Student Book 1 Chapter 1: Forces: Speed and Gravity

What should students have learnt at KS2?

- Notice that some forces need contact between two objects, but magnetic forces can act at a distance
- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces

Scheme of Work 2020 - 2021

Subject: KS3 Science Student Book 1 Chapter 1 Forces: Speed and Gravity

Year Group: 7

Specification: AQA Science Collins

Skill Focus: 4a,b 13f,g,h,k,l 23a,b 24a,b,c 25a

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
1.1.1 Understanding speed	List the factors involved in defining speed. Explain a simple method to measure speed. Use the speed formula	Use a few very simple examples to illustrate the principle of speed measurement and calculation: a person travels 10 km in 1 hour, so their speed is 10 km per hour (10 km/h).	Ask the students to recall a car journey they have made and ask them what the speed limit was on the roads they were travelling on. Ask them to state the units. They should write a few examples of the speeds with units (miles per hour, mph). Ask them to suggest other units that speed may be measured in. Working outside or in a sports hall and using Practical sheet 1.1.1, the students mark out a distance of 10 m and then collect data by timing how long it takes to walk, jog, run and hop the 10 m distance. They can record data on mini-whiteboards. Prior to the activity ask them to compose a short list	Worksheet Graphs	Doddle – Distance, time and speed	Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5

		Someone else travels the same distance but it takes 2 hours, so they only travel 5 km in an hour and their speed is 5 km/h	of suggestions that would constitute acting responsibly during the activity. Working outside or in a sports hall and using Practical sheet 1.1.1, the students mark out a distance of 10 m and then collect data by timing how long it takes to walk, jog, run and hop the 10 m distance. They can record data on mini-whiteboards. Prior to the activity ask them to compose a short list of suggestions that would constitute acting responsibly during the activity. **Keywords:** Distance Speed Unit Formula Average speed			
1.1.2 Describing journeys with distance–time graphs	Gather relevant data to describe a journey. Use the conventions of a distance–time graph. Display the data on a distance–time graph.	Using a distance-time graph, you can get the students to answer questions based on this. You can then extend this to giving the students a short set of instructions that they have to read and complete their own distance-time graph. Could then extend again to get the students to write their own journey to school and complete distance-time graph,	Demonstrate a simple journey by rolling a dynamics trolley down a ramp, across the floor and allowing it to come to rest due to friction or when it reaches a wall. The students describe the journey in words. Ask some students to share their descriptions with the class. Highlight the good points, such as students recognising how speed and distance from the start position changed during the journey. **Keywords:** Distance-time graph Accelerate Stationary	Assess plotting of graphs	Doddle – Graphing speed	Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5

1.1.3 Investigating the motion of a car on a ramp	Interpret distance–time graphs to learn about the journeys represented. Relate distance–time graphs to different situations and describe what they show.	What is the formula for calculating speed? If speed is measured in m/s, what unit is used for acceleration?	Show a video clip of a sporting activity that involves running at different speeds and stopping, such as tennis or football. Ask students to work in small groups and use a large sheet of paper to sketch a distance–time graph for the sporting activity. They should add captions to describe what the sportsperson is doing in each part of the graph. **Keywords:** Time-lapse sequence Acceleration	Assess plotting of graphs Completion of practical and write-up		Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5
1.1.4 Investigating the motion of a car on a ramp	To describe the motion of an object whose speed is changing? To devise questions that can be explored scientifically. To present data so that it can be analysed to	Explain why a car would accelerate down a ramp? If you are setting up a toy car to roll down a ramp, what are the independent and dependent variables?	Show students a marble and a ramp, and say that you are going to roll the marble down the ramp. Ask them to estimate how far it will go from the end of the ramp. Then ask for suggestions about the variables that will influence how far it will roll. Ask students to work in small groups to develop a definitive list of variables. **Keywords:** Independent Dependent Control Variable Correlation	Assess plotting of graphs Completion of practical and write-up		Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5
1.1.5 Understanding relative motion	Describe the motion of objects in relation to each other. Explain the concept of relative motion. Apply the concept of relative motion to various situations.	A person sets off jogging down a canal path at 12 km/h at the same time as a boat sets off at 10 km/h. a) How far will each on travel in half an hour?	Identify the students' experience of forces from KS2 by displaying a range of images that show different situations in which forces are in action. Give the students two minutes to identify some of the forces. Collect feedback, drawing out a range of descriptions and key words. Make a note of some ideas (incorrect and incomplete as well as correct), so that they can be displayed and revisited later. **Keywords:** Relative motion Relative speed	Worksheet	Doddle – Relative motion	Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5

		b) What is their relative speed?				
1.1.6 Understanding forces	Recognise different examples of forces. List the main types of force. Represent forces using arrows.	How would you describe the type of force that the Earth produces on the bungee jumper? Sketch a car that is starting to move away from a set of traffic lights. draw arrows to show the forces at work and comment on the direction of the resultant force.	Identify the students' experience of forces from KS2 by displaying a range of images that show different situations in which forces are in action. Give the students two minutes to identify some of the forces. Collect feedback, drawing out a range of descriptions and key words. Make a note of some ideas (incorrect and incomplete as well as correct), so that they can be displayed and revisited later. **Keywords:** Force Gravity Balance Orbit	Worksheet Exam Qs Quiz	Doddle - Gravity	Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5
1.1.7 Understanding gravitational fields	Describe gravity as a non-contact force. Explore the concept of gravitational field and weight. Relate this concept to life on Earth.	In what direction does Earth's gravitational force act? Different masses fall towards the Earth at the same rate if air resistance is not a factor – explain why.	Gravitational field strength worksheet comparing planets- can be uploaded and shared on P:drive **Key words:** Gravitational field Non-contact force Gravitational field strength Weight	Worksheet		Num Lit So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5
1.1.8 Understanding mass and weight	Explain the difference between mass and weight. Apply ideas about gravity to various situations.	Why do some people confuse weight and mass?	Hold up a bag of sugar and ask students to consider what forces are acting upon it. Then ask students to consider how this would change if you were on the surface of a different planet.	Worksheet	Doddle – Gravity mass and weight	Num Lit

			Show video clips of astronauts on the surface of the Moon and discuss how they move. Ask students to describe what it might feel like to be working in a situation where gravity is one sixth the strength of the Earth's gravitational field. **Keywords:** Weight Gravity Mass Orbit			So 1, 3, 4, 6 So 6, 7, 8 C 3, 6 Sp 2, 5

Student Book 1 Chapter 2 Electromagnets Voltage and Resistance and Current

What should pupils have learnt at KS2

- Identify common appliances that run on electricity
- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- Recognise some common conductors and insulators, and associate metals with being good conductors.
- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- Use recognised symbols when representing a simple circuit in a diagram.

Scheme of Work 2020 – 2021

Subject: KS3 Science Student Book 1 Chapter 2 Electromagnets: Voltage and Resistance and Current

Year Group: 7

Specification: AQA Science Collins

Skill Focus: 13b,c,d 17ab,d 19a,b 20d,e 24a,b,c

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
1.2.1 Describing	Describe and draw circuit diagrams. Explain what is meant by current.	What symbols are represented in the circuits shown?	Ask the students to draw their own representations of a simple circuit with a light bulb, with annotations, explaining how electric current works to transfer energy to the light bulb. Select different	Whiteboards. Red pen piece.	Doddle- weekly set tasks.	Lit- Describing tasks.

electric circuits	Explain how materials allow current to flow.		students to share their ideas. They should clearly show that current is not used up in the circuit, but enables the transfer of energy Using whiteboards to practice drawing out circuits and quizzing students to draw different circuits. Mathematics – Using symbols to represent components. Understanding that electricity travels through a circuit. **Keywords:** Component Electrical conductor Electrons Electrical insulator Current Ammeter Ampere	RAG boxes at the end of the lesson for books.	BBC bite size	Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.2.2 Understanding energy in circuits	Describe what the voltage does in a circuit.	Describe what voltage does in a circuit.	Display a range of electrical appliances, including some that use batteries and others that use mains electricity. Introduce the term 'voltage' and its units. Ask the students to look at the appliances and their voltage ratings. Discuss the meaning of the term 'voltage'; use the analogies given in the Student Book. Use a defining thinking frame with the frame surrounding voltage Mathematics – recognising trends and patterns. Literacy- Using comparison and analogies **Keywords:** Voltage Volt Voltmeter Potential difference	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2

1.2.3 Explaining resistance	Explain what resistance is and how it affects the circuit. Investigate and identify the relationship between voltage and current.	Describe the term 'resistance' and recognise the units; collect reliable data from circuits.	Demonstrate different circuits to discuss the effect of resistance. Start with a circuit that has one battery and one light bulb. Connect the bulb in series with the battery, switch and ammeter. Close the switch and note the ammeter reading. Now connect another bulb in series. Explain that this has the effect of increasing the resistance in the circuit. Note the effect on the brightness and the ammeter reading Ask the students to complete Worksheet 1.2.3 and to answer the Student Book questions. Numeracy – Using formulae to perform calculations. Literacy- constructing explanations. Know the difference between voltage and current **Keywords:** Resistance Free electron Ohm	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.2.4 Describing series and parallel circuits	Describe how the voltage, current and resistance are related in different circuits. Understand the differences between a series and a parallel circuit.	Describe how the voltage, current and resistance are related in different circuits	Give small groups of students' six bulbs, leads, switches and a battery. Ask them to design their own series and parallel circuits, each having three bulbs. They should draw the circuit diagrams and predict the brightness of the bulbs in each arrangement (task 2 of Worksheet 1.2.4). Allow them to build the circuits to test their predictions Using whiteboards/ plain paper to draw circuits to represent what they are making in front of them. Describe how the voltage, current and resistance are related in different circuits Numeracy- Identifying patterns in data. Knowledge of the different parts of a circuit. **Keywords:**	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6

			Series circuit Parallel circuit			M2
1.2.5 Comparing series and parallel circuits	Investigate and explain current and voltage in series and parallel circuits. Explain the circuits in our homes.	Make predictions about current and voltage in different circuit arrangements; explain how the domestic ring main works.	Small groups The students should set up three series circuits – one with two bulbs, one with three bulbs and one with four bulbs, as shown on Practical sheet 1.2.5. They should measure the current and the voltage across one of the bulbs in each circuit and in the main part of the circuit, as shown in the diagram on the practical sheet, and record their results. Using whiteboards/ plain paper to draw circuits to represent what they are making in front of them. Numeracy- Identifying patterns in data. Understanding the different symbols in a circuit. **Keywords:** Ring main Mains supply	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions. Practical work	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.2.6 Investigating static charge	Recognise the effects of static charge. Explain how static charge can be generated. Use evidence to develop ideas about static charge.	Describe how static charge can be produced and detected	The students experiment with rubbing balloons to collect evidence to decide if contact or non-contact forces are involved and if attraction, repulsion or both can occur. They can use Practical sheet 1.2.6. Making a poster to describe the different types of forces with examples to be drawn underneath. Literacy – Identify and describe evidence **Keywords:** Charge Static electricity Field Attract Repel Contact force Non-contact force	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6

						M2
1.2.7 Explaining static charge	Explain static charge in terms of electron transfer. Apply this explanation to various examples.	The big ideas Ask the students to write down, individually, three things they have learned during the lesson. Then ask them to share their facts in groups and to compile a master list of facts	Use a van de Graaff generator (see Technician's notes 1.2.7) to demonstrate a static electricity effect so that the students can recall the main points from the previous lesson. Invite them to make suggestions about why rubbed objects may become charged Explain static charge in terms of electron transfer Mathematics- Use ideas about positive and negative values Knowing how static charge can be generated. **Keywords:** Electron Proton Charged up Negatively charged Positively charged	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions. Practical work	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.2.8 Understanding electrostatic fields	Explain static electricity in terms of fields. Explain how charged objects affect each other.	Describe the electric field around a charged object.	Ask the students to identify evidence that a wall is not normally charged (dust does not stick or no reading on a coulomb meter). They then observe the failure of an uncharged balloon to stick to a wall and the sticking of a charged balloon Summary poster of electromagnets including all the facts they know about the topic since the start. Including The Graaff Generator etc. Literacy- Construct explanations **Keywords:** Electric field Repel Attract	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6

Student Book 1 Chapter 3 Energy: Energy Costs and Energy Transfer

What should pupils have learnt in KS2?

- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)

Scheme of Work 2020 - 2021

Subject: KS3 Science Student Book 1 Chapter 3 Energy: Energy Costs and Energy Transfer

Year Group: 7

Specification: AQA Science Collins

Skill Focus: 3a 5a 7a 9a 11a 12 13a 14a 15a 20a,b 23a,b,c 24a,b,c,d 25a

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
1.3.1 Understanding energy transfers by fuels and food	Describe the use of fuels in the home. Explain that foods are energy stores and that the amount stored can be measured. Explain that energy is not a material and can be neither created nor destroyed.	Present students with a Bunsen burner heating a beaker of water and ask students to suggest what stores there are in this and how the energy is being transferred from The Bunsen to the Water.	Display images of a variety of situations where energy is being transferred and ask students to make a sentence to describe what is happening. Ask students to suggest ways in which energy can be stored and draw these as examples. Thinking frames. Categorising map. Using visual resources to help develop and see energy transfer. Physical education. Looking at different stores of energy in food. Glucose, Protein and carbohydrates.	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9

			Bpes.bp.com Knowing that food is needed to provide animals and humans with energy. **Keywords:** Fuel Joule Kilojoule Energy resource			SP5 SP6 M2
1.3.2 Comparing rates of energy transfer	Describe what is meant by 'rate of energy transfer'. Recall and use the correct units for rate of energy transfer. Calculate quantities of energy transferred when change happens.	Showing the difference between how quickly water cools when it is in a glass beaker compared with when the water is in a glass beaker that is placed in a larger beaker with insulating material packed in the gap between the two.	Using a sticky note write one reason why you may have to control the speed of energy transfer. Then one by one stick the notes to the wall. Read other post-it notes and stick your post-it notes next to another classmate who has a similar answer. Cause and effect thinking map. Ensuring using visual demonstrations using images and objects Knowing that energy can be transferred from one store to another. **Keywords:** Power Watt Kilowatt	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.3.3 Looking at the cost of energy use in the home	Describe the information a typical fuel bill provides. Explain and use the units used on a fuel bill. Explain how the cost of energy used can be calculated.	Ask the students to look at Figure 1.3.3a in the Student Book. Read the 'Fuel bills' section of the Student Book as a class and then ask the students to work	Ask the students to think about previous lessons and to write down the units used for the quantity of energy and the rate of energy transfer (power). Using visual aids such as calculation shown on the board. White boards to practice questions that are put on the board Mathematics. Calculating the cost of different bills within the home. Understanding differed amounts of energy for differed appliances.	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06

		in pairs to answer questions 1–3	**Keywords:** Kilowatt-hour			S08 SP9 SP5 SP6 M2
1.3.4 Getting the electricity we need	Describe ways of generating electricity. Explain advantages and disadvantages of different methods. Evaluate the consequences of using various generating method.	Show students a hand-crank device and ask them to explain in terms of energy transfer what is happening.	Show students an image of nuclear power station and explain that it is the first stage that is different to the fossil fuel power station Using visual aids and drawings/diagrams to represent different stores of fossil fuels. Geography describing the different countries locations of oil and how their power stations distribute energy. Knowing that energy is distributed by power companies and some example of these **Keywords:** Fossil fuel Non-renewable Renewable	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit-Describing tasks. Num-Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.3.5 Using electricity responsibly	Apply the concept of energy transfers to a device such as a hand crank torch. Critique claims made for the running costs of fluorescent light bulbs. Evaluate actions that could be taken in response to rising energy demand.	Sankey diagrams using whiteboards with range of questions using whole numbers to start. Use images to show different transfers	Show a hand-crank torch or radio and demonstrate how it is charged up and discharged (reflection from previous lesson also). Ask students to explain the relationship between the cranking and the amount of light Showing one of the mains light bulbs, ask students to suggest where energy is being transferred to and from. Mathematics to calculate different stores of energy Bpes.bp.com	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit-Describing tasks. Num-Drawing diagrams S02 S06 S08

			Keywords: Dissipated			SP9 SP5 SP6 M2
1.3.6 Stores and transfers	Investigate a model of energy. Describe energy stores and transfers. Apply the energy model to different situations.	Sankey diagrams using whiteboards with range of questions using whole numbers to start. Use images to show different transfers. Story boards to show different types of energy transfer.	Ask students for suggestions about ways in which energy can be stored. Draw out some examples and make a list. Show students a variety of situations in which energy is being transferred and ask them to collaborate in pairs to draft sentences to say what is happening. Show students a Bunsen burner heating a beaker of water and ask students to suggest what stores and how the energy is being transferred the Bunsen to the beaker. Physical education, how athletes transfer energy from food stores to running etc. Understand that energy cannot be lost only transferred. **Keywords:** Model Chemical energy store Gravitational potential energy store Dissipated Thermal energy store Kinetic energy store Elastic energy store	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions. Practical work.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.3.7 Exploring energy transfers	Recognise what energy is and its unit. Describe a range of energy transfers using simple diagrams.	Sankey diagrams using whiteboards with range of questions using	Discuss the energy transfers in each of the demonstration scenarios and model how to draw simple energy transfer diagrams, and also, for	Whiteboards. Red pen piece.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks.

	Use a Sankey diagram as a model to represent simple energy changes.	whole numbers to start. Use images to show different transfers.	higher-attaining students, Sankey diagrams to represent them ENERGY' on the board and ask the students to make a thinking frame with as many words as they can which they associate with it. Turn this into a mind map. **Keywords:** Energy transfer diagram Efficient Sankey diagram	RAG boxes at the end of the lesson for books. Exam questions. Thinking frame		Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.3.8 Understanding potential energy and kinetic energy	Recognise energy transfers due to falling objects. Describe factors affecting energy transfers related to falling objects. Explain how energy is conserved when objects fall.	Using whiteboards again revisiting Sankey diagrams and displaying different examples of photos with energy transfers. White boards to answer	Show a video of Olympic-standard divers in action. Discuss the energy transfers from diving boards of different heights. Question the students about the energy transfers taking place at certain points of a dive and explore the differences for different heights. Show a photo of the vertical drop ride and what is happening in terms of energy transfer Physical education – movement of athletes and the energy transfers that are occurring **Keywords:** Gravitational potential energy store Kinetic energy store	Whiteboards. Red pen piece. RAG boxes at the end of the lesson for books. Exam questions.	Doddle- weekly set tasks. BBC bite size	Lit- Describing tasks. Num- Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2
1.3.9 Understanding	Describe different situations that use the energy stored in compressing and stretching elastic materials.	Using a tennis ball drop it and get the students to	Provide the students with three different types of elastic band. Ask them to follow the instructions on Practical sheet 1.3.9 and investigate which materials	Whiteboards. Red pen piece.	Doddle- weekly set tasks.	Lit- Describing tasks.

elastic potential energy	Describe how elastic potential energy in different materials can be compared. Explain how elastic potential energy is transferred.	draw a story board representing what is being shown	can store and transfer the most elastic potential energy. Discuss students' findings. Show a video of a bungee jump or a catapult being fired. Ask the students discuss the energy transfers taking place Engineering. Structure of a roller coaster and how it's made to transfer energy and increase speed. **Keywords:** Elastic energy store molecules	RAG boxes at the end of the lesson for books. Exam questions. Practical work Peer assessment	BBC bite size	Num-Drawing diagrams S02 S06 S08 SP9 SP5 SP6 M2