



Forces

Contact forces: Learning pathway

Activate

Acquire

Apply

Assess

Analyse

Balanced & unbalanced

Forces

Model a range of interactions using force diagrams to develop a principle for how an object's motion depends on the balance of forces

Sketch force diagrams for balanced and unbalanced situations
 Find missing forces in balanced force situations

Acquire
 Apply

Make deductions about elastic materials

Friction

Forces

Model friction as an interaction of surfaces moving over one another

Describe how friction varies with different weights
 Explain how friction and air resistance affect speed

Acquire
 Apply

Compare vehicle designs in terms of minimising air resistance

Density

Material properties

Build a quantitative model of how to compare materials using density

Solve floating and sinking word problems using density
 Solve word problems using the density formula

Acquire
 Apply

Interpret data on material to relate their applications to density



Sports engineer

Act

Design a model toboggan that runs down at a ramp at a safe, constant speed



Forces

Contact forces: Big ideas

What expert understanding do we want after 5 years?

Forces predict motion

Big idea

Objects interact: the effect depends on the sum of the forces. Objects in equilibrium have constant motion, but change velocity with a resultant force. Newton's laws and the equations of motion can be used to predict motion.

How does the unit develop this?

Balanced & unbalanced

Key Concept

When the net force on an object is zero, it is in equilibrium and its motion is constant

Sub-concepts

Gravity, friction, reaction, tension, compression, net force

Friction

Key Concept

Friction is caused by the interaction of surfaces moving over one another, and acts to resist this

Sub-concepts

Air resistance

Density

Key Concept

Density is a material property which describes the mass of a specific volume of the matter

Sub-concepts

Upthrust, mass

Facts

- Objects float in fluids with equal density
- Density = mass/volume



Forces

Contact forces: Scientific thinking, maths & literacy

How are investigation skills integrated with the concepts?

Friction	Density	Act
Manage variables	Draw conclusions	Engineering
Choose variables to answer a scientific question Control variables that might affect the outcome	Deduce patterns and relationships in data and observations	Build and test a prototype

How are maths skills integrated with the concepts?

Density
Algebra
Substitute values into equations, with units and symbols

How are practical skills integrated with the concepts?

Density	
Apparatus and techniques	AT.1.P

Required practical activity 17: Use appropriate apparatus to make and record the measurements needed to determine density



Forces

Contact forces: Curriculum links

Which parts of KS3 are covered?

AQA KS3 syllabus: 3.1.2 Contact forces

Which parts of GCSE are covered?

(AQA Trilogy combined science)

Balanced & unbalanced	✓ 6.5.1.2 Contact and non-contact forces	✓ 6.5.1.4 Resultant forces
Density	✓ 6.3.1.1 Density of materials	
Draw conclusions	✓ WS 3.5 Draw conclusions from data	
Maths	✓ 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities	

What resources are there to teach this unit?

Visit shop.masteryscience.com



[CPD](#)



[Teaching](#)



[Assessment](#)



Analyse Students look at bicycle designs and rider's technology and predict how well it reduces air resistance

Act Design a safe toboggan, that goes at a steady speed of 0.8 m/s, on a 45° ramp. Make a simple toboggan from a food container e.g. margarine tub and lolly sticks as runners. Test your design by measure the toboggan's speed down the ramp. Improve your design by using different materials attached to the runners