

Year 11 Science Knowledge Booklet

Term 3

Name:

Class:

Year 11 Knowledge and Pillars Test Timetable and Workbook Deadlines

Homework 1	13/01/2025	
Homework 2	27/01/2025	
Homework 3	10/02/2025	





Science Homework 1

Complete the section of the homework workbook identified on the front of this Knowledge organiser and learn the key knowledge questions and answers in this knowledge organiser ready for the knowledge quiz.

C6 Rate of Reaction

Big questions: How can the rate of a chemical reaction be changed?

What is the rate of reaction?

How can we increase the rate of reaction?

Why does putting food in the fridge keep it fresher for longer?

Why does concentration affect the rate of reaction?

Why do medicines come in pill form?

How do we easily increase rate in industry?

Do all reactions go to completion?

How can we control reversible reactions? (Higher Tier only)

Key vocabulary

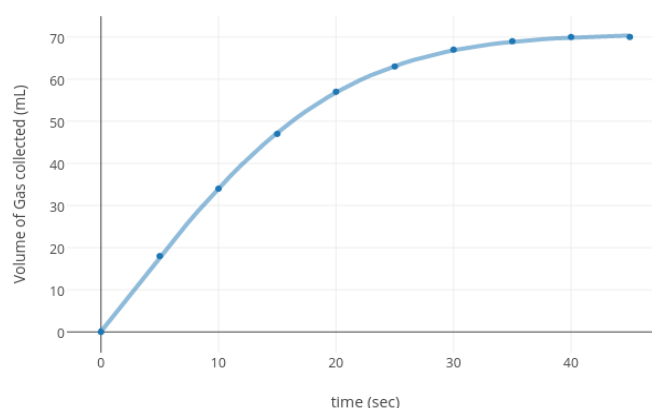
Collisions	Particles need to come together in order for a reaction to occur. For these collisions to be successful, they must have an energy greater than the activation energy
Activation energy	The minimum amount of energy needed for a collision to be successful to form the product.
Temperature	A measure of the average kinetic energy of the molecules. Increasing the temperature increases the average kinetic energy
Rate of reaction	The speed at which a reactant is converted into a product.
Pressure	Pressure is calculated by Force / area. In gases it is linked to the number of collisions per second with the container
Catalyst	A chemical that lowers the activation energy by providing an alternative route for the reaction to take place by. It is not used up in the reaction
Surface Area	The surface area is a measure of how many exposed particles are available to react.
Concentration	The number of particles present in a certain volume. Units are g/dm ³ or mol/dm ³
Limiting reactant	Whichever reactant is present in the smallest number of moles
Gradient	The steepness of the curve calculated by the change in y / the change in x (rise over run)
Plateau	The level (horizontal section) on a graph
Dynamic equilibrium (H)	When a reversible reaction reaches a point where the rate of the forward reaction equals rate of the reverse reaction in a closed system
Reversible	When the reactants can react to form the products but the reverse reaction can also take place.
Moles	A term used to describe the amount of a substance.
Closed system	Where the reactants and products cannot escape, e.g in a sealed container.

What is the rate of reaction?

Rate of reaction is the speed at which a reaction takes place. It measures the change in amount of substance per unit time

Ways to calculate rate of reaction:

- Rate = change in amount of reactant/time
- Rate = change in amount of product/time
- Rate = 1/time (used if there's a colour change or no gas is produced)



Initially a lot of gas is produced in a short period of time, this the initial rate

Over time, the gradient decreases → It is less steep showing the reaction has slowed down

The reaction stops (shown by graph plateauing)

Rate isn't consistent through a reaction, it changes throughout due to the amount of reactants changing with time (they get used up so less of them)

By drawing a tangent we can find the rate at a specific time

- Identify the **time** on the x axis and mark a dot on the curve at this time.
- Use a ruler to **draw a straight line** that only touches curve at this point.
- Pick two points on the straight line, draw lines to **make a triangle**.
- Calculate rise/run. (change in y / change in x)

How can we increase the rate of reaction?

Collision theory: Need to collide with correct orientation (right way round), and need to collide with an energy greater than the activation energy

The factors that affect the rate of reaction

- Concentration (of acid / alkali) or Pressure (gas) - the greater the concentration the more collisions per second. The particles have the same energy regardless of concentration
- Temperature - the particles have more energy. This increase the proportion of particles with an energy greater than the activation energy, whilst also increasing the number of collisions per second
- Surface area (of solid) - the greater the surface area the more collisions per second
- Catalyst - lower the activation energy. Although the particles have the same energy more particles now have an energy greater than the activation energy

Why does putting food in the fridge keep it fresher for longer?

Temperature is a measure of the average kinetic energy of the particles in a substance, by increasing the temperature we increase the average kinetic energy of the particles

Why does concentration affect the rate of reaction?

Concentration is the **number of particles** per unit of **volume**. A simple way of measuring the concentration is looking at the mass of a substance (solute) dissolved in water (solvent) The greater the concentration, the more reactant particles there are per unit of volume

Why do medicines come in pill form?

The surface area is important when using solids in a chemical reaction, as it affects the number of **exposed particles** that are **available** to react from the **start** of the reaction. Increasing the surface area increases the number of exposed particles from the start of the reaction

How do we easily increase rate in industry?

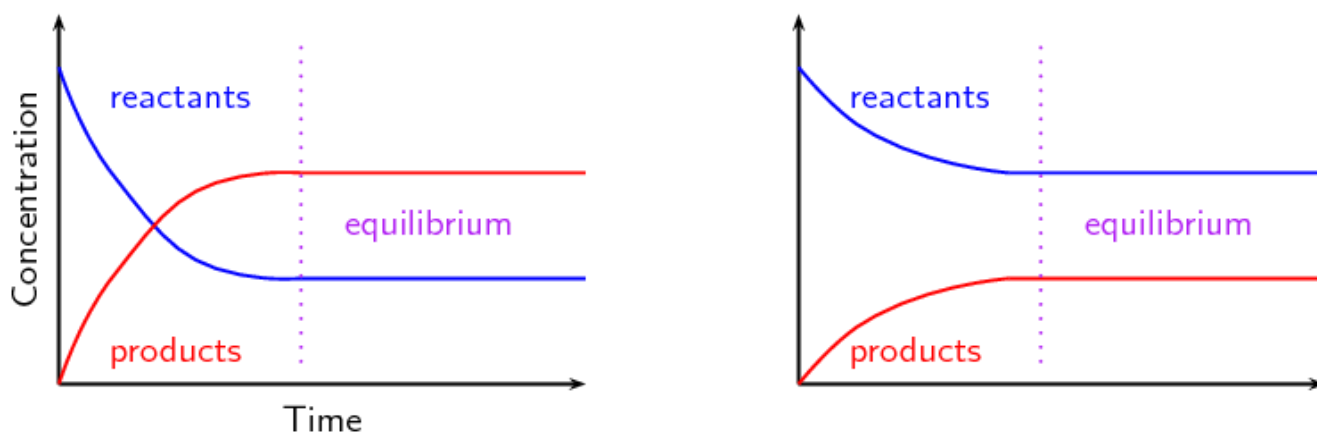
A **catalyst** is a substance that **lowers** the **activation energy** by providing an **alternative** route for the reaction to take place by. The particles **DO NOT** have any extra energy, nor are there more particles.

Do all reactions go to completion?

In **chemical** reactions, we typically represent the equation using an \rightarrow to show the reactants react to form the products. This arrow suggests that the reaction is **irreversible**, which is typical for many reactions. Reversible reactions are those where the products can react / breakdown to reform the reactants, ie the reverse reaction happen.

Dynamic equilibrium - Reaction is reversible, in a closed system. The rate of the forward reaction = rate of reverse reaction \rightarrow The concentration of each substance doesn't change

The appearance of the graph depends on which direction the equilibrium favours (it is rarely exactly in the middle)



We can make simple statements about equilibrium based on these graphs, in terms of which direction the reaction is favouring, just because it is in equilibrium does not mean that it favours reactants and products equally, it just means the concentrations of each stay constant (the reaction is still going).

How can we control reversible reactions? (Higher Tier only)

Temperature

When the Temperature of a closed system is **increased**, the equilibrium will shift in the **Endothermic** direction, therefore moving to **lower** the temperature and minimise the change.

When the Temperature of a closed system is **decreased**, the equilibrium will shift in the **Exothermic** direction, therefore moving to **lower** the temperature and minimise the change

When answering questions about temperature sometimes it is easier to think about the sides as being **HOT** (exothermic) or **COLD** (endothermic)

Le Chateliers principles put simply means you need to do the opposite to minimise the change. So if you want to shift equilibrium to the Exothermic (hot) side, cool it down by lowering the temperature. If you want to shift equilibrium to the Endothermic (cold) side, heat it up by raising the temperature.

Pressure

When the Pressure of a closed system is **increased**, the equilibrium will shift towards the side **with less moles of gas**, therefore moving to **lower** the pressure and minimise the change.

When the Pressure of a closed system is **decreased**, the equilibrium will shift towards the side **with more moles of gas**, therefore moving to **increase** the pressure and minimise the change.

When talking about **pressure**, we only care about the **moles of GAS**

Key knowledge question	Answer
What is the rate of a reaction?	The speed in which a chemical reaction takes place
How can the rate of reaction be calculated from a volume of gas produced?	rate = volume of gas produced/ time
If the initial rate of a reaction is being calculated, where would a tangent be drawn?	time = 0
What are the 4 factors that affect the rate of reaction?	temperature, concentration/pressure, surface area, addition of a catalyst
What happens to the rate of the reaction if the temperature of the reaction is increased?	increases the rate of reaction
Why does increasing the surface area increase the rate of reaction?	(More exposed particles) increases the frequency of collisions
How does a catalyst increase the rate of reaction?	lowers the activation energy, so more particles have the energy greater than the activation energy
What is collision theory?	Particles need to collide in the correct orientation and with enough energy in order to react
What symbol is used to show a reaction is reversible?	\rightleftharpoons



Science Homework 2

Complete the section of the homework workbook identified on the front and learn the key knowledge questions and answers for all of the areas covered in this knowledge organiser ready for the end of term test.

Wider reading

How to get the most out of your knowledge organiser:

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.
- There are several different things you can do
 - Look, cover, write, check, correct
 - Read through the organisers
 - Mind maps
 - Key spellings
 - Make a glossary
 - Missing out key words
 - Questions/answers answers/questions
 - Flash cards
 - Revision clock learning
 - Mnemonics

Science Learning Tools and wider study:

The Oak Academy – Online Science lessons

BBC Bitesize science

You tube channels:

Fuse school

Ted talks

Free science lessons

Primrose Kitten

Shows on Netflix

Our planet

Tiny creatures

A life on our planet

P7 Magnetism and Electromagnetism

Big questions:

- What is the difference between a magnet and a magnetic material?
- What do magnetic field patterns tell us?
- How are electromagnets made?
- What is the motor effect?
- How do electric motors work?

Key vocabulary

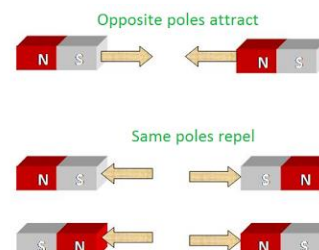
Commutator	A split ring of metal used to reverse the current applied to a motor every half turn. This keeps the motor spinning in one direction.
Electric motor	A device that uses electric current and permanent magnets to produce continuous motion.
Electromagnet	A magnet made by passing an electric current through a wire.
Induced magnetism	Magnetism that is created in a material when another magnet is brought near to it.
Magnetic field	The region around a magnet where the magnetic effect can be felt. Magnetic fields are shown as field lines drawn from the north to the south pole.
Magnetic material	A material that is attracted to a magnet. Magnetic materials can be used to make permanent or temporary magnets. Iron, steel, cobalt, nickel are magnetic materials.
Magnetic pole	The parts of a magnet where the magnetism is strongest . The north pole of a magnet is the pole that is attracted to the north pole of the Earth.
Motor effect	When a wire carrying an electric current is put near to the poles of a magnet the wire experiences a force. This is called the motor effect .
Permanent magnet	An object that attracts magnetic materials and attracts and repels other magnets. A magnet that does not lose its magnetism when the magnetizing force is removed. Steel, cobalt and nickel can be used to make permanent magnets.
Solenoid	An electromagnet made from a long, straight coil of wire. When a current flows the solenoid acts like a bar magnet.

- **What is the difference between a magnet and a magnetic material?**

Magnets attract magnetic materials like iron, steel, cobalt and nickel.

Magnets attract and repel other magnets.

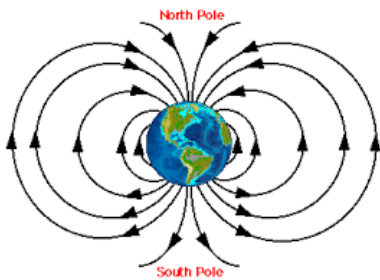
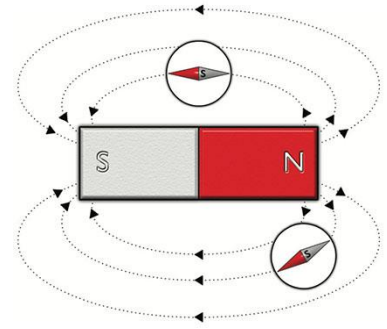
The magnetism is strongest at the poles. The poles are labelled north and south. The North pole is attracted to the north pole of the Earth.



• **What do magnetic field patterns tell us?**

The region around a magnet where the magnetic force can be felt is called the magnetic field.

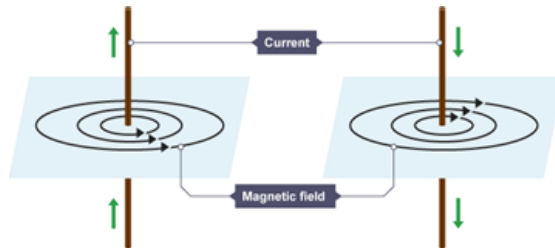
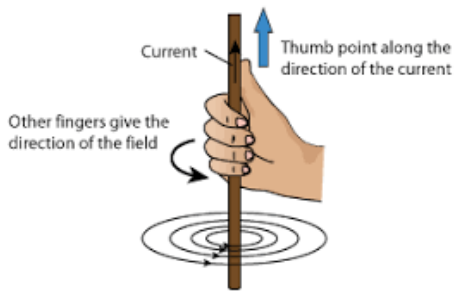
Plotting compasses can be used to show the pattern of a magnetic field.



The **Earth's magnetic field** is similar to a bar magnet with the earth's North pole being a magnetic south pole.

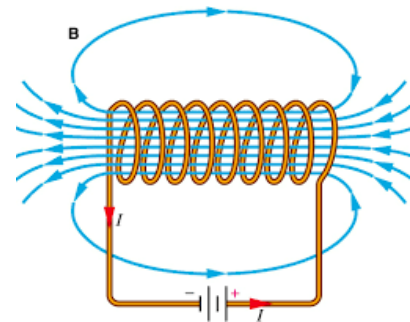
• **How are electromagnets made?**

A wire has a magnetic effect if a current is flowing in the wire. The field is circular around the wire. Its direction is given by the right-hand grip rule.



A **solenoid** is a long, straight coil of wire. When a current flows it has a magnetic field like a bar magnet.

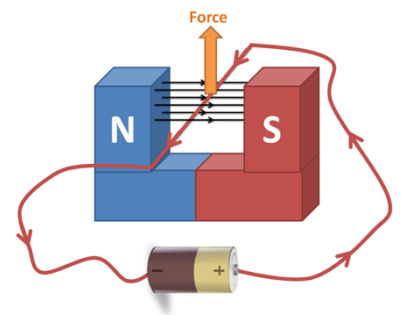
- Magnetic field similar to bar magnet.
- Field strongest where field lines closest.



• **What is the motor effect?**

A wire carrying an electric current experiences a force in a magnetic field.

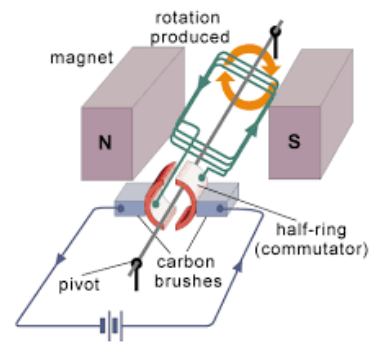
- The force is bigger if the current is bigger.
- The force is bigger if the magnetic field is stronger.
- The force is bigger if the wire is at right angles to the field lines.



- **How do electric motors work?**

- Current flows in the coil - the coil becomes magnetic.
- Flemings left hand rule gives direction of force.
- One side moves up, one side moves down.
- Split-ring commutator reverses the current flow to continue the spin past half-way.
- Motor is faster if more current; more turns of wire on the coils; stronger magnets.

AC motors have slip rings. The current changes directions so no need for commutator.





Science Homework 3

Complete the final section of the homework workbook identified on the front and learn the key knowledge questions and answers for all of the areas covered in this knowledge organiser ready for the end of term test.

Key knowledge question	Answer
What is a permanent magnet	A magnet that produces its own magnetic field
What is an induced magnet	A material that becomes magnet when it is placed in a magnetic field
The force between like poles of a magnet is _____?	Attractive (attraction)
The force between unlike poles of a magnet is _____?	Repulsive (repulsion)
Where is the magnetic field of a magnet strongest?	At the poles
Name three magnetic materials	Iron/steel, cobalt, nickel
Give two ways to show the magnetic field of a magnet	Iron filings, plotting compasses
Give one way to increase the strength of the magnetic field around a wire	increase the electric current
Give three ways to increase the strength of the magnetic field around a coil of wire (solenoid)	increase the current, increase the number of turns (coils), add an iron core
What do the first finger, second finger and thumb represent in Flemming's left hand rule	First finger: field, second finger: current, thumb: force
Give the equation that links force, magnetic flux density, current and length for a wire in a magnetic field.	Force = magnetic flux density x current x length $F = B I l$
Give three ways to increase the speed of an electric motor	increase the current, increase the number of turns (coils), increase the strength of the magnetic field, add an iron core



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