AJS Science Overview - Summer

Key Stage	Year Group	Topic Name	Key Questions	Sticky Knowledge	Key investigations/ activities	Where does this fit into the National Curriculum?
Lower KS2	**Year 3**	**Light**	How would you organise these light sources into natural and artificial sources? How can you protect your eyes from the sun? What is a shadow? How does the distance between the object and the light source affect the size of the shadow?	Light is form of energy that travels in a wave from a source. We need light to be able to see things. Light travels in a straight line. The pupils control the amount of light entering the eyes. If too much light enters, then it can damage the retina. To help protect the eyes, you can wear a hat with a wide brim and sunglasses with a UV rating. Opaque objects do not let any light pass through them. Translucent objects let some light through, but scatter the light so we can't see through them properly. Transparent objects let light travel through them easily, meaning that you can see through the object. A shadow is caused when light is blocked by an opaque object. A shadow is larger when an object is closer to the light source. This is because it blocks more of the light.	Sort items in objects that are light sources/ not. Discuss natural/manmade sources of light. Experiment with the effect of different levels of light on the visibility of different coloured objects. Name safety rules to avoid damaging your eyes from light from the sun. Observe and record the effect of blocking light with solid objects. Investigate with which type of material creates the best shadow.	Recognise that they need light in order to see things and that dark is the absence of light. Notice that light is reflected from surfaces. Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. Recognise that shadows are formed when the light from a light source is blocked by an opaque object. Find patterns in the way that the size of shadows change.

		Forces and Magnets	How does the mass of an object affect how much force is needed to make it move? How far away does a magnet have to be before it attracts a magnetic material?	Forces will change the motion of an object. They will either make it start to move, speed up, slow it down or even make it stop. Different surfaces create different amounts of friction. The amount of friction created by an object moving over a surface depends on the roughness of the surface and the object, and the force between them. A magnet produces a magnetic force that pulls certain objects towards it. Like poles repel. Opposite poles attract.	Discuss which forces makes things move/stop things moving /change shape. Describe and identify forces as push or pull. Investigate how the mass of an objects affects how much force is needed to make it move. Observe and describe how objects move over different surfaces. Carry out tests to find out how far things move on different surfaces. (e.g. Which surface is best to stop you slipping?) Observe that some forces need contact between 2 objects, but magnetic forces can act at a distance. Observe and describe the effect of placing like and different poles of a magnet next to each other. Complete tables/ diagrams to show what happens when different combinations of poles are facing each other.	Compare how things move on different surfaces. Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance. Observe how magnets attract or repel each other and attract some materials and not others. Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. Describe magnets as having 2 poles. Predict whether 2 magnets will attract or repel each other, depending on which poles are facing.

		Electricity	What sorts of things use/need electricity? What electricity do I use? In which ways can we 'get' electricity? (mains/plugs/batteries/wireless) What are the precautions for working safely with electricity? What is a complete/ incomplete circuit?	Many everyday appliances rely on electricity for them to work. Some appliances use mains electricity (are plugged into a socket) and others have a battery to make them work. Electricity sources push electricity round a circuit. A cell converts the chemical energy stored within it, into electrical energy which, in turn, makes the bulb light up. In a series circuit, the components are connected in a loop. Electricity flows through each component in a single pathway. A complete circuit is needed for electricity to flow and devices to work.	Identify and name common appliances that run on electricity. Group common appliances/ devices based on where the electricity comes from. Identify electrical dangers/ safety measures. Construct simple series circuits, trying different components, for example, bulbs, buzzers and motors. Describe circuits as complete/incomplete and make predictions about whether a bulb will light.	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.

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Lower KS2	**Year 4**	**Light**	Which surface gives the best reflection? What might cause shadows to change?	When light hits an object, it is reflected. Reflected light hits our eyes and we can see the object. Some surfaces and materials reflect light well. Other materials do not reflect light well. The surfaces that reflect light best are smooth, shiny and flat. When the light source is directly above the object, the shadow will be directly underneath. When a light source is to one side of an object, the shadow will appear on the opposite side. The shadow will also be longer.	Investigate that white light is made up of 7 colours. Experiment with light reflecting from different surfaces. Categorise surfaces in terms of their reflective properties. Investigate different surfaces and their reflective properties. Observe and record the length of shadows at different times of the day. Observe and record how the size of a shadow changes when the source of light is moved closer or further away from an object causing the shadow.	Recognise that they need light in order to see things and that dark is the absence of light. Notice that light is reflected from surfaces. Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. Recognise that shadows are formed when the light from a light source is blocked by an opaque object. Find patterns in the way that the size of shadows change.
		Forces and Magnets	What are magnetic materials? How can we find out? Are bigger magnets stronger? How are magnet used in everyday life?	Objects which are attracted to a magnet are magnetic. Objects containing iron, nickel or cobalt metals are magnetic. The area around a magnet where there is a magnetic force which will pull magnetic objects towards the magnet is called the magnetic field.	Sort materials into those that are magnetic and those that are not. Explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe).	Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance observe how magnets attract or repel each other and attract some materials and not others compare and group together a variety of everyday materials on

				Repulsion is a force that pushes objects away. Attraction is a force that pulls objects together.	Explore the strengths of different magnets and find a fair way to compare them. Identify how properties of a magnet make them useful in everyday items.	the basis of whether they are attracted to a magnet, and identify some magnetic materials describe magnets as having 2 poles predict whether 2 magnets will attract or repel each other, depending on which poles are facing
		Sound	How can you change the volume of a sound? Which materials vibrate better and produce louder sounds? Can we identify any patterns? How does the volume of a drum change as you move further away from it? How does the type of material affect how well is blocks a sound? How does thickness of material affect how well it blocks a sound?	Sound moves through all materials by making them vibrate. Sound travels as a wave, vibrating the particles in the medium it is travelling in. Sound cannot travel through a vacuum. The size of the vibration is called the amplitude. Louder sounds have a larger amplitude, and quieter sounds have a smaller amplitude.	Draw a labelled diagram/ model that shows how vibrations travel through a medium to the ear. Find out how the volume of sounds can be changed in a variety of ways. Make and play their own instruments by using what they have found out about pitch and volume. Investigate which material provides the best insulation against sound.	identify how sounds are made, associating some of them with something vibrating recognise that vibrations from sounds travel through a medium to the ear find patterns between the pitch of a sound and features of the object that produced it find patterns between the volume of a sound and the strength of the vibrations that produced it recognise that sounds get fainter as the distance from the sound source increases

		Electricity	What materials can carry electricity? (conductors/insulators) Which metal is the best conductor of electricity? How can a switch affect a circuit?	Switches can be used to open or close a circuit. When off, a switch 'breaks' the circuit to stop the flow of electricity. When on, a switch 'completes' the circuit and allows the electricity to flow. Some materials allow electricity to flow easily and these are called conductors. Materials that don't allow electricity to flow easily are called insulators Materials can be tested in a circuit to see if they are electrical conductors or electrical insulators.	Construct simple series circuits with different components and including switches. Use their circuits to create simple devices. Investigate different types of switches. Test different materials in the break in the circuit to categorise materials as electrical insulators/ conductors. Categorise materials based on their conductivity.	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

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Upper KS2	Year 5	**Forces**	What is gravity? How can a force act on an object? How can we see forces? How can we measure forces? How does the amount/depth of tread affect the friction between a shoe and a surface? How can friction be helpful/unhelpful?	Gravity is a pulling force exerted by the Earth (or anything else which has mass). Mass is how much matter is inside an object. It is measured in kilograms (kg). Weight is how strongly gravity is pulling an object down. It is measured in newtons (N). Forces can make an object start moving, stop moving, change shape, change direction, move more slowly, and move quicker. Friction is a force against motion caused by two surfaces rubbing against each other.	Give examples of forces that are push/ pull/ twist. Observe and describe the effect of the force of gravity Research how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation. Measure gravity using objects and force meters Experience forces that make things begin to move, get faster or slow down. Explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Test the effect of friction by pulling weighted item with force meter on different surfaces.	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. Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.

		Light	How does light travel? How does the amount of aluminium foil scrunched affect how much light is scatters? How does the amount of polishing affect how well a piece of metal scatters light? How does the size of an object affect the size of a shadow? How does the distance between the light and the object change the size of a shadow?	Light travels in straight lines. Unlike waves of water or sound waves, light does not need a medium to travel through meaning light can travel through a vacuum - a completely airless space. Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light, so we do not see the beam. A shadow is always the same shape as the object that casts it. When an opaque object is in the path of light travelling from a light source, it will block the light rays that hit it, while the rest of the light can continue travelling. Shadows can be elongated or shortened depending on the angle of the light source.	Draw and label diagrams to show how light travels. Explore how light is reflected on different surfaces. Investigate the size of shadows depending on the position of a light source (distance from object and height) Understand the relationship between the height of a light source and the object that is causing the shadow.	Recognise that light appears to travel in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
		Electricity	What does the ____ symbol represent? How can you represent a switch, bub, buzzer, motor, wire, cell and battery?	Components of a circuit have scientific symbols. A cell is device that stores chemical energy until it is needed. A cell is a single unit. A battery is a collection of cells.	Look at basic parts of a circuit and begin to introduce scientific symbols for components (bulb, wire, switch, motor, buzzer, cell, battery) Represent a simple circuit in a diagram using recognised symbols.	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.

					Systematically identify the effect of changing one component at a time in a circuit.	Use recognised symbols when representing a simple circuit in a diagram.
		Earth and Space	What is in our solar system? Why do we have day/ night?	The sun is a star at the centre of our solar system and that it has 8 planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune Earth rotates on its axis. It does a full rotation once in every 24 hours. Earth also orbits around the Sun. It takes a little more than 365 days to orbit the Sun. Daytime occurs when the side of Earth is facing towards the Sun. Night occurs when the side of Earth is facing away It appears from the Sun. It appears from the Sun. to us that the Sun moves across the sky during the day but the Sun does not move at all. It seems to us that the Sun moves because of the movements of Earth.	Name the planets in the solar system Describe some features of the different planets Place the planets in the solar system in the correct order Create a scaled solar system model using spherical representations Explore the difference between geo and heliocentric solar system and how views have evolved. Compare the time of day at different places on the Earth. Carry out shadow investigations that help support the idea that the Earth moves on its axis Observe, measure and identify patterns in changing shadows across a day.	Describe the movement of the Earth and other planets relative to the sun in the solar system. Describe the movement of the moon relative to the Earth. Describe the sun, Earth and moon as approximately spherical bodies. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

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Upper KS2	Year 6	**Forces**	What is air resistance? What is water resistance? How does surface area of parachute affect the time it takes to fall? How does the surface area of an object affect the time it takes to sink? How can we use levers to lift heavy objects?	Water resistance and air resistance are forms of friction. Friction is sometimes helpful and sometimes unhelpful. Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move.	Observe and describe the effect of air resistance by observing how different objects such as parachutes and sycamore seeds fall. Design and make a variety of parachutes and carry out fair tests to determine which designs are the most effective. Investigate resistance in water by making and testing boats of different shapes. Explore the effects of levers, pulleys and simple machines on movement. Design and make products that use levers, pulleys, gears and/or springs and explore their effects.	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. Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.
		Light	How do animals see? How does a periscope work? What is the law of reflection?	Animals see light sources when light travels from the source into their eyes. Animals see objects when light is reflected off that object and enters their eyes.	Draw and label diagrams to show how objects are seen. Explore the way that light behaves in terms of angles of refraction.	Recognise that light appears to travel in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.

			What colours make visible light? What happens to light when it is shone through water?	The law of reflection states that the angle of incidence is equal to the angle of reflection. Whenever light is reflected from a surface, it obeys this law.	Experiment with making a periscope to demonstrate how objects are seen and using the idea that light appears to travel in straight lines to explain how it works. Look at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water, and coloured filters (they do not need to explain why these phenomena occur).	Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
		Electricity	What is electricity? What will make a bulb brighter or a buzzer louder? What will make a bulb dimmer or a buzzer quieter?	Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.' The greater the current flowing through a device the harder it works. Current is how much electricity is flowing round a circuit. More batteries or a higher voltage create more power to flow through the circuit. Fewer batteries or a lower voltage give less power to the circuit. Shortening the wires in a circuit means the electrons have less resistance to flow through. Lengthening the wires means the electrons have to travel through more resistance.	Construct simple series circuits, to help them to answer questions about what happens when they try different components. Investigate ways to increase/ decrease the brightness of a bulb and the volume of a buzzer. Explain how the brightness of a lamp or the volume of a buzzer can be changed.	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.

		Earth and Space	Can you observe and identify all the phases in the cycle of the Moon?	A moon is a celestial body that orbits a planet (Earth has 1 moon; Jupiter has 4 large moons and numerous smaller ones). The moon orbits Earth in an oval shaped path while spinning on its axis. At various times in a month, the Moon appears to be different shapes because as the Moon rotates round Earth, the Sun lights up different parts of it.	Carry out a simulation investigation to demonstrate why the moon appears as it does in the sky. Look at photos of the moon and identify key features. Match lunar phases to relative positions of the Moon, Sun and Earth.	Describe the movement of the Earth and other planets relative to the sun in the solar system. Describe the movement of the moon relative to the Earth. Describe the sun, Earth and moon as approximately spherical bodies. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.