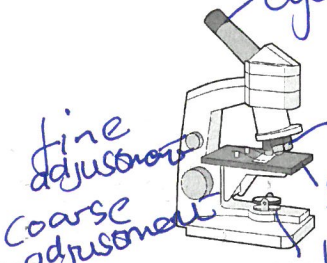
Answers

Paper 1 Core Practical Revision

Core Practical: Using a light microscope (page 13 + 14 in revision guide)

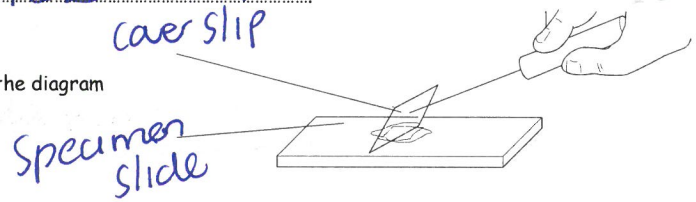
Label the microscope



State two parts of the microscope which magnify the image

1) eyepiece lens
2) objective lens

Label the items shown in the diagram



State the equation that links image size, real size and magnification (1 mark)

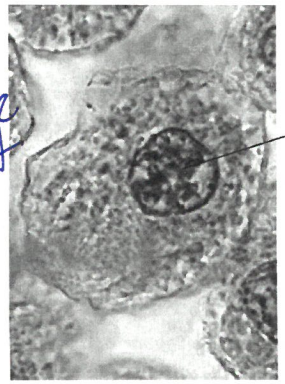
$$\text{magnification} = \frac{\text{image}}{\text{actual}}$$

$$\text{image} = \text{actual} \times \text{magnification}$$

$$\text{actual} = \frac{\text{image}}{\text{magnification}}$$

State what can be done during slide preparation to make the cells more visible (1 mark)

add a stain (eg iodine)



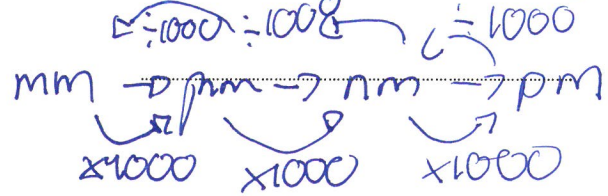
The diameter of the cell is 15μm. actual 15μm

Convert 15μm into mm (1 mark)

÷1000 = 0.015mm

mag = image/actual = 33m / 0.015 = 2200

Calculate the magnification (3 marks)



1000 / time (secs) s^{-1}

rate = 1 / time

Core Practical: Investigation of how pH affects enzyme action (page 16 in revision guide)

Identify the independent, dependent and control variables for the core practical investigation

Independent : pH

Dependent : Time taken for iodine to turn yellow + colourless (amylase to breakdown the starch)

Controls:
- Volume of amylase solution
- Volume of pH solution / volume of starch solution

Calculate the rate of reaction using the following data

Hint: Rate is calculated by 1/time

pH	2	4	6	8	10
Time (mins)	20	7.5	3.6	1.2	8.3
Rate (min^{-1})	0.05	0.13	0.28	0.83	0.12

0 1/20

Describe the effect of pH on the rate of reaction

Hint: Use values in your description

As the pH increases, so does the rate of reaction up to pH 10.

Explain why the rate of reaction decreased at pH 10

pH affects enzymes. If it's too high or too low, the pH interferes with the bonds holding enzyme together - changes shape of active site and denatures enzyme

State one way the student could increase data collection to find the optimum pH

Smaller intervals / use pH meter

Suggest an alternative method to investigate a different factor such as temperature or substrate concentration that affects enzyme action

Hints: Write a step by step method for one of these factors. Use amylase and starch

- Drop of iodine in spotting tile
- Set up water bath to specific temperature
- Place amylase + starch in separate tubes in bath
- Once reached temperature, remove + mix together + start stopclock
- Take a sample from tube every 10 seconds + drop into well - when iodine stays yellow starch no longer present
- Repeat whole experiment at different temperatures

Core Practical: Osmosis in potato slices (page 19 in revision guide)

You were provided with different concentrations of solution and investigated osmosis in potato slices

Describe the process of osmosis (2 marks)

Movement of water molecules from a high concentration to a low concentration across a partially permeable membrane

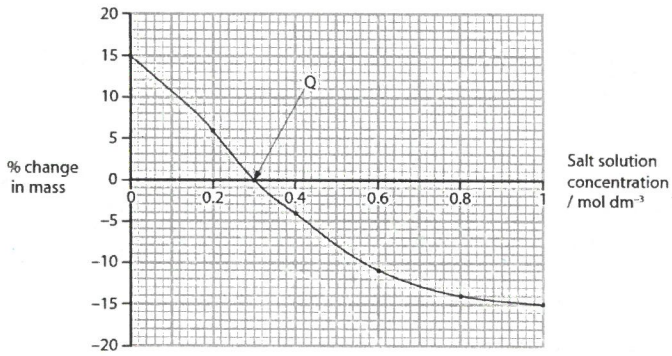
Describe what will happen in the following situations when an animal cell is placed in:

Hints: Where will water move? What will happen to the cell as a result?

Hypotonic solution less solute / more water ↑ in mass - water moves in - burst

Isotonic solution No net movement (no change in mass)

Hypertonic solution more solute / less water ↓ in mass - water moves out



Explain the conclusion that can be made at point Q (2 marks)

Isotonic - they have the same water concentrations

Give one way the student could obtain more data to increase the accuracy of point Q (1 mark)

Variables:

State the **independent** variable: Sucrose concentration

State the **dependent** variable: percentage change in mass

State which variables needed to be **controlled** in this investigation:

Volume of solution / size of potato cylinders / type of potato.

Results:

Hint: Percentage change in mass = Change in mass/Initial mass x 100

Concentration (moldm^{-3})	Initial mass (g)	Final mass (g)	Change in mass (g)	Percentage change in mass (g)
0.0	19.15	21.60	2.45	0.128
0.2	18.30	19.25	0.95	
0.4	15.32	14.85	-0.47	
0.6	16.30	14.40	-1.90	
0.8	18.25	16.00	-2.25	
1.0	19.50	17.20	-2.30	

Percentage change $= \frac{\text{final} - \text{initial}}{\text{initial}} \times 100$

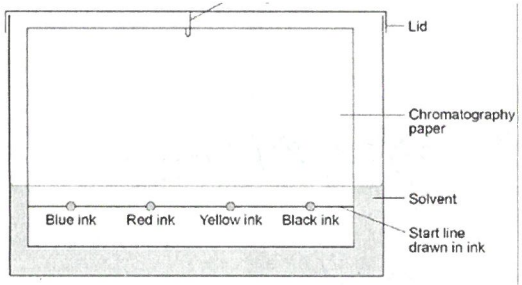
Core Practical: Investigate the composition of inks using simple distillation and paper chromatography (pages 100 & 102 in revision guide)

Chromatography

Identify the mobile phase
where the molecules can move - liquid / gas - solvent (water ethanol)

Identify the stationary phase
where molecules can't move - paper

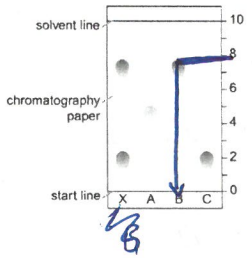
Explain why the base line is drawn in pencil (1 mark)
Insoluble + won't move with solvent



Identify the mistakes and explain what will happen (4 marks)
Mistake 1: Start line drawn in ink

Mistake 2: Start line not above solvent initially

State the formula to calculate the Rf value $R_f = \frac{\text{distance travelled by solute}}{\text{distance travelled by solvent}}$

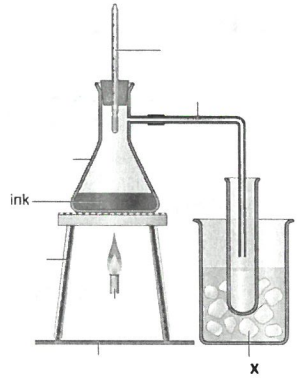


Calculate the Rf value for the blue ink (B)
8/10 = 0.8

Identify and explain which ink is the most soluble (2 marks)
Ink B is most soluble as it travelled the furthest up the paper

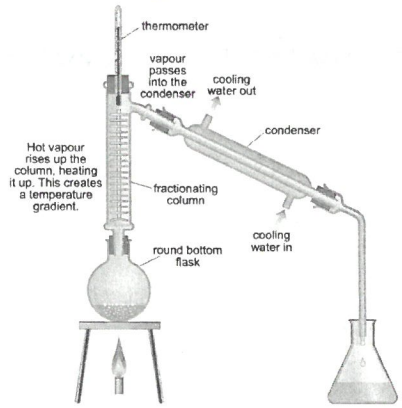
Simple Distillation

Label the equipment needed to carry out simple distillation



Explain why X is needed in simple distillation (1 mark)
To cool + condense the vapour back into a liquid

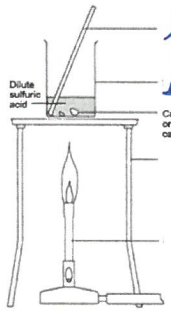
Explain how simple distillation allows a pure solvent to be separated from a solution (3 marks)
Evaporates at exactly a certain temperature (boiling point) (flat line)



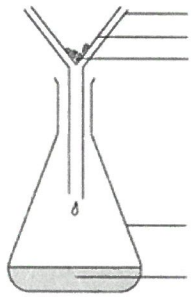
Pure ethanol boils at 78.5oC. Explain how fractional distillation can be used to separate a mixture of ethanol and water (3 marks)
Boiling points are similar
- ethanol will evaporate first
- cool / condense / collect water at 100°C

Core practical: Preparing an insoluble salt (page 101 in revision guide)

Identify the equipment needed from the diagram:



Stirrer
Beaker
Tripod
Bunsen



Filter funnel
filter paper
residue
conical flask
filtrate

Describe what the final step would be to prepare a pure, dry sample of the salt crystals

evaporate water from salt solution + leave to dry

Write a word equation for the reaction of copper oxide and sulphuric acid (2 marks)

Copper oxide + sulphuric acid → copper sulphate + water

Write a balanced symbol equation including state symbols for the above reaction (3 marks)

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

Plan an experiment to prepare pure, dry crystals of **calcium nitrate** by reacting calcium carbonate with a suitable acid (6 marks)

Hints: Include a word equation in your answer and symbol equation in your answer (AO2)

Describe how to carry out the practical in a logical order

Calcium oxide + nitric acid → Calcium nitrate + water

$CaO + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O$

in excess

Add CaO in excess to warm nitric acid (increase rate of reaction) to ensure all acid has been used up.
Filter off excess - left with salt + water
Evaporate water by heating with Bunsen
Leave to cool + crystallise. Dry.

Core Practical: Investigating Neutralisation (page 105 in revision guide)

You investigated the change in pH when powdered calcium hydroxide was added to a fixed volume of hydrochloric acid

Variables: Identify the following

Independent variable: mass of calcium hydroxide

Dependent variable: pH

Control variables: volume of acid / temp / conc of acid

Write a word equation for the reaction between calcium hydroxide and hydrochloric acid (2 marks)

Calcium hydroxide + Hydrochloric acid → Calcium chloride + water

Write a balanced symbol equation, including state symbols for the reaction between powdered calcium hydroxide and hydrochloric acid (3 marks)

$Ca(OH)_{2(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + 2H_2O_{(l)}$

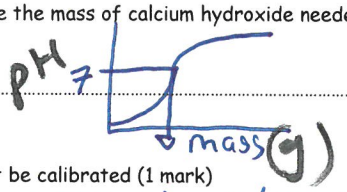
State how the pH of the mixture was measured (1 mark)

pH paper / pH probe (meter)

Mass of calcium hydroxide	pH of the mixture
0.3	2.0
0.6	2.5
0.9	3.5
1.2	5.0
1.5	6.0
1.8	6.5
2.1	7.5

Draw a graph of your results

Use your graph to determine the mass of calcium hydroxide needed to neutralise the hydrochloric acid (1 mark)



Explain why pH meters must be calibrated (1 mark)

assign a new set of values - so they have same pH changes

Give a reason why adding hydroxide ions to an acid solution leads to an increase in pH (1 mark)

↑ in OH^- ions → combine with H^+ ions to form water = ↑ in pH

Panic (electrodes)

Core Practical: Electrolysis (page 112 in revision guide)

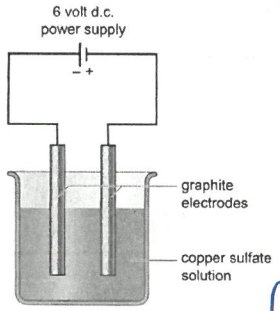
Define electrolysis (2 marks)

The breaking down of a substance using electricity. Current is passed through

State the electrode that is positive (1 mark) anode (anions → electrolyte)

State the electrode that is negative (1 mark) cathode (cation +)

State the material electrodes are usually made of (1 mark) Graphite or copper



C electrolysis circuit for using graphite electrodes

Oxygen is produced in the electrolysis of copper sulfate solution using graphite electrodes. Cu^{2+} SO_4^{2-} H^+ OH^-

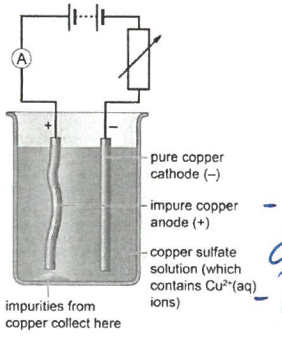
Explain at which electrode will **oxygen be produced** (2 marks)

cathode → ~~H+ SO4~~ Cu^{2+} ions

Anode → OH^- ions

$4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

(ions are discharged)



B Purifying copper by electrolysis. The copper to be purified is used as the anode and some very pure copper is used as the cathode.

Identify the electrode which will gain mass (1 mark)

~~Impure copper electrode (anode)~~

Pure copper electrode → cathode

Explain why this electrode gains mass (2 marks)

- Impure copper anode is oxidised dissolving the electrolyte to form Cu^{2+} ions.
- The copper ions move to the cathode and are reduced to form Copper
- Impurities sink to bottom.

Write a half equation for what is happening at the anode for the electrolysis of copper sulfate using copper electrodes (2 marks)

$Cu \rightarrow Cu^{2+} + 2e^-$ (oxidation)

Write a half equation for what is happening at the cathode for the electrolysis of copper sulfate using copper electrodes (2 marks)

$Cu^{2+} + 2e^- \rightarrow Cu$ (reduction)

Identify from your half equations which product is oxidised and which is reduced (2 marks)

Oxidised: Cu is oxidised

Reduced: Copper ions are reduced

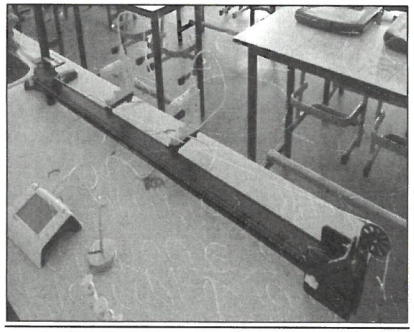
Molten potassium bromide is electrolysed. K^+ Br^-

Predict the products at the anode and cathode (2 marks)

Anode: Bromine gas

Cathode: Potassium.

Physics Core practical 1: Investigation on the effect of mass on the acceleration of the trolley
(page 151 in revision guide)



$\frac{v-u}{t}$

$\frac{\text{Change in vel}}{\text{time}}$

Results: Complete the table calculating the acceleration

Mass (g)	Change in velocity (m/s)	Time taken (s)	Acceleration (m/s^2)
200	7.0	2.2	
400	6.7	2.4	
600	6.8	2.8	
800	6.9	3.0	

Describe the conclusion that can be drawn from this experiment
The greater the mass the lower the acceleration
An object with a large mass will accelerate less for a fixed force

Identify Newton's law that can be referred to in verifying results for this experiment
$F=m\times a$ Newtons 2nd law

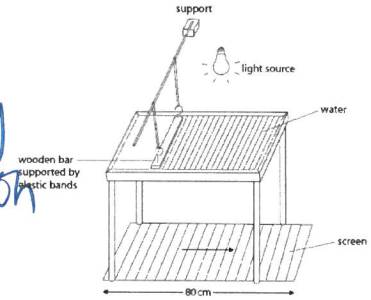
Explain why it was necessary to use two light gates when measuring acceleration in this experiment
Each light gate records the time when the trolley passes through it + the speed at that time. The acceleration of the trolley can then be found using acceleration = change in speed / time

Design an experiment to investigate how the gradient of the slope affects acceleration
Change height of ramp + carry out the same
Keep mass the same

Core Practical: Investigating waves in fluids (page 165 in revision guide)

Identify two equations to calculate speed
1. $V=\frac{x}{t}$ speed = $\frac{\text{distance}}{\text{time}}$
2. $V=f\times\lambda$

Speed = frequency × wavelength



Identify a control when using a ripple tank (1 mark)
Speed of dipper

Describe how you can calculate the frequency of waves using a ripple tank (2 marks)
Count how many waves pass a mark on the screen in a given time then divide by the time in seconds to get frequency

Describe how you can work out the wavelength of a wave (2 marks)
The distance between each shadow line is equal to one wavelength Measure the distance between lines that are 10 wavelengths apart (and average)

Explain how the investigation can be improved (2 marks)
Take a photograph - not measuring - put on screen + analyse

Describe a method to calculate the speed of sound of an echo (3 marks)
Measure distance to wall + back
Time how long
$v=\frac{x}{t}$

The frequency of a sound wave is 2kHz and travels in air at 330m/s. Calculate the wavelength (3marks)
$\lambda=\frac{v}{f}=\frac{330}{2000}=$ 0.165m

Core Practical: Investigating refraction (page 167 in revision guide)

Define refraction (1 mark)

Slowing down + bending of light

Describe a method to investigate refraction using a glass block, raybox and a protractor (4 marks)

pg 167 revision guide method

Using the data in the table **describe** the results (2 marks)

Angle of incidence is greater than angle of refraction

Angle of incidence	Angle of refraction
5	3
10	7
15	10
20	15

Explain what conclusion you can make from the data in the table (2 marks)

When light enters a more dense medium it slows down and bends towards the normal.