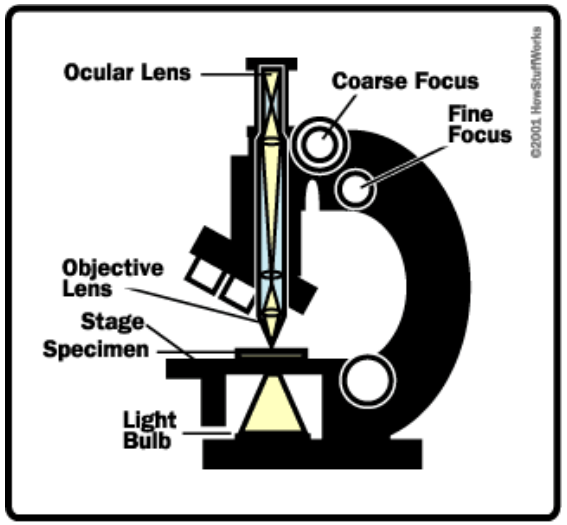
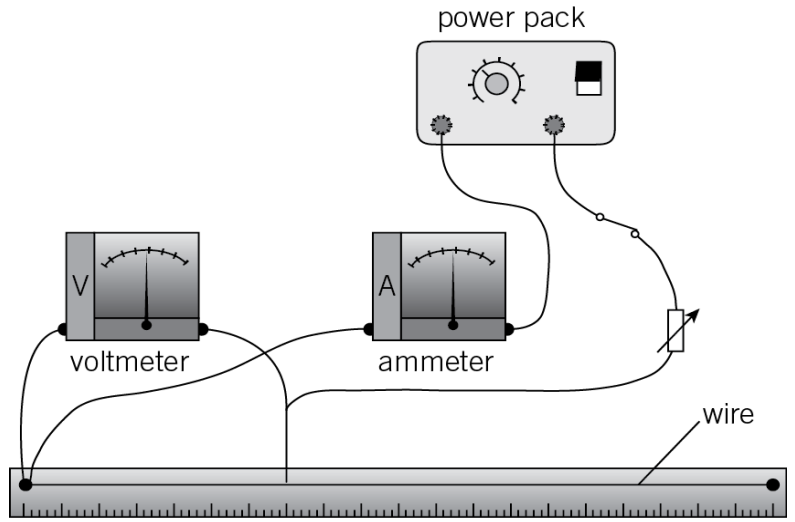
GCSE Required Practical Handbook- Higher





Required practical's: Biology Paper 1

1.Food test

https://www.youtube.com/watch?v=akMLGbNA0gE&list=PLAd0MSIZBSsF3vV_uxzbcNHuDrQ6Hc-Ul&index=4

2. Enzymes

https://www.youtube.com/watch?v=8Yqbu56ImXk&list=PLAd0MSIZBSsF3vV_uxzbcNHuDrQ6Hc-Ul&index=8

3. Photosynthesis

https://www.youtube.com/watch?v=id0aO_OdFwA&list=PLAd0MSIZBSsF3vV_uxzbcNHuDrQ6Hc-Ul&index=2

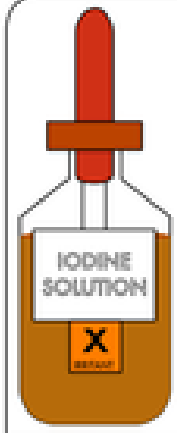
GCSE Required Practical – Biology 1 – Food Tests

What's the point of the practical?

To find out if sugars, starch and/or proteins are in certain foods.

Example Apparatus and results

BIOCHEMICAL (FOOD) TESTS

CHEMICAL	TESTS FOR ...?	HOW TO CARRY OUT THE TEST	RESULT	CHEMICAL	TESTS FOR ...?	HOW TO CARRY OUT THE TEST	RESULT
	Starch	1.) Add the iodine solution directly to the substance to be tested (in solid or liquid form) and look for a colour change.	Turns blue black with starch		Protein	1.) Add Biuret's to the solution/ suspension to be tested and look for a colour change.	Turns purple with protein
	Reducing Sugar	1.) Add Benedict's to the solution/ suspension to be tested. 2.) Heat for 2 mins in a water bath at boiling point and look for a colour change.	Turns brick red with reducing sugars (green/ yellow/ orange if less sugar present)		Lipid (known as the Emulsion test)	1.) Add ethanol to the solution/ suspension to be tested and shake thoroughly. 2.) Then add water and look for a colour change.	Turns cloudy/ milky with lipid

What may they ask us about?

- Qualitative test (tell you just yes/no) vs Quantitative (tells you how much) tests.
- Sources of error – how could you make mistakes?
- Why is it hard to judge colour change accurately?
- Resolution of measurements, repeatability, reproducibility etc.

GCSE Required Practical – Biology 1 – Investigating amylase enzyme

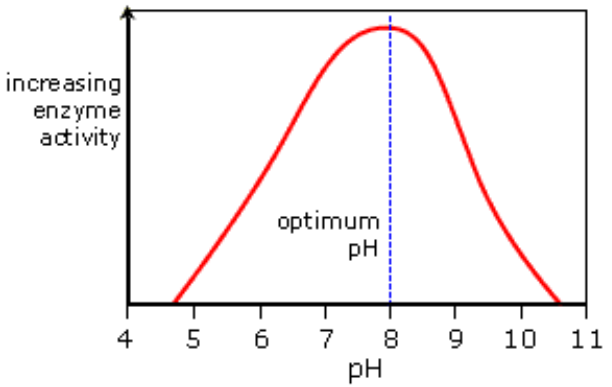
Enzyme: a biological catalyst. Speeds up reactions in the body by lowering the activation energy.
pH: how acidic or alkali a substance is (1 = strong acid, 7=neutral, 14 = strong alkali)
Amylase: an enzyme that breaks down starch into sugar

What's the point of the practical?

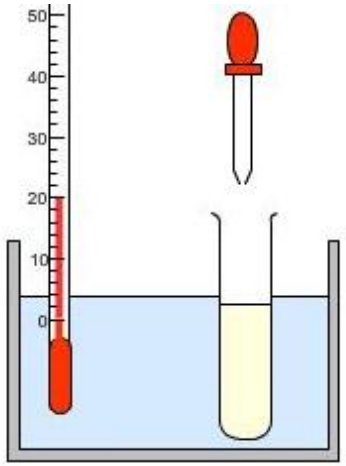
To find out what happens to the rate of enzyme activity when the pH changes.

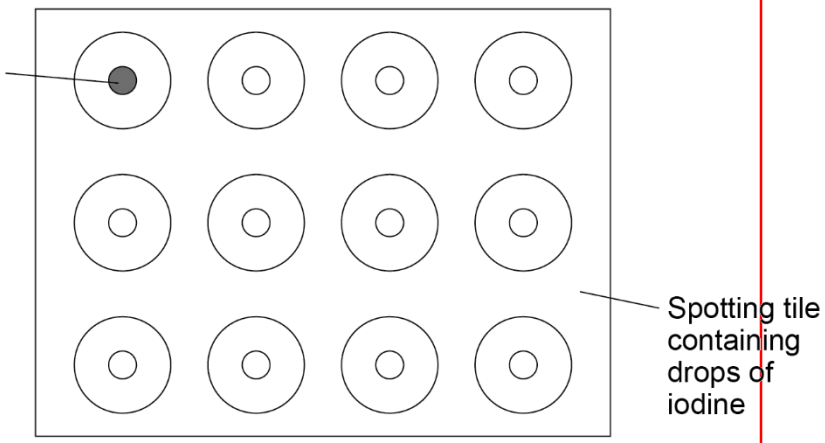
Results

- At low pH and high pH, the iodine keeps turning black because the enzyme has been denatured.
- After just a few minutes at pH 7-9, the iodine stays brown – the starch has all broken down into sugar.



Example Apparatus





- Starch reacts with amylase in a water bath
- Take samples from the mixture every 30 seconds and add it to iodine
- Iodine goes black = starch present
- Iodine stays brown = no starch present (it's reacted)

What may they ask us about?

- Why do you need a water bath? *(To maintain the correct temperature, because temperature affects reaction rate)*
- If you test at pH 3,4,5,6,7,8,9 and 10, Why don't we know the exact optimum pH? *(because although two answers may both show quick reactions (e.g. pH7 and pH8), the actual optimum could be between those number (e.g. pH 7.6) so you need to test different pH's to find out the exact optimum.*
- Sources of error and weaknesses – e.g. in measuring, starting and stopping timers etc

GCSE Required Practical – Biology 1 – Light and Photosynthesis

Photosynthesis: when plants use carbon dioxide and water to make glucose (and oxygen). Happens in the chloroplast and needs light to happen.

What's the point of the practical?

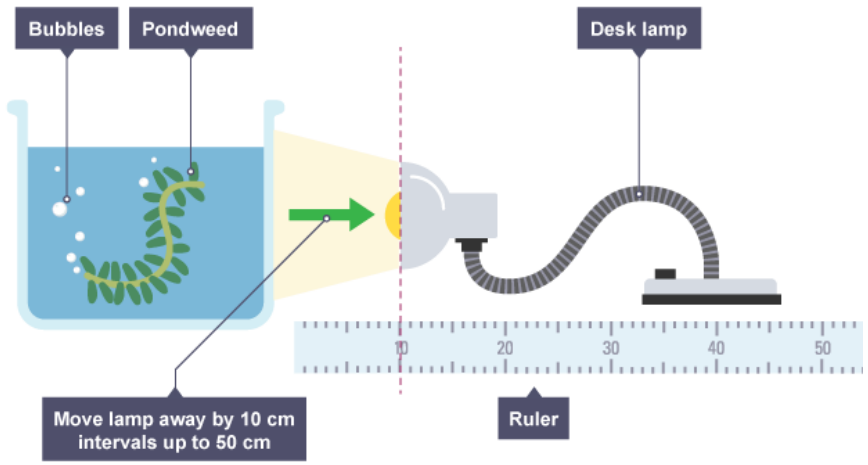
To find out what happens to the rate of photosynthesis when we change the light intensity

Photosynthesis

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

carbon dioxide + water → glucose + oxygen

Example Apparatus



Results

- The closer the lamp, the quicker the bubbles are produced (so higher rate of photosynthesis)

What may they ask us about?

- Why results may be inaccurate (*difficult to count very small bubbles, each bubble counts as '1' no matter how big it is*)
- Why should you leave the plant for a few minutes before starting to count bubbles (*as it takes time for the plant to adjust to the light/temperature and for photosynthesis to reach the correct rate*).
- Heat from the lamp is a source of error, how could you avoid this? (*Place a glass screen in front of the beaker so that light gets through but heat doesn't*)
- What are the other limiting factors apart from light? Why will rate of photosynthesis level off, even with maximum light? (*The plant also needs enough temperature and CO_2*)

Required practical's: Chemistry Paper 1

1. Making a salt

https://www.youtube.com/watch?v=qIOMlwBoe_4&list=PLAd0MSIZBSsF3vV_uxzbcNHuDrQ6Hc-Ul&index=1

2. Electrolysis

https://www.youtube.com/watch?v=tCHE_7QeRUc&list=PLAd0MSIZBSsEygAZyDRkK0PgQZ6uiC98F&index=6

3. Temperature change in solution

https://www.youtube.com/watch?v=tKxcQYZ2YH8&list=PLAd0MSIZBSsEygAZyDRkK0PgQZ6uiC98F&index=5

GCSE Required Practical –Chemistry 1 – Making a salt from a carbonate or oxide

Salt: an ionic substance soluble: something that dissolves in water insoluble: something that doesn't dissolve in water

Acid + metal carbonate → metal salt + water + carbon dioxide

Acid + metal oxide → metal salt + water

What's the point of the practical?

To find out how to make a pure, dry sample of a soluble salt from an insoluble carbonate or oxide.

Results

- Hydrochloric Acid makes Metal Chlorides
- Sulfuric Acid makes Metal Sulfates
- Nitric Acid makes Metal Nitrates

What may they ask us about?

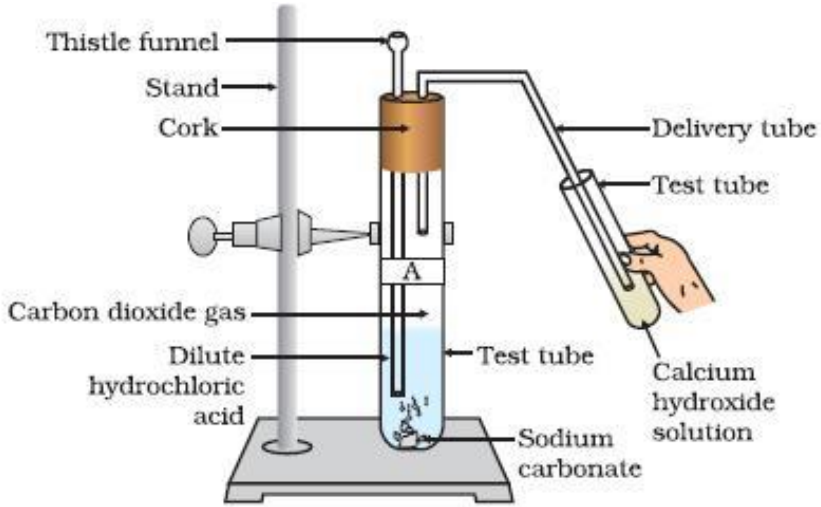
- How do you get solid crystals from the salt solution (*crystallize, evaporate the water*)
- Why do we heat the solution
- What are the risks and safety precautions
- Why do we filter the solution
- How could we test the pH of the salt solution?
- Name the salt produced.

Example Apparatus

Acid + Carbonate

Limewater (calcium hydroxide can be used

To show Co_z is produced



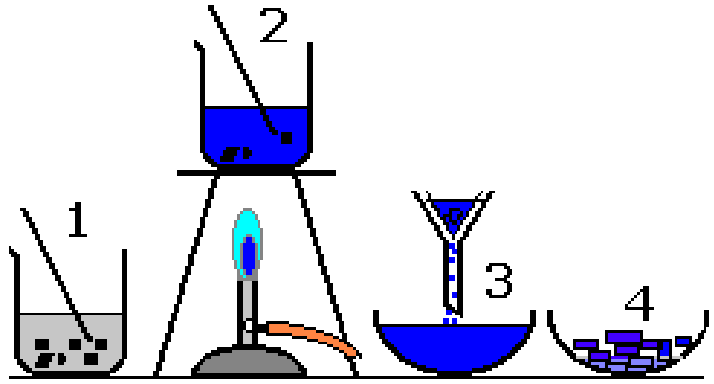
Acid + Metal Oxide

- Excess of metal oxide ac
- Need to heat the solution

to ensure as acid fully reacts with available metal oxide particles

- Then filter to remove

Excess metal oxide

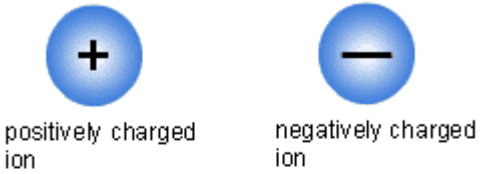


GCSE Required Practical – Chemistry 1 – Electrolysis

Electrolysis: when a salt solution is separated using electricity

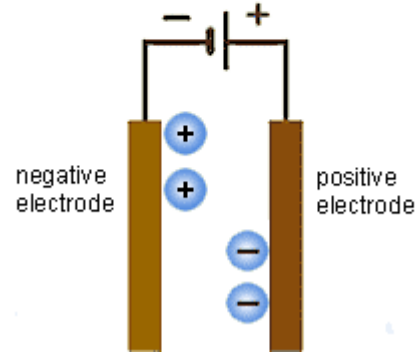
What's the point of the practical?
To find out how different solutions behave when electrolysed

What may they ask us about?
- How could you test the gas that is produced (*hydrogen = pop, chlorine = bleaches damp litmus paper).*
- What happens when the …….. Ions get to the ……. Electrode? (*positive ions are reduced – gain electrons. Negative ions are oxidised – lose electrons).*
- What would happen if you added universal indicator to the solution? (*turns purple – hydroxide is produced – alkali).*

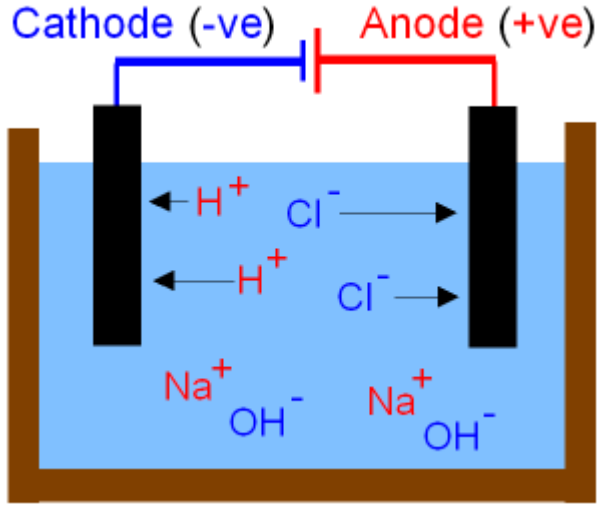


Example Apparatus
Molten compounds or less reactive salt solutions

- Positive ions to negative electrode. Negative ions to positive electrode. Easy.



More reactive metal solutions e.g. Sodium Chloride solution (Brine)
- If the metal is more reactive than Hydrogen
- Hydrogen is produced at the Negative electrode (instead of the metal).
- Metal hydroxide is produced In the solution.



GCSE Required Practical –Chemistry 1 – Temperature changes in solutions

Exothermic reaction: releases energy (heat exits) Endothermic reaction: absorbs energy (gets cold)

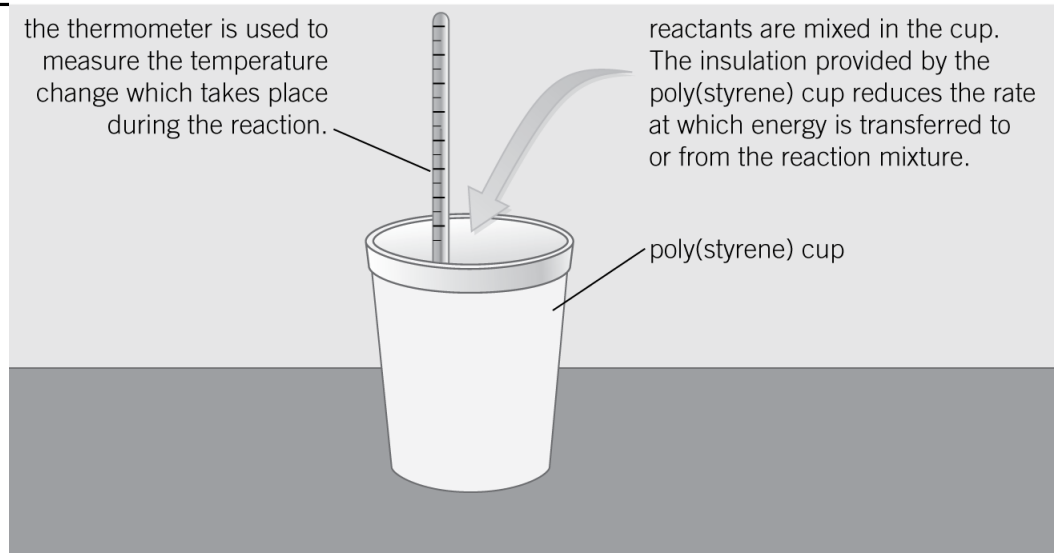
What's the point of the practical?

To find out how different variables affect energy changes in solutions.

Results

- Displacement reactions are exothermic
- Neutralisation reactions are exothermic

Example Apparatus



- Displacement (e.g. Copper Sulfate + Iron → Iron Sulfate + Copper)
- Neutralisation

(e.g. Hydrochloric Acid + Sodium Hydroxide → Sodium Chloride + Water)

What may they ask us about?

- Why do you use a polystyrene cup / lid? (*to reduce temperature loss to the surroundings - makes results more accurate)*
- Resolution and accuracy of measurements.
- Repeatability, calculating mean results, uncertainty etc

Required practical's: Physics Paper 1

1. Specific heat capacity

https://www.youtube.com/watch?v=loeRLKNeUsc&list=PLAd0MSIZBSsGNWKdHJdQYIndKl3HZUrSB&index=6

2.Electrical components

https://www.youtube.com/watch?v=ksPfzUjMbBk&list=PLAd0MSIZBSsGNWKdHJdQYIndKl3HZUrSB&index=10

GCSE Required Practical – Physics 1 – Specific Heat Capacity

Specific Heat Capacity: the amount of energy needed to raise the temp of 1kg by 1°C

What's the point of the practical?

To find out the specific heat capacity of a material.

(You'll need to heat it and work out how much energy has gone in.)

If you haven't got a joulemeter, but do have a ammeter, voltmeter or power meter you can work out the amount of energy by:

Energy = power x time

Power = current x potential difference

Results:

$$\text{specific heat capacity } c\ (\text{J/kg °C}) = \frac{\text{energy transferred } \Delta E\ (\text{J})}{\text{mass } m\ (\text{kg}) \times \text{temperature change } \Delta\theta\ (\text{°C})}$$

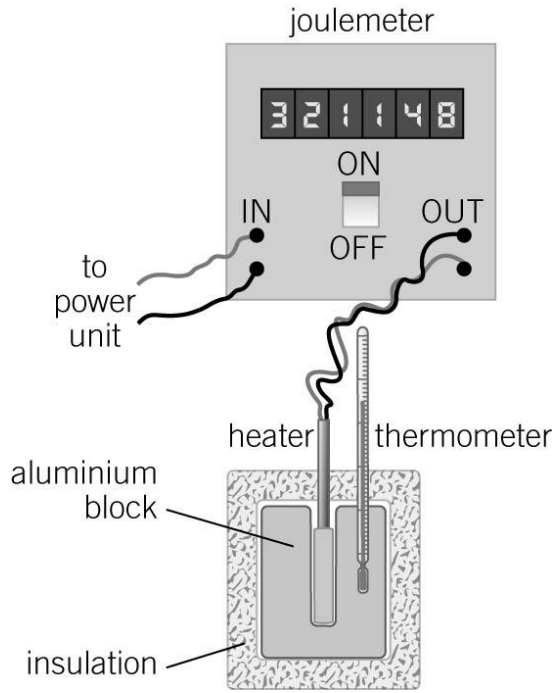
Example Apparatus

Joulemeter – measures energy going into the heater in joules

Heater – heats the block

Insulation – stops heat escaping into the atmosphere

Thermometer – measures the temperature rise



What may they ask us about?

Why do you need to insulate the block (*to stop heat loss to the atmosphere*)

Why is your answer not the true value (*because not all the heat was transferred into the block and through to the thermometer*)

Why is the temperature increase slower at first? *(because it takes some time for the block to heat up and for the heat to reach the thermometer.)*

It may not be a block of metal. You could use a kettle to heat an amount of water or any other way of heating something.

What's the **resolution** of temperature measurements? This experiment could be repeated and you'd get slightly different readings. They could ask about **repeatability** and ask you to calculate the **mean** or the **uncertainty**.

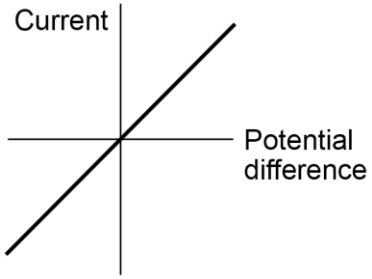
GCSE Required Practical – Physics 1 – Investigating Electrical Components (lamp, diode, resistor)

Component: part of a circuit Current: the flow of charge diode: only allows current to flow one way
Potential Difference (V): the energy transferred to part of a circuit by each coulomb of charge
Resistor: limits the current in a circuit

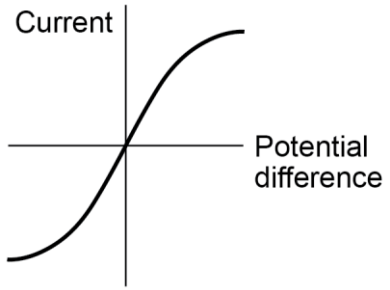
What's the point of the practical?

To find out how current and potential difference change in different components

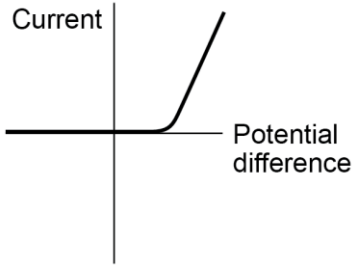
Results:



Resistor



lamp

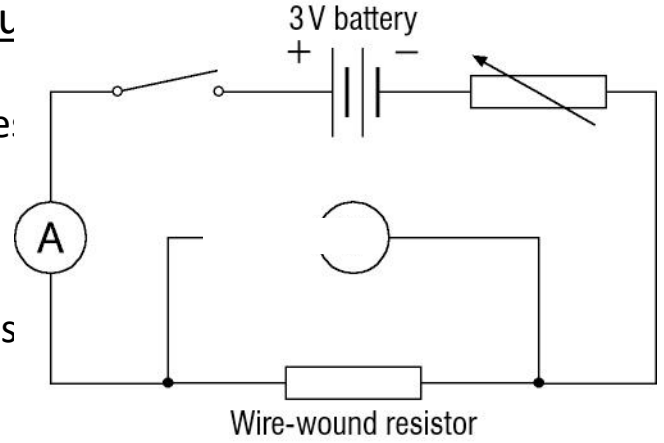


Diode

Example Apparatu

Voltmeter: measure the potential Difference

Ammeter: measures the current



Resistor: what we're testing. (can be replaced with a lamp, then a diode

What may they ask us about?

- Explain the pattern for each component (***resistor****: fixed resistance – more PD =more current.* ***Lamp:*** *more PD = more current but at high PD, the filament gets hot, ions vibrate so resistance increases and current levels off.* ***Diode****: current can only flow in one direction)*
- Resolution of measurements, repeatability, reproducibility, control variables etc etc

Required practical's: Biology Paper 2

1. Measuring population

https://www.youtube.com/watch?v=RhMOCxXcDrQ&list=PLAd0MSIZBSsHv1pioWRdg-pZCWTo84cdP&index=3

GCSE Required Practical – Biology 1 – Measuring population size

Population: all the individuals of a species in a particular area.
Distribution: how the individuals are 'spread out' across a certain area

Abiotic factors: non-living factors

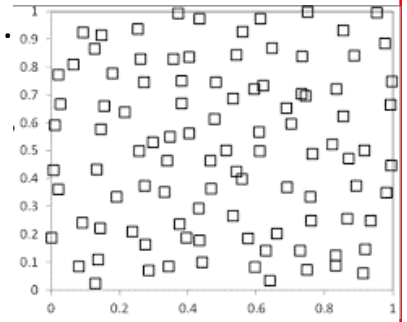
biotic factors: living factors

What's the point of the practical?

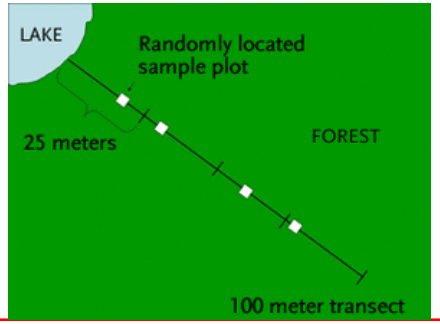
To find out how different factors affect how species are distributed

Results

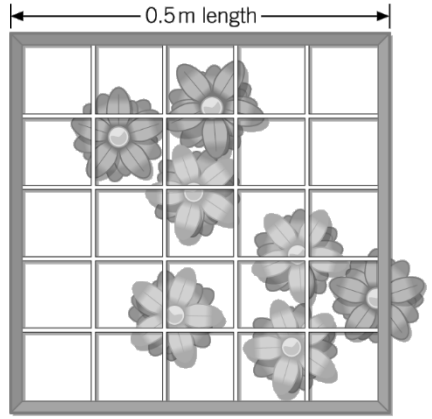
- Random sampling – used when you want to know how the organisms are spread out across an area.



- Line transect – used when you want to see how one particular feature (e.g. a river/road/building) affects an area. You take samples in a line (called a transect) and repeat to compare the difference near and far from the feature.



Example Apparatus



- Quadrat – frame of a certain size used to isolate a particular area so you can see what's in that certain space

What may they ask us about?

- Accuracy of measurements – is it 100% accurate?
- Reproducibility and validity of data – is it completely fair?
- Calculate means and work out the total number in a certain area.
- How could you improve the sample to make it more representative?

Required practical's: Chemistry Paper 2

1. Rates of reactions: Concentration

https://www.youtube.com/watch?v=Gl6LVl7oAlU

https://www.youtube.com/watch?v=ssa3wh3RNt0

2.Chromatography

https://www.youtube.com/watch?v=pnTGNAfu6GE

GCSE Required Practical –Chemistry 2 – How does concentration affect rate of reaction

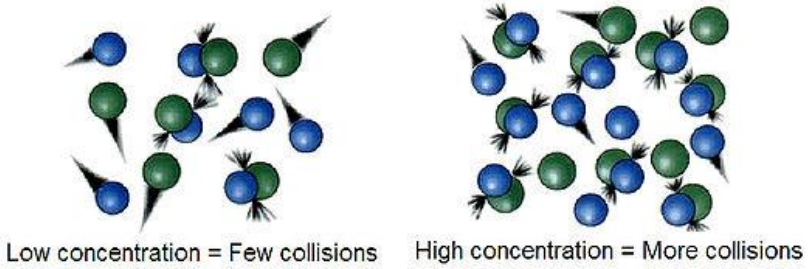
Concentration: the amount of substance in a certain space

What's the point of the practical?

To find out how changes in concentration affect the rate of reaction.

Results

- The higher the concentration, the faster the re

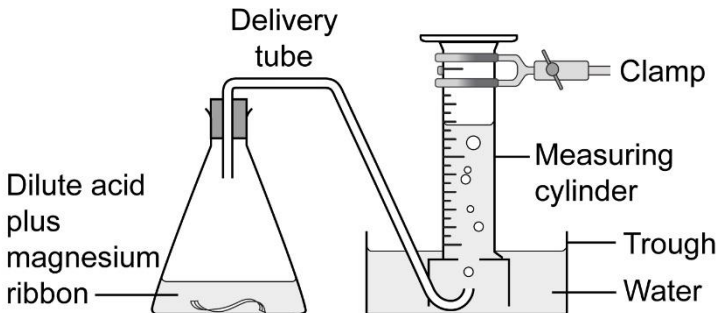


What may they ask us about?

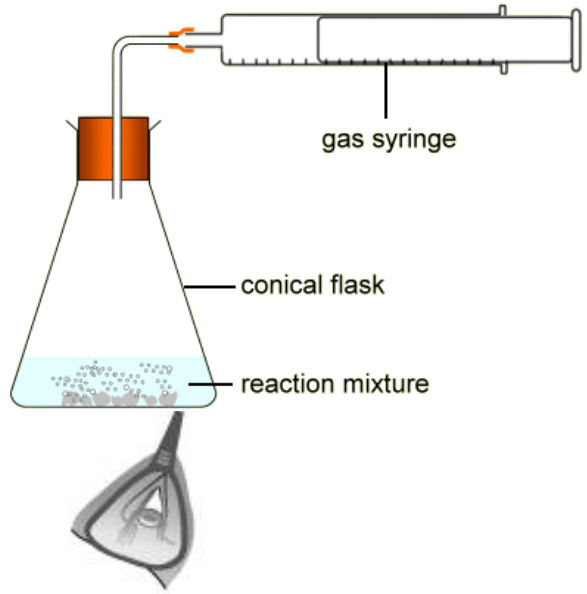
- What are the sources of errors that could lead to anomalous results? (*not getting the bung in quickly enough, starting the timer exactly on time etc)*
- Resolution and accuracy of measurements
- Control variables – just change the concentration – everything else has to stay the same (e.g. why must temperature be controlled)

Example Apparatus

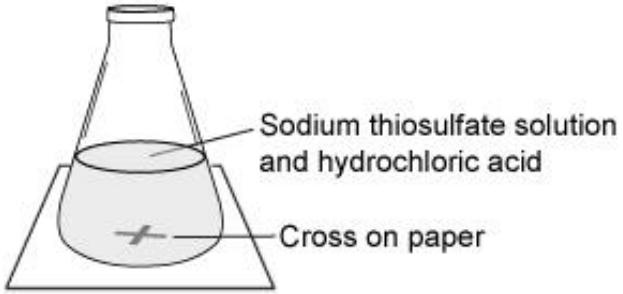
Measuring cylinder
- used to measure gas Production over time



Gas syringe - used to measure gas production over time



'Disappearing' cross – used to measure how quickly the colour changes



GCSE Required Practical –Chemistry 2 –Identifying substances using chromatography

Chromatography: the process where a dissolved substance is separated by running a solvent along a material (e.g paper)

What's the point of the practical?

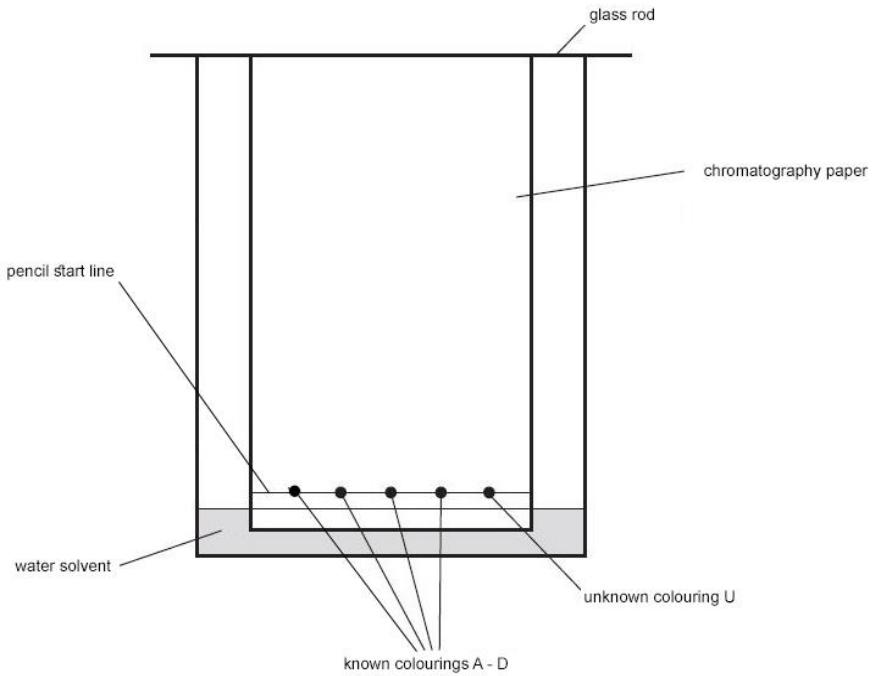
To separate substances and identify what they're made of

Results

- The substance moves up the paper (stationary phase). It is carried by the solvent (mobile phase). Each substance goes a certain distance

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Example Apparatus



What may they ask us about?

- Why must the start line be drawn in pencil? (*because pencil does not smudge/run in the solvent whereas pen would*)
- Why does there need to be a lid? (*to stop the solvent from evaporating*)
- Measure the R_f value – be accurate. Compare different substances with different R_f values. See what substances are contained in certain mixtures
- Sources of error, resolution or measurements etc

Required practical's: Physics Paper 2

1. Surface and radiation

https://www.youtube.com/watch?v=LFwio38EK9s&list=PLAd0MSIZBSsGNWKdHJdQYIndKl3HZUrSB&index=2

GCSE Required Practical – Physics 2 – Surfaces and radiation

Infrared Radiation: electromagnetic waves that heat things up.

Emit: when something **gives off** something

Absorb: when something takes in or soaks up something

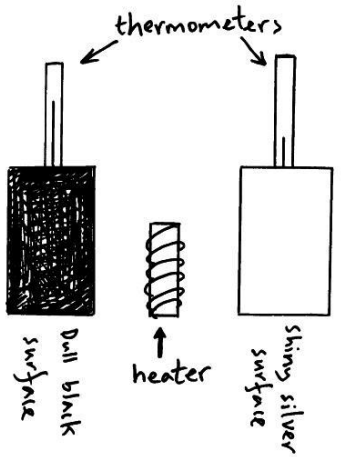
What's the point of the practical?

To find out how the colour and texture of the surface affects how much heat (radiation) is absorbed or emitted

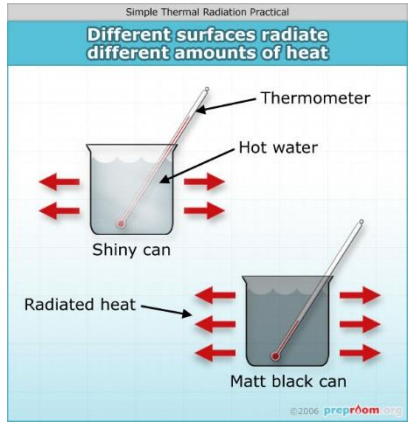
Results:

Matt black surfaces **absorb** and **emit** much more radiation than shiny smooth surfaces.

Example Apparatus



Heated from the outside



Heated from the inside

What may they ask us about?

- Independent, dependent and control variables (*same sizes, same volumes, same thickness, starting temp etc*)
- Why should you put lids on each container (*to reduce heat loss through convection)*
- Resolution of measurements *(1°C?),* repeatability, reproducibility, calculating means etc
- Why won't you get exactly the same measurements if you repeat the experiment? What are the sources of error? (*hard to read the temp at exactly the right time, slightly different volumes, slightly different starting temperatures, can may be warm already)*