Paper 2 Core Practical Revision

Core Practical: Light Intensity and Photosynthesis (page 47 in revision guide)

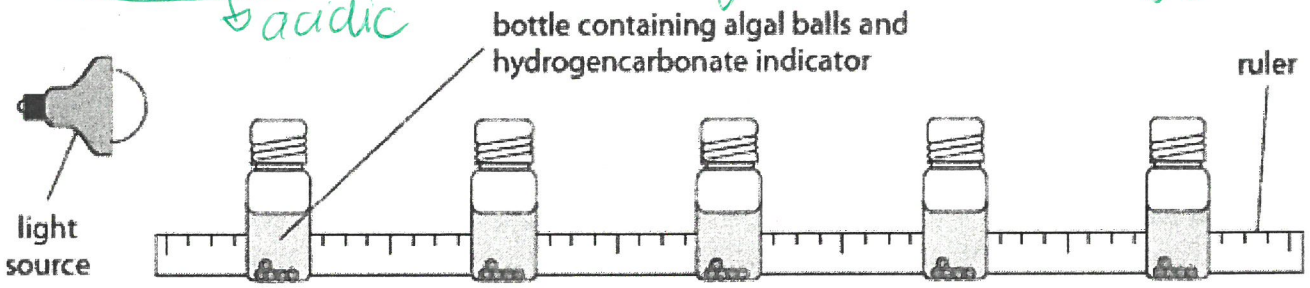
You used algae balls to investigate photosynthesis at different distances from the lamp. Hydrogen carbonate indicator was used to measure the pH of the solution.

Hydrogen carbonate indicator is a red colour. In high concentrations of carbon dioxide it turns red and in low concentrations of carbon dioxide it turns purple.

Write the word equation for photosynthesis

Carbon Dioxide + water → (Sunlight, chlorophyll) Glucose + oxygen

↳ acidic



Identify the independent variable

Light intensity (distance from lamp)

Identify the dependent variable

pH

Identify the control variables in the investigation

Volume of indicator / Number of algal balls

Describe using the diagram what you would expect the results to show.

Purple = less CO_2 = more photosynthesis

Yellow = more CO_2 = less photosynthesis

Close to light = more photosynthesis

State the colour you would expect the hydrogen carbonate indicator to be nearest the lamp

Purple

Explain why the solution has turned this colour

CO_2 has been taken in for photosynthesis so solution is less acidic = purple

Describe how you would investigate how temperature affects the rate of photosynthesis

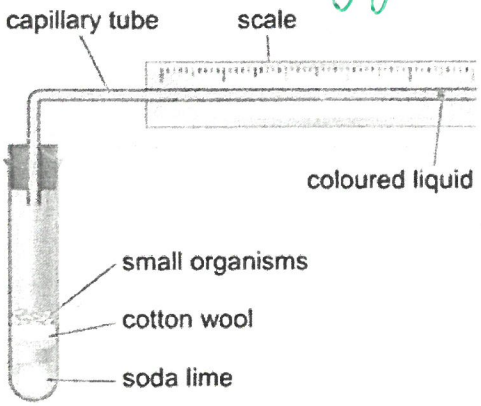
Same distance from light source but different temperatures in a water bath

Core Practical Biology: Respiration rates (page 65 in revision guide)

You investigated how temperature affected the rate of respiration

Write the word equation for aerobic respiration

glucose + oxygen → carbon dioxide + water + energy



B a simple respirometer

Identify the independent variable

Temperature

Identify the dependent variable

Distance bubble moved (rate of respiration)

Identify two control variables

No of small organisms

Time left for.

Explain why one of your control variables needs to be controlled

More organisms = more respiration = bubble will move further

Explain the role of soda lime in your investigation (2 marks)

Absorbs CO_2 produced by respiring woodlice so bubble doesn't get pushed backaw.

State an appropriate control in your investigation (1 mark)

Glass beads in place of organisms

Explain the need for controls in the investigation (1 mark)

To see what rate of respiration is being changed by the temperature of the living organism.

Temperature (°C)	Distant moved by coloured liquid in 5 minutes (mm)
20	18
25	28
30	36

Describe what the results show from the investigation

The higher the temperature, the further the bubble travels

Explain the results of the investigation

Higher temperature = higher rate of respiration as enzyme activity is greater

Calculate the **rate** at 25°C ***(Hint: Look at the units)***

28 / 5 = 5.6 mm min^{-1}

Explain how the student's results from above can be improved

use a greater range of temperatures

Repeat to calculate mean

Core practical Biology: Quadrats and Transects (page 68 in revision guide)

Name 3 abiotic factors non-living

Temperature, water, light, pollutants

Describe how to carry out a belt transect

- Mark out line
- Collect data along line using quadrats placed next to one another
- Count N° of organisms

Results are from a belt transect carried out by a student.

Distance from tree (m)	Number of daisies
0	1
1	4
2	6
3	10
4	15

Describe the effect of distance from the tree on the number of daisies

As the distance from tree increases, the number of daisies increases

Suggest an explanation for this effect

Because there is more light (less shade) for photosynthesis

Explain how the student could improve their investigation

- Record abiotic factors along transect
- Repeat several times to find the mean number of organisms

In a $1m^2$ quadrat there are 25 limpets. The total area of the shore is $500m^2$. Extimate the total population size of limpets.

Total population = 25×500

$= 12,500$

Core Practical Chemistry: Investigating Reaction Rates (page 129 + 130 in revision guide)

State 4 factors that affect the rate of a reaction

1. Temperature
2. Surface Area
3. Concentration
4. Pressure / catalyst

Part 1: Investigating the reaction rates measuring the production of a gas

Write the word equation when calcium carbonate reacts with hydrochloric acid

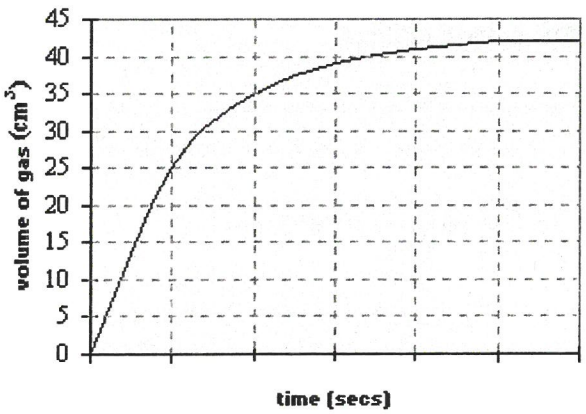
Calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide

A student filled a beaker to 50cm^3 line and added it to a conical flask. He then added 4 large pieces of marble chips and added a bung on. He measured the gas produced every 20 seconds in an inverted measuring cylinder. He then repeated the experiment using 4 small pieces of marble chips

State and explain 2 ways the student could improve the method

1) Use a gas syringe → more accuracy Record mass of chips (not size)
2) Use a smaller time scale → every 10 secs use powdered chips to compare

The students results are shown below. **Sketch what the graph would look like with the smaller chips.**



Describe how you would calculate the reaction rate in cm^3/second using the graph

Gradient rate = change in y / change in x

Explain how surface area affects the rate of a reaction

↑ S.a ↑ rate of reaction

Particles around it will have more area to work on, so frequency of collisions will increase.

Explain how and weighing scale could be used to investigate the rate of reaction between calcium carbonate and hydrochloric acid

Change in mass (usually a gas given off)
Quicker the reading drops on the balance, the faster the reaction.

Describe a method to investigate how concentration affects the rate of reaction between calcium carbonate and hydrochloric acid

Same mass/s.a of marble chips + same volume of acid but use different concentrations of acid.
Measure volume of gas produced using a gas syringe
Take readings at regular intervals

Explain how concentration affects the rate of a reaction

↑ conc = more particles of reactants in same volume
Collisions are more likely so the rate of reaction increases

Part 2: Investigating reaction rates observing a colour change

$$Na_2S_2O_{3\,(aq)} + 2HCl_{\,(aq)} \rightarrow 2NaCl_{\,(aq)} + H2O_{\,(l)} + S_{\,(s)}$$

Explain which product causes the colour change

Sulphur - precipitate (s)

Explain how temperature affects the rate of a reaction

↑ temp - particles move faster, with more energy - more collisions

Core practical Physics: Investigating resistance (page 186 + 189 in revision guide)

Part 1: Investigating resistance in a filament lamp and a resistor

Describe how to measure current and potential difference in a circuit. You may use a labelled diagram (4 marks).

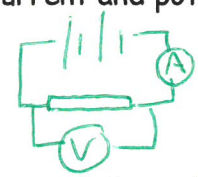
Place ammeter in series

Place voltmeter parallel to component

State the equation that links current, potential difference and resistance

$V = I \times R$

Sketch a diagram on how you would measure the current and potential difference in a resistor.



Results below show the potential difference and current through a resistor

Potential difference (V)	Current flowing through resistor (A)
0	0
1	0.3
2	0.6
3	0.9
4	1.2

Calculate the resistance of the resistor

$V = I \times R \quad R = \frac{V}{I} \quad R = \frac{4}{1.2} = 3.3\Omega$

Describe the relationship between potential difference and current in a fixed resistor

Directly proportional

Core practical Physics: Investigating resistance

Part 2: Investigating resistance of a filament lamp in a series and parallel circuit

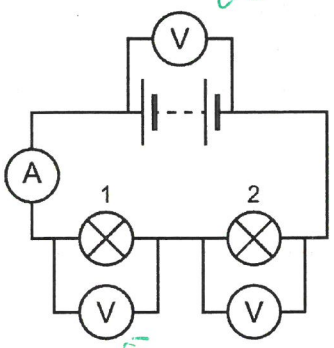
Describe how current flows in a series circuit

Current is the same everywhere

Describe how current flows in a parallel circuit

Divided between branches

Series 6V



D 3.5

The potential difference across the battery was 6V. If the potential difference across bulb 1 was 3.5V, state the potential difference across bulb 2.

2.5V (P.D shared)

Describe what would happen to the current if another filament lamp is added to this circuit

Current would decrease (bulbs go dimmer)

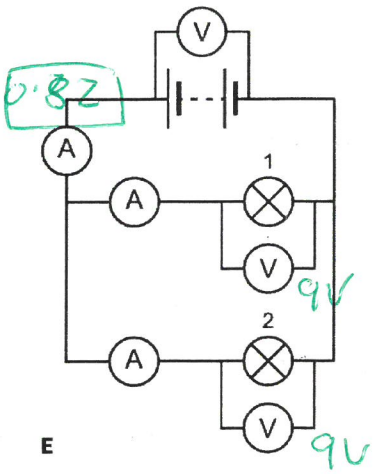
9V

The potential difference across the battery in circuit E was 9V. If the potential difference across bulb 1 was 9V, state the potential difference across bulb 2.

9V (stays the same)

In circuit E the current leaving the battery is 0.82A. The bulbs in the circuit are identical. State the ammeter reading of bulb 1 and 2.

Bulb 1: 0.41 A Bulb 2: 0.41A



E

Explain which circuit would have the lowest resistance

E - parallel circuit - more pathways for the current to flow

Core practical Physics: Investigating densities (page 200 in revision guide)

State the equation to calculate density

Density = mass / volume

Explain in terms of particles why a solid is more dense than a liquid

The particles in a solid are closer together

Method:

Describe how to calculate the density of a cube	Describe how to calculate the density of an object with an irregular shape
Density = mass / volume Place cube on scales → record mass Measure volume l × w × h	Density = mass / volume Place object on scales record mass Volume: - Displacement can fill to spout with water - Stand measuring cylinder under spout - Place object into container collect displaced water = volume of object

Describe how calculating the density of a liquid would differ from calculating the density of a solid

Density = mass / volume

Place empty measuring cylinder on scales and zero it. Fill with water - note mass + volume

0.5kg of water fills a 500cm³ flask. Calculate the density in g/cm³.

Density = 500g / 500 = 1 g/cm³

A piece of wood is 1m long, 20cm wide and 5cm thick. It has a mass of 7kg. Calculate the density in kg/m³

Density = mass / volume 20cm = 0.2m

= 7kg / (1 × 0.2 × 0.05) 5cm = 0.05m

= 7 / 0.01 = 700 kg/m³

Core Practical: Investigating water (page 202 + 203 in revision guide)

Define specific heat capacity

The amount of energy required to raise 1kg of a substance by 1°C

State the equation that links specific heat capacity, mass, temperature change and thermal energy

$\Delta Q = m \times c \times \Delta\theta$

Describe an experiment on how the specific heat capacity of water could be measured

Think about the equation and what measurements you would need for it

- Use a balance to record the mass of water (zero with beaker)
- Measure the temperature at start (thermometer)
- Record energy on joulemeter (set for a period of time)
- Measure the temperature at the end (work out change)

Input into equation $c = \frac{\Delta Q}{m \times \Delta\theta}$

Describe why a polystyrene cup is used

Good insulating material

Calculate the specific heat capacity of water when a student heated 500g of water. The joulemeter reading was 22kJ and the temperature change went from 20 to 30°C.

0.5kg

$c = \frac{\Delta Q}{m \times \Delta\theta} = \frac{22\,000}{0.5 \times 10} = \frac{22000}{5} = 4,400$ J/kg°C

The specific heat capacity of water is 4181 J/kg/°C. Explain why results obtained from this experiment are likely to be higher than this value.

Heat energy is lost to the surroundings (dissipated) so more energy required

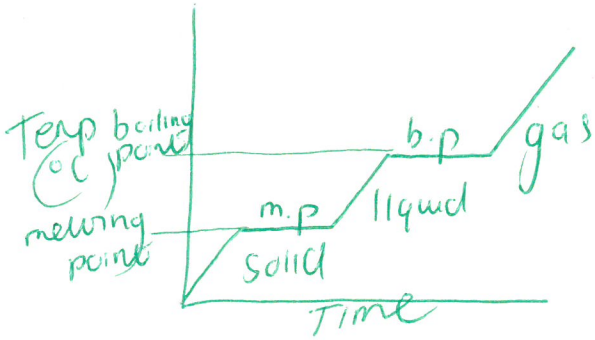
Define specific latent heat

The amount of energy to change the state of 1kg of a substance

State the equation that links change in thermal energy, mass and specific latent heat.

$Q = m \times L$

Sketch a graph to show the temperature changes when ice melts



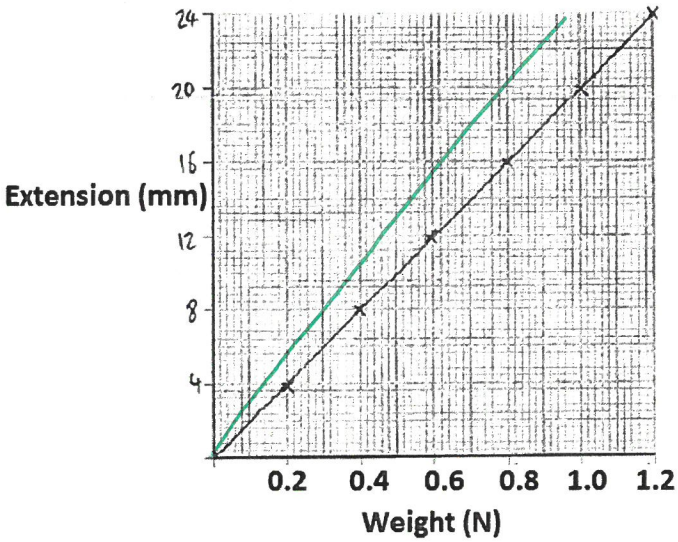
Core practical Physics: Investigating springs (page 206 in revision guide)

State the equation that links extension, spring constant and force.

$F = k \times x$ (k = N/m)

Describe how to set equipment up to investigate the effect of force on the extension of a spring

- Set up clamp stand with ruler
- Attach spring - ensure bottom of spring at 0mm on ruler
- Add a mass to the spring → record extension
- Repeat until you have at least 6 measurements
- Plot force - extension graph



Describe the relationship shown from the data collected

Directly proportional
- Straight line passing through origin

Calculate the spring constant of the spring in the graph (Hint: Think about units)

$k = \frac{F}{x}$ (0.2) convert ÷100 → 4 convert ÷10 → $\frac{0.2}{0.004}$

[mm ÷10 → cm ÷100 → m.] = 50 N/m

Sketch on the graph the results of a spring with a **higher** spring constant

Steeper = Stiffer!

Explain the difference between the length of a spring and the extension

Length = natural length with no force applied

Extension = change in length

Calculate the spring constant when a spring is stretch 50cm with 5N of force.

50 ÷100 = 0.5m

$F = k \times x$ $k = \frac{F}{x} = \frac{5N}{0.5m} =$ 10 N/m

Calculate the energy stored in a spring of spring constant 0.9N/m when it is extended by 63cm.

63 ÷100 = 0.63m

$E = \frac{1}{2} \times k \times x^2$

$= 0.5 \times 0.9 \times 0.63^2$

$= 0.5 \times 0.9 \times 0.3969 =$ 0.18 J