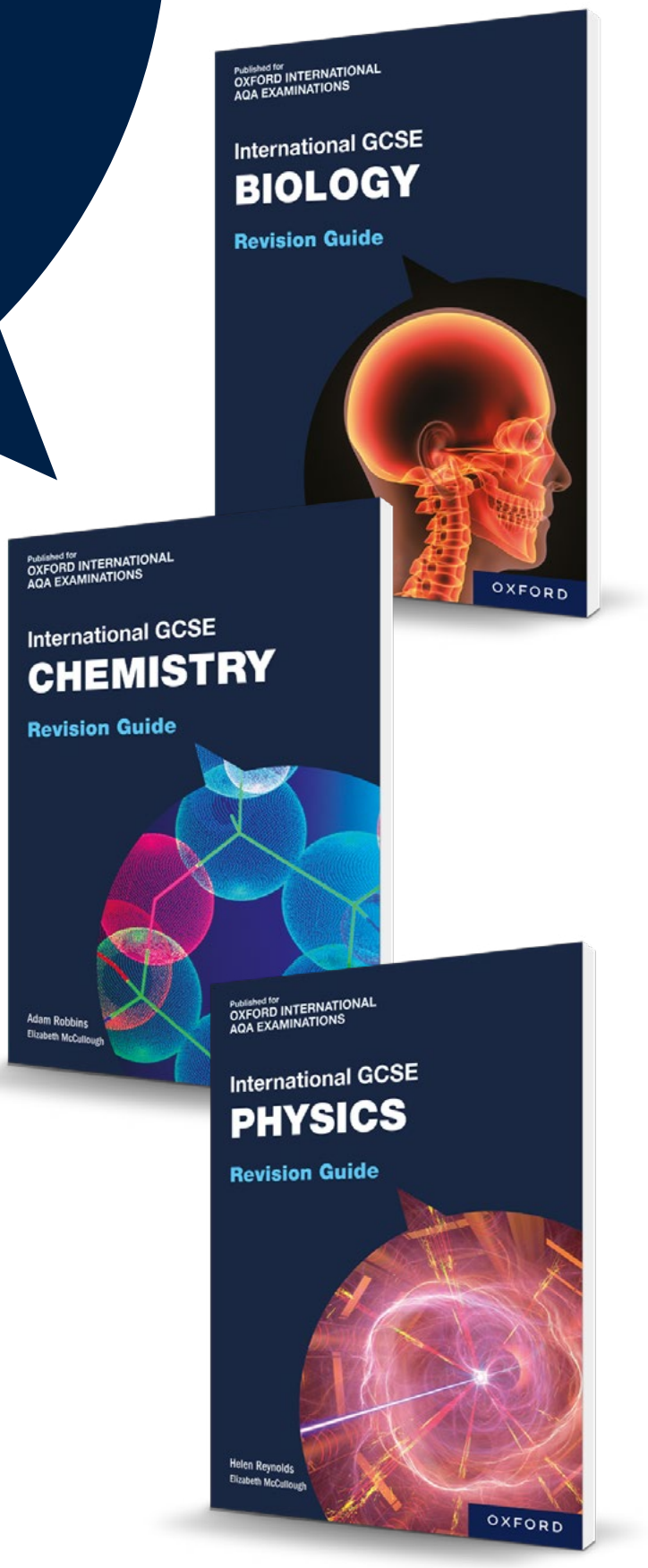

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International GCSE
Biology Revision Guide

Award-winning three-step "Oxford Revise" approach to exam preparation: Knowledge, Retrieval & Practice

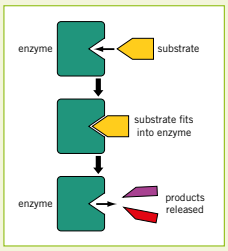
Knowledge

B6

B6 Enzymes and digestion

Enzymes

Enzymes are large proteins that **catalyse** (speed up) reactions. Enzymes are not changed in the reactions they catalyse.

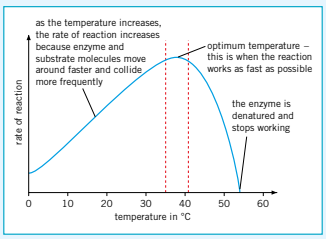


Lock and key theory

This is a simple model of how enzymes work:

1. The enzyme's **active site** (where the reaction occurs) is a specific shape.
2. The enzyme (the lock) will only catalyse a specific reaction because the **substrate** (the key) fits into its active site.
3. At the active site, enzymes can break molecules down into smaller ones or bind small molecules together to form larger ones.
4. When the products have been released, the enzyme's active site can accept another substrate molecule.

The effect of temperature on enzymes



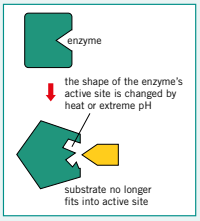
Revision tip

This is one area where biology and chemistry overlap.

The first part of the graph can be explained by the collision theory you have learnt in your chemistry lessons.

Denaturation

At extremes of pH or at very high temperatures the shape of an enzyme's active site can change.



The substrate can no longer bind to the active site, so the enzyme cannot catalyse the reaction – the enzyme has been **denatured**.

Key terms

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

active site, amylase, catalyse, denatured, enzyme, lipase, optimum, protease, substrate

Digestive enzymes

Digestive enzymes are produced in glands and the lining of the gut. They are released into the gut, where they come into contact with food molecules. Digestive enzymes catalyse the breakdown of large, insoluble food molecules into small, soluble molecules that can then be absorbed into the bloodstream. For example, carbohydrases break down carbohydrates into simple sugars.

These products of digestion can be used to build new carbohydrates, lipids, and proteins.

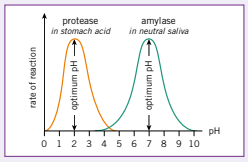
Some of the glucose produced is used in respiration.

Enzyme	Sites of production	Reaction catalysed	Site of reaction
amylase	salivary glands pancreas small intestine	starch → glucose	mouth and small intestine
proteases	stomach pancreas small intestine	proteins → amino acids	stomach and small intestine
lipases	pancreas small intestine	lipids → fatty acids and glycerol	small intestine

The effect of pH on enzymes

Different enzymes have different **optimum** pH values.

This allows enzymes to be adapted to work well in environments with different pH values. For example, the stomach produces hydrochloric acid. Enzymes in the stomach work most effectively in acid conditions.



Bile

Bile is produced in the liver and stored in the gall bladder. From there, it is released into the small intestine.

Bile has two main roles in digestion:

- It creates alkaline conditions – to allow small intestine enzymes to work effectively.
- It emulsifies fats – increasing the surface area of fats for lipase enzymes to act on.

Use of enzymes in the home and industry

Some microorganisms produce useful enzymes that we can use in our homes or in industry, for example:

Use	Enzymes used	Advantages
biological detergents	proteases and lipases	work best at low temperatures, saving electricity
baby food	proteases	pre-digest some of the protein in the food, making it easier for the baby to digest
lower-calorie foods	isomerases (Convert glucose syrup into fructose syrup)	fructose is much sweeter than sugar so less needs to be added to food products

Tips from revision expert Primrose Kitten in every unit

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International GCSE
Chemistry Revision Guide

Interleaved retrieval questions check that knowledge is secure and improve long-term retention

Retrieval

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.

C5 questions	Answers
1 What is electrolysis?	process of using electricity to extract elements from a compound
2 What is an electrode?	the end of a circuit which is placed in the electrolyte
3 What is an electrolyte?	the liquid or solution that electrolysis is carried out in
4 What is the cathode?	the negative electrode
5 What is the anode?	the positive electrode
6 Where are metals formed?	at the cathode
7 Where are non-metals formed?	at the anode
8 How can ionic substances be electrolysed?	by melting or dissolving them
9 Why can solid ionic substances not be electrolysed?	they do not conduct electricity
10 In the electrolysis of aluminium oxide, why is the aluminium oxide mixed with cryolite?	to lower the melting point
11 In the electrolysis of aluminium oxide, why do the anodes need to be replaced?	they react with the oxygen being formed
12 In the electrolysis of solutions, when is the metal not produced at the cathode?	when the metal is more reactive than hydrogen
13 In the electrolysis of solutions, what is produced at the anode?	a halogen or oxygen
14 What are the three products of the electrolysis of sodium chloride solution?	hydrogen, sodium hydroxide, chlorine
15 What are the reasons for electroplating a metal?	increase durability, improve desirability, reduce corrosion

C5

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

Previous questions	Answers
1 What is the relative mass of a proton?	1
2 What is the relative mass of a neutron?	1
3 What is the relative mass of an electron?	0
4 How are covalent bonds formed?	atoms sharing electrons
5 How many electrons go into a covalent bond?	2 for a single bond, 4 for a double bond
6 Between which kinds of atom does covalent bonding occur?	non-metals
7 What are the three main types of covalent structure?	giant covalent, small molecules, large molecules
8 Describe the structure and bonding of a giant covalent substance.	billions of atoms bonded together with strong covalent bonds
9 What is an ion?	an atom that has lost or gained electrons

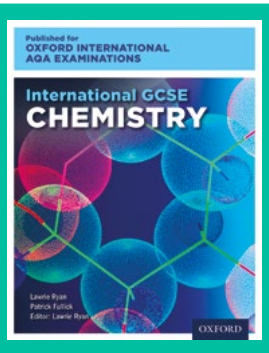
Put paper here

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.

Electrolysis	Worked Example	Practice
You need to be able to describe the method of electrolysis, and label the experimental set-up for electrolysis. Electrolysis uses electricity to break ionic compounds down into simpler compounds or elements. Metals or hydrogen are made at the negative electrode, and non-metal molecules are made at the positive electrode. You will need to be able to apply the principles of electrolysis to any example, as many solutions can undergo electrolysis. This includes predicting the products of electrolysis for different solutions, identifying which ions move to each electrode, and writing equations for the reactions at the two electrodes.	The electrolysis of aqueous sodium chloride gives three products. Identify these products and state how we can test for them. **Answer:** The three products are chlorine gas (Cl_2), hydrogen gas (H_2), and sodium hydroxide solution ($NaOH$). To test for hydrogen gas, collect the gas in a test tube and insert a glowing splint – it should burn with a squeaky pop noise. To test for chlorine gas, collect the gas in a test tube and insert damp litmus paper – the litmus paper will bleach white. Sodium hydroxide can be tested for using universal indicator – the solution will turn purple as sodium hydroxide is an alkali.	1 State what you would observe at each electrode during the electrolysis of copper(II) chloride. 2 Give the products of the electrolysis of sodium sulfate. 3 Explain why the electrodes must not touch each other during electrolysis.

Easy-to-use, visually appealing units structure content, with clear links and connections to aid understanding



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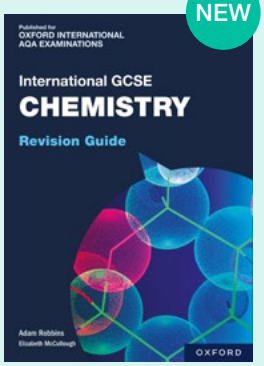

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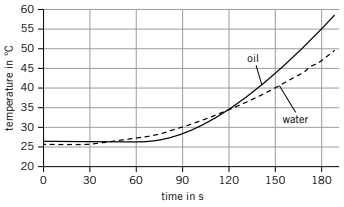
International GCSE
Physics Revision Guide

Plenty of exam-style questions, fully matched to OxfordAQA Assessment Objectives

11 A teacher shows data from an experiment involving heating oil and water (**Figure 5**).
The teacher wants to compare the liquids in terms of their specific heat capacity.

Figure 5



11.1 The teacher does not allow the students to conduct an experiment involving heating oil with a Bunsen burner. Suggest why. **[1 mark]**

11.2 Explain why the heater used to heat the liquids needs to have the same power. **[1 mark]**

11.3 Compare the relationships between temperature and time for the liquids. **[3 marks]**

11.4 Use the differences between the graphs to compare the specific heat capacity of oil and water.
State any assumptions that you have made. **[4 marks]**

Exam Tip
Look at the differences in the lines on the graph.

12 A student sees a demonstration involving gallium.
Gallium has a melting point of 29.8 °C.
A small piece of gallium melts in the palm of the demonstrator's hand.

12.1 Calculate the energy needed to raise gallium to its melting point.
Room temperature = 20 °C.
The specific heat capacity of solid gallium is 371 J/kg °C. **[3 marks]**

12.2 The demonstrator uses a second piece of gallium.
It has three times the mass of the first piece of gallium.
Calculate how much energy would need to be transferred to the second piece to raise it to its melting point. **[2 marks]**

12.3 Aluminium has a greater specific heat capacity than gallium.
Describe what you would notice about the temperature rise of 5 g of aluminium if you transferred the same amount of energy as calculated in **12.1**.
Explain your answer. **[2 marks]**

Exam Tip
You don't need to know the temperature of the demonstrator's hand, you only need to work out the temperature change.

13 One way to heat milk is to pass steam through it.

13.1 Suggest how a jet of steam heats a cup of milk. **[2 marks]**

13.2 The mass of milk in a cup is 242 g. The specific heat capacity of milk is 3.93 kJ/kg °C. Show that the energy required to heat the milk from 20 °C to 70 °C is about 48 kJ. Use an equation from the *Physics Equations Sheet*. **[4 marks]**

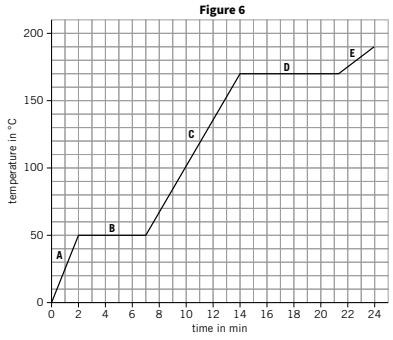
13.3 The specific latent heat of vaporisation of water is 2260 kJ/kg. Calculate the mass of steam that would need to condense into water to produce the energy calculated in **13.2** **[4 marks]**

13.4 Write down one assumption that you made when doing the calculation. **[1 mark]**

Exam Tip
Look out for non-standard units!

14 A substance is heated. **Figure 6** shows how the temperature of the substance changes with time. The straightline sections of the graph are labelled **A, B, C, D,** and **E**.

Figure 6



14.1 Write the letters of all the sections of the graph that show a change of state.
Explain why you have chosen these sections. **[4 marks]**

14.2 Did the substance start out as a solid or a liquid?
Explain your answer. **[2 marks]**

14.3 Write down the section of the graph where the vibration of the particles is increasing. **[1 mark]**

14.4 Write down the **two** sections of the graph where the kinetic energy of the particles is increasing. **[2 marks]**

Exam Tip
Question **14.1** is worth four marks – it gives you a clue to what the examiner is looking for and helps structure your answer:
- 1st mark, give letter showing change of state
- 2nd mark, explain why you chose that letter
- 3rd mark, give letter showing second change of state
- 4th mark, explain why you have chosen this letter