

Year 9 Science Revision Summary - Bolingbroke Academy

This revision guide covers the core science topics from the Year 9 curriculum across Biology, Chemistry, and Physics, broken down by term. It is designed to support exam preparation by focusing on key content, diagrams, and formulas likely to appear in end-of-year assessments.

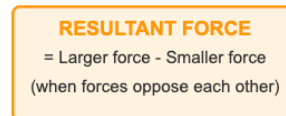
Physics: Forces Predict Motion

7. Forces in Balance / Motion - Resultant force = difference between opposing forces - Newton's First Law (object stays at rest/moving unless acted on) - Newton's Second Law: ($F = ma$) (Force = mass x acceleration)

FORCES IN BALANCE / MOTION - Year 9 Physics

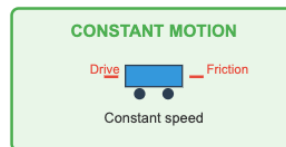
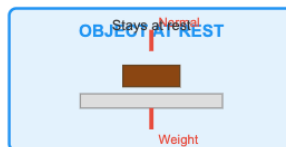
RESULTANT FORCE

Difference between opposing forces



NEWTON'S FIRST LAW

"An object stays at rest or moving at constant speed unless acted on by an unbalanced force"



NEWTON'S SECOND LAW

$$F = ma$$

Force = mass × acceleration



EXAMPLE 1

Find Force (F):
Mass = 10 kg
Acceleration = 5 m/s²
 $F = m \times a$
 $F = 10 \times 5 = 50 \text{ N}$

EXAMPLE 2

Find Acceleration (a):
Force = 60 N
Mass = 20 kg
 $a = F \div m$
 $a = 60 \div 20 = 3 \text{ m/s}^2$

EXAMPLE 3

Find Mass (m):
Force = 100 N
Acceleration = 4 m/s²
 $m = F \div a$
 $m = 100 \div 4 = 25 \text{ kg}$

UNITS TO REMEMBER

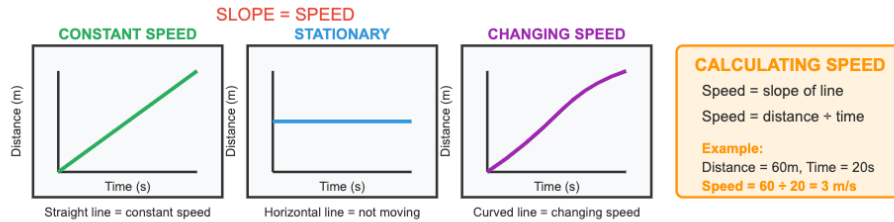
- Force (F) measured in Newtons (N)
- Mass (m) measured in kilograms (kg)
- Acceleration (a) measured in m/s²

More force = more acceleration (if mass stays same) • **More mass** = less acceleration (if force stays same) • **Zero resultant force** = no acceleration YEAR 9 EXAM TIPS ✓ **Resultant force = 0**: balanced forces, no acceleration ✓ **Always show working** for $F=ma$ calculations ✓ **Use the triangle method** to rearrange $F=ma$ ✓ **Include correct units** in your final answers

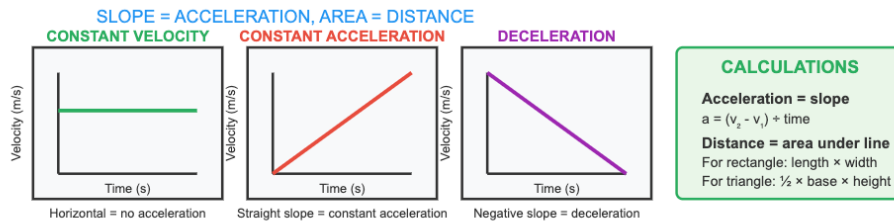
8. Interpreting Graphs of Motion - Distance-time graph: slope = speed - Velocity-time graph: slope = acceleration; area = distance

INTERPRETING GRAPHS OF MOTION - Year 9 Physics

DISTANCE-TIME GRAPHS



VELOCITY-TIME GRAPHS



WORKED EXAMPLES

DISTANCE-TIME EXAMPLE

A car travels 120m in 40 seconds.

What is its speed?

Speed = distance ÷ time
Speed = $120 \div 40 = 3 \text{ m/s}$
The slope of the line = 3 m/s

VELOCITY-TIME EXAMPLE

A bike accelerates from 0 to 15 m/s in 5 seconds.

Find: (a) acceleration (b) distance travelled

(a) Acceleration = $(15-0) \div 5 = 3 \text{ m/s}^2$
(b) Distance = $\frac{1}{2} \times \text{base} \times \text{height}$
Distance = $\frac{1}{2} \times 5 \times 15 = 37.5 \text{ m}$

AREA = DISTANCE

Constant velocity of 10 m/s for 6 seconds

Area under line = distance travelled

Rectangle area = length × width
Distance = $6 \times 10 = 60 \text{ m}$
This works for any shape under the line!

KEY DIFFERENCES FOR EXAM

DISTANCE-TIME GRAPHS: • Slope = Speed • Steep slope = fast speed • Horizontal = stationary
VELOCITY-TIME GRAPHS: • Slope = Acceleration • Area under line = Distance • Horizontal = constant velocity

EXAM TIPS: Always label axes and units! Use triangles to calculate slopes. Remember: steep = fast, flat = slow/constant

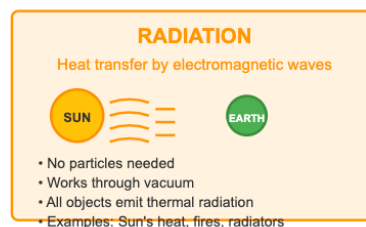
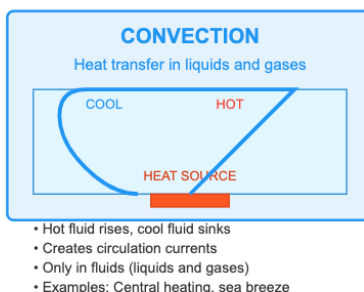
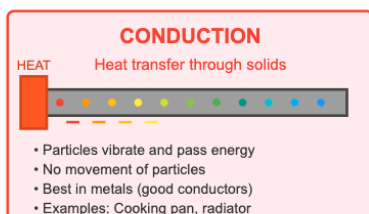
Physics: Energy is Conserved

13. Heating and Energy Transfer - Conduction, Convection, Radiation - Specific Heat Capacity: ($Q = mc\Delta T$) - ($Q =$) heat energy, ($m =$) mass, ($c =$) specific heat, ($\Delta T =$) temperature change

HEATING AND ENERGY TRANSFER - Year 9 Physics

Energy is Conserved

THREE METHODS OF HEAT TRANSFER

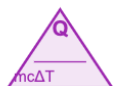


SPECIFIC HEAT CAPACITY

Energy needed to raise 1kg of material by 1°C

$$Q = mc\Delta T$$

Heat Energy = mass \times specific heat \times temperature change



Cover what you want to find

VARIABLE DEFINITIONS

Q = Heat energy (Joules, J) **m** = Mass (kilograms, kg) **c** = Specific heat capacity (J/kg°C) **ΔT** = Temperature change (°C) **ΔT** = Final temp - Initial temp Always use temperature CHANGE, not final temperature

WORKED EXAMPLES

EXAMPLE 1: Find Q
Heat 2kg of water from 20°C to 80°C $m = 2\text{kg}$, $c = 4200\text{ J/kg°C}$, $\Delta T = 60\text{°C}$ $Q = mc\Delta T$
 $= 2 \times 4200 \times 60$ $Q = 504,000\text{ J} = 504\text{ kJ}$

EXAMPLE 2: Find ΔT 5kg copper, 50,000J energy added $Q = 50,000\text{J}$, $m = 5\text{kg}$, $c = 380\text{ J/kg°C}$ $\Delta T = Q \div (mc)$ $\Delta T = 50,000 \div (5 \times 380)$ $\Delta T = 26.3\text{°C}$

EXAMPLE 3: Find m Unknown mass of iron, 100,000J, $\Delta T = 50\text{°C}$ $Q =$

Physics: Radiation Transfers Energy

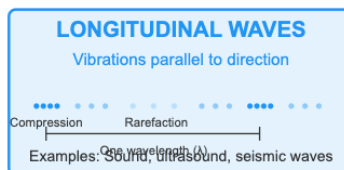
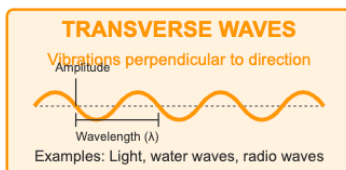
15. Sound and Waves - Longitudinal vs transverse waves - Wave formula: ($v = f \lambda$) - ($v =$) wave speed, ($f =$) frequency, ($\lambda =$) wavelength - Reflection: angle of incidence = angle of reflection - Refraction: wave bends at boundary due to speed change

Diagrams: - Ray diagrams showing reflection and refraction

SOUND AND WAVES - Radiation Transfers Energy

Year 9 Physics Exam Revision

TYPES OF WAVES



WAVE FORMULA

$$v = f \lambda$$

Wave speed = frequency \times wavelength



VARIABLES

v = wave speed (m/s) f = frequency (Hz) λ = wavelength (m) EXAMPLE $f = 20$ Hz, $\lambda = 17$ m $v = 20 \times 17 = 340$ m/s (Speed of sound in air!) REFLECTION Angle of incidence = Angle of reflection Mirror Normal Incident ray Reflected ray i r $i = r$ Both angles measured from normal REFRACTION Wave bends at boundary due to speed change Air (fast) Glass (slow) Normal Incident ray Refracted ray θ_1 θ_2 Ray bends TOWARDS normal when slowing down PRACTICAL EXAMPLES REFLECTION • Mirrors • Echoes • Periscopes REFRACTION • Lenses • Prisms • Water appearing shallow WAVE

Key Mathematical & Scientific Skills to Practice: - Rearranging equations (e.g. ($F = ma$), magnification) - Interpreting graphs and diagrams (e.g. velocity-time graphs) - Drawing cells, ray diagrams, food chains - Using and interpreting Punnett squares - Evaluating risk and method in experiments

YEAR 9 EXAM SKILLS - Complete Revision Aid

Essential Skills Across Physics, Chemistry, and Biology

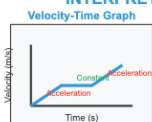
REARRANGING EQUATIONS



TRIANGLE METHOD:

1. Cover what you want to find
2. What's left is the calculation needed

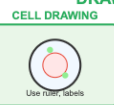
INTERPRETING GRAPHS



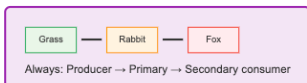
KEY POINTS:

- Slope = acceleration
- Area = distance
- Flat = constant velocity
- Steep = fast acceleration

DRAWING SKILLS



DRAWING FOOD CHAINS



PUNNETT SQUARES

Eye Color: Bb × Bb

B	BB	Bb
b	Bb	bb

Result: 75% Brown, 25% Blue eyes

EVALUATING RISK & METHOD

HAZARD	CONTROL
Hot water	Wear gloves
Sharp objects	Handle carefully
Chemicals	Wear goggles

Always: Identify hazard → Suggest control

EXAM TECHNIQUE CHECKLIST

PHYSICS SKILLS

- ✓ Use triangle method for equations
- ✓ Include units in all calculations
- ✓ Show all working clearly
- ✓ Read graph scales carefully
- ✓ Use ruler for ray diagrams

CHEMISTRY SKILLS

- ✓ Balance equations step by step
- ✓ Use formula triangles
- ✓ Remember significant figures
- ✓ Know your ions and formulas
- ✓ State conditions clearly

BIOLOGY SKILLS

- ✓ Draw cells with ruler and labels
- ✓ Use arrows in food chains
- ✓ Set up Punnett squares properly
- ✓ Calculate percentages/ratios
- ✓ Explain observations scientifically

COMMON EXAM MISTAKES TO AVOID

CALCULATION ERRORS:

- ✗ Forgetting units in final answers
- ✗ Not showing working clearly
- ✗ Rounding too early in calculations
- ✗ Using wrong formula triangle
- ✗ Misreading graph scales

DRAWING ERRORS:

- ✗ Not using a ruler for diagrams
- ✗ Missing labels on cell diagrams
- ✗ Wrong arrow directions in food chains
- ✗ Incorrect ray diagram angles
- ✗ Unlabeled Punnett square axes

CONTENT ERRORS:

- ✗ Confusing genotype with phenotype
- ✗ Wrong reactants in chemical equations
- ✗ Mixing up dominant/recessive alleles
- ✗ Incorrect energy flow in ecosystems
- ✗ Not explaining scientific reasoning

SUCCESS TIPS FOR YEAR 9 EXAMS

✓

Always read questions twice - underline key words ✓ **Show ALL working** - even if wrong method, you get method marks ✓ **Use scientific vocabulary** correctly ✓ **Check units match** the question ✓ **Practice past papers** regularly

Tips for Exam Success: - Always label diagrams clearly - Learn key formulas and be able to rearrange them - Show all working in calculations - Use scientific language in long answers

End of Revision Summary