

Science Faculty Scheme of Learning

Physics Faculty: Science

Topic: Forces Key Stage 3

<p>Prior knowledge? Year 2 Pupils should be taught to: describe how things move at different speeds, speed up and slow down, using simple comparisons, comparative vocabulary and superlative vocabulary.</p> <p>Year 3 Pupils should be taught to: explore and discuss how a push or a pull is exerted by something and acts on something else describe how some forces are made by contact (pushing, pulling) while others act at a distance (e.g. gravity and magnets) explain how gravity pulls things down, and that on the Earth’s surface, we are supported by a contact force with the ground describe the use of magnets in familiar objects explain that magnets attract magnetic materials; that magnets work through, e.g. cardboard make a magnet.</p> <p>Year 5 Pupils should be taught to: compare and give reasons, based on testing, for how forces, including gravity, friction, air and water resistance, affect the movement of a variety of objects explain, through observation, that forces push and pull objects, making them change shape, and that there is always some-thing doing the pushing or pulling either by contact or at a distance [223] explain that drag forces tend to slow things down, including air resistance and, to a greater extent, resistance in liquids measure the size of a force.</p> <p>Year 6 Pupils should be taught to: explain the idea of speed. determine the distance travelled based on the speed and time of travel. explain that magnets have two poles, and that magnets can both attract and repel – unlike poles attract and like poles</p>	
<p>GCSE Links Motion velocity as speed in a given direction acceleration = change in velocity ÷ time; distance/time and velocity/time graphs and their interpretation estimating sizes of everyday velocities and accelerations relative velocity, net velocity in head-on collision</p> <p>Motion and forces movement without forces; skating and sliding in low friction; difficulty of starting or stopping constant velocity if no net force: Newton’s First Law acceleration caused by unbalanced force; the effect of a force depending on the object being moved; mass as the ratio of force to acceleration (inertia); Newton’s Second Law direction of change and direction of resultant force; force as a vector</p> <p>Collisions and momentum defining momentum as mass x velocity; speeds before and after objects collide: conservation of momentum force as rate of change of momentum: Newton’s Third Law.</p> <p>Magnetism and electromagnetism</p> <ul style="list-style-type: none">▪ magnetic effects: action at a distance; magnetic fields▪ ferromagnets; induced magnetism in some materials	

<p>Be familiar with prior learning and eventual outcomes at Key Stage 4 (and possibly 5).</p> <p>Plan according to the needs of the group.</p> <p>Always consider health and safety via the CLEAPSS information and department policy.</p>
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Key Stage 3 National Curriculum

<p>Describing motion ▣ speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) ▣ the representation of a journey on a distance-time graph ▣ relative motion: trains and cars passing one another.</p> <p>Forces ▣ forces as pushes or pulls, arising from the interaction between two objects ▣ using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces ▣ moment as the turning effect of a force ▣ forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water ▣ forces measured in newtons, measurements of stretch or compression as force is changed ▣ force-extension linear relation; Hooke’s Law as a special case ▣ work done and energy changes on deformation ▣ non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity.</p> <p>Pressure in fluids ▣ atmospheric pressure, decreases with increase of height as weight of air above decreases with height ▣ pressure in liquids, increasing with depth; upthrust effects, floating and sinking ▣ pressure measured by ratio of force over area – acting normal to any surface.</p> <p>Balanced forces ▣ opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.</p> <p>Forces and motion ▣ forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) ▣ change depending on direction of force and its size.</p> <p>Magnetism ▣ magnetic poles, attraction and repulsion ▣ magnetic fields by plotting with compass, representation by field lines ▣ Earth’s magnetism, compass and navigation</p>

	Objective	Possible outcome	Year?
I	Identify and label forces.	I can label at least 6 different forces correctly.	7
	Identify contact and non-contact forces.	I can identify contact and non-contact forces.	7
	Identify frictional forces.	I can identify frictional forces.	7
D	Describe what a force is and what it does to objects.	I can describe what happens to an object under a force.	7
	Describe how to measure a force in Newtons.	I can measure forces in Newton's in two situations.	7
	Work out distance using speed and velocity (no unit conversions).	I can work out distance if I am given speed and time.	7
	Describe the effects of magnets (including poles).	I can describe how magnets affect objects in different situations.	7
	Draw distance-time graphs using data.	I can draw a distance time graph from my own data.	7
E	Explain the effect of unbalanced and balanced pairs of forces.	I can explain what happens if forces on an object aren't balanced.	7/8
	Explain speed, distance and time by using a formula triangle.	I can work out speed, distance and time.	7/8
	Explain how gravity causes a force which is different on different planets.	I can explain how weight and mass vary on different planets.	7/8
	Explain what the slope and shape of DT and VT graphs mean.	I can explain what the slope of a DT and VT graph mean.	8/9
A	Analyse the effects of forces.	I can predict what will happen to an object in different situations.	8/9
	Analyse speed, distance and time, including conversions of units.	I can work out speed, distance and time inc. converting units.	8/9
	Analyse the gradient of DT graphs to find acceleration and velocity, and area for distance under a VT graph.	I can find the gradient of a line on a graph and I can work out the area under a line on a graph.	8/9
	Analyse the differences between speed and velocity.	I know the difference between speed and velocity.	8/9
L	Link to Hooke's Law.	I know what Hooke's law is and understand how to apply it.	9
	Link to atmospheric and gas pressure.	I understand pressure and how to calculate it.	8/9
	Link to water pressure, including deep sea diving.	I understand some issues faced by pressure under water.	9
S	Suggest how this relates to energy changes.	I can use ideas about energy to compare to forces.	9
	Suggest how force is related to momentum.	I can work out momentum and relate this to collisions.	9

	Year 7	Year 8	Year 9
Topic	Sir Isaac Newton	Rocket launches	The Titanic
Skills	Graphs Formulae	Graphs Formulae	Graphs Formulae
Cross-curricular	History	Maths, history	History, Technology
Literacy	Writing non-fictional information.	Sequencing events in writing.	Writing from perspective.
Numeracy	Using a basic formula: SDT	Rearranging a formula: SDT Gradient of a line, area of a graph.	Using and rearranging various formulae Units
ICT	Light gates for SDT, researching history	Communicating with rockets, filming rockets.	Simulations in ICT, measuring impacts
SMSC	Class and status in history.	Spending money on space. Countries/races in space.	Class divisions on Titanic, respecting burial sites
LGBT	LGBT in historical science.	Sci-fi links with LGBT characters in space.	Escaping lives in Europe
Careers	Mathematicians, scientists	Engineers, astronauts.	Working at sea.

Possible Lesson Order (for average class):

Lesson	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
Year 7	Measuring and labelling Forces	Contact and non-contact forces	Frictional forces	Pairs of forces	Magnetism (non-electrical)	SDT and Graphs
Year 8	Audit and recap of forces. Vectors	Newton's Laws	$F = MA$	SDT (more complex)	DT/VT graphs for rockets	Pressure
Year 9	Audit and recap of forces and SDT.	Density and forces in water.	Hooke's Law and tension	Water pressure (deep-sea diving)	Momentum	Collisions

Suggested Investigations

Year 7

Measuring forces with a Newton metres. Comparing frictional forces (tiles and blocks), SDT using light gates (and ramp etc.)

Year 8

Rocket launches (record for us in lessons).

Pressure (sealed syringes—temperature)

Year 9

Density (masses in water), Hooke's law, momentum using trolley and marbles to jump blocks, collisions using ramp and trolley.