

Year 9 Science Knowledge Booklet

Term 4

Name:

Class:

Homework 1 Due: 3rd March

Homework 2 Due: 17th March

Homework 3 Due: 31st March





Science Homework 1

Read all of this knowledge organiser. The work covered will be in the first knowledge quiz of the term.

P2 Electricity

Big questions: What is electricity?

- Why do circuits need to be loops?
- What is electric current?
- What does potential difference tell us in a circuit?
- How does the resistance of components affect current?
- How are current and potential difference connected?
- What is Ohm's law?
- What is a series circuit?
- What are the patterns in circuits with two loops?
- How do you calculate power in a circuit?

Key vocabulary

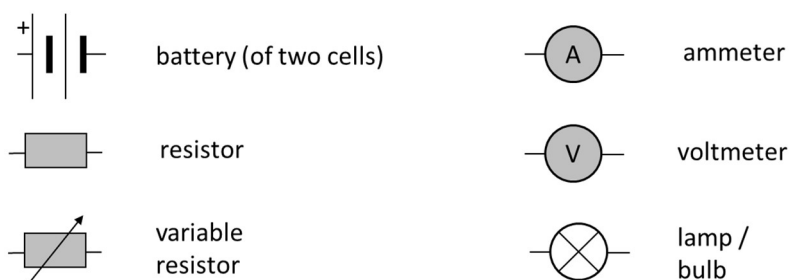
Electric current	The flow of electric charge around a circuit. Electric current carries energy transferred from the cells. Measured in amps, A.
Series circuit	A single loop of a circuit with the components following one after another. The current is the same all around the loop.
Voltmeter	A meter to measure potential difference. Voltmeters are connected in parallel with the component they are measuring in their own loop.
Light dependent resistor	A device whose resistance goes down when the amount of light goes up. They are useful in light sensing circuits such as automatic street lights.
Potential difference	The energy per coulomb transferred between two points in a circuit. Measured in volts, V
Parallel circuit	A circuit with more than one loop. The current from the cells divides at the junction.
Variable resistor	A resistor whose value can be changed (varied). They can control the current in a circuit to make it bigger or smaller.
Alternating current	Electric current that rapidly changes direction. Mains electricity is 50Hz ac – it changes direction 50 times a second.
Resistance	How much a component in a circuit slows down the current. It is found by dividing the potential difference by the current. Measured in ohms, Ω
Ammeter	A meter to measure electric current. Ammeters are connected in series in the loop they are measuring.
Thermistor	A device whose resistance goes down when the temperature goes up. They are useful in temperature sensing circuits like thermostats.
National grid	The network of overhead cables and transformers that connects power stations and our homes to provide us with electricity.

Why do circuits need to be loops?

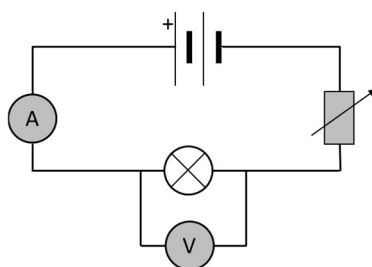
Electric circuits transfer energy.

- Energy is transferred from a power supply or battery to a device like a bulb, a heater or motor.
- Energy is transferred by the electric current.
- The current must flow from the power supply to the device and then back to the power supply. This is called an electrical circuit. The circuit must be a complete loop.
- If it not a complete circuit, current will not flow.

Symbols are used to represent the components in an electrical circuit.



Circuits are drawn neatly with a ruler and pencil.



What is electric current?

Electric current is rate of flow of charge. In metal wires, the charges that flow are electrons. Electrons are negatively charged.

An ammeter connected in series is used to measure the electric current. The unit of current is amps (A).

What does potential difference tell us in a circuit?

Potential difference is a measure of the amount of energy supplied into or out of the circuit between two points.

A voltmeter connected in parallel across a component is used to measure the potential difference. The unit of potential difference is volts (V).

How does the resistance of components affect current?

Resistance is the opposition to the current. As resistance increases, current decreases. The unit of resistance is ohms (Ω).



Science Homework 2

Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

Key knowledge question	Answer
How is resistance defined?	
If resistance in a circuit increases what happens to the current?	
What is the equation that links potential difference, current and resistance?	
What is current?	
What is the unit of current?	
What is the unit of potential difference?	
What is the unit of resistance?	
What meter is used to measure potential difference?	
What meter is used to measure current?	
What is the equation that links power, current and potential difference?	

How are current and potential difference connected?

As potential difference increases, current increases.

What is Ohm's law?

Ohm's Law: current is directly proportional to potential difference for a fixed resistor at constant temperature.

We can use the equation:

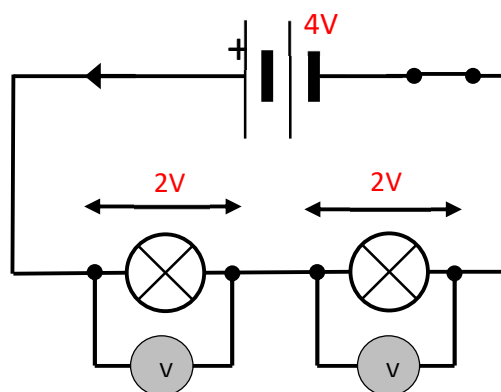
Potential difference = current x resistance

$$V = IR$$

What is a series circuit?

A series circuit has just one loop – one path for the current to take. Current is the same at all points in a series circuit.

The potential difference supplied by a battery is shared between the components in the circuit.

**What are the patterns in circuits with two loops?**

A parallel circuit has two or more loops – two or more paths for the current to take.

When two paths meet, the currents add together.

The potential difference across each branch is the same.

How do you calculate power in a circuit?

Power is a measure of how much energy is transferred each second.

Power = current x potential difference

$$P = IV$$

Key knowledge question	Answer
How is resistance defined?	The opposition to the flow of current
If resistance in a circuit increases what happens to the current?	It decreases
What is the equation that links potential difference, current and resistance?	$V = IR$ potential difference = current x resistance
What is current?	The rate of flow of charge
What is the unit of current?	Amps (A)
What is the unit of potential difference?	Volts (v)
What is the unit of resistance?	Ohms (Ω)
What meter is used to measure potential difference?	A voltmeter
What meter is used to measure current?	An ammeter
What is the equation that links power, current and potential difference?	$P = IV$ Power = current x potential difference

C8 Chemical Analysis**Big questions:**

What is the difference between a pure substance and a formulation?

How can we separate pure substances?

How do we test for common gases?

Key vocabulary

Carbon dioxide	A gas that turns limewater from clear to cloudy white.
Chromatography	A method of separating substances with different solubilities.
Chlorine	A gas that turns damp blue litmus paper white
Formulation	A mixture designed to be a useful product
Hydrogen	A gas that burns with a pop.
Insoluble	A substance that does not dissolve
Mixture	Two or more substances not chemically bonded together
Mobile phase	The solvent in chromatography that moves through the paper (this is usually water).
Oxygen	A gas that relights a glowing splint.
pure	In everyday life: not contaminated, not mixed with anything In chemistry: a single element or compound, with a fixed boiling point.
Rf value	A value from which a substance can be identified. $\text{Rf value} = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$
Start line	The pencil line in chromatography on which the substances are put. The line is drawn in pencil as pencil does not dissolve.
Solubility	How easily a substance dissolves in a solvent
Solute	A substance that dissolves (or is soluble)
Solvent	A liquid in which a solute dissolves
Solvent line (front)	The distance the solvent moved through the paper from the start line.
Stationary phase	The paper in chromatography that does not move, and to which substances are attracted

What is the difference between a pure substance and a formulation?

The majority of substances used in everyday life are mixtures, which means that they are made up of more than one type of substance that is not chemically bonded to the other.

Each substance has a specific melting/boiling point if it is pure, and mixtures retain many of the original properties of the individual substances. However, the melting / boiling points can be altered, like adding salt to water to lower the melting point or increase the boiling point.

In everyday life, many products are complex mixtures that require specific amounts of each substance to ensure consistency in the product. For example, medicines, foods and drinks, fuels and alloys.

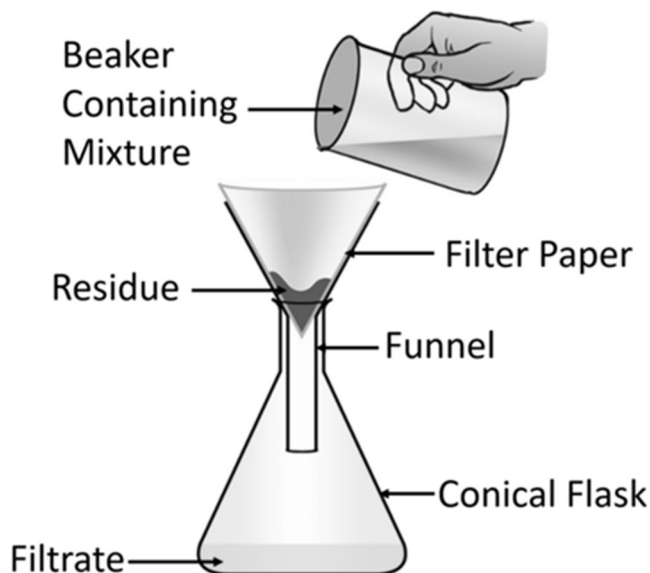
In a formulation, every chemical has been added in a carefully measured amount. Each chemical has a specific purpose in the formulation. With formulations, each component is there for a specific purpose. E.g in medicines the substance that is actually needed to treat a condition is referred to as the active ingredient.

How can we separate pure substances?

In mixtures, the different substances are not chemically bonded together. Because of this, they can often be separated by relatively simple techniques.

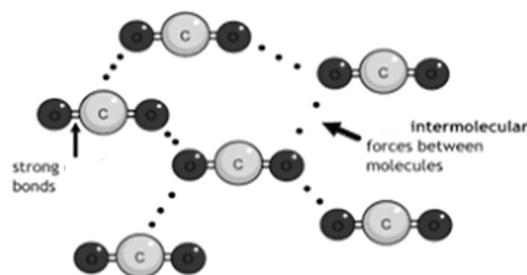
Filtration

- Filtration can be used to separate a liquid from an insoluble solid.
- It is also used to separate a solution from a solid that is mixed with it, but not dissolved.



Evaporation

- Evaporation is the process where a liquid turns into a gas.
- The intermolecular forces in the liquid are overcome and broken; separating the particles.



What is the difference between boiling and evaporation?

- Boiling occurs at the boiling point of a substance.
- It is typically accompanied by bubbling as the gas escapes the liquid.

Distillation

- **Soluble solids and liquids** – the solvents will evaporate and leave the solid in the round-bottomed flask
- **Liquids of different boiling points** - the liquid with the lower boiling point will evaporate off; leaving the liquid with the higher boiling point in the round-bottomed flask.

2) Gas particles are free to move around the container, so they rise and leave the round-bottomed flask.

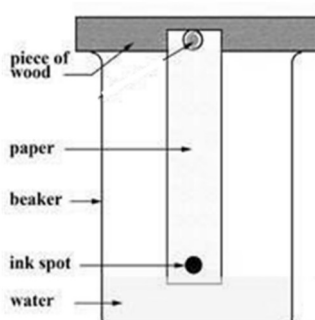
1) The solvent starts as a liquid, and as it's heated it will evaporate and become a gas.

3) The condenser has cold water running through, and so the cold surface makes the gas condense and become a liquid.

4) The liquid solvent is collected in the conical flask. This is called the **distillate**.

Chromatography

- Chromatography is used as a way of checking to see if a substance is a mixture or pure, and as a means of comparing one unknown against known substances.
- If different solutions are mixed together, they can also be separated by their solubility.





Science Homework 2

Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests

Key knowledge question	Answer
In science what is a pure substance?	
How can we show that substance is pure when heating?	
How can we separate an insoluble solid from a liquid?	
How can we separate a soluble solid from a solution?	
How can we separate two liquids with different boiling points?	
How can we separate two different dyes?	
In chromatography, what is the stationary phase?	
In chromatography, what is the mobile phase?	
How can we calculate the R_f value?	
Describe the test for hydrogen	
Describe the test for oxygen	
Describe the test for carbon dioxide	
Describe the test for chlorine	

How do we test for common gases?

You need to know how to test for some common gases.

Test	Observation	Inference
Glowing splint held in a test tube	Splint relights	Oxygen is present
Lighted splint held in a test tube	Pop sound heard	Hydrogen is present
Gas bubbled through limewater	Limewater turns milky or cloudy white	Carbon dioxide is present
Damp litmus paper held in a test tube	Paper turns white	Chlorine is present

Why are scientists concerned about rising CO₂ levels?

Why is methane production a concern?

Key knowledge question	Answer
In science what is a pure substance?	A pure element or compound is not mixed with any other substance,
How can we show that substance is pure when heating?	Pure substances melt and boil at specific temperatures
How can we separate an insoluble solid from a liquid?	Filtration
How can we separate a soluble solid from a solution?	Evaporation/crystallisation
How can we separate two liquids with different boiling points?	Distillation
How can we separate two different dyes?	Chromatography
In chromatography, what is the stationary phase?	The paper
In chromatography, what is the mobile phase?	The water
How can we calculate the R_f value?	$R_f = \text{distance to spot} / \text{distance to solvent front}$
Describe the test for hydrogen	A lit splint causes a squeaky pop
Describe the test for oxygen	A glowing splint relights
Describe the test for carbon dioxide	Limewater turns from colourless to cloudy white
Describe the test for chlorine	Damp blue litmus paper bleaches white