Science Core Knowledge

Year 8 2020

This booklet contains the core knowledge that we believe is the foundation of understanding for each of the topics taught in year 7.

Pupils are require to learn a selection of these knowledge each week for homework. Their teacher will then carry out regular quizzes to check pupil progress.

We suggest that pupils work with each other or with adults at home to memorise a few at a time in much the same way you may have prepared for spelling tests in the past.

Digital copies of these knowledge, the presentations that teachers use in their lessons, links to other websites, details of test dates and other things you may find useful can be found on our google drive:

bit.ly/aylshamscience

(You will need to type this in to the the address bar exactly as is because the site is hidden from Google.)

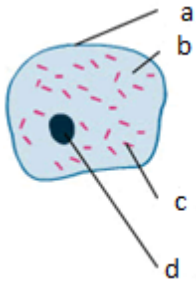
We also sell CGP KS3 revision guides from room 10 at lunch or break time at a significantly reduced price.

We've uploaded sets of these core knowledge onto Quizlet too, so you can use the smartphone app or find the website on a computer. All you have to do is search for AHS_science under users and lookup the topic number and name and quiz yourself.

8B1 Cells and Body Systems Core knowledge

No.	Question	Answer
1.	Give **two** reasons why cells need food.	• Respiration (energy) • To make new cells • To repair themselves
2.	Name **three** essential types of nutrient in a healthy diet	• Carbohydrates • Proteins • Lipids (fats and oils) • Vitamins • minerals
3.	Name two other components of a healthy diet that aren't nutrients.	Water and fibre
4.	Name the unicellular organisms that live in the human digestive system and keep it healthy.	Bacteria
5.	Name **three** organs of the digestive system	• Mouth • Oesophagus • Stomach • Small intestine • Large intestine • Liver • Pancreas • Gall bladder
6.	What are some of the consequences of not getting a balanced diet?	Starvation, obesity and deficiency diseases.
7.	How can we test foods for sugar?	Benedict's test. If it turns green/yellow/brick red then sugar is present
8.	How can we test for starch?	Iodine test. If iodine turns blue/black then starch is present.
9.	How can we test for protein?	Biuret test. If solution turns lilac/purple then protein is present
10.	How can we test for fats/oils?	Ethanol emulsion test. If it turns milky white then fat is present.
11.	What is an enzyme?	A protein made in cells to help a chemical reaction to happen.
12.	What is the name for the reactant(s) in an enzyme-controlled reaction?	Substrate(s)
13.	Name the part of the enzyme where the substrate(s) bind	Active site
14.	What is it called when an enzyme loses its shape because it has become too hot or the pH is wrong?	The enzyme is **denatured.**
15.	Name the **type of enzyme** that digests **carbohydrates** and the **product** of this reaction.	Enzyme is **carbohydrase** Product is **glucose**
16.	Name the **type of enzyme** that digests **proteins** and the **product** of this reaction.	Enzyme is **protease** Product is **amino acids**
17.	Name the **type of enzyme** that digests **lipids** (fats and oils) and the **product** of this reaction.	Enzyme is **lipase** Products are **fatty acids and glycerol**
18.	How is the small intestine adapted to absorb nutrients?	Lots of **villi** give it a large surface area, wall is only 1 cell thick, good blood supply
19.	Name **two** jobs of the skeleton.	• Support • Protection • Movement • Making blood cells
20.	Name the organ system that we need for support and movement	The skeletomuscular system
21.	What do we call a pair of muscles that control the movement of a joint?	Antagonistic muscles

8B2 Respiration Core Knowledge

What is Respiration	The process which the cells in your body use to produce energy.
What is Aerobic respiration	This is respiration using oxygen.
What is the word equation for aerobic respiration?	glucose + oxygen → Carbon dioxide + water + energy
What is Anaerobic respiration in humans	Respiration without oxygen. This produces less energy than aerobic respiration Lactic acid can build up in your muscles and cause cramp.
What is the word equation for anaerobic respiration?	glucose → lactic acid + energy
What is Anaerobic respiration in microorganisms e.g. yeast	This reaction can be used in fermentation to make ethanol (alcohol). e.g. glucose → carbon dioxide + ethanol + energy
What is gas exchange?	• the process by which oxygen and carbon dioxide move between the bloodstream and the lungs. • It is an example of diffusion
What are the adaptations of the alveoli?	• Large surface area • Extensive blood supply • Thin walls
1. Identify these parts of a typical animal cell:  	a) Cell membrane b) Cytoplasm c) Mitochondria d) Nucleus
Where does respiration occur in a cell?	Mitochondria
How do you calculate the magnification of a microscope?	Total Magnification = magnification of OBJECTIVE lens **x** magnification of EYEPIECE lens
How do you calculate the magnification of a specimen under the microscope?	magnification = measured size / actual size.
What are the alveoli?	Small sacs in your lungs where oxygen is taken in to your blood stream and carbon dioxide moves out of your blood stream.
What is an oxygen debt?	An *Oxygen Debt* is the amount of extra *oxygen* needed by muscle tissue to oxidise lactic acid following exercise
What is ventilation (breathing)?	The process of moving air into and out of the lungs

8B3 Genetics Core Knowledge

No.	Question	Answer
1.	What is a cell?	The smallest structural unit of living things.
2.	What is the function of the nucleus?	Contains genetic material/DNA molecule, the 'instructions' for running the cell.
3.	What is the function of the cytoplasm?	Where the cell's chemical reactions happen.
4.	What is the function of the cell membrane?	To control what goes in and out of the cell.
5.	Name three structures that you might find inside a plant cell but *not* inside an animal cell.	• Cell wall • Vacuole • Chloroplast
6.	What is a genome?	A complete set of chromosomes/ full set of DNA.
7.	What are chromosomes?	Chromosomes are strands of DNA found in the nucleus.
8.	What is DNA (deoxyribonucleic acid)?	DNA is a polymer (molecules bonded together in long repeating chains), made of many smaller units called nucleotides.
9.	How many chromosomes are there in the nucleus of human body cells (somatic cells)?	46 chromosomes (23 pairs of chromosomes).
10.	What are gametes?	Sex cells (e.g. egg cells, sperm cells, pollen).
11.	How many chromosomes are there in human gametes?	23 chromosomes (half the number of chromosomes found in the nucleus of body cells (somatic cells).
12.	What is a zygote?	A fertilized egg cell produced after the nuclei of a sperm cell and an egg cell fuse. The nucleus of a zygote contains 46 chromosomes.
13.	State the three reproductive structures of a flowering plant	• Carpel – stigma; style; ovary • Ovule • Stamen – anther; filament
14.	State three methods of seed dispersal	• Wind dispersal • Animal internal • Animal external • Explosive / self-propelled
15.	What is the purpose of fruits in plants?	To promote animals to carry the seeds away from the plant.
16.	Describe sexual reproduction?	Sexual reproduction involves the joining of two sex cells, or gametes during fertilisation. These offspring have two parents and are genetically similar to both but not identical to either.
17.	Describe asexual reproduction?	Asexual reproduction only involves one parent so there is no joining of sex cells during fertilisation. The offspring are genetically identical to each other and their parent.
18.	Why do cells do mitosis?	• Growth • Repair • Asexual reproduction
19.	Describe mitosis	The production of two daughter cells, genetically identical to each other and the parent cell.
20.	Define meristem in plants	Regions of in plant where cell division occurs.
21.	Where are meristems found in plants?	The main meristems are close to the tip of the shoot and the tip of the root.
22.	Define elongation in plant cells	The process where plant cells throughout the plant (not just meristem) become longer as they grow, (cell elongation does not occur in animals).
23.	Define differentiation	When an unspecialised cell becomes a more specialised cell type.
24.	How is growth different in plants and animals?	In animals, cells divide then differentiate. In plants they divide, elongate then differentiate.

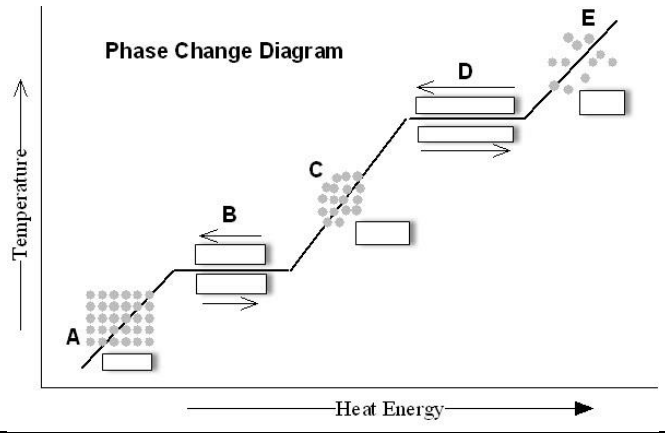
8B4 Plants and Photosynthesis Core Knowledge

What is photosynthesis?	The process by which plants and some other organisms use sunlight to make food from carbon dioxide and water
What is the word equation for photosynthesis?	Carbon Dioxide + Water $\longrightarrow$ Glucose + Oxygen
What is the symbol equation for photosynthesis?	$CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$
What are the reactants of photosynthesis?	Carbon dioxide and water
What are the products of photosynthesis?	Glucose and oxygen
What does the plant use glucose for?	• Used in respiration for energy • Converted to storage molecules • Used to build plants structure
What is biomass?	The total quantity or weight of organisms in a given area
Where in the plant does photosynthesis take place?	In the leaves
What is the green pigment called that is necessary for photosynthesis?	Chlorophyll
In which organelle is this green pigment found?	Chloroplast
Where does gas exchange take place?	Stomata in the leaves
What is the process called by which plants exchange gases?	Diffusion
What chemical is used to test for starch?	Iodine
What are the limiting factors for photosynthesis?	Light, carbon dioxide, water
How do plants get water?	Through their roots
How are roots adapted for the uptake of water and minerals?	They have root hairs which increases the roots surface area
Name 3 minerals that plants need for growth	• Nitrogen • Phosphorous • Potassium
Why are fertilisers used?	To add minerals to increase crop yield
Why is it important to reduce the number of weeds around food crops?	Weeds will compete for water and resources that the crop needs
What is transpiration?	Transpiration is the movement of water from the roots to the leaves and is driven by the evaporation of water from the leaves
How does temperature effect the rate of transpiration?	Temperature increases the rate of transpiration.
What does the xylem transport?	Water and minerals
Describe the structure of the xylem	A column of hollow dead cells, supported with lignan
What does the phloem transport?	sugars
What is the above process known as?	Translocation
Describe the structure of the phloem	A column of living cells, sieve plates in between the cells and companion cells to help transport sugars into phloem cells.

8C1 Atoms and The Periodic Table Core Knowledge

1	What is produced when magnesium burns with oxygen?	Magnesium Oxide
2	What is the chemical symbol for magnesium?	Mg
3	What is the chemical symbol for the oxygen?	O_2
4	What is the chemical symbol for magnesium oxide?	MgO
5	How does the total mass of reactants change as they become products	The mass doesn't change
6	Give the word equation for the reaction between magnesium and oxygen	Magnesium + oxygen → magnesium oxide
7	What are the chemicals before they react called?	Reactants
8	What are the chemicals after they react called?	Products
9	When is a chemical reaction balanced?	When the number of each type of atom is the same before and after the reaction
10	How do we represent solids in a symbol equation?	(s)
11	How do we represent liquid in a symbol equation?	(l)
12	How do we represent gas in a symbol equation?	(g)
13	How do we represent something dissolved in water in a symbol equation?	(aq)
14	Define the atomic number	The number of protons in an atom
15	Define the mass number	The combined number of protons and neutrons
16	How can we calculate the number of neutrons in an atom?	Number of neutrons = mass – atomic number
17	How can we know the number of protons in an atom?	It is the atomic number
18	How can we know the number of electrons in an atom?	It is the atomic number
19	How do we calculate the formula mass of a compound?	add all the atomic masses in a compound together
20	How are the elements on the periodic table ordered?	By atomic mass
21	What is a period on the period table?	The elements in the same horizontal row
22	What is a group on the period table?	The elements in the same vertical column
23	Describe the properties of elements in the same group.	Similar
24	Where on the periodic table are the non-metals found?	The top right
25	Where on the periodic table are the metals found?	Everywhere except the top right
26	Where on the period table are alkali metals found?	Group 1
27	Where on the period table are transition metals found?	In the middle block
28	Where on the period table are the halogens found?	Group 7
29	Where on the period table are the noble gases found?	Group 0
30	What is the maximum number of electrons in the first energy level?	2
31	What is the maximum number of electrons in the second energy level?	8
32	What is the maximum number of electrons in the third energy level?	8
33	How are group numbers and electrons related?	The group number is the number of electrons in the outer energy level
34	How are period and electrons related?	The period number is the number of energy levels

8C2 Particle Theory Core knowledge

1	What are the three states of matter?	Solid, liquid, gas
2	What is melting?	Solid becoming liquids
3	What is evaporating?	Liquids becoming gases
4	What is freezing?	Liquids becoming solids
5	What is condensing?	Gases becoming liquids
6	Label A-E 	A – Solid B – Melting/Freezing C – Liquid D – Evaporating/Condensing E – Gas

8C3 Chemical Reactions Core knowledge

No.	Question	Answer
22.	What is a physical change?	A **change of state**. e.g. from solid to liquid.
23.	Define 'chemical reaction' using ideas about atoms and their arrangements.	A chemical reaction is a **rearrangement of atoms.**
24.	Which observation always shows that a chemical reaction has occurred?	**A new substance has formed.**
25.	What are the chemicals at the start of a chemical reaction called (to the left of the arrow in the middle)	**Reactants**
26.	What are the chemicals at the end of chemical reaction called (to the right of the arrow in the middle)	**Products**
27.	State the law of conservation of mass as it applies to chemical reactions.	Total **mass of reactants** is exactly **equal** to total **mass of products**.
28.	Describe what happens to bonds between atoms in *reactants* during a chemical reaction.	Bonds are broken
29.	Describe what happens to bonds between atoms in *products* during a chemical reaction.	Chemical bonds are formed (to produce new substances)
30.	How would the temperature around an *exo*thermic reaction change?	Temperature **increases** (it **gets hotter**)
31.	How does the temperature around an *endo*thermic reaction change?	Temperature **decreases** (it **gets colder**)
32.	Which releases energy to the surroundings? Breaking chemical bonds in the reactants atoms or making chemical bonds in the products?	**Making** chemical bonds between atoms in the products releases energy to the surroundings
33.	In an exothermic reaction, which step involves the higher amount of energy? Breaking the chemical bonds in the reactants or making the chemical bonds in the products?	**Making bonds** releases more energy than the energy taken in to break bonds during an exothermic reaction
34.	What is distillation?	**Boiling then condensing** to collect a pure liquid
35.	What is the pure liquid collected during distillation called?	**Distillate**
36.	What type of mixture is separated by distillation?	Substances with **different boiling points**
37.	What type of substances are separated by filtration?	An **insoluble solid** and a **solution or liquid**.
38.	What is the liquid called that passes through a filter paper during filtration?	Filtrate
39.	What is the solid called that is left on the filter paper during filtration?	Residue
40.	Describe crystallisation?	Heating a solution so the solvent boils off/evaporates, leaving the solute behind as a solid
41.	What type of substances are separated by crystallisation?	**Soluble** substance in a **solution**
42.	What type of substances are separated by paper chromatography?	**Soluble** substances of different colours
43.	Why must the start line in paper chromatography be drawn in pencil and not pen?	So it is **insoluble** and won't move or contaminate the sample.

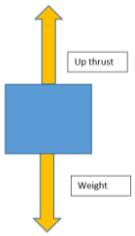
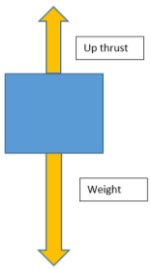
8C4 Earth Science Core Knowledge

Question	Answer
Name the 4 layers of the earth	Crust, Mantle, outer core and inner core.
Name the three types of rock in the rock cycle.	Sedimentary, igneous and metamorphic rock
Describe how sedimentary rocks are formed	Layers or sediment are laid down over thousands of years, which are compressed by the sediment above to form porous rock. Examples are: Chalk, limestone, sandstone and shale,
Describe how igneous rocks are formed	Molten (liquid) rock forms when rocks melt. The molten rock is called **magma**. When the magma cools and solidifies, a type of rock called igneous rock forms. Examples are obsidian, basalt, granite and gabbro.
Describe how metamorphic rocks are formed	Rocks become deeply buried or squeezed. As a result, the rocks are **heated** and put under great **pressure**. They do not melt, but the minerals they contain are changed chemically, forming **metamorphic rocks**. Examples are marble and slate
Name the three types of weathering	Chemical, physical and biological weathering.
Which greenhouse gas in responsible for recent climate change	Carbon Dioxide
Name two other greenhouse gasses	Methane. Water vapour
Which gas in responsible for Acid Rain?	Sulphur Dioxide
Why does acid rain occur?	Sulphur dioxide is dissolved in rain water. Which forms sulphuric acid. Which makes rain water more acidic.
Which indicator is used to test the pH of Soil?	Universal indicator
What happens to the particles in a substance in a chemical reaction?	During a chemical reaction the atoms in the molecules rearrange to form new molecules, with new properties.
What is “acid rain”, and how does it arise?	Acid rain is rain that is more acidic than normal. All fossil fuels (coal, gas and crude oil) contain impurities, particularly sulfur. When the fuel is burnt the sulfur combines with oxygen to produce sulfur dioxide gas. When water vapour in the atmosphere condenses the sulfur dioxide gas dissolves in it to form an acidic solution. This can then fall as rain and because it is more acidic than normal rainwater it is called “acid rain”.
What are the problems associated with acid rain?	Acid rain makes rivers, lakes and soils acidic, harming the organisms living there. Acid rain damages the leaves and roots of plants and trees. Acid rain can speed up the weathering of limestone (rocks or buildings) and marble.
How are nitrogen oxides produced?	Many hydrocarbons are burnt in engines. The high temperatures involved mean that the nitrogen and oxygen from the air combine to produce oxides of nitrogen.

8C5 Metals Core Knowledge

Question	Answer
What element do all acids contain?	Hydrogen
When an acid and an alkali react what are the products?	A salt and water
What type of salt does nitric acid produce?	Nitrates
What type of salt does sulfuric acid produce?	Sulfates
What type of salt does hydro*chloric* acid produce?	Chlorides
What is produced when we react a metal with oxygen?	A metal oxide
What is oxidation	Gaining oxygen
What is reduction	Losing oxygen
What is displacement?	Where the more reactive metal replaces a less reactive metal
What is the reactivity series?	A list of metals with the most reactive at the top and the least reactive at the bottom
What is an ore?	A rock with enough metal in to make it worth extracting
What is used to extract (reduce) iron form its ore?	Carbon (coke)
Why can't carbon be used to extract magnesium?	It is not reactive enough
What could be used to extract magnesium?	Electricity
What is the formula for calcium carbonate?	$CaCO_3$
What is a physical reaction?	A change that is easily reversible
What is a chemical reaction?	A change that is not easily reversible
What two things does the formula of a compound tell us?	What elements are in a compound, What ratio of those elements in the compound
In chemistry, what does the word "product" mean?	A product is a new substance made in a chemical reaction.

8P1 Forces Year 8 Core knowledge

Define friction.	Friction is a force that opposes the motion of one surface against another.
Describe the relationship between atmospheric pressure and height.	As height increases pressure decreases.
Why does gas pressure vary with height/depth?	Pressure increases as the force of the weight of fluid above increases. This itself depends on the height of the fluid column above the object. The density of the fluid and the gravitational field strength it experiences.
How does pressure vary with depth?	As depth increases so does pressure.
Define up thrust.	The resultant force on an object in a fluid created by a pressure gradient across it, due to its length.
Draw a free body diagram to show an object floating.	
Draw a free body diagram to show an object starting to sink.	
Recall the equation for pressure.	Force = Pressure / Area
State a unit for pressure.	Pascal, N/m^2 Any other Force over a given area.
State the units of force.	Newton's (N)
How are forces represented on diagrams?	Using arrows.

8P2 Motion core knowledge

No	Core question	Answer
1	What is Newton's first law of motion?	An object remains in the same state of motion unless a resultant force acts on it.
2	What happens if the resultant force on an object is zero?	• a stationary object stays stationary • a moving object continues to move at the same velocity (at the same speed and in the same direction)
3	What is Newton's second law of motion?	When an unbalanced force acts on an object: the direction of the object's acceleration is the same as the direction of the unbalanced force
4	Which equation describes Newton's second law of motion? (include the units in your answer)	Force (N) = mass (kg) x acceleration (m/s^2)
5	What is relative motion?	The change in position with time of one object compared to another object.
6	How do you calculate relative motion if two objects are moving in the same direction?	Fastest speed- slowest speed
7	How do you calculate relative motion if two objects are moving in opposite directions?	Add the two speeds together

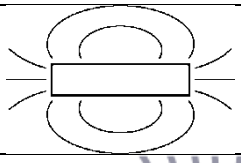
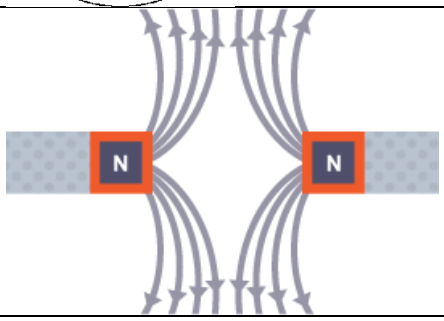
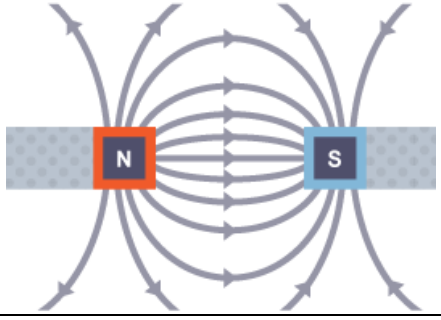
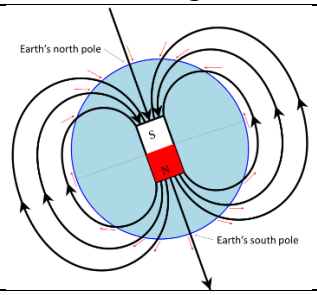
8P3 Energy Core Knowledge

Name the three types of thermal energy transfer.	Conduction, Convection, Radiation
Define convection.	The transfer of thermal energy due to the cycling of particles created by a variation in density within a fluid.
Define thermal radiation	The transfer of thermal energy through electromagnetic waves.
Define conduction	The transfer of heat energy through the collisions between atoms.
In which sates of matter can convection take place.	Liquids and Gases
In which states of mater can conduction take place?	All but is not very effective in liquids and even less so in gases
State the term given to the material through which something may travel.	Medium.
Why do objects cool down?	Due to a net flow of energy away from the object.
What word is used to describe the spreading out a movement away if thermal energy?	Dissipates.
What instrument is used to measure temperature?	Thermometer
What are the units for temperature?	Degrees Celsius, degrees Fahrenheit or kelvin.

8P4 Waves Core Knowledge

No	Core question	Answer
1	Describe two characteristics of a sound wave	Longitudinal Can travel through solids, liquids and gasses but not a vacuum
2	Describe two characteristics of a light wave	Transverse Can travel through solids, liquids, gasses AND a vacuum
3	State the auditory range of humans	Between 20Hz and 20 000 Hz (20kHz)
4	State two uses of ultrasound	Physiotherapy, cleaning, imaging scans
5	Describe how we can observe an object	**Light** travels in **straight lines** from a **source** to an **object**, where it is **reflected** into our eye
6	What is an angle of incidence?	Angle between the normal and the incident ray.
7	What is a normal line	An imaginary but useful line at right angles to the boundary between two surfaces. All angles are measured to this line.
8	What is a reflected ray?	A light ray leaving a surface or boundary
9	What does refraction mean?	Process by which a wave changes speed and sometimes direction upon entering a denser or less dense medium
10	State the rule that describes how light rays reflect off a mirror	The angle of incidence is the same as the angle of reflection (when measured between the light ray and the normal- 90^{o} to the surface.
11	Describe what happens when light rays enter a more dense material	The light ray slows down and bends towards the normal.
12	Describe the relationship between the incident and reflected angles when light rays enter a less dense material	The light ray speeds up and bends away from the normal

8P5 Electricity and Magnetism Core Knowledge

1. When potential difference on a power supply increases, what happens to the current in the circuit?	Current increases
2. What happens to potential difference in series circuits?	It is shared between components
3. Draw a basic magnetic field around a bar magnet	
4. Draw what happens to the shape and direction of the magnetic field when two like poles are near one another?	
5. Draw what happens to the shape and direction of the magnetic field when two unlike poles are near one another?	
6. State the difference between a permanent and induced magnet	A permanent magnet is always magnetic An induced magnet is only magnetic when it is within the magnetic field of another magnet
7. Draw a simple model of the Earth's magnetic field	
8. What are compasses used for?	Navigation
9. Describe how to induce a current in a magnet	Move a magnet within a coil of wire or place a wire within a magnetic field
10. Describe how to induce a magnetic field	Pass a current through a wire
11. Describe what happens to the strength of the magnetic field as the distance increases from the wire	The magnetic field gets weaker
12. Describe what happens to the strength of a magnet if the coil number around the magnet increases	The magnet gets stronger

8P6 Astronomy Core Knowledge

1. Describe the relationship between weight and gravitational field strength	As gravitational field strength increases, weight increases
2. Describe the relationship between gravitational field strength and mass of planet	As the mass of the planet increases, the gravitational field strength increases
3. Describe the relationship between gravitational field strength and distance from planet	As the distance from the planet increases, the gravitational field strength decreases
4. How is weight affected by the gravitational field strength?	Weight will change depending on the gravitational field strength of the planet, moon etc that the object is on. The stronger the gravitational field strength, the heavier the weight. (For example, a 1 kg mass bag of sugar will weigh 9.8N on earth, and only 1.6 N on the moon).
5. How is weight calculated?	Weight (N) = Mass (kg) x Gravitational field strength (N/kg)
6. What is the weight of a 300kg planetary landing craft on the surface of the Earth?	Equation: W = M x GFS Substitute: W = 300 kg x 10 N Calculate: 300 x 10 = 3000 Units: W = 3000 N
7. What is the mass of an object if the weight is 120N on Jupiter whose GFS is 25N/kg?	Equation: M = W / GFS Substitute: M = 120 N / 25 N/kg Calculate: M = 120 / 25 = 0.48 Units: M = 4.8 kg
8. What is the GFS of Mars if a 150kg object has a weight of 570N?	Equation: GFS = W / M Substitute: GFS = 570 N / 150 kg Calculate: 570 / 150 = 3.8 Units: GFS = 3.8 N/kg
9. Name come celestial objects scientists have observed in the night sky	Stars Moons Planets Galaxies Black holes
10. State what is meant by a light year	The distance that light travels in one year. (9,461,000,000,000,000,000 m)