Easter Brain Boost

Science (Separate)

10 X 10

ADDITIONAL SCIENCE C3: CHEMISTRY **Higher content bold & labeled as HT** **Key words in bold**	Video	Exam Q	☺ 😐 ☹
Newlands & **Mendeleev** classified the elements by arranging them in order of their atomic weights.			
The early **periodic tables** were incomplete & some elements were put in inappropriate groups. Mendeleev overcame the problems by leaving gaps for undiscovered elements.			
The modern periodic table is arranged by electronic structures. Elements in the same group have the same number of electrons in their highest occupied energy level (outer shell)			
Group 1 (alkali metals) are metals with low density, react with non-metals to form ionic compounds. In water they release hydrogen & form hydroxides that give alkaline solutions			
In Group 1, the further down the group an element is the more reactive the element & the lower its melting point & boiling point			
Compared with Group 1, **transition elements** have higher melting points (except for mercury), higher densities, are stronger & harder, are much less reactive & form coloured compounds & are used as catalysts			
Group 7 (halogens) react with metals to form **ionic compounds**. The halide ion has a -1 charge. Further down the group the less reactive & the higher its melting & boiling point. More reactive halogens displace less reactive halogens from an aqueous solution of its salt			
HT: The higher the energy level of the outer electrons the more easily electrons are lost & the less easily electrons are gained			
Soft water readily forms lather with soap. **Hard water** reacts with soap to form **scum** & so more soap is needed to form lather. Soapless detergents do not form scum			
Hard water contains dissolved compounds, usually of **calcium or magnesium**. The compounds are dissolved when water comes into contact with rocks			
There are two types of hard water. **Permanent hard water** remains hard when it is boiled. **Temporary hard water** is softened by boiling			
HT: Temporary hard water contains hydrogen carbonate ions (HCO_3^-) that decompose on heating to produce carbonate ions which react with calcium & magnesium ions to form precipitates			
Using hard water can increase costs because more soap is needed. When temporary hard water is heated it can produce **scale** that reduces the efficiency of heating systems & kettles			
Hard water has some benefits because calcium compounds are good for the development & maintenance of bones & teeth & also help to reduce heart disease			
Hard water is softened by adding **sodium carbonate**, which reacts with the calcium & magnesium ions to form a **precipitate** of **calcium carbonate & magnesium carbonate**. **Ion exchange columns** containing hydrogen ions or sodium ions, replace the calcium & magnesium ions when hard water passes			
Water filters containing carbon, silver & ion exchange resins can remove some dissolved substances from tap water to improve the taste & quality			
Chlorine is added to drinking water to reduce microbes & fluoride may be added to improve dental health			
Pure water can be produced by **distillation**			
The relative amounts of energy released when substances burn can be measured by simple **calorimetry**, eg by heating water in a glass or metal container			
The amount of energy released or absorbed by a chemical reaction in solution can be calculated from the temperature change in an **insulated container**. Can be used for reactions of solids with water or for neutralisation reactions			
Simple energy level diagrams can be used to show the relative energies of reactants & products, the **activation energy** & the overall energy change of a reaction			
During a chemical reaction energy must be **supplied to break bonds** & **energy is released when bonds are formed**			
HT: In an exothermic reaction, the energy released from forming new bonds is greater than the energy needed to break existing bonds			
HT: In an endothermic reaction, the energy needed to break existing bonds is greater than the energy			

released from forming new bonds			
Catalysts provide a different pathway for a chemical reaction that has a lower activation energy			
Hydrogen can be burned as a fuel in combustion engines. It can also be used in fuel cells that produce electricity to power vehicles. **Hydrogen + Oxygen → Water**			
Flame tests identify **metal ions**. lithium → crimson, sodium compounds → yellow, potassium compounds → lilac, calcium compounds → red, barium compounds→ green			
Aluminium, calcium & magnesium ions form white precipitates with sodium hydroxide solution but only the aluminium hydroxide precipitate dissolves in excess sodium hydroxide solution			
Copper(II), iron(II) & iron(III) ions form coloured precipitates with sodium hydroxide solution. Copper forms a blue precipitate, iron(II) a green precipitate & iron(III) a brown precipitate			
Carbonates react with dilute acids to form carbon dioxide. Carbon dioxide produces a white precipitate with limewater. This turns limewater cloudy			
Halide ions in solution produce precipitates with silver nitrate solution in the presence of dilute nitric acid. Silver chloride is white, silver bromide is cream & silver iodide is yellow			
Sulfate ions in solution produce a white precipitate with barium chloride solution in the presence of dilute hydrochloric acid			
The volumes of acid & alkali solutions that react with each other can be measured by **titration** using a suitable indicator			
HT: If the concentration of one of the reactants is known, the results of a titration can be used to find the concentration of the other reactant			
The raw materials for the **Haber process** are nitrogen & hydrogen. Nitrogen is obtained from the air & hydrogen may be obtained from natural gas or other sources			
The purified gases are passed over a catalyst of iron at a high temperature & a high pressure Some hydrogen & nitrogen reacts to form **ammonia**. The reaction is **reversible**. Remaining hydrogen & nitrogen are recycled			
HT: When a reversible reaction occurs in a closed system, equilibrium is reached when the reactions occur at exactly the same rate in each direction. Relative amounts of reacting substances at equilibrium depend on the conditions of the reaction			
HT: If the temperature is raised, the yield from the endothermic reaction increases & the yield from the exothermic reaction decreases			
HT: If the temperature is lowered, the yield from the endothermic reaction decreases & the yield from the exothermic reaction increases			
HT: In gaseous reactions, an increase in pressure will favour the reaction that produces the least number of molecules as shown by the symbol equation for that reaction			
HT: These factors, together with reaction rates are important when determining the optimum conditions in industrial processes, including the Haber process			
Alcohols contain the functional group –OH. **Methanol, ethanol & propanol** are the first three members of a homologous series of alcohols			
Methanol, ethanol & propanol dissolve in water to form a neutral solution, react with sodium to produce hydrogen, burn in air, are used as a fuels & solvents, & ethanol is the main alcohol in alcoholic drinks			
Ethanol can be oxidised to ethanoic acid, either by chemical oxidising agents or by microbial action. Ethanoic acid is the main acid in vinegar			
Ethanoic acid is a member of the carboxylic acids, which have the functional group **–COOH**			
HT: It does not ionise completely when dissolved in water & so is a weak acid. Aqueous solutions of weak acids have a higher pH value than aqueous solutions of strong acids with the same concentration			
Ethyl ethanoate is the **ester** produced from ethanol & ethanoic acid. Esters have the functional group **–COO–.** They are volatile compounds with distinctive smells & are used as flavourings & perfumes			

ADDITIONAL SCIENCE P3: PHYSICS **Higher content in bold**	Video	Exam Q	☺ 😐 ☹
X-rays (part of em spectrum), have a very short wavelength & cause ionisation.			
X-rays can be used to diagnose and treat some medical conditions.			
Precautions to be taken when X-ray machines and CT scanners are in use.			
Electronic systems can be used to produce ultrasound waves, which have a frequency higher than the upper limit of hearing for humans.			
Ultrasound waves are partially reflected when they meet a boundary between two different media. The time taken for the reflections to reach a detector can be used to determine how far away such a boundary is.			
Calculation of the distance between interfaces in various media: s = v x t			
Ultrasound waves can be used in medicine.			
Refraction is the change of direction of light as it passes from one medium to another.			
A lens forms an image by refracting light.			
In a convex or converging lens, parallel rays of light are brought to a focus at the principal focus. The distance from the lens to the principal focus is called the focal length. Refractive index = sin i / sin r			
The nature of an image is defined by its size relative to the object, whether it is upright or inverted relative to the object and whether it is real or virtual.			
The nature of the images produced by converging and diverging/concave lenses for an object placed at different distances from the lenses and uses of each lens.			
The construction of ray diagrams to show the formation of images by converging and diverging lenses.			
The magnification produced by a lens is calculated using the equation: Magnification = image height / object height			
The structure of the eye and the range of vision. The eye can focus on objects between the near point and the far point.			
Comparison between the structure of the eye and the camera.			
The power of a lens is given by: P = 1/f (where f is the focal length, in m)			
The focal length of a lens is determined by: the refractive index of the material from which the lens is made, and the curvature of the two surfaces of the lens.			
For a given focal length, the greater the refractive index, the flatter the lens. This means that the lens can be manufactured thinner.			
Total internal reflection and critical angle: **Refractive index = 1 / sin c**			
Visible light can be sent along optical fibres.			
The laser as an energy source for cutting, cauterising and burning.			
The centre of mass of an object is that point at which the mass of the object may be thought to be concentrated.			
If freely suspended, an object will come to rest with its centre of mass directly below the point of suspension.			
The centre of mass of a symmetrical object is along the axis of symmetry.			
For a simple pendulum: T = 1 / f			
The time period depends on the length of a pendulum.			
The turning effect of a force is called the moment.			
The size of the moment is given by the equation: M = F x d			
If an object is not turning, the total clockwise moment = total anticlockwise moment.			

The calculation of the force, or its distance from pivot, acting on a balanced object if the line of action of the weight of an object lies outside the base of the object there will be a resultant moment and the body will tend to topple.			
Liquids are virtually incompressible, the pressure in a liquid is transmitted equally in all directions.			
The use of different cross-sectional areas on the effort and load side of a hydraulic system enables the system to be used as a force multiplier.			
The pressure in different parts of a hydraulic system is given by: P = F / A			
When an object moves in a circle it continuously accelerates towards the centre of the circle. This acceleration changes the direction of motion of the body, not its speed.			
The resultant force causing this acceleration is called the centripetal force and is always directed towards the centre of the circle.			
The centripetal force needed to make an object perform circular motion increases as: - the mass of the object increases - the speed of the object increases - the radius of the circle decreases.			
When a current flows through a wire a magnetic field is produced around the wire.			
The motor effect and its use.			
The size of the force can be increased by: - increasing the strength of the magnetic field - increasing the size of the current.			
The conductor will not experience a force if it is parallel to the magnetic field.			
The direction of the force is reversed if either the direction of the current or the direction			
If an electrical conductor 'cuts' through a magnetic field a potential difference is induced across the ends of the conductor.			
If a magnet is moved into a coil of wire a PD is induced across the ends of the coil.			
The basic structure of the transformer: An alternating current in the primary coil produces a changing magnetic field in the iron core and hence in the secondary coil. This induces an alternating potential difference across the ends of the secondary coil.			
In a step-up transformer the potential difference across the secondary coil is greater than the potential difference across the primary coil.			
In a step-down transformer the potential difference across the secondary coil is less than the potential difference across the primary coil.			
The potential difference across the primary and VP secondary coils of a transformer are related by the equation: VP / VS = nP / nS			
If transformers are assumed to be 100% efficient, the electrical power output would equal the electrical power input. Vp x Ip = Vs x Is			
Switch mode transformers operate at a high frequency, often between 50 kHz & 200 kHz.			
Switch mode transformers are much lighter and smaller than traditional transformers working from a 50 Hz mains supply.			
Switch mode transformers use very little power when they are switched on but no load is applied.			

CORE SCIENCE B1: BIOLOGY **HIGHER content labeled**	Video	Exam Q	☺ 😐 ☹
KEEPING HEALTHY			
Describe the components of a balanced diet and say why each is needed.			
Describe the effects of an unbalanced diet – eating too much or too little.			
Describe how exercise affects health.			
Explain metabolic rate and the affect of exercise on metabolic rate.			
State how inherited factors may affect metabolic rate or cholesterol.			
Define pathogen.			
Describe how viruses and bacteria make us ill.			
State some ways the body protects against pathogens.			
Describe the 3 ways white blood cells work.			
Describe how an individual may become immune to a pathogen.			
Describe how vaccinations can protect individuals and populations.			
Describe the work of Semmelweiss and explain its importance.			
State how some different types of medicines work.			
Explain why antibiotics don't work on viral infections, and why treatment is difficult.			
Explain antibiotic resistance. **HIGHER**			
Give some of the problems with resistance strains of bacteria or viruses. **HIGHER**			
Write a method for culturing microorganisms in sterile conditions.			
Explain differences in school & industrial conditions for growing microbes.			
NERVES AND HORMONES			
State the role of the nervous system in responding to the environment.			
Link some examples of stimuli and receptor cells.			
State some of the features of light receptor cells.			
Describe the pathway of a simple reflex action.			
Explain how water, ions, temperature & blood sugar levels are controlled.			
Describe the general role of hormones in the body.			
Describe the role of hormones in controlling the menstrual cycle.			
Explain the use of hormones in controlling fertility			
Describe how plants are sensitive to light, moisture and gravity.			
Explain how hormones can control growth in plants.			
Give some agricultural uses of hormones.			
USE AND ABUSE OF DRUGS.			
Describe the stages in developing and testing new medical drugs.			
State the use of statins.			
Describe the problems, and current use of, thalidomide.			
Describe what a 'drug' is and the problems with dependence and addiction.			
State some of the effects of misuse of legal and illegal recreational drugs.			
Describe some examples of performance enhancing drugs in sport.			

INTERDEPENDENCE AND ADAPTATION			
Describe what animals compete			
Describe what plants compete for			
Explain how particular adaptations help animals to survive in their habitats			
Explain what extremophiles are			
Describe how distribution of organisms can change when the environment changes			
State some examples of changes in the environment			
Explain how lichens and invertebrates can be used as indicator species			
Describe how we can use equipment to measure oxygen levels, temperature and rainfall			
ENERGY AND BIOMASS IN FOOD CHAINS			
State that the sun is the source of energy for living organisms			
Describe the energy transfer that takes place during photosynthesis			
Draw a pyramid of biomass for a food chain			
Explain why the energy and biomass decrease further up the pyramid			
WASTE MATERIALS FROM PLANTS AND ANIMALS			
State that living things remove materials from the environment			
State that when organisms die and decay, materials are returned to the environment			
Define the term 'decay' & describe the conditions that microorganisms grow fastest in			
Explain why decay is important for plant growth			
Describe a stable community in terms of the materials being cycled within it			
State how carbon dioxide is removed from, and released into the atmosphere			
Describe the role of plants, animals and microorganisms in the carbon cycle			
Explain how combustion affects carbon dioxide levels			
GENETIC VARIATION AND ITS CONTROL			
Define the term 'gene' & describe how genes are passed on from parents to offspring			
State that genes control characteristics			
Give reasons to describe why there may be differences in characteristics in organisms			
Describe what sexual reproduction is			
Describe what asexual reproduction is			
Explain if offspring will be identical or different to their parents based the type of			
Describe the process of taking cuttings & state some advantages of taking cuttings			
Describe the stages involved in tissue culture, embryo transplants and adult cell cloning			
Describe what genetic engineering is			
Define what GM (genetically modified) is			
Give examples of ways in which we could modify crops and evaluate GM crops			
EVOLUTION			
Describe Darwin's theory of evolution			
Give three reasons why the theory of natural selection was not accepted at first			
Describe the main stages of natural selection			
State that variation can occur due to mutation			
State the groups that living are classified into			
Interpret evolutionary trees			
Describe Lamarck's theory of evolution			

ADDITIONAL SCIENCE B2: BIOLOGY **Higher content in bold**	Video	Exam Q	☺ 😐 ☹
B2.1 – CELLS AND SIMPLE TRANSPORT			
Label an animal cell and a plant cell.			
Give the functions of each of the part of a cell.			
Label a bacterial cell and a yeast cell.			
Give examples of specialised cells and explain how they are adapted to their function.			
Define diffusion.			
Give a factor that affects the rate of diffusion.			
Explain why diffusion is important for respiration.			
B2.2 – TISSUES, ORGANS AND ORGAN SYSTEMS			
Describe what organisms are made up of in terms of cells, tissues, organs & systems.			
Give functions of muscular tissue, glandular tissue and epithelial tissue in the stomach.			
Label the digestive system.			
Describe the role of the main organs in the digestive system.			
Give examples of plant organs.			
Describe the role of plant tissues (mesophyll, xylem, phloem, epidermis).			
Label the internal structure of the leaf.			
B2.3 – PHOTOSYNTHESIS			
Describe the process of photosynthesis.			
Explain how the rate of photosynthesis can be limited by different factors.			
Evaluate the pros and cons of artificially manipulating conditions within a greenhouse.			
State what plants use glucose and nitrate ions for.			
B2.4 – ORGANISMS AND THEIR ENVIRONMENT			
Be able to calculate the mean, median and mode.			
Describe how to collect *valid* data on distribution of organisms & check reproducibility.			
State some physical factors that can affect the distribution of organisms.			
Evaluate the methods used to collect environmental data.			
B2.5 – PROTEINS FUNCTIONS AND USES			
Describe what proteins are made up of.			
State some types of proteins in the body.			
Describe the role of catalysts.			
Describe factors that affect the shape of an enzyme.			
Name enzymes involved in digestion, & name the substrate & products of breakdown.			
Explain how hydrochloric acid and bile help enzymes in digestion.			
Describe the role of enzymes in the home and industry.			
Evaluate the role of enzymes in the home and industry.			

B2.6 – Aerobic and Anaerobic Respiration			
State where respiration takes place.			
Give the word equation for aerobic respiration.			
Describe what the energy released is used for in plants and animals.			
Explain changes that take place to the heart rate & breathing rate during respiration.			
Describe what anaerobic respiration is and why it happens.			
Compare anaerobic and aerobic respiration in terms of the energy released			
Explain what 'oxygen debt' means			
Explain why muscles become fatigued after long periods of exercise.			
B2.7 – Cell Division and Inheritance			
Describe where, why and how mitosis takes place.			
Describe where and why meiosis takes place.			
Describe the process of meiosis.			
Describe what happens during fertilisation.			
Describe what stem cells are.			
Evaluate the use of stem cells in research and medicine.			
Explain how sexual reproduction leads to genetic variation.			
Define the terms gene, allele, chromosome and DNA.			
State the sex chromosomes in males and in females.			
Explain the link between genes, amino acids and proteins.			
Describe what genetic fingerprinting could be used for.			
Describe what polydactyl is.			
Draw and interpret genetic diagrams for the inheritance of polydactyly.			
Describe what cystic fibrosis is.			
Draw and interpret genetic diagrams for the inheritance of cystic fibrosis.			
Construct genetic diagrams using heterozygous, homozygous, genotype, phenotype.			
Evaluate embryo screening.			
B2.8 – Speciation			
Describe how fossils are formed.			
Explain why some organisms did not leave fossils behind.			
Explain how fossils can be used to help us find out about changes to organisms.			
State factors that can cause extinction.			
Describe the process of speciation.			

CORE SCIENCE C1: CHEMISTRY Higher content in bold	Video	Exam Q	☺ 😐 ☹
FUNDAMENTAL IDEAS IN CHEMISTRY			
Annotate a diagram of an atom with names and features of each part.			
State no. of protons and electrons in an atom and use this to explain the overall charge.			
Define 'element', 'mass number' and 'atomic number'.			
Draw diagrams to show electronic structure of the first 20 elements.			
State and explain the relationship between elements in the same group.			
State what noble gases are and explain why they are so unreactive.			
Define 'compound' and 'molecule'.			
Explain how ionic compounds are formed from metals and non-metals.			
Explain how molecular compounds are formed from non-metals.			
LIMESTONE AND BUILDING MATERIALS			
Give the chemical name and formula for limestone.			
Describe how limestone is quarried.			
Describe thermal decomposition of calcium, magnesium, zinc & sodium carbonates.			
Describe the reaction of calcium oxide with water and of limewater.			
Describe how limestone is used to make cement and how cement is used.			
METALS AND THEIR USES			
Link how metals are found in the earth's crust to their reactivity.			
Describe how metals can be extracted by reduction or electrolysis			
Choose which method of extraction would be used, depending on the reactivity of a metal			
Describe how copper, aluminium and titanium are extracted and purified.			
Evaluate the benefits of recycling.			
Explain the properties of different iron and steels.			
Link some properties of everyday alloys to their uses.			
Define transition metals. Link some properties of transition metals to their uses.			
Link the properties of copper to its uses in electrical wiring and plumbing.			
CRUDE OIL AND FUELS			
Define 'mixture' and describe what crude oil is and what it is made up of.			
Recognise & define 'alkanes', name & draw the first 4 hydrocarbons in formulae/diagrams.			
Describe how fractional distillation is used.			
Link the size of molecule to its boiling point, viscosity and flammability.			
State products of combustion of fuels, e.g sulphur dioxide, nitrogen oxides, carbon monoxide			
Give the environmental problems with some of these products.			
Describe how levels of sulphur dioxide can be reduced.			
Evaluate the advantages of biofuels.			

OTHER USES OF CRUDE OIL			
State why hydrocarbons are cracked			
Describe the process and conditions of cracking and state the products of cracking			
Give the general formula for alkenes			
Recognise alkenes from their names & formulae and draw out the structures for alkenes			
Describe the bromine test			
State that some products of cracking can be used as fuels			
State what monomers & polymers are			
Identify names of polymers and monomers			
Match monomers to the polymers they would make			
Explain why waste disposal is a problem of using polymers			
Explain why plastic bags are being made from cornstarch			
Give the advantages and disadvantages to using and disposing of polymers			
Describe how ethanol can be produced from ethane or from fermentation			
PLANT OILS ANDS THEIR USES			
Describe the stages involved in extracting vegetable oils			
Describe why vegetable oils are important foods			
State how the boiling points of vegetable oils compares to water			
Explain how fried foods are different to boiled foods			
Describe what an emulsion is			
State some uses of emulsions based on their special properties			
Describe how emulsifiers work			
Describe how we can identify unsaturated vegetable oils			
Describe how vegetable oils can be hardened			
Explain the properties of hydrogenated vegetable oils and link these to their uses			
CHANGES IN THE EARTH AND ITS ATMOSPHERE			
State the layers of the Earth			
Describe the layers of the Earth in terms of size and properties			
Describe why tectonic plates move			
Explain how earthquakes and volcanoes happen			
State what the Earth's atmosphere is made up of and how it changed over time			
Explain one theory of how life was formed and the Miller-Urey experiment			
Describe how oxygen became part of the atmosphere			
Describe two reasons why the levels of carbon dioxide have decreased			
Explain why increased levels of carbon dioxide in the ocean can be a problem			
Explain why burning fossil fuels is a problem			
Explain how the gases in air can be separated			
Describe some industrial processes that the gases in air can be used for			

ADDITIONAL SCIENCE C2: CHEMISTRY **Higher content in bold**	Video	Exam Q	☺ 😐 ☹
Structure and Bonding			
Define element and compound.			
Describe bonding in terms of achieving noble gas electron configuration.			
Describe how ions are formed & represented using diagrams (group 1 & 7 elements)			
Explain the structure of an ionic lattice.			
Describe how covalent bonds are formed.			
Represent the formation of covalent bonds using dot and cross and line diagrams.			
Describe simple molecular and giant covalent structures.			
Draw bonding in H_2, Cl_2, HCl, H_2O, NH_3 & CH_4 & describe in diamond & silicon dioxide.			
Describe the arrangement of atoms in metals, **in terms of delocalised electrons.**			
State the properties (melting/boiling point & conductivity) of simple molecular substances.			
Explain the low melting/boiling point in terms of overcoming forces of attraction.			
Explain the lack of electrical conductivity in simple molecular substances.			
Explain the high melting and boiling points of ionic compounds.			
Explain the electrical conductivity in molten and aqueous solutions of ionic compounds.			
Explain why giant covalent structures have very high melting points.			
Explain, in terms of bonding, why diamond is hard.			
Explain, in terms of bonding, why graphite is slippery and **conducts electricity.**			
Describe some uses of fullerenes.			
Explain, in terms of bonding, why metals conduct heat and electricity.			
Explain, in terms of the structure, why metals are malleable.			
Define alloy, and explain why they are harder than pure metals.			
Describe shape memory alloys, using Nitinol in braces as an example.			
Describe how polymers with different properties may be produced.			
Describe & explain the differences between thermosetting and thermosoftening plastics.			
Define nanoscience.			
Link some of the use of nanomaterials to their properties.			
Atomic Structure and Quantitative Chemistry.			
Draw an atom to show the location, mass and charge of protons, neutrons & electrons.			
Define and work out atomic number and mass number.			
Define isotope.			
Define relative atomic mass (Ar).			
Calculate relative formula mass (Mr) from the formula of a compound.			
Define a mole.			
Describe why instrumental methods are good for detecting and identifying substances.			
Describe how to identify additives, including paper chromatography.			
Explain how gas chromatography can separate a mixture.			
Describe how mass spectrometry can be used to give Mr of each component.			
Calculate the percentage by mass of an element in a compound.			
Work out the empirical formula from masses or % of elements in a compound.			
Calculate masses of reactants and products from balanced equations.			
Explain why yield will always be less than expected.			
Calculate percentage yield.			
Define a reversible reaction and recognise from their equations.			

Rates of Reaction			
Calculate the rate of a chemical reaction.			
Describe how reactions occur in terms of particles.			
Define activation energy.			
List the factors that can affect the rate of a reaction.			
Explain how each of these factors affect rates of a reaction, in terms of particles colliding.			
State what catalysts can do.			
Explain why catalysts are important in industrial processes.			
Endo and Exothermic Reactions			
Define an endothermic reaction, giving examples of some .			
Define an exdothermic reaction, giving examples of some.			
Link endo/exothermic reactions and reversible reactions.			
Link some of the use of nanomaterials to their properties.			
Acids, Bases and Salts			
State what (s), (l), (g) and (aq) in equations mean.			
Describe the three things acids can be reacted with to make a soluble base.			
Describe how solid salts can be formed from salt solutions.			
Describe how insoluble salts can be made and how to separate the salt.			
Write equations to show how insoluble salts are formed.			
Explain how precipitation reactions can be used to treat drinking water.			
Write a definition for a base with examples.			
Describe what an alkali is.			
Identify the name of the salt based on the acid used (e.g. nitric acid produces nitrate salts).			
Write an equation to show the reaction between an acid and a metal or an acid and a base.			
Describe what sort of solution is produced when ammonia is dissolved in water.			
Give one use of ammonia.			
State the ions present in an acidic solution and an alkaline solution.			
Write an ionic equation to show how these ions react together in a neutralisation reaction.			
Describe acids and bases in terms of the pH scale.			
Electrolysis			
Define the terms 'electrolysis' and 'electrolyte'.			
Explain why an ionic substance needs to be melted or dissolved for electrolysis to happen			
State which ions will go to the positive and negative electrodes during electrolysis.			
Give examples of what electroplating can be used for.			
Describe reduction and oxidation and state which electrode they are taking place at.			
Use a reactivity series to decide which ion will go to each electrode.			
Write half equations for the reactions at each electrode.			
Describe electrolysis of aluminium oxide to form aluminium, including products at electrodes.			
Label a diagram to show what is produced during the electrolysis of sodium chloride solution.			
Give a use for each of the three products of the electrolysis of sodium chloride solution.			

CORE SCIENCE P1: PHYSICS	Video	Exam Q	☺ 😐 ☹
TRANSFER OF ENERGY IN HEATING			
State what infrared radiation is and that objects emit and absorb it.			
Describe how the amount of infrared radiation can vary.			
Describe how different surfaces vary in their absorption of infrared radiation.			
Describe how different surfaces vary in their reflection of infrared radiation.			
Describe the particle arrangement and different levels of energy in the states of matter.			
Explain the different energy states using the kinetic theory.			
Describe the bonds between particles in the different states of matter			
Describe what is meant by conduction, in terms of particles, including the role of free electrons.			
Describe what is meant by convection, in terms of particles, including explaining changes in density.			
Describe how energy is transferred in evaporation and condensation and factors affecting each.			
Describe the factors that affect the rate of heat transfer from an object.			
State the use of U-values.			
Describe how solar panels work.			
Describe what is meant by specific heat capacity and use the equation.			
ENERGY AND EFFICIENCY			
Describe how energy is wasted and what happens to it.			
Construct and Read information from a Sankey diagram			
Calculate the efficiency of a device using the equation.			
Describe payback time and calculate it.			
USEFFULNESS OF ELECTRICAL APPLIANCES			
Describe energy transfers in everyday electrical appliances.			
Link the amount of energy transferred to the power and the amount of time switched on.			
Calculate the energy transferred when you know the time and power.			
Calculate the cost of electricity given the cost per kilowatt-hour.			
GENERATING ELECTRICITY			
State some energy sources that are used to generate electricity (heat water).			
Describe the processes that occur in different power stations			
Describe alternative methods of generating electricity.			
Evaluate alternative methods of generating electricity.			
Explain what a pumped storage system does			
Explain the advantages and disadvantages of small scale energy production.			
State what the National Grid is.			
Label the different essential parts of the National Grid.			
Explain the use of transformers.			
USING WAVES			
Describe the difference between and transverse and longitudinal wave, using sound and electromagnetic waves as			
Define and calculate the speed, frequency or wavelength of a wave.			
State the speed of an electromagnetic waves and describe what is meant by the electromagnetic spectrum.			
State which electromagnetic waves are used for communication.			
Describe the hazards associated with electromagnetic waves.			
Describe what happens when a wave is reflected including law of reflection and images in a plane mirror.			
Explain how waves can be refracted.			
Explain how waves can be diffracted.			
Describe what is meant by frequency and how this relates to pitch.			
Describe what an echo is.			
Explain the Doppler Effect and relate this to frequency and wavelength of waves.			
Explain how the evidence from red-shift supports the Big Bang Theory.			
Describe what Cosmic Microwave Background Radiation (CMBR) is.			

ADDITIONAL SCIENCE P2: PHYSICS **Higher content in bold**	Video	Exam Q	☺ 😐 ☹
Resultant Forces			
Define resultant force & describe its effect on moving & stationary objects.			
Predict the motion of an object based on the forces acting on it.			
Forces and Motion			
Use the formula: $f = m \times a$			
Construct and interpret distance-time graphs.			
Calculate the speed of an object from the distance-time graph.			
Define velocity.			
Use the formula: $a = v-u / t$			
Interpret velocity-time graphs.			
Calculate acceleration and distance travelled from a velocity-time graph.			
Forces and Braking			
Label forces acting on a moving object.			
Describe the relationship between braking force, distance and speed.			
Explain the energy transfers that occur on braking.			
Define stopping distance, thinking distance and braking distance.			
Explain the factors affecting thinking and braking distance.			
Forces and Terminal Velocity			
Calculate the weight of an object, using: $W = m \times g$.			
Explain how air resistance changes as the speed of a falling object changes.			
Explain how an object falling through a fluid reaches terminal velocity.			
Draw & interpret velocity-time graphs for objects reaching terminal velocity.			
Forces and Elasticity			
Describe how forces acting on an object may change its shape.			
Explain how this could store elastic potential energy.			
Describe how the force on an elastic object relates to extension, using: $F = k \times e$.			
Forces and Energy			
Define work done.			
Use the equation: $W = F \times d$			
Explain how energy can be transferred when work is done.			
Use the equation: $P = E / t$			
Describe gravitational potential energy using: $E_p = m \times g \times h$			
Calculate kinetic energy using: $E_k = ½ \times m \times v^2$			
Momentum			
Describe momentum, using: $p = m \times v$.			
Describe how momentum is conserved after an event.			
Calculate momentum before and after an event.			
Static Charges			
Explain how static charges can be built up on insulating materials.			
Describe forces acting on similarly or oppositely charged objects brought close together.			
Describe how charges may easily flow through some substances but not others.			

Electrical Circuits			
Describe what current is, and calculate using: $I = Q/t$			
Describe potential difference, and calculate using: $V = W/Q$			
Draw and interpret circuit diagrams, using correct symbols.			
Explain the applications of thermistors and LDRs in circuits in terms of how their resistance			
Interpret current-potential difference graphs for resistors at a constant temperature, filament bulbs			
Describe the relationship between resistance and potential difference & current, and how it may			
Use the equation: $V = I \times R$			
Describe current, resistance and potential difference in series and parallel circuits.			
Describe the properties and used of LEDs.			
Household Electricity			
Describe alternating and direct current and give examples of both.			
State the frequency of the alternating current in mains electricity, and its potential difference.			
Describe the structure and wiring of a 3-pin plug.			
Describe how fuses and RCCBs protect electrical equipment.			
Describe how an earth wire protects equipment with a metal casing.			
Current, Charge and Power			
Describe the energy transfers when current flows through a resistor.			
Compare the efficiency of filament bulbs and CFLs.			
Describe the power of an appliance, using the equation: $P = E/t$			
Describe the power of an appliance, using the equation: $P = I \times V$			
Explain the energy transferred in a circuit, using the equation: $E = V \times Q$			
Atomic Structure			
Describe the structure of an atom, and experiments that have given us evidence for this.			
State the relative masses and charges of protons, neutrons and electrons.			
State how an ion may be formed.			
Define mass number, atomic number and isotope.			
Atoms and Radiation			
Describe how some atoms decay randomly.			
Explain half life of a radioactive substance.			
Describe the origins of background radiation.			
Describe alpha, beta and gamma radiation **and write nuclear equations to show alpha and beta**			
Compare and explain the differences in ionising power, penetrating power and range in air of the			
Describe how electrical and magnetic fields affect each type of radiation.			
Describe the uses and dangers of each type of radiation.			
Nuclear Fission			
State that uranium-235 and plutonium-239 are fissionable substances in common use.			
Define and describe the stages in nuclear fission.			
Explain how this may start a chain reaction.			
Nuclear Fusion			
Define and describe nuclear fusion			
State that this is the way energy is released in stars.			
Describe how stars are formed from clouds of dust and gas in space.			
Describe the forces acting on a main stage star.			
Describe the life cycle of both stars the size of our Sun and those much bigger.			
Describe how fusion in stars provides all elements in the universe.			