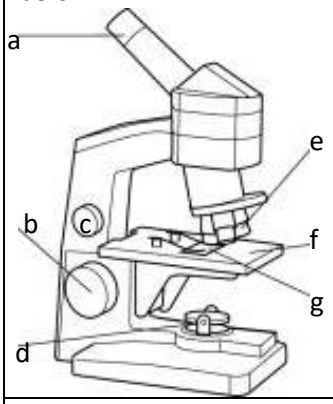
Name _____ Form _____

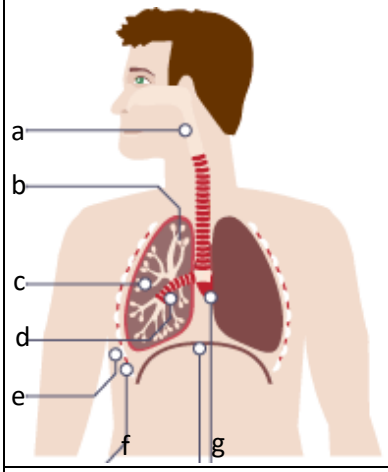
Memory Workout – Common Entrance 13+ Science

Biology – cells and organisation

Which piece of scientific equipment can be used to observe cells?	Light microscope									
Name the labelled parts in the diagram below:  	A – eyepiece lens B – coarse focussing wheel C – fine focussing wheel D – mirror/light E – objective lens F – stage G – slide									
What are the two key differences between a light microscope and an electron microscope	Electron microscope has: • Higher magnification (more zoom) • Higher resolution (more detail)									
What is a cell?	The smallest structural unit in an organism									
What is a tissue?	Cells of the same type joined together									
Give two examples of tissue types in humans.	• Muscle • Epithelial (top layer of skin) • Connective • Nervous									
What is an organ?	Tissues of different types joined together									
Give five examples of organs in humans.	• Heart • Lungs • Kidneys • Liver • Brain • Stomach • Intestines									
Give two examples of organs in plants.	• Leaves • Stem • Root • Flower									
What is an organ system?	A number of organs working together									
Give two examples of organ systems in humans.	• Digestive system • Gas exchange system • Circulatory system • Nervous system									
Give two examples of organ systems in flowering plants.	• Shoots • Roots									
Name the four organelles in an animal cell.	• Nucleus • Cytoplasm • Mitochondria • Cell membrane									

Name the seven organelles in a plant cell.	• Nucleus • Cytoplasm • Mitochondria • Cell membrane • Cell wall • Vacuole • Chloroplasts									
What is the role of the nucleus?	Contains genes which control the production of proteins in the cell.									
What are genes made of?	DNA									
What is the role of the cytoplasm?	It is a jelly-like substance in which most of the chemical reactions take place.									
What is the role of the mitochondria?	It is where aerobic respiration takes place.									
What is the role of the cell membrane?	It controls which substances enter and leave the cell.									
What is the role of the cell wall?	It provides structure for the cell.									
What is the role of the vacuole?	It stores cell sap.									
What is the role of the chloroplasts?	It is where photosynthesis takes place.									
What is the role of a stain (e.g. methylene blue or iodine solution)?	Highlighting certain organelles (e.g. nucleus) when cells are viewed under a microscope									
Which stain is used for cheek cells?	Methylene blue									
Which stain is commonly used for plant cells?	Iodine solution									
What is the definition of diffusion?	The movement of particles from an area of higher concentration to an area of lower concentration.									
Describe how oxygen moves from the air into cells.	Oxygen is inhaled and enters the lungs. It diffuses out of the lungs into the bloodstream. It is carried around the body in the blood. It diffuses out of the blood into cells.									
Describe how carbon dioxide moves from cells into the air	Carbon dioxide diffuses out of cells into the bloodstream. It is carried back to the lungs in the blood. It diffuses out of the blood into the lungs. It is exhaled from the lungs.									
Describe how glucose moves from the small intestines into cells.	Glucose diffuses out of the small intestines (through the villi) into the bloodstream. It is carried around the body in the blood. It diffuses out of the blood into cells.									
How are the lungs adapted to allow fast diffusion of gases?	• Alveoli increase the surface area • Alveoli have a wall one cell thick (decreases the diffusion distance) • Good blood supply (maintains the concentration gradient)									

How are the small intestines adapted to allow fast diffusion of nutrients?	• Villi increase the surface area • Villi have a wall one cell thick (decreases the diffusion distance) • Good blood supply maintains the concentration gradient									
How are gases exchanged in leaves?	The stomata open and close allowing gases to enter and leave									

In which organ does gas exchange happen most frequently?	The lungs									
What is the term used to describe the intake of gases?	Inspiration									
What is the term used to describe the outflow of gases?	Expiration									
What is the trachea?	The tube connecting the mouth/nose to the lungs									
What are the alveoli?	The air sacks which increase the surface area of the lungs.									
What is the diaphragm?	A dome-shaped muscle found below the lungs.									
Identify each labelled part of the diagram below:  	A – trachea B – alveoli C – bronchioles D – bronchi E – ribs F – intercostal muscles G – diaphragm									
What is the effect of the diaphragm contracting (moving down)?	The pressure in the chest is reduced and therefore air is drawn into the lungs.									
What is the effect of the diaphragm relaxing (moving up)?	The pressure in the chest is increased and therefore air is forced out of the lungs.									
What is the role of the rib cage?	To protect the lungs and other organs in the chest.									
What is the role of the intercostal muscles?	They allow the volume of the chest to increase, providing more space for the lungs to expand.									

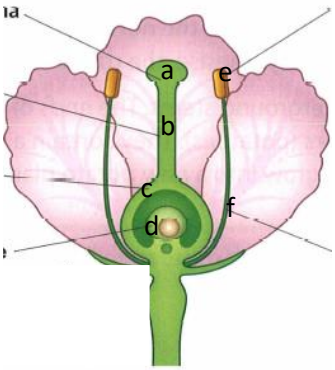
What is vital capacity a measure of?	The maximum volume of air that can be breathed in and out with the deepest breath a patient can manage.								
How could lung volume be measured?	By exhaling air through a tube into an unturned bottle filled with water. The volume of water displaced can then be measured.								
How does asthma affect the gas exchange system?	Asthma causes the trachea to get narrower, meaning that it is harder to inhale air.								
How does an inhaler help in treating asthma	An inhaler causes the lining of the trachea to relax, widening the passage.								
Name 3 impacts of smoking on the gas exchange system.	• Lung cancer • Heart disease • Reduced lung surface area								
What are the names of the blood vessels which carry blood away from the heart?	Arteries								
What are the names of the blood vessels which carry blood towards the heart?	Veins								
How are red blood cells adapted to carrying oxygen?	• No nucleus – more space from carrying oxygen • Biconcave shape – provides a larger surface area								
What is the function of the red blood cells?	To carry oxygen around the body								
What is the function of the white blood cells?	To fight diseases								

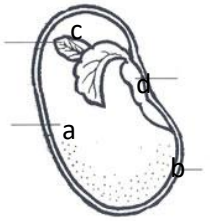
What is the word equation for aerobic respiration?	Glucose + oxygen → water + carbon dioxide									
In which part of the cell does aerobic respiration take place?	Mitochondria									
What is the purpose of respiration?	The release of energy from glucose									
What is the difference between breathing and respiration?	Breathing is the inspiration and expiration of gases (using the lungs) Respiration is a chemical reaction involving glucose and oxygen									
By what process to gases move between the lungs and the blood?	Diffusion									
How are the lungs adapted for gas exchange?	• Alveoli increase the surface area • A good blood supply maintains the concentration gradient • Alveoli have walls one cell thick – smaller diffusion distance • A moist layer allows gases to dissolve									
How can we test for carbon dioxide?	Bubbling the gas through limewater. It will turn from colourless to cloudy white if carbon dioxide is present.									
How will the composition of exhaled air compare to the composition of inhaled air?	Inhaled air will contain more oxygen (~20%) and less carbon dioxide (~0.06%)									
What is difference between aerobic and anaerobic respiration?	Anaerobic respiration does not require oxygen.									
What is the equation for anaerobic respiration in animals (including humans)?	Glucose → lactic acid									
Does anaerobic respiration release more of less energy than aerobic respiration?	Much less									
What is the issue with producing lactic acid?	It is a mild poison which causes cramp in the muscles.									
What is the effect of exercise on breathing rate?	More exercise = higher breathing rate									
Explain why your breathing rate increases during exercise.	It increases the amount of oxygen reaching your lungs and the amount of carbon dioxide being removed from your lungs.									
What is the effect of exercise on heart rate?	More exercise = higher heart rate									
Explain why your heart rate increases during exercise.	More oxygen and glucose must be delivered to cells to allow respiration to happen more quickly, releasing more energy.									
Explain why anaerobic respiration is necessary during hard exercise?	You cannot transport oxygen quickly enough to your cells.									

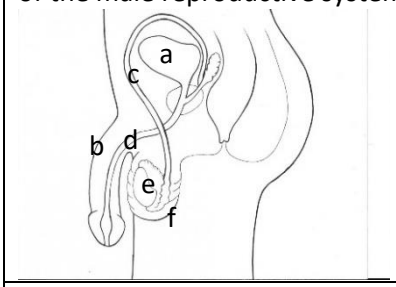
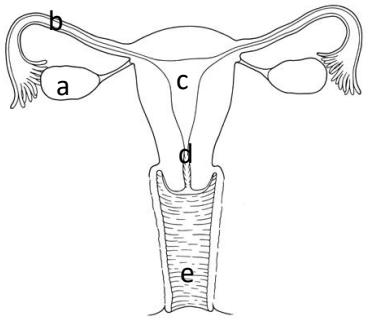
Why do we continue to breathe fast and have a high heart rate after exercise?	To transport oxygen to our cells to break down lactic acid (oxygen debt).								
What is the word equation for the breakdown of lactic acid?	Oxygen + lactic acid → water + carbon dioxide								
What is the equation for anaerobic respiration in plants and yeast?	Glucose → carbon dioxide + ethanol								
What is yeast used for?	• Baking (production of carbon dioxide causes the bread to rise) • Brewing beer (production of ethanol makes the beer alcoholic)								

What is the word equation for photosynthesis?	Carbon dioxide + water → glucose + oxygen									
What is also required for photosynthesis to take place?	Light									
In which part of a plant does photosynthesis take place?	The leaves									
In which part of a plant cell does photosynthesis take place?	Chloroplast									
What is the name of the substance inside the chloroplast which allows photosynthesis to take place?	Chlorophyll									
What three things happens to the glucose after it has been made?	• It is converted to starch for storage • It is used in respiration • It is used for growth to become cell walls, seeds or fruits									
Which four factors may affect the rate of photosynthesis?	• Light intensity • Concentration of carbon dioxide • Temperature • Volume of water (although this is less important)									
What is the effect of increasing the light intensity on the rate of photosynthesis?	It will increase									
What is the effect of increasing the concentration of carbon dioxide on the rate of photosynthesis?	It will increase									
What is the effect of increasing the temperature on the rate of photosynthesis?	It will increase at first, but if it gets too hot it will decrease and stop									
How can a leaf be tested for carrying out photosynthesis?	• Boil it in water to kill it • Put it into boiling ethanol to remove the chlorophyll (green colour) • Add iodine which will turn blue/black if starch is present									
What piece of equipment could be used for measuring the volume of gas produced during photosynthesis?	A gas syringe Or An unturned measuring cylinder filled with water									
Suggest three reasons that plants are so important to life on Earth.	• They produce oxygen which is essential for life on Earth • They provide biomass which is used by animals as food • They remove carbon dioxide from the atmosphere which prevents global warming and the Earth becoming too hot									

Suggest three ways in which leaves are adapted for photosynthesis.	• Large flat shape increases surface area for absorbing sunlight • Stomata (holes on the bottom of the leaf) allow gases to enter and leave • Large spaces between cells allow gases to diffuse • Palisade cells contain lots of chloroplasts to absorb more light									
What is the name of vessels which transport water through the plant?	Xylem									
What is the name of vessels which transports sugars through the plant?	Phloem									
How are leaves adapted to prevent excessive water loss?	• Waxy layer on top • Stomata open and close allowing water to be trapped if it is too hot									
Which part of the plant absorbs water?	Roots (root hair cells)									
How are root hair cells adapted for taking in lots of water?	They have a large surface area									
Apart from water, what else do the roots absorb?	Mineral ions (especially nitrates, but also magnesium, potassium, calcium and phosphate)									
What are nitrate ions used for in a plant?	Making proteins									
Which elements are found in nitrate ions?	Nitrogen and oxygen									
What are magnesium ions used for in plants?	Producing chlorophyll									
What can farmers add to their fields if there are not enough nutrients in the soil?	Fertilisers									
What are 3 issues with the use of fertilisers?	They can run off into rivers causing: • Excessive growth of algae • Polluted drinking water • Death of fish and other animals									
What do we call the process of adding and removing carbon from the atmosphere?	The carbon cycle									
Which process add carbon (as carbon dioxide) to the atmosphere?	• Respiration • Combustion • Decomposition (by bacteria and fungi)									
Which process removes carbon from the atmosphere?	Photosynthesis									

Name the labelled parts of the reproductive system in flower plants: 	A – stigma B – style C – ovary D – ovule E – anther F – filament									
What is the male reproductive organ called in a plant?	Stamen									
Which parts make up the male reproductive organ in a plant?	Anther and filament									
What is the female reproductive organ called in a plant?	Carpel									
Which parts make up the female reproductive organ in a plant?	Stigma, style, ovary and ovule									
What is the name for the transfer of pollen to the stigma of a flowering plant?	Pollination									
By which two main methods does pollination occur?	• Insect pollination • Wind pollination									
What is the role of the petals in flowering plants?	To attract insects									
What is the role of the sepals in flowering plants?	To protect the plant's reproductive system									
What is the male gamete in plants?	Pollen									
What is the female gamete in plants?	Eggs									
Describe how fertilisation occurs in flowering plants.	Pollen travels from the stigma down the style. It then enters the ovule and combines with the egg.									
What is formed following fertilisation of an egg cell?	A seed									
What is the scientific word for 'spreading out seeds'?	Dispersal									
By which methods can seed dispersal take place?	• By wind • By animals • By explosion • By water									
Why is it important for seeds to be dispersed?	To avoid competition for water/light/other resources									
How are seeds which use dispersal by wind adapted?	They have a parachute or wings to allow them to travel further									

How are seeds which use dispersal by animals adapted?	• They have sweet flesh to encourage animals to eat them • A hard seed coat to avoid the seed being digested • Brightly coloured skin to attract animals									
How are seeds which use dispersal by water adapted?	The outside (husk) is made of fibres which trap air. This helps them to float.									
What three things are required for germination to occur?	• Water • Oxygen • Warmth									
Name the labelled parts of the germinating seed:  	A – food store B – seed coat C – shoot embryo D – root embryo									
What are the stages involved in germination?	• Water softens the seed coat • The food store dissolves in the water and reacts with oxygen, releasing energy • Roots and shoots start to form • Shoots break through the soil and can start to photosynthesise									

What are the names of each labelled part of the male reproductive system:  	A – bladder B – penis C – sperm duct D – urethra E – testis F – scrotum G – foreskin									
What is the role of each of the following: • Bladder • Sperm duct • Urethra • Testis • Scrotum	• Bladder – stores urine • Sperm duct – transports sperm from the testes to the urethra • Testis – produces and stores sperm • Scrotum – expands and contracts to control to temperature of the testis									
What are the names of each labelled part of the female reproductive system:  	A – ovary B – oviduct (fallopian tube) C – uterus D – cervix E – vagina									
What is the role of each of the following: • Ovary • Oviduct • Uterus • Cervix	• Ovary – develops and releases eggs • Oviduct – contains cilia (small hairs) which sweep eggs towards the uterus • Uterus – where the baby will develop • Cervix – holds the baby in place during pregnancy									
What is the scientific term for 'sex cells'?	Gametes									
In humans, what is the male gamete?	Sperm									
In humans, what is the female gamete?	Ovum (egg)									
What is the term used to describe the process of combining an ovum with a sperm cell?	Fertilisation									
What is the scientific term for a fertilised egg cell?	Zygote									

How are sperm cells adapted for their role?	• They have a flagellum (tail) for swimming • They have a streamlined shape • They have an acrosome which contains enzymes for entering the egg cell • They have lots of mitochondria to provide energy • They have a nucleus with half the number of chromosomes									
How are egg cells adapted for their role?	• They contain a large glucose store to provide energy during the first part of growth • The cell membrane hardens once a sperm has entered to egg to prevent multiple sperm entering • They have a nucleus with half the number of chromosomes									
How many chromosomes are there in gametes?	23									
How many chromosomes are there in normal body cells?	46 (23 pairs)									
How many days does a menstrual cycle normally last for?	Between 24 and 28 days									
What happens at the beginning of the menstrual cycle?	Menstruation – the lining of the uterus is broken down giving the woman her period									
What follows this stage?	The lining of the uterus starts to rebuild and an egg develops inside one of the ovaries.									
On which day of the menstrual cycle is an egg released?	Day 14									
What happens after the egg is released?	The egg travels down the oviduct towards the uterus									
If the egg is fertilised, what will happen?	It will implant on the wall of the uterus and begin to divide									
If the egg is not fertilised, what will happen?	The lining of the uterus will break down and the egg will be passed out along with it. The cycle restarts.									
What is the term used for the period in which a fetus is growing inside the uterus?	Gestation									
How long is the gestation period in humans?	Nine months									
How is the fetus protected whilst inside the uterus?	It is suspended in the amniotic fluid (inside the amniotic sac)									
How does the fetus get nutrients whilst in the uterus?	Nutrients are transported through the placenta, and then carried in the umbilical cord which attaches the mother to the fetus.									

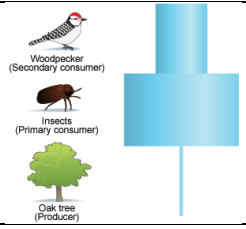
What is the potential impact of the mother drinking alcohol during pregnancy?	Premature birth, low birth weight and brain disorders								
What is the potential impact of the mother smoking during pregnancy?	Premature birth, low birth weight and heart/breathing problems								
How are waste products (e.g. carbon dioxide) excreted by the fetus?	The waste products travel through the umbilical cord, pass across the placenta, and are then excrete by the mother.								
Whose blood flows inside the umbilical cord?	The fetus'								
What changes take place in the body during puberty?	• Grow more body hair • Penis enlarges (in men) • Voice deepens (in men) • Menstrual cycle starts (in women) • Breasts develop (in women) • Hormones (testosterone in men and oestrogen in women are produced)								

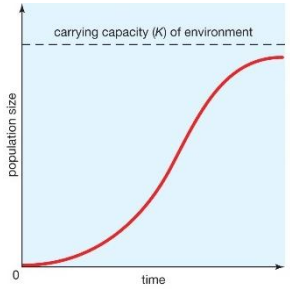
What are the seven substances required by the body (5 are nutrients, 2 are not)?	• Carbohydrates • Protein • Fats (lipids) • Vitamins • Minerals • Fibre (not a nutrient) • Water (not a nutrient)									
What are the two main types of carbohydrate?	Sugar and starch									
What is the role of carbohydrates in the body?	Energy (sugar – quick release, starch – slow release)									
What is the role of protein in the body?	Growth and repair of body tissue									
What is the role of lipids in the body?	Energy, insulation, and protection of organs									
What is the role of fibre in the body?	Keeps food moving through the body preventing constipation									
What is the role of water in the body?	Regulates temperature and maintains other bodily functions.									
What are the roles of the follow minerals: • Calcium • Iron	Calcium – strengthens bones and teeth Iron – used in the production of red blood cells									
What are the roles of the following vitamins: • Vitamin A • Vitamin C	Vitamin A – maintains good eyesight and healthy skin Vitamin C – growth and repair of tissues and strengthens the immune system									
What food is a good source of the following nutrients: • Starch • Sugar • Protein • Lipids • Fibre • Water • Calcium • Iron • Vitamin C	• Starch – pasta, rice, bread • Sugar – Chocolate, fruit • Protein – Meat, beans, eggs • Lipids – Cheese, crisps • Water – Milk, fruit juice • Calcium – Dairy products • Iron – red meat, beans, spinach • Vitamin C – Citrus fruits									
What is the consequence of a lack of vitamin C in the diet?	Scurvy – causes bleeding gums									
What is the consequence of a lack of calcium in the diet?	Rickets – soft/weak bones and stunted growth									
Describe the test for starch.	Iodine turns from orange/brown to blue/black									
Describe the test for glucose.	Benedict's solution turns from blue to yellow/orange/red when heated.									
Describe the test for fat	Rub the food on filter paper. If it turns translucent, fat is present.									
Describe the test for protein	Biuret solution turns from blue to purple									

How could the amount of energy contained in a food be determined?	Burn the food underneath a test-tube of water. Measure the temperature rise of the water.									
Suggest two variables which should be controlled during this investigation.	• Same mass of food • Same distance from test tube • Same volume of water • Same starting temperature of water									
Which substances break down food chemically?	Enzymes									
Which enzyme breaks down starch?	Amylase									
What is starch broken down into?	Simple sugars									
What is the consequence of taking in too little energy?	Weight loss									
What is the consequence of taking in too much energy?	Weight gain (and ultimately obesity)									
What is the difference between starvation and malnutrition?	Starvation is a lack of food Malnutrition is a lack of certain nutrients.									
State the names of the organs (in order) involved in the digestion of food.	• Mouth • Esophagus • Stomach • Small intestine • Large intestine • Rectum • Anus									
What happens in the mouth?	Food is ingested and then broken down mechanically by the teeth and chemically by enzymes in the saliva									
What are the four main kinds of teeth?	• Incisors • Canines • Pre-molars • Molars									
What is the role of each kind of tooth: • Incisors • Canines • Pre-molars • Molars	• Incisors – cutting food • Canines – tearing food • Prep-molars – tearing and crushing food • Molars – grinding food									
What happens in the stomach?	Food is compressed by the contracting stomach wall. Bacteria are killed by stomach acid.									
What is the effect of plaque on teeth?	Plaque provides a breeding-ground for bacteria, causing tooth decay									
What happens in the small intestine?	Nutrients diffuse into the bloodstream through the villi									
What happens in the large intestine?	Excess water is removed									
What happens in the rectum and the anus?	Faeces is stored and then egested									

What is the definition for the word 'health'?	A state of complete mental, physical and social wellbeing. It is not merely the absence of infirmity (illness).									
What is the scientific definition for the word 'drug'?	A substance taken into the body that modifies or affects chemical reaction inside the body									
What are some of the short-term risks of drinking alcohol?	• Impaired judgement • Dehydration									
What are some of the risks to health of drinking larger amounts of alcohol?	• Liver damage • Heart disease • Obesity (it can contain lots of energy) • Damage to sex organs									
What are some of the risks to health of taking recreational drugs such as marijuana?	• Paranoia • Memory loss • Addiction									
Which three harmful chemicals are found in cigarette smoke?	• Carbon monoxide • Nicotine • Tar									
Why is carbon monoxide harmful?	It binds to your red blood cells preventing them from transporting oxygen around your body									
Why is nicotine harmful?	It is addictive, making you crave more cigarettes									
Why is tar harmful?	It reduces the surface area of your lungs, reducing gas exchange.									
What are some elements of a healthy lifestyle?	• A balanced diet • Exercise • Positive social interactions									
What are some of the key benefits of exercise?	• Reduces obesity • Increases strength • Improves heart and lung function									
What is the definition for a non-infectious (or non-communicable) disease?	A disease which cannot be passed from one organism to another.									
Give two examples of non-infectious diseases.	• Cancer • Heart disease • Diabetes • Lung disease									
What is the definition for an infectious disease?	A disease which can be passed from one organism to another.									
What are infectious diseases caused by?	Pathogens (disease causing organisms)									
What are the four types of pathogen?	• Bacteria • Fungi • Viruses • Protists									
Give two examples of diseases caused by bacteria.	• Plague • Cholera • Tuberculosis									

Give two examples of diseases caused by viruses.	• Flu • HIV • Herpes									
How to viruses reproduce?	• They attach to a body cell • The viral genes instruct the cell to make copies of the virus • The cell bursts causing the copied viruses to escape									
How do bacteria reproduce?	• By binary fission • The bacterial cells divide approximately every 30 minutes									
How can pathogens be spread?	• In food and water • In the air • Through bodily fluids (blood or sexual fluids) • Through animal vectors (e.g. mosquitos)									
What physical defences does the body have against pathogens?	• Skin • Cilia and mucus • Blood clots									
What chemical defences does the body have against pathogens?	• White blood cells • Lysozymes (enzymes in tears which break down bacteria)									
Which pathogens can be controlled using antibiotics?	Bacteria									
Suggest two things that we can personally do to act as a defence against disease.	• Maintain good hygiene (hand-washing, tooth brushing etc.) • Eat a balanced diet • Take regular exercise • Resting • Not smoking or drinking excessive volumes of alcohol									
What are the responsibilities of a community in preventing disease?	• Providing medical care • Removing rubbish • Providing safe drinking water • Maintaining high standard of health and hygiene in businesses									

What type of diagram is used to describe the feeding links between different organisms?	A food chain									
What does an arrow represent in a food chain?	The transfer of energy from one organism to another									
What happens to the amount of energy transferred as you move through a food chain?	It decreases									
Suggest three reasons the energy transferred will decrease?	• Organisms use some energy for movement • Organisms use some energy for keeping warm • Organisms may reproduce and transfer energy in growing their offspring									
Why are there normally no more than 4 or 5 levels in a food chain?	There is insufficient energy remaining to be transferred									
What are the different levels in a food chain called?	Trophic levels									
What is the term used to describe the first organism in a food chain?	Producer									
From where to producers get their energy?	The sun – through photosynthesis									
What is a herbivore?	An organism which feeds on plants									
What is a carnivore?	An organism which feed on the flesh of other animals									
What is an omnivore?	An organism which eats both plants and meat									
Put these organisms into a food chain: Mouse Hawk Snake Corn	Corn → Mouse → Snake → Hawk									
What would be the effect on each of the other organisms of all of the snakes catching a disease and dying?	The population of hawks would fall – less prey The population of mice would increase – less predators The population of corn would fall – more predators (mice)									
What type of diagram is used to describe interlinked food chains?	Food webs									
What is the name for this type of diagram? 	Pyramid of numbers									

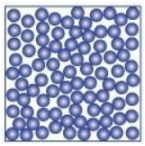
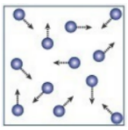
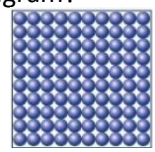
Why may it be a problem to introduce a new species into an ecosystem?	It is difficult to know what effect it will have on the food web. Native species may die out.									
What piece of equipment may be used to estimate the population of plants or small, slow moving animals?	A quadrat									
How should a quadrat be used to estimate population in an area?	1. Place the quadrat **randomly** in the area. 2. Count the number of organisms of that species inside the quadrat 3. Repeat this a number of times and find the mean 4. Multiply the mean by the number of quadrats which will fit inside the area									
Which part of this method is increasing the reliability?	Taking multiple samples and calculating an average									
What may cause the population of a species to fall?	• Increased competition for resources • Increased predation • Disease • Pollution • Habitat loss									
Which resources may plants compete for?	• Water • Light • Carbon dioxide • Space • Nutrients									
Which resources may animals compete for?	• Food • Water • Shelter									
Describe the shape of a population curve.	Increases slowly at first, then faster as time goes on. Reaches a maximum point.									
Explain, giving reasons, the shape of the population curve below:  	• The graph starts slowly because there are not many organisms which are reproducing • The graph gets steeper as more organisms reach maturity and can reproduce • The graph levels off because of disease, competition or predation									
What does the word 'conservation' mean?	Protecting the environment though management									

What are some of the problems of deforestation?	• Habitat loss and extinction of species • Reduced soil fertility • Flooding and landslides • Changes to the atmosphere (less oxygen, more carbon dioxide, drier air)									
What are some conservation activities which may be carried out?	• Creation of new habitats – plants new trees, digging a garden pond • Creation of nature reserves • Captive breeding – such as in zoos									
What does the word 'biodiversity' mean?	A range of living organisms									
Why is biodiversity important?	Without biodiversity, it is more likely that the death of one species will result in the death of many more species									

What does the word 'variation' mean?	Differences (between organisms)									
What is discontinuous variation?	Differences which can be put into different groups easily (i.e. cannot be measured on a scale)									
Give three examples of discontinuous variation.	• Blood type • Eye colour • Whether you can roll your tongue									
What is continuous variation?	Differences which can be measured on a scale and can take any value (between limits)									
Give three examples of continuous variation.	• Height • Weight • Head size									
Why does variation exist?	Random mutations in DNA happen which can change the appearance of an organism									
Why do you look similar to your parents?	When the sperm and eggs cells combine, 50% (23 chromosomes) of you DNA comes from your mum and 50% comes from your dad.									
What is meant by the term 'species'?	Two organisms of the same species can reproduce to produce fertile offspring									
What is 'natural selection'?	Survival of those organisms within a species which have favourable variations (e.g. sheep living in a cold country with thick wool)									

What are the five stages of evolution?	1. Variation exists within a species 2. Environmental conditions change which some organisms are better adapted for 3. Those with favourable variations survive and reproduce 4. The favourable variations are passed on to their offspring 5. This continues over millions of years until a new species emerges									
How have polar bears evolved to survive in the arctic?	• Thick fur for insulation • White fur for camouflage • Large paws to stop them sinking into the snow • Large claws for hunting									
How have cacti evolved to survive in the desert?	• Small/no leaves to reduce water loss • Very deep, long roots to absorb water • Spikes for protection									
How have camels evolved to survive in the desert?	• Large humps for fat storage • Yellow/brown fur for camouflage • Large feed to stop them sinking into the sand • Long eyelashes to keep sand out of their eyes									
What evidence do we have for evolution?	Fossils									
What are the 5 kingdoms of life?	• Animals • Plants • Fungi • Protists • Bacteria									
What are the key characteristics of animal cells?	• Have a nucleus • Do not have a cell wall									
What are the key characteristics of plant cells?	• Have a nucleus • Have a cell wall made of cellulose • Contain chloroplasts									
What are the key characteristics of fungal cells?	• Have a nucleus • Have a cell wall made of chitin									
What are the key characteristics of protist cells?	• Have a nucleus • Unicellular									
What are the key characteristics of bacterial cells?	• Do not have a nucleus • Unicellular									
What is a vertebrate?	An animal with a backbone									
What is an invertebrate?	An animal without a backbone									

What are the key characteristics of a reptile?	• Cold blooded • Lays eggs with soft shells • Has scales and dry skin									
What are the key characteristics of an amphibian?	• Cold blooded • Lays eggs in water • Doesn't have scale									
What are the key characteristics of a bird?	• Warm blooded • Lays eggs with hard shells • Has feathers									
What are the key characteristics of a fish?	• Cold blooded • Lays eggs in water • Has scales and wet skin									
What are the key characteristics of a mammal?	• Warm blooded • Doesn't lay eggs • Feeds its young milk • Has fur/hair									
What are the key characteristics of insects?	• Three main body parts • 6 legs • Usually 2 pairs of wings									
What are the key characteristics of spiders?	• Two main body parts • 8 legs • No wings									

What are the names of the 3 states of matter?	Solid, liquid, gas									
For which state of matter is this the particle diagram? 	Liquid									
For which state of matter is this the particle diagram? 	Gas									
For which state of matter is this the particle diagram? 	Solid									
How are the particles arranged in a solid?	• Regular arrangement • Particles touching									
How do particles move in a solid?	Vibrate about a fixed point									
How are the particles arranged in a liquid?	• Random arrangement • Particles touching									
How do particles move in a liquid?	Move around each other									
How are the particles arranged in a gas?	• Random arrangement • Particles far apart									
How do particles move in a gas?	Move freely									
Explain why gases can be compressed, but solids and liquids cannot.	There is space between the particles, so they can be moved closer together.									
Explain why gases and liquids can flow, but solids cannot.	The intermolecular forces in liquids and gases and weaker than in solids. This means that particles are not fixed in place.									
What are intermolecular forces?	Forces between molecules									
In which state of matter do the particles have most energy?	Gas									
What causes gas pressure?	Collision of particles with the container wall									
What is the term used for the random motion of particles?	Brownian motion									
What is the definition for diffusion?	The movement of particles from an area of higher concentration to an area of lower concentration.									
What type of change is a change of state?	Physical change									

What is the main difference between a chemical change and a physical change?	A chemical change results in new substances being formed, whereas a physical change does not									
What are all the changes of state called?	Melting, freezing, evaporating, boiling, condensing and sublimating									
What happens to the arrangement, movement and energy of particles during melting?	The particles gain energy, which means they move faster. This allows them to overcome the attractions between themselves enough to be able to move away from each other and out of their fixed positions.									
What happens to the arrangement, movement and energy of particles during boiling/evaporation?	The particles gain energy, which means they move faster. This allows them to overcome the attractions between themselves enough to be able to move away from each other, which means they are no longer touching.									
What state will a substance be if the temperature is above its boiling point?	Gas									
What state will a substance be if the temperature is between its melting point and boiling point?	Liquid									
What state will a substance be if the temperature is below its melting point?	Solid									
What is the melting point of water?	0^{o}C									
What is the boiling point of water?	100^{o}C									
What happens to water when it freezes?	It expands									
Why does water expand when it freezes?	The particles are further apart from each other									
What does this mean happens to the density of water when it freezes?	It decreases (all other solids are denser than their liquid state)									
What are the stages involved in the water cycle?	• Evaporation (from oceans and rivers) • Condensation (to form clouds) • Precipitation (as rain, snow etc.) • Run-off (water flows back to oceans and seas)									
What can be done to increase the rate of evaporation?	• Better air flow (more wind) • Warmer temperatures • Larger surface area (shallower container)									
How could the volume of water lost over a number of days be accurately measured?	1. Measure the mass of water before the experiment. 2. Measure the mass of water after the experiment.									

What is the definition of the word 'atom'?	The smallest particle of a chemical element which can exist.									
What is the definition of the word 'molecule'?	Two or more atoms chemically joined together									
What is definition of the word 'compound'?	Two or more atoms of different types chemically joined together									
What is the definition of the word 'element'?	Atoms of the same type									
What is the chemical symbol for hydrogen?	H									
What is the chemical symbol for oxygen?	O									
What is the chemical symbol for carbon?	C									
What is the chemical symbol for nitrogen?	N									
What is the chemical symbol for sulfur?	S									
What is the chemical symbol for magnesium?	Mg									
What is the chemical symbol for sodium?	Na									
What is the chemical symbol for chlorine?	Cl									
What is the chemical symbol for calcium?	Ca									
What is the chemical symbol for copper?	Cu									
What is the chemical symbol for iron?	Fe									
What is the chemical symbol for helium?	He									
What is the formula of a molecule of water?	H_2O									
What is the formula of a molecule of carbon dioxide?	CO_2									
What is the formula of a molecule of oxygen?	O_2									
What is the formula of a molecule of methane?	CH_4									
What is the formula of sodium chloride?	NaCl									
What is the formula of hydrochloric acid?	HCl									
What is the formula of sodium hydroxide?	NaOH									
What is the formula of calcium carbonate?	$CaCO_3$									
What is the formula of copper sulfate?	$CuSO_4$									
What is the formula of sulfuric acid?	H_2SO_4									
How are the chemical elements organised?	In the periodic table									
Where are non-metals found in the periodic table?	At the top-right									
Will a compound have the same properties as the elements from which it is made?	No (e.g. iron sulphide is not magnetic despite containing iron)									

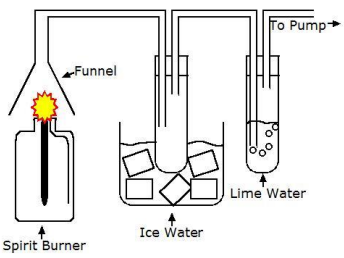
What are some properties of metals?	• Malleable • Good conductors of heat and electricity • Lustrous (shiny) • Sonorous (rings when hit)									
What are some properties of non-metals?	• Brittle • Poor conductors of heat and electricity • Dull									
What is the composition of air?	78% nitrogen 21% oxygen 1% other gases (including carbon dioxide)									
What does the ending -ate mean for a compound?	It contains oxygen									

Chemistry – pure and impure substances: physical changes

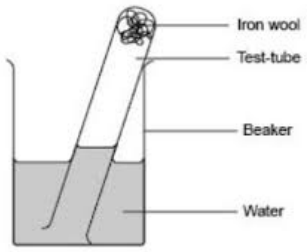
What is the definition of a pure substance?	A substance containing particles of only one type									
What is the definition of a mixture?	A substance containing particles of more than one type, not bonded together									
How can a pure substance be identified?	A pure substance melts and boils at a particularly temperature. A mixture melts and boils across a range of temperatures.									
What happens to the volume of most solids, liquids and gases when they are heated (with the exception of water)?	They expand									
How does a thermometer work?	The mercury or alcohol inside expands when it gets hot. This forces it up the capillary tube where the temperature can be read-off.									
What is the difference between evaporation and boiling?	Evaporation can happen at any temperature. Boiling occurs at a specific temperature for a particular substance.									
What is the law of conservation of mass?	Mass cannot be gained or lost because atoms cannot be made or destroyed									
What is a solvent?	A liquid into which a substance can be dissolved									
What is a solute?	A solid or a gas which has been dissolved									
What is a solution?	A mixture of a solvent and a solute									
What are three ways to increase the rate at which a substance will dissolve?	• Increase the temperature • Stir the solvent • Increase the surface area of the solute (grind it up!)									
What is the term used to describe a solution with only a small amount of solute dissolved?	Dilute									
What is the term used to describe a solution with a large amount of solute dissolved?	Concentrated									
What do we call a solution into which no more solute can be dissolved?	Saturated									
What is the effect of increasing the temperature upon the mass of solute which can dissolve in a solvent?	It increases									
What do we call a substance which cannot be dissolved in a solvent?	Insoluble									
What do we call a mixture of a solvent and an insoluble substance?	A suspension									
What are the two methods of separating an insoluble solid from a liquid?	• Decanting • Filtration									
What is decanting?	Allowing solid particles to sink to the bottom of a container (sedimentation) and then carefully pouring off the liquid									

What is filtration?	Passing a suspension through a very fine sieve (normally made of paper).								
How does filtration work?	Small, liquid particles, are able to pass through the pores in the filter paper. Larger, solid particles, get trapped and cannot pass through.								
What is the same for the solid that is trapped by the filter paper?	Residue								
What is the name for the liquid which passes through the filter paper?	Filtrate								
What type of mixtures can be separated using distillation?	Mixtures of substances with different boiling points. Evaporation and condensation only happen once.								
What type of mixtures can be separated using paper chromatography?	A mixture of different coloured compounds dissolved in a liquid. These substances must have different levels of solubility.								
How is paper chromatography carried out?	1. A line is drawn in pencil towards the bottom of the chromatography paper 2. A small spot of the mixture is placed on the line 3. The bottom of the chromatography paper is placed in a solvent (usually water) and the water allowed to move up the paper								
Why is the line drawn in pencil?	Graphite doesn't dissolve in water and so won't move up the paper								
How high does the water level need to be?	Between the bottom of the paper and the pencil line								
What does it mean if a spot doesn't move from the pencil line?	The substance doesn't dissolve in that solvent								
What does the distance moved by a spot tell you about the solubility of the substance?	The further a spot moves, the more soluble it is								
How can you tell the difference between pure and impure substances on a paper chromatogram?	A pure substance will only have one spot. An impure substance will separate into multiple spots								
How can you tell if two substances from different mixtures are the same?	They will have the same R_F value (and will have travelled the same distance)								
Which alternative solvents can be used in paper chromatography?	Ethanol or propanone								
What is potable water?	Water that is safe to drink								

How can waste and ground water be made potable?	• Sedimentation (allowing large, insoluble substances to sink to the bottom) • Filtration (removes smaller pieces of insoluble material) • Chlorination (adding chlorine to kill micro-organisms including bacteria)									
How can sea water be made potable?	By using distillation (evaporation followed by condensation)									
Why is distilled water more suitable than tap water for chemical analysis?	Distilled water doesn't contain any dissolved salts which may interfere with the results of chemical analysis									
What is suck-back?	When cold water is sucked back through the gas exchange tube after heating has finished									
Why is suck-back dangerous?	When cold liquids come into contact with hot glassware, it can cause it to shatter									
How can suck-back be prevented?	Remove the gas-exchange tube from the liquid before turning off the Bunsen burner									
Which piece of equipment will condense a solvent more effectively than a beaker of ice water?	A Liebig condenser									
Why should a salt solution not be completely dried by being heated?	• The hot salt/solvent may spit out and burn you • The heat from the Bunsen flame may cause the salt to break down (decompose)									

What is the law of conservation of mass when applied to chemical reactions?	The mass of the reactants is the same as the mass of products formed									
What is a chemical reaction?	The rearrangement of atoms to form new substances. This involves the breaking and forming of chemical bonds.									
Suggest some examples of chemical reactions in everyday life.	• Ripening fruit • Setting superglue • Cooking food									
What is a combustion reaction?	The burning of a substance in oxygen to release energy									
Which piece of scientific equipment is used for heating things strongly in a lab?	A Bunsen burner									
Suggest some safety precautions to take when using a Bunsen burner.	• Long hair tied back • Goggles on • Use tongs for handling hot objects									
What type of flame is used for heating things strongly?	A roaring blue flame									
What type of flame is used for gentle heating, or when the Bunsen burner is not being used?	A safety flame									
How is a safety flame set using a Bunsen burner?	The air hole is closed									
Which part of the roaring blue flame is the hottest?	The tip of the light blue inner cone									
Which 3 things are required for combustion?	Heat, a fuel and oxygen									
What is the chemical test for oxygen?	A flowing splint relights									
What is the chemical test for carbon dioxide?	Limewater turns from colourless to cloudy-white when carbon dioxide is bubbled through it									
What is the chemical test for water?	• Anhydrous copper sulfate turns from white to blue									
What is a hydrocarbon?	A compound containing only hydrogen and carbon atoms									
What are the products of the complete combustion of a hydrocarbon?	Carbon dioxide and water									
What is the word equation for the complete combustion of a hydrocarbon?	Hydrocarbon + oxygen → carbon dioxide + water									
Describe how this equipment can be used to determine the products of  combustion.	Gases are collected by the funnel and passed through the gas-exchange tube. The ice water condenses the water vapour. The lime water turns cloudy due to the carbon dioxide.									

What is formed during the incomplete combustion of a hydrocarbon?	Carbon monoxide and soot (solid carbon particles)								
What is the problem with carbon monoxide?	It binds to your red blood cells preventing them from carrying oxygen around the body. This can lead to death.								
What is the problem with soot?	It makes buildings dirty and can cause problems for people with asthma (by irritating the trachea)								
Which human activities release carbon dioxide?	Any involving burning fossil fuels (driving petrol/diesel cars, making electricity etc.)								
What is the impact of carbon dioxide on the climate?	Carbon dioxide is a greenhouse gas and causes heat to be trapped inside the Earth's atmosphere								
How does the greenhouse effect work?	• Light from the sun enters the atmosphere and hits the Earth. • The Earth absorbs and reemits some of this energy back into space. • Greenhouse gases absorb infrared radiation (heat) and reemit it back to Earth								
How is sulfur dioxide produced?	Sulfur impurities in coal react with oxygen creating sulfur dioxide								
What is the problem with sulfur dioxide in the atmosphere?	Sulfur dioxide dissolves in clouds to create acid rain								
What is the problem with acid rain?	• It corrodes buildings/statues • It kills fish and other aquatic organisms								
How can the production of sulfur dioxide and carbon dioxide be reduced?	• Burn fewer fossil fuels • Produce electricity using renewable methods • Drive electric cars (or walk/cycle)								
What is a thermal decomposition reaction?	The breaking down of a substance using heat								
What are the products of the thermal decomposition of hydrated copper sulfate?	Dehydrated copper sulfate and water								
What are the products of the thermal decomposition of a metal carbonate?	A metal oxide and carbon dioxide								
What is the word equation for the thermal decomposition of copper carbonate?	Copper carbonate → copper oxide + carbon dioxide								
What is an oxidation reaction?	A reaction involving the addition of oxygen to a substance								
What does the term 'reduction' mean?	The removal of oxygen from a substance								
What is the word equation for the reaction between a metal and oxygen?	Metal + oxygen → metal oxide								

What is the word equation for the reaction between a reactive metal and water?	Metal + water → metal hydroxide + hydrogen									
What is the word equation for the reaction between a metal and an acid?	Metal + acid → salt + hydrogen									
What type of salt is created when hydrochloric acid is used?	A metal <u>chloride</u>									
What type of salt is created when sulfuric acid is used?	A metal <u>sulfate</u>									
What type of salt is created when nitric acid is used?	A metal <u>nitrate</u>									
What is the chemical test for hydrogen?	A lit splint makes a squeaky pop									
What is the corrosion of a metal?	The slow reaction of a metal with oxygen									
What is the name for the corrosion of iron and steel?	Rusting									
What is required for rusting?	Oxygen and water									
What is the chemical name for rust?	Iron oxide									
Under what conditions will iron rust most quickly?	When it is placed in salt water or dilute acid									
How could this equipment be used to determine the percentage of oxygen in air?  	The iron wool will react with the oxygen in the air. This will cause the water in the test tube to rise. The percentage increase in height will be the same as the percentage of oxygen in air (approx. 20%)									
How can rusting be prevented?	• Barrier methods (such as painting or using oil) • Sacrificial methods (attaching a metal which is more reactive and therefore oxidises more easily than iron does)									
What is galvanisation?	Coating iron or steel in a thin layer of zinc. This involves both a barrier and a sacrificial method									
What is the term used for metals found combined with other substances?	Ores									
What is the term used for metal found uncombined in the ground?	Native metals									
Which metals are likely to be found in their native state?	Unreactive metals (gold, silver, platinum)									
How are the most reactive metals extracted from their ores?	Electrolysis – using electricity to split the compound									
How are metals which are less reactive than carbon extracted from their ores?	Heating with carbon – causing a displacement reaction									
How are the least reactive metals extracted from their ores?	Roasting – heating in air									

What does this symbol represent and what general precautions would you take when using a chemical that displayed this symbol? 	Flammable; keep away from flames (and sources of heat)									
What does this symbol represent and what general precautions would you take when using a chemical that displayed this symbol? 	Corrosive; wear gloves and safety glasses (wash away spills with lots of water)									
What does this symbol represent and what general precautions would you take when using a chemical that displayed this symbol? 	Generally harmful or irritant to skin/eyes/respiratory system; keep away from skin and eyes									
What does this symbol represent and what general precautions would you take when using a chemical that displayed this symbol? 	Toxic; do not swallow, or breathe in, the material or allow it to come into contact with skin									
What does this symbol represent and what general precautions would you take when using a chemical that displayed this symbol? 	Can cause harm to life in the environment; avoid release to the environment e.g. don't put down the sink									
What is an acid?	A substance which reacts with a base to produce a salt and water									
What is an alkali?	A base which will dissolve in water									
Which particle do all acids contain?	Hydrogen ions (charged hydrogen atoms)									
Give some examples of every-day acids.	• Lemon juice (citric acid) • Vinegar (ethanoic acid) • Stomach acid (hydrochloric acid) • Tea (tannic acid)									
Give some examples of every-day alkalis.	• Soap • Oven cleaner • Toothpaste									

Which scale is used to measure the strength of acids and alkalis?	pH scale								
With universal indicator, what colour will a strong acid turn? What pH does this represent?	Red; 1-2								
With universal indicator, what colour will a weak acid turn? What pH does this represent?	Yellow; 5-6								
With universal indicator, what colour will a neutral substance turn? What pH does this represent?	Green; 7								
With universal indicator, what colour will a weak alkali turn? What pH does this represent?	Blue/green; 8-9								
With universal indicator, what colour will a strong alkali turn? What pH does this represent?	Purple; 13-14								
What colour will litmus paper turn with an acid?	Red								
What colour will litmus paper turn with an alkali?	Blue								
How could you prepare an indicator using red cabbage, raw beetroot or blackcurrants?	• Grind up the plant in water • Filter the liquid • Add to acid/alkali								
What is a better method for measuring pH, rather than using an indicator?	Using a pH probe								
What is the general word equation for the reaction between an acid and a base?	Acid + base → salt + water								
What is the general word equation for the reaction between an acid and a metal?	Acid + metal → salt + hydrogen								
What is the general word equation for the reaction between an acid and a metal oxide?	Acid + metal oxide → salt and water								
What is the general word equation for the reaction between an acid and a metal hydroxide?	Acid + metal hydroxide → salt + water								
What is the general word equation for the reaction between an acid and a metal carbonate?	Acid + metal carbonate → salt + water + carbon dioxide								
What is the name for the type of reaction between an acid and a base which forms a salt and water	Neutralisation reaction								
What is the method for making a pure salt from an acid and an insoluble base?	1. React an acid with excess base 2. Filter the excess base 3. Evaporate the water								
What is the effect of evaporating the water more slowly?	Larger crystals								

What is the definition of a 'renewable' energy resource?	One which can be replenished within a lifetime									
What are the four examples of non-renewable energy resources?	• Coal • Oil • Gas • Nuclear									
What are some examples of renewable energy resources?	• Biofuel (biomass) • Solar • Wind • Wave • Tidal • Geothermal • Hydroelectric									
Suggest three advantages of renewable energy resources.	• No greenhouse gas emissions • They won't run out • Cheap to run									
Suggest three disadvantages of renewable energy resources.	• Can't be used all the time (it's not always sunny!) • Expensive to set up • Only available in certain locations									
Suggest two advantages of non-renewable energy resources.	• High energy density (lots of energy for a small mass of fuel) • Can be used at any time									
Suggest two disadvantages of non-renewable energy resources.	• Burning fossil fuels emits greenhouse gases • Fossil fuels will run out and are expensive									
What are fossil fuels?	Fuels that we dig up (or extract) from the Earth's crust.									
How are fossil fuels made?	They are formed from dead plants and animals which have been exposed to heat and pressure over millions of years. The pressure comes from layers building up on top of the dead organisms.									
How are fossil fuels used to generate electricity?	They are burned and the heat used to boil water. The steam then turns turbines to generate electricity.									
What are nuclear fuels?	Elements which can undergo nuclear reactions to release large amounts of energy									
What are bio-fuels?	Fuels made from animal waste or plants									
How can the wind be used as a source of energy?	Wind turbines can be used to generate electricity									
What is hydro-electricity?	Electricity generated by water falling through a dam (turning turbines)									
How can the tides be used as a source of energy?	When the tides goes in or out, it can turn turbines in a river or estuary									

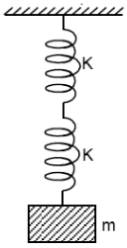
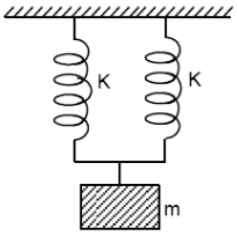
How can the sun be used as a source of energy?	Solar cells can use energy transferred by radiation from the sun to generate electricity								
What is geothermal energy?	Energy generated through steam turning turbines. The steam is generated using hot rocks under the ground.								
What is the ultimate source of most of Earth's energy?	The sun								
How does the sun provide the energy for hydroelectricity?	Water evaporates and is then precipitated into rivers/lakes								
How does the sun provide energy for wave power?	Temperature differences cause a flow of air (wind). When the wind blows across water it makes waves.								
How does the sun provide energy for fossil fuels?	Plants take in light for photosynthesis and use it to grow.								

What is energy?	A measure of the work which has been done or work which is able to be done.								
What is the unit for energy?	Joules								
What are the 7 energy stores? Give an example of each.	• Chemical (e.g. a battery, food, matches etc.) • Thermal (e.g. a fire, a radiator) • Kinetic (e.g. a car moving) • Elastic (strain) (e.g. a rubber band) • Gravitational (e.g. climbing a ladder) • Magnetic (e.g. magnets attracting/repelling) • Nuclear (e.g. the sun, radio-active fuel in a power station)								
What are the 4 energy transfer pathways?	• Electrically (charges moving through a circuit) • By radiation (light or sound) • Mechanically (a force moving through a distance) • By heating (due to a difference in temperature)								
What are the energy transfers taking place when a battery-powered torch is turned on?	Chemical → thermal (electrically and by light)								
What are the energy transfers taking place when Bunsen burner is used to heat water?	Chemical → thermal (by heating)								
What are the energy transfers taking place when a roller coaster goes down a hill?	Gravitational → kinetic (mechanically)								

What are the energy transfers taking place when a person rubs their hands together?	Kinetic → thermal (mechanically)									
What is the law of conservation of energy?	Total energy at the start = Total energy at the end Energy cannot be made or destroyed, but it can be transferred from one store to another.									
What do we mean when we say that energy is dissipated?	The energy has become stored in less useful ways (e.g. the surrounding may heat up)									
What is meant by the term 'efficiency'?	The proportion of energy which is transferred to 'useful' energy stores.									
How can efficiency be calculated?	$Efficiency = \frac{useful\ energy\ transferred}{total\ energy\ supplied}$ This can be multiplied by 100 to give a percentage									
How can unwanted energy transfers be reduced?	• Using lubrication in moving systems • Using insulation where thermal energy is needed									
What is temperature?	A measure of the average kinetic energy of the particles in a substance									
What are the units of temperature?	• Degrees Celsius (°C) • Degrees Kelvin (K)									
Convert 0 K to °C	-273°C									
What is another name for 0 K?	Absolute zero									
Why can the temperature of a substance not go below absolute zero?	At absolute zero, the particles have no kinetic energy.									
What is the name for a substance which allows heat to be transferred easily?	A conductor of heat									
How does conduction transfer heat?	The particles vibrate and collide with each other, transferring the energy									
In which direction is heat transferred?	From hotter objects to colder objects									

What is a force?	Something which changes the speed, direction or shape of an object									
What are the units for force?	Newtons (N)									
Which piece of equipment could be used to measure a force?	Force meter (Newton meter)									
How do we represent forces in diagrams?	Using arrows (showing the size and direction of the force)									
What do we call the sum (or total) of all of the forces acting on an object?	The resultant force									
What is a contact force?	A force which requires objects to be touching for the force to act									
Give 4 examples of contact forces.	• Normal contact force • Tension • Friction (including air/water resistance) • Upthrust • Lift									
What is a non-contact force?	A force which does not require objects to be touching to act.									
Give 3 examples of non-contact forces.	• Gravitational force • Magnetic force • Electrostatic force (force between charged particles)									
What is the equation which links speed, distance and time?	$Speed = \frac{distance}{time}$									
Which piece of scientific equipment may be used to measure distance?	Ruler, tape measure etc.									
Which piece of scientific equipment may be used to measure time?	Stop clock									
What are the units used for speed?	Metres per second (m/s)									
What are the units used for distance?	Metres									
What are the units used for time?	Seconds									
How can minutes be converted to seconds?	Multiply by 60									
How can hours be converted to seconds?	Multiply by 60 twice (or multiply by 3600)									
How can kilometres be converted to metres?	Multiply by 1000									
What is 'relative motion'?	The speed of a moving object compared to another moving object									
How is relative speed calculated for objects moving in the same direction?	Fastest speed – slowest speed									
How is relative speed calculated for objects moving in opposite directions?	Speed of object A + speed of object B									
On a distance-time graph, what is represented by a straight line moving up?	Moving forward at a constant speed									
On a distance-time graph, what is represented by a straight line moving down?	Moving backwards at a constant speed									

On a distance-time graph, what is represented by a flat line?	A stationary object								
How can the speed of an object be calculated using a distance-time graph?	By calculating the gradient (steepness of the lines) – $\frac{change\ in\ distance}{change\ in\ time}$								
On a distance-time graph, what does a steep line represent?	Moving quickly								
On a distance-time graph, what does a shallow line represent?	Moving slowly								
In which direction does gravity act?	Towards the centre of mass (e.g. the centre of the Earth)								
Which two factors do the strength of gravity depend upon?	• The mass of both objects • The distance between the objects								
If the mass of the object increases, what happens to the size of gravity?	It increases								
If the distance between the objects increase, what happens to the size of gravity?	It decreases								
What is the meaning of the word 'mass'?	The amount of matter (stuff) that an object is made up of								
What is the meaning of the word 'weight'?	A force caused by gravity acting upon a mass								
What is the equation which links weight, mass and gravitational field strength?	$Weight = mass \times gravitational\ field\ strength$								
What are the units for mass?	Kilograms (kg)								
What are the units for weight?	Newtons (N)								
What are the units for gravitational field strength?	Newtons per kilogram (N/kg)								

If forces are balanced, what is the size of the resultant force?	Zero									
If no resultant force acts upon an object, what will happen to its motion?	It will remain at a constant speed, in a constant direction (or will be stationary)									
If two forces are acting in the same direction, how can the resultant force be calculated?	Add the forces together									
If two forces are acting in opposite directs, how can the resultant force be calculated?	Take the smaller force away from the larger force									
What is Hooke's law?	The amount of stretch for a spring is directly proportional to the mass added.									
Which equation links: force, extension and spring constant	$Force = spring\ constant \times extension$									
If the force applied to a spring is doubled, what will happen to the extension of the spring?	It will double									
What is the term used for when a spring will no longer return to its original form?	Limit of proportionality (or the elastic limit)									
What is the term used for this arrangement of springs? 	Series									
What is the effect on the total extension of the springs, of adding an identical spring in series?	The extension will double									
What is the term used for this arrangement of springs? 	Parallel									
What is the effect on the total extension of the springs, of adding an identical spring in parallel?	The extension will half									
Which force opposes the forward motion of an object?	Friction (including air resistance and water resistance)									
What causes air and water resistance?	The collision of gas (or water) molecules hitting an object. This exerts a force, slowing the object down									
Which energy transfer happens as a result of friction?	Kinetic → thermal									

What is meant by the term 'stopping distance'?	The distance required to stop a vehicle at different speeds									
What is meant by the term 'thinking distance'?	The distance travelled between seeing a danger and applying the brake									
What is meant by the term 'braking distance'?	The distance travelled between applying the brake and stopping									
How is stopping distance calculated?	Stopping distance = thinking distance + braking distance									
Which factors may affect the thinking distance?	• Speed of the vehicle • Visibility • Whether the driver has taken any drugs (alcohol, caffeine etc.) • Tiredness									
What factors may affect the braking distance?	• Speed of the vehicle • Type of road surface • Condition of brakes • Mass of the vehicle • Weather conditions									
How can friction be reduced?	• Smooth the surfaces • Use a lubricant • Moving more slowly									
What is the equation which links: pressure, force and area?	$Pressure = \frac{force}{area}$									
What are the units for area?	Metres squared (m^2) or centimetres squared (cm^2)									
What are the units for pressure?	Newtons per metre squared (N/m^2) or newtons per centimetre squared (N/cm^2)									
Why does a person wearing skis not sink into the snow, whereas a person wearing shoes would sink into the snow?	The area of the skis is higher and therefore the pressure is lower.									
Why does a drawing pin (see picture) go into the wall, but not hurt your thumb? 	The area of the pointed bit is small, and therefore the pressure is high. The area of the flat bit is large, and therefore the pressure small.									
Suggest 4 more examples of ways in which pressure is used in everyday life.	• Studs on football boots sink into the ground • A sharp knife cuts things easily • A camel has a large foot to prevent it sinking into the sand • Large tractor tyres stop the tractor from sinking into the mud									

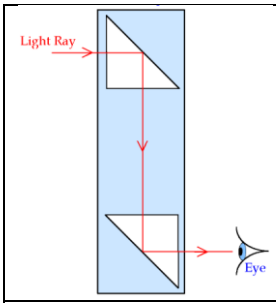
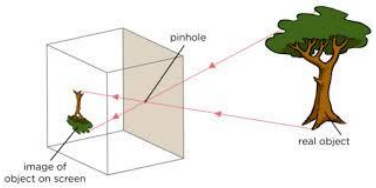
What is the equation which links: density, mass and volume?	$Density = \frac{mass}{volume}$								
What are the units for mass?	Kilograms (kg)								
What are the units for volume?	Metres cubed (m^3) or centimetres cubed (cm^3)								
What are the units for density?	Kilograms per metres cubed (kg/m^3) or grams per centimetre cubed (g/cm^3)								
What is the link between centimetres cubed (cm^3) and millilitres (mL)?	They are the same								
Which state of matter has the greatest density (with the exception of water)?	Solids								
Why do solids have the greatest density?	The particles are most closely packed together in this state								
Which state of matter has the smallest density (with the exception of water)?	Gases								
Why do gases have the smallest density?	The particles are most widely spaced in this state								
Which piece of equipment is used to measure mass?	A balance								
Which piece of equipment is used to measure volume?	A ruler (length x width x height) for regular shapes Or A measuring cylinder if a displacement can is used								
How should a displacement can be used to measure volume of an irregular shape?	1. Fill the displacement can with water 2. Add the object and collect the water which run out of the spout in a measuring cylinder								

What is a wave?	A transfer of energy without the transfer of matter								
What are the 3 key properties which are used to describe a wave?	• Amplitude • Wavelength • Frequency								
What is the definition for the amplitude of a wave?	The maximum displacement of a point on the wave from its rest position (or – the height of the wave)								
What are the units for amplitude?	Metres (m)								
What is the definition for the wavelength of a wave?	The distance between equivalent points on adjacent waves (or – the distance between 2 peaks on a wave)								
What are the units for wavelength?	Metres (m)								

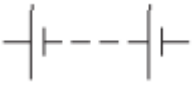
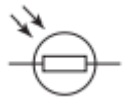
What is the definition for the frequency of a wave?	The number of waves passing a point in one second									
What are the units for frequency?	Hertz (Hz)									
What causes a sound?	A vibrating object									
How does sound travel from the vibrating object to our ears?	The vibrating object causes particles in the medium (normally the air) to vibrate, transferring the energy to our ears									
How is sound detected by our ears?	The eardrum vibrates									
In a sound wave, do the particles in the medium (air) vibrate parallel or perpendicular (at right angles) to the direction that the wave is moving?	Parallel									
How can a sound be made louder?	Increasing the size of the vibrations									
Which property of the wave would this increase?	The amplitude									
Why do sounds get quieter the further away that you get from the source?	The vibrations lose energy, causing particles to vibrate with a smaller amplitude									
How do sounds echo?	The sound waves are reflected by a boundary									
What is an important use of this?	Echo-location (e.g. to locate shipwrecks, submarines etc. and to determine the depth of the sea)									
Which states of matter can sounds travel through?	Solids, liquids and gases									
Why can sound not travel through a vacuum?	There are no particles to vibrate									
Which state of matter will sounds travel fastest in?	Solids									
Explain why sounds will travel fastest in solids.	The particles are closest together, allowing the vibrations to be transferred most easily									
Suggest a method for measuring the speed of sound.	1. Stand in front of a wall (or cliff) and bang two sticks together 2. Measure the time taken for the echo to reach you 3. Use: $Speed = \frac{distance}{time}$ to determine the speed of the wave Note: remember to double to distance to the wall because the sound has travelled there **and** back									
What is the speed of sound?	330 m/s									
What is the speed of light?	300000000 m/s (300 million m/s)									
Suggest two situations where we can detect the difference in speed between sound and light.	• Thunder and lightning • Fireworks									

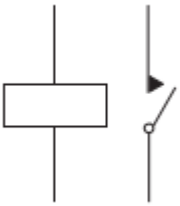
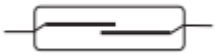
Which piece of scientific equipment can produce an image (or trace) of a sound wave?	Oscilloscope									
What will cause a higher pitch sound?	A higher frequency vibration (or vibrations per second)									
What range of frequencies can be detected by humans?	20 – 20000 Hz									
What happens to this range of hearing as you get older?	It gets smaller (~30 – 16000 Hz)									
What could be the effects on the ear of hearing very loud sounds?	• Perforated (broken) ear drum – temporary deafness • Damage to the cochlea – permanent deafness									

What is the term used for an object which gives out light?	Luminous									
How does light travel?	• As a wave • In straight lines • At 300 million m/s									
How can non-luminous objects be seen?	Light is reflected by these objects									
In which direction do light rays travel?	From a luminous object to your eyes									
What is the term used for an object which absorbs or reflects light (does not transmit light)?	Opaque									
What is the term used for an object which transmits and scatters light?	Translucent									
What is the term used for an object which transmits light in straight lines?	Transparent									
How are shadows made?	An opaque object is placed in front of a light source									
What is the effect of moving an opaque object closer to the light source?	The shadow created will be larger									
Why can light travel through a vacuum?	It doesn't need particles to be transmitted									
What is the law of reflection?	Angle of incidence = angle of reflection									
What is the 'normal'?	A line at 90^{o} to the surface of the mirror									
What is the angle of incidence?	The angle made between the incoming ray of light and the normal									
What is the angle of reflection?	The angle made between the reflected ray of light and the normal									
What types of objects make good mirrors?	Smooth, shiny surfaces									
What happens when light is reflected by a rough surface?	The rays are scattered									
What is the name used for this arrangement of mirrors?	Periscope									

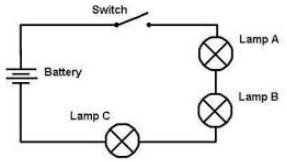
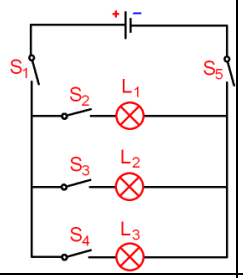
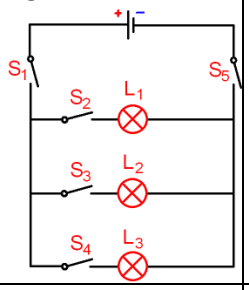
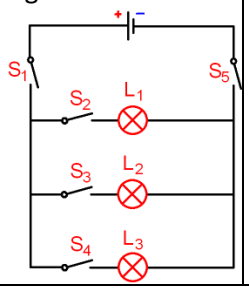
										
What might a periscope be used for?	• Seeing over a wall • In submarines to see above the water									
Use this diagram to explain how a pinhole camera works: 	1. Light (or reflected light) from the object passes through the pinhole 2. The light hits the screen at the back of the camera 3. The image is upside down because the light rays travel in straight lines									
What is a pinhole camera used to represent (in a very basic way)?	An eye									
What is the name used to describe the bending of light due to a change in the density of the medium?	Refraction									
If light passes from a less dense medium (e.g. air) to a more dense medium (e.g. water or glass), what will happen to the speed of the wave?	It will slow down									
If light passes from a less dense medium (e.g. air) to a more dense medium (e.g. water or glass), what will happen to the direction of the wave?	It will bend towards the normal									
If light enters a medium with a difference density whilst travelling along the normal, what will happen to the direction of the wave?	It will continue in the same direction									
What is the difference between different colours of light?	The frequency									
What is white light?	A mixture of all of the different colours of light									
In order, what are the different colours in white light?	Red Orange Yellow Green Blue Indigo Violet									
What happens when white light is passed through a water drop (or a prism)?	It is split up into each of the different colours to produce a rainbow									
What is the name for this effect?	Dispersion									

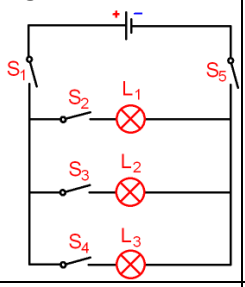
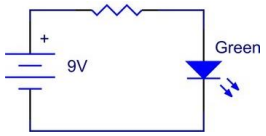
Why does dispersion happen?	Different colours of light are refracted (bent) by different amounts. Red is refracted least. Violet is refracted most.									

What is an electric current?	A flow of charged particles (electrons in wires)									
What does this circuit symbol represent? 	A cell									
What does this circuit symbol represent?	Terminals (ends of a wire)									
What does this circuit symbol represent? 	Buzzer									
What does this circuit symbol represent? 	Lamp/bulb									
What does this circuit symbol represent? 	Motor									
What does this circuit symbol represent? 	Open SPST switch									
What does this circuit symbol represent? 	Closed SPST switch									
What does this circuit symbol represent? 	Battery									
What does this circuit symbol represent? 	Fuse									
What does this circuit symbol represent? 	Light dependent resistor (LDR)									
What does this circuit symbol represent? 	Diode									
What does this circuit symbol represent?	Light emitting diode (LED)									

										
What does this circuit symbol represent? 	Fixed resistor									
What does this circuit symbol represent? 	Variable resistor									
What does this circuit symbol represent? 	Push-button switch									
What does this circuit symbol represent? 	Relay									
What does this circuit symbol represent? 	Ammeter									
What does this circuit symbol represent? 	Reed switch									
What does this circuit symbol represent? 	Junction of conductors (or wires)									
What is a series circuit?	A circuit which only has one path for the electrons to take									
What is a parallel circuit?	A circuit which has multiple paths which the electrons can take									
In a series circuit, what is the effect of adding another bulb?	The bulbs will be dimmer									
In a series circuit, what is the effect of adding another battery (or increasing the voltage of the power pack)?	The bulbs will be brighter									
In a series circuit, what is the effect of one of the bulbs breaking?	All of the other bulbs will go out									

In a parallel circuit, what is the effect of adding another bulb (in a separate branch)?	The brightness will not change									
In a parallel circuit, what is the effect of adding another batter (or increasing the voltage of the power pack)?	The bulbs will be brighter									
In a parallel circuit, what is the effect of one of the bulbs breaking?	All of the other bulbs will remain lit									
What are the units for current?	Amperes (or amps) (A)									
Which component is used to measure the current?	Ammeter									
Should an ammeter be connected in series or in parallel?	In series (because the electrons need to flow through it)									
In a series circuit, how does the current vary?	The current is the same everywhere in a series circuit									
In a parallel circuit, how does the current vary?	The current is split amongst the branches. The electrons them recombine to go through the battery (or cell)									
What is electrical resistance?	A measure of the difficulty of passing electric current through a material or component									
Suggest 3 materials with a low resistance.	• Metals (particularly copper) • Graphite (in pencils) • Salt water									
What is another name for materials with a low resistance?	Electrical conductors									
Suggest 3 materials with a high resistance.	• Rubber • Wood • Air									
What is another name for materials with a high resistance?	Electrical insulators									
How can the resistance in a circuit be increased?	Adding components (e.g. bulbs, buzzers, motors, resistors)									
What is a fixed resistor?	A resistor which has a constant resistance									
What is a variable resistor?	A resistor where the resistance can be changed									
What is a light dependent resistor?	A resistor where the resistance changes depending on the light intensity									
What is the effect of increasing the light intensity on the resistance of an LDR?	High light intensity = lower resistance									
What is a reed switch?	A switch which is opened and closed using a magnetic field									
What is a relay circuit?	A circuit which can be turned on an off using another circuit. This involves an electromagnet and a reed switch									
What is the effect of increasing the resistance in a circuit on the current?	The current will decrease									

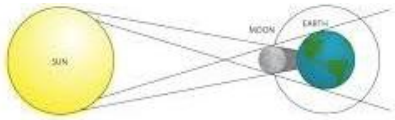
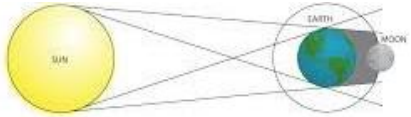
Explain why the current decreases when the resistance is increased.	The electrons move more slowly because it is harder for them to move through the circuit									
In the series circuit below, what is the effect of opening the switch on each of lamp A, B and C? 	Lamp A will be off Lamp B will be off Lamp C will be off									
In the parallel circuit below, what is the effect of opening switch 1 on each of lamp 1, 2 and 3 (assuming that all other switches are closed)? 	Lamp 1 will be off Lamp 2 will be off Lamp 3 will be off									
In the parallel circuit below, what is the effect of opening switch 2 on each of lamp 1, 2 and 3 (assuming that all other switches are closed)? 	Lamp 1 will be off Lamp 2 will be on Lamp 3 will be on									
In the parallel circuit below, what is the effect of opening switch 3 on each of lamp 1, 2 and 3 (assuming that all other switches are closed)? 	Lamp 1 will be on Lamp 2 will be off Lamp 3 will be on									

In the parallel circuit below, what is the effect of opening switch 4 on each of lamp 1, 2 and 3 (assuming that all other switches are closed)? 	Lamp 1 will be on Lamp 2 will be on Lamp 3 will be off									
What is a fuse used for?	Protecting electrical appliances from power surges.									
How does a fuse work?	If the current is too high, the wire inside the fuse will melt and break. This breaks the circuit.									
Which way should a diode (or LED) be placed in a circuit so that it works?	With the flat side of the triangle closest to the positive side of the cell (or battery) 									
Why must an LED be placed into a circuit the correct way around?	An LED has very low resistance in one direction and very high resistance in the other. This means that it will only work if placed the correct way around.									
What are the energy transfers which take place in a battery powered torch?	Chemical → electrical → light									
What is a short circuit?	When electrons take the easiest route to get back to the battery (e.g. if a piece of wire is placed in parallel with the bulb)									

Which 3 metals elements can be magnetised?	• Iron • Cobalt • Nickel									
What is the term used to describe a piece of metal which is always magnetic?	A permanent magnet									
What is the term used to describe a piece of metal has been magnetised due to being brought inside a magnetic field?	A temporary magnet									
What are the two ends of a magnet called?	North pole and south pole									
Is magnetism a contact or a non-contact force?	Non-contact because the magnet and the other object do not need to be touching for a force to act									
Why is magnetism a non-contact force?	Magnets have a magnetic field which extends beyond the magnet itself									
Is the force between a magnet and unmagnetized iron attractive for repulsive?	Attractive									
Is the force between opposite poles on different magnets attractive for repulsive?	Attractive									
Is the force between like (the same) poles on different magnets attractive for repulsive?	Repulsive									
Which piece of equipment can be used to detect, and draw the shape of, a magnetic field?	A compass (or plotting compass)									
Why does a compass point north on Earth?	The Earth has a magnetic field									
Which part of the Erath does the north-seeking end of a compass point to?	The magnetic south pole (geographical north pole)									
Which is the direction of the magnetic field lines around a bar magnet?	North to south									
Where is the magnetic field around a bar magnet strongest and how do you know this?	It is strongest next to the poles. The magnetic field lines are closest together at these points.									
How can you show that putting a current through a piece of wire induces (creates) a magnetic field?	• Use iron filings to observe the shape of the field • Use plotting compasses									
What is the definition for a solenoid?	A coil of wire with a current flowing through it									
What are 3 ways of increasing the strength of an electromagnet?	• Increasing the current • Increasing the number of coils • Adding an iron core (such as a nail)									
Where is the strength of the magnetic field in a solenoid strongest?	In the centre of the coil									

What is the effect of reversing the current?	The direction of the magnetic field will change								
Suggest 4 uses of electromagnets.	• Electric bells • Picking up cars in a scrap-yard • Relay circuits • In magnetic door locks								

What word is used to describe the shape of the Sun, Earth and Moon?	(Approximately) spherical								
How long does it take for the Earth to spin on its axis?	24 hours (1 day)								
Why do we experience day and night?	As the Earth spins on its axis, part of the Earth will be facing the sun and part will be facing away from the sun								
Which direction does the Sun appear to move across the sky?	From East to West								
Why are shadows longer in the morning than at midday?	The Sun is lower in sky								
How long does it take for the moon to orbit the Earth?	28 days								
How long does it take for the Earth to orbit the Sun?	365.25 days (1 year)								
What is the name given to the shape of the path which the Earth takes around the Sun?	An elliptical orbit								
How many planets are there in our solar system?	8								
What are the names of these planets (in order from closest to the Sun)?	Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune								
What is a moon?	A non-luminous, naturally occurring, satellite for a planet								
How do we see the moon?	Light from the Sun is reflected by the moon, and then down to the Earth								

Why do the northern and southern hemispheres experience different seasons?	• The Earth's axis is tilted • This means that the northern hemisphere will be tilted either towards or away from the Sun • When it is tilted towards the sun, the concentration of light rays hitting the Earth is higher • This means that it is summer • For the other half of the year, the northern hemisphere will be tilted away from the sun, meaning a lower concentration of light rays from the sun and hence colder weather									
During summer, what do we know about the height of the sun and the length of shadows?	The Sun is higher in the sky Therefore, there are shorter shadows									
During what time of year are days longer in the northern hemisphere?	Summer									
When does a lunar eclipse take place?	When the Earth is between the moon and the Sun									
Why does a lunar eclipse take place?	Light from the Sun is blocked by the Earth (creating a shadow), meaning that no light can be reflected by the moon									
When does a solar eclipse take place?	When the moon is between the Earth and the Sun									
Why does a solar eclipse take place?	Light form the Sun is blocked by the moon (creating a shadow on the Earth)									
What is represented by the diagram below? 	A solar eclipse									
What is represented by the diagram below? 	A lunar eclipse									
Put these in order of size (smallest to largest): Star Planet Universe Solar system Moon Galaxy	Moon Planet Star Solar system Galaxy Universe									
What is a galaxy?	A collection of stars and planets									
Which galaxy is the Earth in?	Milky Way									
What is the nearest star to the Earth?	Sun									

Why can we see stars?	They are luminous (give out their own light)								
Why can we see planets?	Light from the Sun is reflected by the planet								
What is the unit used to measure astronomical distances?	Light years								
What is a light year?	The distance travelled in one year by light (over 9 trillion km)								
Why do the planets orbit the Sun?	The Sun has a large gravitational field which attracts the planets								
Which objects will have a gravitational field?	Anything with mass								
Why can we not detect the gravitational field of an apple?	The mass is too smaller Larger mass = larger gravitational field strength								
What is the gravitational field strength on Earth?	10 N/kg								
Which planet will experience the largest gravitational force? Why?	Mercury because it is closest to the Sun								
Why do the planets not fall into the Sun?	They are moving sideways, and therefore constantly falling around the Sun								
Give 4 ways in which artificial satellites are used around the Earth?	• To study and predict weather patterns • For navigation (and GPS) • For communication • For observation (spy and military satellites)								
What is meant by the term 'geostationary orbit'?	A satellite which stays above the same geographical point on Earth (it takes the same amount of time to orbit the Earth as the Earth does to rotate on its axis).								
What is meant by the term 'high elliptical orbit'?	A satellite which moves closer to, and then further away from the Earth during its orbit								
What is meant by the term 'polar orbit'?	A satellite which orbits from the North pole to the South pole								
What is meant by the term 'low Earth orbit'	A satellite which orbits very close to the Earth and therefore has a short orbit time								

Revisiting plan

Page number	Date became confident	Planned review date 1	Date that confidence returned	Planned review date 2	Date that confidence returned
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Revisiting plan