Edexcel GCSE (9-1) Separate Science Revision Checklist

This checklist includes **all units** for the Edexcel GCSE (9-1) Separate Science Course.

Please ask your teachers about which units have been covered in Years 9, 10 and 11.

You can also access the individual unit checklists from www.revise4science.weebly.com

BIOLOGY

SB1 Key Concepts in Biology (Paper 1 and Paper 2)

SB1a Microscopes

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall what an electron microscope is.	☐	☐	☐
	Recall what is meant by an instrument's resolution.	☐	☐	☐
	Explain why some cell structures can be seen with an electron microscope but not with a light microscope.	☐	☐	☐
	Calculate total magnification using a formula.	☐	☐	☐
	Calculate sizes using magnifications.	☐	☐	☐
	Interpret the SI prefixes milli-, micro-, nano- and pico-.	☐	☐	☐

SB1b Plant and animal cells

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Identify the parts of plant and animal cells.	☐	☐	☐
	Recall the parts of plant and animal cells.	☐	☐	☐
	Make drawings of plant and animal cells using a light microscope and identify their parts.	☐	☐	☐
	Describe the functions of the sub-cellular structures commonly found in eukaryotic cells (nucleus, cell membrane, cell wall, chloroplasts, mitochondria and ribosomes).	☐	☐	☐
	Estimate sizes using microscope fields of view.	☐	☐	☐
	Estimate sizes using scale bars.	☐	☐	☐

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SB1c Specialised cells

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how sperm cells are adapted to their function.	☐	☐	☐
	Describe how egg cells are adapted to their function.	☐	☐	☐
	Describe how ciliated epithelial cells are adapted to their function.	☐	☐	☐
	Draw conclusions about a cell's function from its adaptations.	☐	☐	☐

SB1d Inside bacteria

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Identify the common parts of bacteria.	☐	☐	☐
	Describe the functions of common parts of bacteria.	☐	☐	☐
	Describe why bacteria are classified as being prokaryotic.	☐	☐	☐
	Change numbers to and from standard form.	☐	☐	☐
	Compare eukaryotic and prokaryotic cells.	☐	☐	☐

SB1e Enzymes and nutrition

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State that enzymes are proteins.	☐	☐	☐
	Give examples of enzymes and where they are found in the human body and in other species.	☐	☐	☐
	Recall the subunits from which carbohydrates, proteins and lipids are formed (sugars, amino acids, fatty acids and glycerol).	☐	☐	☐
	Describe what enzymes do (catalyse the synthesis and breakdown of substances, such as carbohydrates, proteins and lipids, by speeding up the rate of reaction).	☐	☐	☐
	Define an enzyme as a biological catalyst.	☐	☐	☐
	Explain why catalysis by enzymes is important for life processes (because reactions happen much faster).	☐	☐	☐

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SB1f Testing foods

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe how to test for starch in food.	☐	☐	☐
5th	Describe how to test for reducing sugars in food.	☐	☐	☐
5th	Describe how to test for proteins in food.	☐	☐	☐
5th	Describe how to test for lipids in food.	☐	☐	☐
7th	Explain how calorimetry can be used to measure the energy in food.	☐	☐	☐
8th	Evaluate calorimetry tests for accuracy.	☐	☐	☐

SB1g Enzyme action

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	State what enzyme specificity means.	☐	☐	☐
7th	State that an enzyme's action is due to its active site.	☐	☐	☐
7th	Describe the role of the active site in enzyme function (including specificity).	☐	☐	☐
9th	Use the lock-and-key model to develop explanations for enzyme activity.	☐	☐	☐
8th	Explain why enzymes have a particular shape, as a result of the sequence of amino acids in the chain.	☐	☐	☐
9th	Explain how enzymes become denatured.	☐	☐	☐

SB1h Enzyme activity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
8th	Describe the effect of temperature on enzyme activity.	☐	☐	☐
8th	Describe the effect of substrate concentration on enzyme activity.	☐	☐	☐
8th	Describe the effect of pH on enzyme activity.	☐	☐	☐
8th	Explain what is meant by the optimum pH/temperature of an enzyme.	☐	☐	☐
9th	Calculate the rate of enzyme activity from experimental data.	☐	☐	☐
9th	Explain why temperature, substrate concentration and pH affect enzyme activity.	☐	☐	☐

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SB1i Transporting substances

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State that substances are transported by diffusion, osmosis and active transport.	☐	☐	☐
	Describe how substances are transported by active transport (including the need for energy).	☐	☐	☐
	Explain how substances are transported by diffusion.	☐	☐	☐
	Explain how substances are transported by osmosis.	☐	☐	☐
	Explain the effects of osmosis on cells and tissues.	☐	☐	☐
	Investigate osmosis in potatoes.	☐	☐	☐
	Calculate percentage gain and loss of mass in osmosis.	☐	☐	☐

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SB2 Cells and control (Paper 1)

SB2a Mitosis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	List the names and order of the stages of the cell cycle, including mitosis.	☐	☐	☐
	Describe what happens in each stage of the cell cycle, including mitosis.	☐	☐	☐
	Describe why mitosis is important for an organism. (growth, repair, asexual reproduction)	☐	☐	☐
	Explain why organisms may rely on asexual reproduction.	☐	☐	☐
	Describe how mitosis produces genetically identical, diploid cells.	☐	☐	☐
	Describe how cancers grow.	☐	☐	☐

SB2b Growth in animals

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define growth in animals as an increase in cell number and size.	☐	☐	☐
	Give examples of specialised animal cells.	☐	☐	☐
	Describe how structure of specialised animal cells is related to their function.	☐	☐	☐
	Explain why cell differentiation is important in the development of specialised cells.	☐	☐	☐
	Use percentile growth curves to interpret growth in children.	☐	☐	☐

SB2c Growth in plants

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the stages of growth in plants (cell division/mitosis, elongation, differentiation).	☐	☐	☐
	Give examples of specialised plant cells.	☐	☐	☐
	Describe how the structures of specialised plant cells are related to their functions.	☐	☐	☐
	Explain why cell differentiation is important in the development of specialised cells in plants.	☐	☐	☐

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SB2d Stem cells

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe where stem cells are found.	☐	☐	☐
	Describe the function of stem cells in plants and animals.	☐	☐	☐
	Compare embryonic and adult stem cells in animals.	☐	☐	☐
	Give examples of where stem cells may be used in medicine.	☐	☐	☐
	Identify benefits and risks of using stem cells in medicine.	☐	☐	☐
	Evaluate the use of stem cells in medicine (by comparing their benefits and risks).	☐	☐	☐

SB2e The brain

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what the brain is made up of.	☐	☐	☐
	Identify different parts of the brain (cerebellum, cerebral hemispheres, medulla oblongata).	☐	☐	☐
	Describe the functions of different parts of the brain (cerebellum, cerebral hemispheres, medulla oblongata).	☐	☐	☐

SB2f Brain and spinal cord problems

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe CT and PET scanning.	☐	☐	☐
	H Explain how brain function is studied using scanning, and the advantages of this	☐	☐	☐
	H Explain the effects of spinal cord damage.	☐	☐	☐
	H Explain the effects of damage to different parts of the brain (including tumours).	☐	☐	☐
	H Explain the limitations of brain surgery.	☐	☐	☐
	H Explain why some types of spinal cord damage cannot be fully repaired	☐	☐	☐

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SB2g The nervous system

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	List the parts of the nervous system.	☐	☐	☐
	Describe how the nervous system detects stimuli.	☐	☐	☐
	Describe the structure of sensory neurones.	☐	☐	☐
	Describe the routes that impulses take to and from the brain.	☐	☐	☐
	Explain how sensory neurones are adapted to their functions (including the myelin sheath).	☐	☐	☐

SB2h The eye

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Identify the main parts of the eye.	☐	☐	☐
	Explain how the cornea, lens, iris and retina are adapted to their functions.	☐	☐	☐
	Explain how receptor cells allow full colour vision in bright light.	☐	☐	☐
	Describe common eye defects (cataracts, long-sightedness, short-sightedness, colour blindness).	☐	☐	☐
	Describe how cataracts are treated.	☐	☐	☐
	Explain how long- and short-sightedness can be corrected.	☐	☐	☐

SB2i Neurotransmission speeds

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the nervous system responds to stimuli.	☐	☐	☐
	Describe the structures of motor neurones and relay neurones.	☐	☐	☐
	Explain how motor neurones are adapted to their functions.	☐	☐	☐
	Explain the action and function of synapses.	☐	☐	☐
	Explain how the structure of the reflex arc allows a faster response.	☐	☐	☐
	Describe the structure and function of the reflex arc.	☐	☐	☐

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SB3 Genetics (Paper 1)

SB3a Sexual and asexual reproduction

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe features of asexual reproduction (rapid reproductive cycle, no need for mate, no variation of offspring).	☐	☐	☐
	Explain how some features of asexual reproduction can be advantageous or disadvantageous.	☐	☐	☐
	Describe features of sexual reproduction (slower reproductive cycle, requires mate, variation in offspring).	☐	☐	☐
	Explain how some features of sexual reproduction can be advantageous or disadvantageous.	☐	☐	☐
	Compare the advantages and disadvantages of asexual and sexual reproduction in evaluating the life cycle of an organism.	☐	☐	☐

SB3b Meiosis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall that gametes are produced by meiosis.	☐	☐	☐
	Describe what happens in meiosis. [without details of the stages]	☐	☐	☐
	Explain why haploid gametes are needed for sexual reproduction.	☐	☐	☐
	Recall what an organism's genome is.	☐	☐	☐
	Describe where genes are found.	☐	☐	☐
	Recall the function of genes.	☐	☐	☐

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SB3c DNA

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall where DNA is found in a eukaryotic cell.	☐	☐	☐
	Name the bases in DNA.	☐	☐	☐
	Recall the pairing of bases in DNA.	☐	☐	☐
	Describe how DNA strands are held together.	☐	☐	☐
	Describe the overall structure of DNA.	☐	☐	☐
	*Describe how DNA can be extracted from fruit.*	☐	☐	☐

SB3d Protein synthesis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Recall where proteins are made.	☐	☐	☐
	H Describe how the shape of a protein is determined.	☐	☐	☐
	H Explain how the order of amino acids in a protein is determined.	☐	☐	☐
	H Describe what happens during the transcription stage of protein synthesis.	☐	☐	☐
	H Describe what happens during the translation stage of protein synthesis.	☐	☐	☐

SB3e Genetic variants and phenotypes

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe what a mutation is.	☐	☐	☐
	H Recall some ways in which mutations occur.	☐	☐	☐
	H Describe possible effects of mutations on amino acid sequences.	☐	☐	☐
	H Describe how gene transcription is regulated.	☐	☐	☐
	H Explain the effects of mutations on protein activity.	☐	☐	☐
	H Explain how mutations can influence RNA polymerase binding and so alter protein production.	☐	☐	☐

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SB3f Mendel

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall who discovered the basis of genetics.	☐	☐	☐
	Describe how breeding pea plants was used to work out the basis of genetics.	☐	☐	☐
	Describe why it was difficult to understand inheritance before the idea of genes.	☐	☐	☐

SB3g Alleles

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the difference between a gene and an allele.	☐	☐	☐
	Explain the effects of alleles on inherited characteristics.	☐	☐	☐
	Describe the relationship between a genotype and a phenotype.	☐	☐	☐
	Identify homozygous and heterozygous genotypes.	☐	☐	☐
	Use genetic diagrams to work out possible combinations of alleles in the offspring of parents.	☐	☐	☐
	Explain why the effects of some alleles in an organism's genotype are not seen in its phenotype.	☐	☐	☐

SB3h Inheritance

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Use Punnett squares to work out possible combinations of alleles in the offspring of parents.	☐	☐	☐
	Interpret family pedigree charts to work out possible inherited genotypes and phenotypes.	☐	☐	☐
	Describe how sex is determined in humans.	☐	☐	☐
	Calculate ratios of phenotypes (controlled by alleles of a single gene) when organisms are crossed.	☐	☐	☐
	Calculate probabilities of certain phenotypes occurring when organisms are crossed.	☐	☐	☐

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SB3i Multiple and missing alleles

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe ABO blood groups as an example of multiple alleles for one gene.	☐	☐	☐
	Describe how ABO blood groups are inherited.	☐	☐	☐
	Explain the inheritance of codominance.	☐	☐	☐
	H Give examples of sex-linked genetic disorders.	☐	☐	☐
	H Explain why some genetic disorders are sex-linked.	☐	☐	☐

SB3j Gene mutation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of characteristics controlled by multiple genes.	☐	☐	☐
	Define the term mutation.	☐	☐	☐
	Describe some potential applications of mapping human genomes.	☐	☐	☐
	Explain how a mutation can cause variation (limited to changes in the protein formed, which can affect processes in which that protein is needed).	☐	☐	☐
	Give examples of mutations in human genes that affect the phenotype, and examples of those that have little or no obvious effect.	☐	☐	☐
	Explain why many mutations have no effect on the phenotype.	☐	☐	☐

SB3k Variation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Distinguish between genetic variation and environmental variation.	☐	☐	☐
	Distinguish between continuous and discontinuous variation.	☐	☐	☐
	Describe the causes of genetic variation (mutation and sexual reproduction).	☐	☐	☐
	Describe the causes of environmental variation (differences in the environment, acquired characteristics).	☐	☐	☐
	Analyse the contribution of genes and environment to the variation in a characteristic.	☐	☐	☐

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SB4 Natural Selection and Genetic Modification (Paper 1)

SB4a Evidence for human evolution

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define ‘evolution’.	☐	☐	☐
	Recognise binomial species names.	☐	☐	☐
	Explain how evidence from fossils and stone tools supports current ideas about human evolution.	☐	☐	☐
	Recall how stone tools are dated from their environment.	☐	☐	☐
	Describe how stone tools created by human-like species have developed over time.	☐	☐	☐
	Describe the fossil evidence for human-like species that lived 4.4, 3.2 and 1.6 million years ago.	☐	☐	☐

SB4b Darwin’s theory

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the cause of genetic variation.	☐	☐	☐
	Describe how adaptations allow organisms to survive.	☐	☐	☐
	Explain how natural selection allows some members of a species to survive better than others when conditions change.	☐	☐	☐
	Explain how natural selection can lead to the evolution of a new species.	☐	☐	☐
	Explain how the development of resistance in organisms supports Darwin’s theory.	☐	☐	☐

SB4c Development of evolution theory

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the names of the scientists who first developed the idea of evolution by natural selection.	☐	☐	☐
	Describe some of the evidence that Darwin and Wallace used to support their idea.	☐	☐	☐
	Explain the impact of the idea of evolution by natural selection on modern biology.	☐	☐	☐
	Recall what is meant by the pentadactyl limb, and where it is found.	☐	☐	☐
	Explain how changes in the pentadactyl limb provide evidence for evolution by natural selection.	☐	☐	☐

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SB4d Classification

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how organisms are classified into smaller and smaller groups (based on their characteristics).	☐	☐	☐
	Identify genus and species from a binomial name.	☐	☐	☐
	Identify an organism as a member of one of the five kingdoms.	☐	☐	☐
	Describe what genetic analysis is.	☐	☐	☐
	Explain why biologists often now classify organisms into three domains.	☐	☐	☐

SB4e Breeds and varieties

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe why new breeds and varieties are created.	☐	☐	☐
	Describe what is meant by a ‘genetically modified organism’.	☐	☐	☐
	Describe how selective breeding is carried out.	☐	☐	☐
	Explain the impact of selective breeding on domesticated plants and animals.	☐	☐	☐

SB4f Tissue culture

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how tissue culture is carried out.	☐	☐	☐
	Explain why tissue culture produces many identical cells.	☐	☐	☐
	Describe advantages of using tissue culture in medical research.	☐	☐	☐
	Describe advantages of using tissue culture in plant breeding programmes.	☐	☐	☐

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SB4g Genes in agriculture and medicine

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe the main stages of genetic engineering.	☐	☐	☐
	Recall some uses of selectively bred organisms (in agriculture).	☐	☐	☐
	Recall some uses of genetically engineered organisms (in agriculture, in medicine).	☐	☐	☐
	Evaluate the benefits and risks of using selective breeding and genetic engineering to produce new varieties and breeds.	☐	☐	☐

SB4h GM and agriculture

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of useful GM organisms.	☐	☐	☐
	Describe how crop plants can be modified to make them resistant to insect pests.	☐	☐	☐
	Explain how using GM organisms can increase the amount of food we produce.	☐	☐	☐
	Explain how using GM organisms can cause problems in the environment.	☐	☐	☐
	Evaluate the advantages and disadvantages of using GM organisms.	☐	☐	☐

SB4i Fertilisers and biological control

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the principle of biological control.	☐	☐	☐
	Explain why we need to produce more food.	☐	☐	☐
	Explain how biological control can help to increase crop yield.	☐	☐	☐
	Explain how biological control can cause problems (in decreasing biodiversity).	☐	☐	☐
	Explain how fertilisers can increase crop yield.	☐	☐	☐
	Explain how fertilisers can damage the environment (by causing pollution).	☐	☐	☐

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SB5 Health, Disease, and the Development of Medicines (Paper 1)

SB5a Health and disease

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term health.	☐	☐	☐
	Define the term disease.	☐	☐	☐
	Describe how communicable and non-communicable diseases differ.	☐	☐	☐
	Outline the role of the immune system in protecting against disease.	☐	☐	☐
	Explain how disease can affect the immune system.	☐	☐	☐

SB5b Non-communicable disease

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of non-communicable diseases.	☐	☐	☐
	Define the term malnutrition.	☐	☐	☐
	Explain how diet can lead to malnutrition.	☐	☐	☐
	Describe the link between alcohol and liver disease.	☐	☐	☐
	Explain the effect of alcohol consumption on liver disease at local, national and global levels.	☐	☐	☐

SB5c Cardiovascular disease

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how obesity is measured (BMI and waist : hip calculations).	☐	☐	☐
	Describe how obesity correlates with cardiovascular disease.	☐	☐	☐
	Describe how smoking correlates with cardiovascular disease.	☐	☐	☐
	Explain why exercise and diet affect obesity.	☐	☐	☐
	Compare how cardiovascular diseases are treated	☐	☐	☐

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SB5d Pathogens

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe some problems and diseases caused by bacteria.	☐	☐	☐
	Describe a disease caused by a virus.	☐	☐	☐
	Describe a disease caused by a protist	☐	☐	☐
	Describe a disease caused by a fungus.	☐	☐	☐
	Explain how signs of a disease can be used to identify the pathogen.	☐	☐	☐

SB5e Spreading pathogens

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State the ways in which pathogens can be spread.	☐	☐	☐
	Give examples of pathogens that are spread in different ways (e.g. cholera bacteria by water, tuberculosis bacteria and chalara dieback fungi by air, malaria protist by vector, *Helicobacter* by mouth, Ebola by body fluids).	☐	☐	☐
	Explain how the spread of different pathogens can be reduced or prevented.	☐	☐	☐

SB5f Virus life cycles

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the structure of a virus.	☐	☐	☐
	Explain how viruses differ from cells.	☐	☐	☐
	Describe the lytic pathway of a virus life cycle.	☐	☐	☐
	Describe the lysogenic pathway of a virus life cycle.	☐	☐	☐
	Compare and contrast the lytic and lysogenic pathways.	☐	☐	☐
	Calculate the cross-sectional area of viral cultures and clear agar jelly.	☐	☐	☐

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SB5g Plant defences

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe some physical barriers of plants to pests and pathogens.	☐	☐	☐
5th	Describe some chemical defences of plants to pests and pathogens.	☐	☐	☐
6th	Describe how plant protective chemicals are used to treat human diseases or symptoms.	☐	☐	☐
6th	Describe examples of aseptic technique.	☐	☐	☐
7th	Explain why aseptic technique is used during the culture of microorganisms.	☐	☐	☐

SB5h Plant diseases

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	H Describe how plant diseases are detected using visible symptoms.	☐	☐	☐
6th	H Describe how environmental causes of plant problems are eliminated when identifying disease.	☐	☐	☐
6th	H Describe how distribution analysis can help identify a plant disease.	☐	☐	☐
6th	H Describe how plant pathogens are diagnosed in the lab.	☐	☐	☐

SB5i Physical and chemical barriers

Step	Learning outcome	Had a look	Nearly there	Nailed it!
8th	Explain how the spread of the STIs Chlamydia and HIV can be reduced or prevented.	☐	☐	☐
5th	Give examples of physical barriers.	☐	☐	☐
5th	Give examples of chemical barriers.	☐	☐	☐
6th	Describe how physical barriers protect the body (e.g. skin, mucus and cilia).	☐	☐	☐
6th	Describe how chemical barriers protect the body (e.g. lysozymes, hydrochloric acid).	☐	☐	☐

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SB5j The immune system

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State that the immune system protects the body by attacking pathogens.	☐	☐	☐
	Describe how antigens trigger the release of antibodies and the production of memory lymphocytes.	☐	☐	☐
	Describe the role of antibodies in the immune response.	☐	☐	☐
	Describe the role of memory lymphocytes in triggering a secondary response.	☐	☐	☐
	Explain how immunisation protects against infection by a pathogen.	☐	☐	☐
	Discuss advantages and disadvantages of immunisation including herd immunity.	☐	☐	☐

SB5k Antibiotics

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term antibiotic (as medicines that inhibit cell processes in bacteria).	☐	☐	☐
	Explain why antibiotics are useful for treating bacterial infections (because they do not damage human cell processes).	☐	☐	☐
	Explain why antibiotics cannot be used to treat infections by pathogens other than bacteria.	☐	☐	☐
	Describe the stages of development of new medicines.	☐	☐	☐
	Explain why each stage of the development of a new medicine is needed.	☐	☐	☐

SB5l Monoclonal antibodies

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	**H** Define the term monoclonal antibody.	☐	☐	☐
	**H** Define the term hybridoma cell.	☐	☐	☐
	**H** Describe how monoclonal antibodies are produced by lymphocytes.	☐	☐	☐
	**H** Explain how monoclonal antibodies are used in pregnancy testing.	☐	☐	☐
	**H** Explain how monoclonal antibodies are used in diagnosis of disease (including blood clots and cancer).	☐	☐	☐
	**H** Explain the advantages of monoclonal antibodies compared with drug and radiotherapy treatments to target cells.	☐	☐	☐

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SB6 Plant Structures and their Functions (Paper 2)

SB6a Photosynthesis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	Explain why photosynthetic organisms are producers of biomass.	☐	☐	☐
6th	Recall some substances produced from glucose and their roles in the plant.	☐	☐	☐
8th	Summarise what happens in photosynthesis (including the use of a word equation).	☐	☐	☐
9th	Explain why photosynthesis is an endothermic reaction.	☐	☐	☐
6th	Explain how a leaf and its cells are adapted for photosynthesis.	☐	☐	☐

SB6b Factors that affect photosynthesis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Recall what is meant by a rate of reaction.	☐	☐	☐
7th	Describe the effects of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis.	☐	☐	☐
9th	Explain the effects of limiting factors of photosynthesis.	☐	☐	☐
9th	H Explain the effects of more than one factor on the rate of photosynthesis.	☐	☐	☐
8th	H Describe how light intensity and rate of photosynthesis are related.	☐	☐	☐
9th	H Explain why the rate of photosynthesis is inversely proportional to the distance of a light source.	☐	☐	☐

SB6c Absorbing water and mineral ions

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain how root hair cells are adapted to taking in water and mineral ions.	☐	☐	☐
6th	Recall that substances can be transported by diffusion, osmosis and active transport.	☐	☐	☐
6th	Describe what is meant by a concentration gradient.	☐	☐	☐
7th	Explain why active transport is needed to transport some molecules.	☐	☐	☐
8th	Explain how molecules move by osmosis.	☐	☐	☐

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SB6d Transpiration and translocation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how xylem tissue is adapted to its functions.	☐	☐	☐
	Explain how phloem tissue is adapted to its function.	☐	☐	☐
	Describe now transpiration occurs.	☐	☐	☐
	Describe how translocation occurs.	☐	☐	☐
	Explain the effects of environmental factors on the rate of transpiration (light intensity, air movement, temperature, humidity).	☐	☐	☐
	Describe how to measure the rate of transpiration.	☐	☐	☐

SB6e Plant adaptations

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Identify the different tissues in a leaf.	☐	☐	☐
	Describe the functions of the different tissues in a leaf.	☐	☐	☐
	Describe some adaptations that plants have to living in extreme environments.	☐	☐	☐
	Explain how leaf structure is adapted for photosynthesis and gas exchange.	☐	☐	☐
	Explain some ways in which plants are adapted to reducing water loss in extreme environments.	☐	☐	☐

SB6f Plant hormones

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the names of three types of plant hormone.	☐	☐	☐
	Define the term tropsim.	☐	☐	☐
	Identify negative and positive photo- and gravitropisms.	☐	☐	☐
	Explain how auxins cause phototropism in plant shoots and roots.	☐	☐	☐

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SB6g Uses of plant hormones

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe the uses of axuins by plant growers.	☐	☐	☐
	H Describe the uses of gibberellins by plant growers and fruit farmers.	☐	☐	☐
	H Describe how fruit is artificially ripened using plant hormones.	☐	☐	☐
	H Compare the advantages and disadvantages of using plant hormones in fruit farming.	☐	☐	☐

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SB7 Animal Coordination, Control and Homeostasis (Paper 2)

SB7a Hormones

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	State where hormones are produced (in endocrine glands).	☐	☐	☐
6th	Describe the general role of hormones in the body.	☐	☐	☐
6th	Describe how hormones are transported around the body.	☐	☐	☐
6th	Describe the production and release of some common hormones from their endocrine glands (pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes).	☐	☐	☐
6th	Identify the target organs of some common hormones.	☐	☐	☐
7th	Explain the importance of hormones.	☐	☐	☐

SB7b Hormonal control of metabolic rate

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	H Describe the effects of adrenalin on the body.	☐	☐	☐
7th	H Explain how adrenalin prepares the body for fight or flight.	☐	☐	☐
5th	H Define metabolic rate.	☐	☐	☐
6th	H Describe the effect of thyroxine on metabolic rate.	☐	☐	☐
7th	H Describe how a negative feedback mechanism works.	☐	☐	☐
8th	H Explain how negative feedback controls the production of thyroxine.	☐	☐	☐
10th	H Explain why negative feedback mechanisms are important in living organisms.	☐	☐	☐

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SB7c The menstrual cycle

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Describe what happens during the menstrual cycle.	☐	☐	☐
6th	Describe the function of oestrogen in the menstrual cycle.	☐	☐	☐
6th	Describe the function of progesterone in the menstrual cycle.	☐	☐	☐
7th	Explain how barrier methods can be used as contraception.	☐	☐	☐
8th	Explain how hormones can be used as contraception.	☐	☐	☐
9th	Compare, contrast and evaluate hormonal and barrier methods of contraception.	☐	☐	☐

SB7d Hormones and the menstrual cycle

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	H Describe how changes in hormones affect the uterus wall, ovulation and menstruation.	☐	☐	☐
8th	H Explain how oestrogen, progesterone, FSH and LH interact in the menstrual cycle.	☐	☐	☐
6th	H Describe examples of Assisted Reproductive Technology (ART).	☐	☐	☐
8th	H Explain how clomifene is used to stimulate ovulation.	☐	☐	☐
8th	H Explain how hormones are used in IVF treatment.	☐	☐	☐

SB7e Control of blood glucose

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	Define homeostasis.	☐	☐	☐
8th	Explain why a constant internal environment is important.	☐	☐	☐
8th	Explain the role of insulin in regulating blood glucose concentration.	☐	☐	☐
8th	H Explain the role of glucagon in regulating blood glucose concentration.	☐	☐	☐
7th	Explain how type 1 diabetes is caused.	☐	☐	☐
7th	Explain how type 1 diabetes can be controlled.	☐	☐	☐

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SB7f Type 2 diabetes

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how type 2 diabetes is caused.	☐	☐	☐
	Explain how type 2 diabetes can be controlled.	☐	☐	☐
	Describe the correlation between body mass and type 2 diabetes.	☐	☐	☐
	Explain how BMI and waist : hip ratio are related to body mass.	☐	☐	☐
	Evaluate the correlation between body mass and type 2 diabetes.	☐	☐	☐

SB7g Thermoregulation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term ‘thermoregulation’.	☐	☐	☐
	Explain the importance of thermoregulation in enzyme activity.	☐	☐	☐
	Explain the role of the skin in thermoregulation [blood flow in dermis, sweating and hair erection in epidermis].	☐	☐	☐
	Explain the role of the hypothalamus in thermoregulation.	☐	☐	☐
	Explain the role of muscles in raising low body temperature.	☐	☐	☐
	H Explain the role of changing blood vessel diameter in thermoregulation.	☐	☐	☐

SB7h Osmoregulation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the structure of the urinary system.	☐	☐	☐
	State how urea is formed.	☐	☐	☐
	Define the term ‘osmoregulation’.	☐	☐	☐
	Describe how kidney failure is treated [kidney dialysis, organ donation]	☐	☐	☐
	Explain why osmoregulation is important.	☐	☐	☐

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SB7i The kidneys

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the parts of a nephron.	☐	☐	☐
	State what urine contains.	☐	☐	☐
	Explain how the structure of the nephron allows filtration.	☐	☐	☐
	Explain how the structure of the nephron supports reabsorption of glucose.	☐	☐	☐
	Explain how the structure of the nephron supports reabsorption of water.	☐	☐	☐
	**H** Explain the role of ADH in controlling body water content.	☐	☐	☐

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SB8 Exchange and Transport in Animals (Paper 2)

SB8a Efficient transport and exchange

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the names of substances that need to be transported into and out of the body.	☐	☐	☐
	Describe the functions of the substances that are transported into the body.	☐	☐	☐
	Describe the adaptations of the lungs for gas exchange.	☐	☐	☐
	Calculate surface area : volume ratios.	☐	☐	☐
	Explain the importance of surface area : volume ratios in transport systems.	☐	☐	☐

SB8b Factors affecting diffusion

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what is meant by concentration and use appropriate units.	☐	☐	☐
	Describe how surface area affects the rate of diffusion.	☐	☐	☐
	Describe how concentration gradient affects the rate of diffusion.	☐	☐	☐
	Describe how distance affects the rate of diffusion.	☐	☐	☐
	Calculate rates of diffusion using Fick's law.	☐	☐	☐

SB8c The circulatory system

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the components and function of the circulatory system.	☐	☐	☐
	Recall the functions of the different types of blood vessels.	☐	☐	☐
	Describe the functions of the different types of blood cells (erythrocytes, phagocytes, lymphocytes).	☐	☐	☐
	Describe the functions of blood platelets and plasma.	☐	☐	☐
	Describe how the different blood vessels are adapted to their functions.	☐	☐	☐

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SB8d The heart

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the parts of the heart.	☐	☐	☐
	Describe the flow of blood through the heart.	☐	☐	☐
	Explain how the heart is adapted for its function (valves, differing ventricle muscle thicknesses).	☐	☐	☐
	Recall and use the equation that relates cardiac output, stroke volume and heart rate.	☐	☐	☐

SB8e Cellular respiration

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain why organisms need to respire.	☐	☐	☐
	Recall the word equation for aerobic respiration.	☐	☐	☐
	Recall the word equation for anaerobic respiration in humans.	☐	☐	☐
	Explain why respiration is an exothermic process.	☐	☐	☐
	Compare aerobic and anaerobic respiration.	☐	☐	☐

SB9 Ecosystems and Material Cycles (Paper 2)

SB9a Ecosystems

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State what is meant by the ecological terms community, population and habitat.	☐	☐	☐
	Give examples of an ecosystem, a community, a population and a habitat.	☐	☐	☐
	Describe the organisation of the components of an ecosystem (including populations, communities, habitats and abiotic factors).	☐	☐	☐
	Describe how the interdependence of organisms in an ecosystem allows their survival.	☐	☐	☐
	Explain how to estimate population size, including the use of quadrats.	☐	☐	☐

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SB9b Energy transfer

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the energy transfers that occur between trophic levels.	☐	☐	☐
	Explain how energy is transferred at each trophic level, including making some energy less useful.	☐	☐	☐
	Explain how energy transfers limit the length of a food chain.	☐	☐	☐
	Explain how energy transfers determine the shape of pyramids of biomass.	☐	☐	☐
	Calculate the efficiency of energy transfer between trophic levels.	☐	☐	☐
	Calculate the percentage of biomass transferred between trophic levels.	☐	☐	☐

SB9c Abiotic factors and communities

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of abiotic factors.	☐	☐	☐
	Explain how communities are affected by abiotic factors (temperature, light, water, pollutants).	☐	☐	☐
	Explain how to investigate the effect of abiotic factors on the distribution of organisms using belt transects.	☐	☐	☐

SB9d Biotic factors and communities

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of biotic factors.	☐	☐	☐
	Describe how competition can affect communities.	☐	☐	☐
	Describe how predation can affect communities.	☐	☐	☐
	Explain how predator–prey cycles affect communities.	☐	☐	☐
	Explain how the structure of a community can affect biodiversity.	☐	☐	☐

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SB9e Assessing pollution

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	**H** Name some indicator species and what they indicate.	☐	☐	☐
	**H** Explain why indicator species are evidence for a particular level of air or water pollution.	☐	☐	☐
	**H** Describe the advantages of using indicator species as evidence for the level of pollution.	☐	☐	☐
	**H** Describe the disadvantages of using indicator species as evidence for the level of pollution.	☐	☐	☐
	**H** Evaluate the use of indicator species for assessing the level of pollution.	☐	☐	☐

SB9f Parasitism and mutualism

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term ‘parasitism’.	☐	☐	☐
	Define the term ‘mutualism’.	☐	☐	☐
	Describe how parasites are dependent on their hosts.	☐	☐	☐
	Describe how hosts are harmed by parasites.	☐	☐	☐
	Identify parasites and mutualists in examples.	☐	☐	☐
	Explain how mutualists benefit from their relationship.	☐	☐	☐

SB9g Biodiversity and humans

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term eutrophication.	☐	☐	☐
	Describe examples of the introduction of non-indigenous species.	☐	☐	☐
	Describe the advantages of fish farming.	☐	☐	☐
	Explain how fish farming can affect ecosystems and biodiversity.	☐	☐	☐
	Explain how the introduction of species can affect ecosystems and biodiversity.	☐	☐	☐
	Explain how eutrophication can affect ecosystems and biodiversity.	☐	☐	☐

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SB9h Preserving biodiversity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term conservation.	☐	☐	☐
	Explain what is meant by reforestation.	☐	☐	☐
	Give examples of animal conservation.	☐	☐	☐
	Explain how animal conservation can benefit biodiversity.	☐	☐	☐
	Explain how reforestation can benefit biodiversity.	☐	☐	☐

SB9i Food security

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the term ‘food security’.	☐	☐	☐
	Describe the effect of increasing human population on food security.	☐	☐	☐
	Describe the effect of new pests and pathogens on food security.	☐	☐	☐
	Describe the effect of animal farming and consumption on food security.	☐	☐	☐
	Describe the effect of human-induced environmental change on food security.	☐	☐	☐
	Describe the effect of sustainability issues [production of biofuels, cost of agriculture] on food security.	☐	☐	☐

SB9j The water cycle

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of materials that cycle through ecosystems.	☐	☐	☐
	Describe the processes by which water cycles through abiotic parts of an ecosystem.	☐	☐	☐
	Describe the processes by which water cycles through living organisms.	☐	☐	☐
	Describe how drinking water is produced where water is plentiful.	☐	☐	☐
	Explain how drinking water can be produced by desalination in areas of drought.	☐	☐	☐
	Explain why water is important to living organisms.	☐	☐	☐

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SB9k The carbon cycle

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of decomposers.	☐	☐	☐
	Define the term *decomposer*.	☐	☐	☐
	Describe the carbon cycle.	☐	☐	☐
	Identify the key processes in the carbon cycle.	☐	☐	☐
	Explain how carbon is cycled through the biotic and abiotic components of an ecosystem.	☐	☐	☐
	Explain the importance of the carbon cycle (in balancing photosynthesis and respiration, and removal of wastes by decomposition).	☐	☐	☐

SB9l The nitrogen cycle

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how plants use nitrates.	☐	☐	☐
	Describe the different roles of bacteria in the nitrogen cycle.	☐	☐	☐
	Explain how fertilisers increase the nitrate content of the soil.	☐	☐	☐
	Explain why bacteria are important for soil fertility.	☐	☐	☐
	Explain how crop rotation can increase the nitrogen content of the soil.	☐	☐	☐

SB9m Rates of decomposition

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe ways that food is preserved.	☐	☐	☐
	Explain why food is preserved in different ways [reducing temperature, water content and oxygen availability].	☐	☐	☐
	Describe how compost is made.	☐	☐	☐
	Explain how the rate of decomposition in composting can be increased.	☐	☐	☐
	Calculate the rate of decay in food and compost.	☐	☐	☐

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CHEMISTRY

SC1 States of Matter (Paper 1)

SC1a States of matter

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Name the three states of matter, and the physical changes that occur between them.	☐	☐	☐
	Describe the arrangements and movement of particles in the different states of matter.	☐	☐	☐
	Use information to predict the state of a substance.	☐	☐	☐
	Describe the relative energies of particles in the different states of matter.	☐	☐	☐
	Explain why the movement and arrangement of particles change during changes of state.	☐	☐	☐
	Explain why the energy of particles changes during changes of state.	☐	☐	☐

Edexcel GCSE (9-1) Separate Science Revision Checklist

SC2 Methods of Separating and Purifying Substances (Paper 1)

SC2a Mixtures

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the differences between a pure substance and a mixture.	☐	☐	☐
	Use melting point information to decide whether a substance is pure or is a mixture.	☐	☐	☐
	Describe what happens to atoms at a pure substance's melting point.	☐	☐	☐
	Interpret a heating curve to identify a melting point.	☐	☐	☐
	Explain why the temperature does not change as a pure substance melts.	☐	☐	☐

SC2b Filtration and crystallisation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State some mixtures that can be separated by filtration.	☐	☐	☐
	State some mixtures that can be separated by crystallisation.	☐	☐	☐
	Draw and interpret diagrams showing how filtration and crystallisation are done.	☐	☐	☐
	Explain the formation of crystals during crystallisation.	☐	☐	☐
	Explain how mixtures are separated by filtration.	☐	☐	☐
	Explain ways of reducing risk when separating mixtures by filtration and crystallisation.	☐	☐	☐

SC2c Paper chromatography

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how some mixtures can be separated by chromatography.	☐	☐	☐
	Identify pure substances and mixtures on chromatograms.	☐	☐	☐
	Identify substances that are identical on chromatograms.	☐	☐	☐
	Draw and interpret diagrams showing how chromatography is done.	☐	☐	☐
	Explain how substances can be separated by chromatography.	☐	☐	☐
	Calculate R_f values and use them to identify substances.	☐	☐	☐

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SC2d Distillation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how to carry out, and explain what happens in, simple distillation.	☐	☐	☐
	Distinguish between simple distillation and fractional distillation.	☐	☐	☐
	Identify when fractional distillation should be used to separate a mixture.	☐	☐	☐
	Describe how to carry out fractional distillation.	☐	☐	☐
	Explain how the products of fractional distillation are linked to the boiling points of the components.	☐	☐	☐
	Explain what precautions are needed to reduce risk in a distillation experiment.	☐	☐	☐

SC2e Drinking water

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain why water used in chemical analysis must not contain dissolved salts.	☐	☐	☐
	Describe how fresh water can be produced from seawater.	☐	☐	☐
	Describe the steps needed to make fresh water suitable for drinking.	☐	☐	☐
	Suggest how to purify water when you know what it contains.	☐	☐	☐
	Evaluate the hazards and control the risks present when purifying water.	☐	☐	☐

Edexcel GCSE (9-1) Separate Science Revision Checklist

SC3 Atomic Structure (Paper 1 and Paper 2)

SC3a Structure of an atom

Step	Learning outcome	Had a look	Nearly there	Nailed it!
8th	Describe how Dalton's ideas about atoms have changed.	☐	☐	☐
8th	Describe how the subatomic particles are arranged in an atom.	☐	☐	☐
8th	Explain how atoms of different elements are different.	☐	☐	☐
7th	Recall the charges and relative masses of the three subatomic particles.	☐	☐	☐
8th	Explain why all atoms have no overall charge.	☐	☐	☐
8th	Describe how the size of an atom compares to the size of its nucleus.	☐	☐	☐

SC3b Atomic number and mass number

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	State where most of the mass of an atom is found.	☐	☐	☐
7th	State the meaning of atomic number.	☐	☐	☐
7th	State the meaning of mass number.	☐	☐	☐
8th	Describe how the atoms of different elements vary.	☐	☐	☐
8th	State the number of electrons in an atom from its atomic number.	☐	☐	☐
8th	Calculate the numbers of protons, neutrons and electrons using atomic and mass numbers.	☐	☐	☐

SC3c Isotopes

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	State what is meant by an isotope.	☐	☐	☐
7th	Identify isotopes from information about the structure of atoms.	☐	☐	☐
8th	Calculate the numbers of protons, neutrons and electrons using atomic numbers and mass numbers.	☐	☐	☐
9th	Explain why the relative atomic mass of many elements is not a whole number.	☐	☐	☐
10th	H Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes.	☐	☐	☐

Edexcel GCSE (9-1) Separate Science Revision Checklist

SC4 The Periodic Table (Paper 1 and Paper 2)

SC4a Elements and the periodic table

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the chemical symbols of some common elements.	☐	☐	☐
	Describe how Mendeleev arranged elements into a periodic table.	☐	☐	☐
	Describe how Mendeleev predicted the existence and properties of some elements yet to be discovered.	☐	☐	☐
	Explain how Mendeleev's early ideas were supported by later evidence.	☐	☐	☐

SC4b Atomic number and the periodic table

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain some problems Mendeleev had when ordering the elements.	☐	☐	☐
	Explain the meaning of the term 'atomic number'.	☐	☐	☐
	Describe how the elements are arranged in the modern periodic table.	☐	☐	☐
	Recall the positions of metals and non-metals in the periodic table.	☐	☐	☐

SC4c Electronic configurations and the periodic table

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State what the term 'electronic configuration' means.	☐	☐	☐
	Show electronic configurations in the form 2.8.1 and as diagrams.	☐	☐	☐
	Predict the electronic configurations of the elements hydrogen to calcium.	☐	☐	☐
	Explain the links between an element's position in the periodic table and its electronic configuration.	☐	☐	☐
	Recall the positions of metals and non-metals in the periodic table.	☐	☐	☐

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SC5 Ionic Bonding (Paper 1 and Paper 2)

SC5a Ionic bonds

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Recall the formulae of simple ions.	☐	☐	☐
8th	Explain how cations and anions are formed.	☐	☐	☐
8th	Use dot and cross diagrams to explain how ionic bonds are formed.	☐	☐	☐
8th	Explain the difference between an atom and an ion.	☐	☐	☐
9th	Calculate the numbers of protons, neutrons and electrons in simple ions.	☐	☐	☐
9th	Explain the formation of ions in groups 1, 2, 6 and 7 of the periodic table.	☐	☐	☐

SC5b Ionic lattices

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Recall the formulae of common polyatomic ions, and the charges on them.	☐	☐	☐
7th	Interpret the use of –ide and –ate endings in the names of compounds.	☐	☐	☐
7th	Name ionic compounds using –ide and –ate endings.	☐	☐	☐
8th	Work out the formula of an ionic compound from the formulae of its ions.	☐	☐	☐
8th	Describe the structure of ionic compounds.	☐	☐	☐
8th	Explain how ionic compounds are held together.	☐	☐	☐

SC5c Properties of ionic compounds

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe the properties of ionic compounds.	☐	☐	☐
7th	Explain why ionic compounds have high melting points and high boiling points.	☐	☐	☐
7th	Explain why ionic compounds conduct electricity when they are molten and in aqueous solution.	☐	☐	☐
7th	Explain why ionic compounds do not conduct electricity as solids.	☐	☐	☐
7th	Identify ionic compounds from data about their properties.	☐	☐	☐

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SC6 Covalent bonding (Paper 1 and Paper 2)

SC6a Covalent bonds

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how covalent bonds are formed.	☐	☐	☐
	Recall the names of some common molecular elements.	☐	☐	☐
	Recall the names of some common molecular compounds.	☐	☐	☐
	State the bonding that is found in molecules.	☐	☐	☐
	State the approximate size (order or magnitude) of atoms and small molecules.	☐	☐	☐
	Explain the formation of covalent bonds using dot and cross diagrams.	☐	☐	☐

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SC7 Types of Substance (Paper 1 and Paper 2)

SC7a Molecular compounds

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall examples of common covalent, simple molecular compounds.	☐	☐	☐
	Describe the general properties of covalent, simple molecular compounds.	☐	☐	☐
	Explain why covalent, simple molecular compounds have low melting and boiling points.	☐	☐	☐
	Explain why covalent, simple molecular compounds are poor conductors of electricity.	☐	☐	☐
	Describe the structure of a polymer.	☐	☐	☐

SC7b Allotropes of carbon

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall some allotropes of carbon.	☐	☐	☐
	Describe the basic differences between covalent, simple molecules and giant covalent structures.	☐	☐	☐
	Describe the structures of diamond, graphite, fullerenes and graphene.	☐	☐	☐
	Describe the properties of diamond, graphite, fullerenes and graphene.	☐	☐	☐
	Explain the properties and uses of diamond and graphite in terms of their structure and bonding.	☐	☐	☐
	Explain the properties of fullerenes and graphene in terms of their structure and bonding.	☐	☐	☐

SC7c Properties of metals

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the particles and how they are arranged in metals.	☐	☐	☐
	Explain why metals are malleable.	☐	☐	☐
	Explain why metals conduct electricity.	☐	☐	☐
	Describe the typical properties of metals.	☐	☐	☐
	Describe the typical properties of non-metals.	☐	☐	☐

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SC7d Bonding metals

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Give examples of ionic; covalent, simple molecular; covalent, giant molecular; and metallic substances.	☐	☐	☐
	Describe how the different types of bonds and structures are formed.	☐	☐	☐
	Explain how the structure and bonding of a substance is linked to its physical properties. (Relative melting point and boiling point, relative solubility in water and ability to conduct electricity, as solids and in solution.)	☐	☐	☐
	Explain why we use models to represent structure and bonding.	☐	☐	☐
	Represent structures and bonding using a variety of different models (dot and cross, ball and stick, 2D, 3D).	☐	☐	☐
	Describe the limitations of the different models used to represent structure and bonding (dot and cross, ball and stick, 2D, 3D).	☐	☐	☐

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SC8 Acids and Alkalis (Paper 1)

SC8a Acids, alkalis, and indicators

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what the main hazard symbols mean.	☐	☐	☐
	Describe the safety precautions that should be observed when handling different acids and alkalis.	☐	☐	☐
	Name the ions present in all acidic and all alkaline solutions.	☐	☐	☐
	State the pH values associated with acidic, alkaline and neutral solutions.	☐	☐	☐
	Describe the effect of acids and alkalis on common indicators.	☐	☐	☐
	H Explain the link between pH and the concentration of ions in acids and alkalis.	☐	☐	☐

SC8b Looking at acids

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe the relationship between hydrogen ion concentration and pH.	☐	☐	☐
	H Explain the difference between a dilute and concentrated solution (in terms of the amount of solute present).	☐	☐	☐
	H Explain the difference between strong and weak acids (in terms of the degree of dissociation of the acid molecules).	☐	☐	☐
	H Explain how the pH and reactivity of an acid depend on the concentration and the strength of the acid.	☐	☐	☐

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SC8c Bases and salts

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how a base reacts in a neutralisation reaction.	☐	☐	☐
	Describe what happens when an acid reacts with a metal oxide.	☐	☐	☐
	Write word equations for the reactions of acids and metal oxides.	☐	☐	☐
	Write symbol equations for the reactions of acids and metal oxides.	☐	☐	☐
	Explain what happens during a neutralisation reaction.	☐	☐	☐
	Describe the steps involved in preparing a soluble salt from an acid and an insoluble reactant.	☐	☐	☐
	Explain why: an excess of insoluble reactant is used when preparing a soluble salt the excess reactant is removed when preparing a soluble salt the remaining solution contains only a salt and water, when preparing a soluble salt from an acid and an insoluble reactant.	☐	☐	☐

SC8d Alkalis and balancing equations

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the chemical formulae of some common compounds.	☐	☐	☐
	Recall and use state symbols.	☐	☐	☐
	Balance chemical equations.	☐	☐	☐
	Recall that alkalis are soluble bases.	☐	☐	☐
	Describe the reactions of alkalis with acids.	☐	☐	☐

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SC8e Alkalis and neutralisation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain what happens to the ions from acids and alkalis during neutralisation.	☐	☐	☐
6th	Explain why titration is used to prepare soluble salts.	☐	☐	☐
6th	Describe how to carry out an acid–alkali titration.	☐	☐	☐

SC8f Reactions of acids with metals and carbonates

Step	Learning outcome	Had a look	Nearly there	Nailed it!
9th	H Write balanced ionic equations.	☐	☐	☐
7th	Explain the general reaction between an acid and a metal to produce a salt and hydrogen.	☐	☐	☐
7th	Explain the general reaction between an acid and a metal carbonate to produce a salt, water and carbon dioxide.	☐	☐	☐
5th	Describe the test for hydrogen.	☐	☐	☐
5th	Describe the test for carbon dioxide.	☐	☐	☐

SC8g Solubility

Step	Learning outcome	Had a look	Nearly there	Nailed it!
4th	Recall the general rules for the solubility of common substances in water.	☐	☐	☐
6th	Predict whether or not a precipitate will form from two solutions.	☐	☐	☐
6th	Name the precipitate formed in a reaction.	☐	☐	☐
6th	Describe how to prepare a pure, dry sample of an insoluble salt.	☐	☐	☐

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SC9 Calculations involving masses (Paper 1 and Paper 2)

SC9a Masses and empirical formulae

Step	Learning outcome	Had a look	Nearly there	Nailed it!
8th	Calculate the relative formula mass of a substance from relative atomic masses.	☐	☐	☐
8th	Calculate the empirical formula of a compound from the masses of the elements it contains.	☐	☐	☐
8th	Explain the difference between an empirical formula and a molecular formula.	☐	☐	☐
7th	Deduce the empirical formula from a molecular formula.	☐	☐	☐
8th	Deduce the molecular formula for a compound from its empirical formula and its relative formula mass.	☐	☐	☐
7th	Describe an experiment to determine the empirical formula for a compound.	☐	☐	☐

SC9b Conservation of mass

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain the law of conservation of mass in a closed system.	☐	☐	☐
6th	Explain the law of conservation of mass in a non-enclosed system.	☐	☐	☐
8th	Calculate the mass of product formed from a given mass of reactant, using a balanced equation.	☐	☐	☐
8th	Calculate the mass of a reactant needed to produce a given amount of product, using a balanced equation.	☐	☐	☐
6th	Calculate the concentration of a solution in g dm^{-3}.	☐	☐	☐

SC9c Moles H

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	H Describe what is meant by a mole of particles.	☐	☐	☐
8th	H Calculate the number of moles of particles in a given mass of a certain substance and vice versa.	☐	☐	☐
9th	H Calculate the number of particles in a given number of moles or mass of a substance and vice versa.	☐	☐	☐
7th	H Explain that the mass of a product formed in a reaction is controlled by the mass of reactant that is not in excess.	☐	☐	☐
9th	H Deduce the balanced equation for a reaction from the masses of reactants and/or products.	☐	☐	☐

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SC10 Electrolytic Processes (Paper 1)

SC10a Electrolysis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	State the meaning of the term ‘electrolyte’.	☐	☐	☐
7th	Outline what happens during electrolysis.	☐	☐	☐
7th	Explain the movement of the ions during electrolysis.	☐	☐	☐
8th	H Write half equations for the reactions at the electrodes.	☐	☐	☐
9th	H Explain the meaning of oxidation and reduction in terms of the movement of electrons.	☐	☐	☐
8th	H State the electrodes at which oxidation and reduction occur.	☐	☐	☐

SC10b Products from electrolysis

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Recall the products formed from the electrolysis of a variety of common compounds and solutions (copper chloride solution, sodium chloride solution, sodium sulfate solution, acidified water, molten lead bromide).	☐	☐	☐
8th	Explain the formation of the products in the electrolysis of a variety of common compounds and solutions (copper chloride solution, sodium chloride solution, sodium sulfate solution, acidified water, molten lead bromide).	☐	☐	☐
8th	Predict the products formed from the electrolysis of a molten, binary, ionic compound.	☐	☐	☐
8th	Explain how the electrolysis of copper sulfate solution using copper electrodes can be used to purify copper.	☐	☐	☐

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SC11 Obtaining and Using Metals (Paper 1)

SC11a Reactivity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the reactions of common metals with water and acids.	☐	☐	☐
	Describe the reactions of metals with salt solutions.	☐	☐	☐
	**H** Explain why displacement reactions are redox reactions.	☐	☐	☐
	Deduce the order of metals in the reactivity series from their reactions with water, acids and salt solutions.	☐	☐	☐
	Explain the reactivity series in terms of the tendency of different metal atoms to form cations.	☐	☐	☐

SC11b Ores

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the meaning of the term ‘ore’.	☐	☐	☐
	Recall some metals that are found uncombined in the Earth’s crust.	☐	☐	☐
	Explain how and why some metals are extracted from their ores by heating with carbon.	☐	☐	☐
	Explain how and why some metals are extracted from their ores by electrolysis.	☐	☐	☐
	**H** Describe two biological methods of metal extraction.	☐	☐	☐
	**H** Evaluate biological methods of metal extraction.	☐	☐	☐

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SC11c Oxidation and reduction

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Explain why reactions occurring at the electrodes during electrolysis are redox reactions.	☐	☐	☐
	Describe the meanings of oxidation and reduction in terms of oxygen.	☐	☐	☐
	Explain which substance has been oxidised and which substance has been reduced in a reaction.	☐	☐	☐
	Recall that all metals are extracted by reduction of their ores.	☐	☐	☐
	Explain how the position of a metal in the reactivity series is related to its resistance to oxidation.	☐	☐	☐

SC11d Life cycle assessment and recycling

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State the advantages and disadvantages of recycling a metal.	☐	☐	☐
	Describe a process where a material or product is recycled for a different use.	☐	☐	☐
	Evaluate the advantages and disadvantages of recycling a material or product to decide whether recycling is a viable option.	☐	☐	☐
	Describe the four stages in carrying out a life cycle assessment (LCA) of a material or product.	☐	☐	☐
	Evaluate data from a life cycle assessment of a material or product.	☐	☐	☐

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SC12 Reversible Reactions and Equilibria (Paper 1)

SC12a Dynamic equilibrium

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what happens in reversible reactions.	☐	☐	☐
	Explain the use of the symbol ⇌ in chemical equations.	☐	☐	☐
	Explain what is meant by dynamic equilibrium.	☐	☐	☐
	Describe the formation of ammonia.	☐	☐	☐
	State the conditions used for the Haber process.	☐	☐	☐
	H Describe how changing the temperature, pressure and concentration all affect the relative amount of substances in an equilibrium mixture.	☐	☐	☐

SC13 Transition Metals, Alloys and Corrosion (Paper 1)

SC13a Transition metals

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the position of the transition metals in the periodic table	☐	☐	☐
	Describe some general physical properties of transition metals.	☐	☐	☐
	Describe some general chemical properties of transition metals.	☐	☐	☐
	Explain why iron has the typical properties of a transition metal.	☐	☐	☐

SC13b Corrosion

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe corrosion of metals as the result of oxidation.	☐	☐	☐
	Describe how rusting of iron occurs.	☐	☐	☐
	Explain how rusting can be prevented by excluding oxygen and/or water.	☐	☐	☐
	Explain how sacrificial protection works.	☐	☐	☐

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SC13c Electroplating

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall what electroplating is.	☐	☐	☐
	Recall some common examples of electroplating.	☐	☐	☐
	Explain why metal objects may be electroplated.	☐	☐	☐
	Explain how electroplating is carried out.	☐	☐	☐

SC13d Alloying

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the name of a common alloy.	☐	☐	☐
	Describe what alloys are.	☐	☐	☐
	Explain why iron is alloyed with other metals.	☐	☐	☐
	Explain why alloys are often stronger than the metals they contain.	☐	☐	☐

SC13e Uses of metals and their alloys

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall common uses for aluminium, copper and gold.	☐	☐	☐
	Recall the names and compositions of common alloys containing aluminium or copper.	☐	☐	☐
	Explain why different metals and their alloys have different uses.	☐	☐	☐

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SC14 Quantitative Analysis (Paper 1)

SC14a Yields

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	State what is meant by the theoretical yield of a reaction.	☐	☐	☐
5th	State what is meant by the actual yield of a reaction.	☐	☐	☐
8th	Calculate the percentage yield of a reaction.	☐	☐	☐
6th	Understand that the actual yield is always less than the theoretical yield of a reaction.	☐	☐	☐
6th	Describe some reasons why the actual yield is less than the theoretical yield of a reaction.	☐	☐	☐

SC14b Atom economy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Recall the formula for calculating atom economy.	☐	☐	☐
9th	Calculate the atom economy for forming a desired product in a reaction.	☐	☐	☐
7th	H Explain how atom economy and yield determine the choice of reaction pathway.	☐	☐	☐
7th	H Explain how the usefulness of by-products determines the choice of reaction pathway.	☐	☐	☐

SC14c Concentrations

Step	Learning outcome	Had a look	Nearly there	Nailed it!
4th	H State the meaning of the term concentration.	☐	☐	☐
6th	H Calculate concentration in g dm^{-3}.	☐	☐	☐
6th	H Calculate concentration in mol dm^{-3}.	☐	☐	☐
8th	H Convert concentration in g dm^{-3} into concentration in mol dm^{-3}.	☐	☐	☐
9th	H Convert concentration in mol dm^{-3} into concentration in g dm^{-3}.	☐	☐	☐

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SC14d Titrations and calculations

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe the steps in carrying out an acid-alkali titration.	☐	☐	☐
7th	H Calculate the number of moles of solute in a given volume of solution.	☐	☐	☐
9th	H Deduce the mole ratio of acid to alkali from a balanced equation.	☐	☐	☐
9th	H Calculate the concentration of a solution using the results of an acid-alkali titration.	☐	☐	☐
9th	H Calculate the volume of solution required in an acid-alkali titration, given the concentrations of both the acid and the alkali.	☐	☐	☐

SC14e Molar volume of gases

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	H Describe what is meant by the molar volume of a gas.	☐	☐	☐
8th	H Use the molar volume in calculations involving solids and gases in reactions.	☐	☐	☐
6th	H Recall Avogadro's law.	☐	☐	☐
9th	H Use Avogadro's law to calculate the volumes of reacting gases.	☐	☐	☐

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SC15 Dynamic Equilibria, Calculations Involving Volumes of Gases (Paper 1)

SC15a Fertilisers and the Haber process

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall some compounds found in fertilisers.	☐	☐	☐
	Describe and compare small-scale and large-scale production of ammonium sulfate.	☐	☐	☐
	Describe how ammonium nitrate is made using ammonia produced by the Haber process.	☐	☐	☐

SC15b Factors affecting equilibrium

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how changing the reaction conditions affects the relative amount of substances in an equilibrium mixture.	☐	☐	☐
	Predict how different conditions affect how quickly equilibrium is reached.	☐	☐	☐
	Explain how the conditions are chosen for industrial reactions.	☐	☐	☐
	Explain how the rate of reaction and equilibrium position determine the choice of reaction pathway.	☐	☐	☐

SC16 Chemical Cells and Fuel Cells (Paper 1)

SC16a Chemical cells and fuel cells

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall why a chemical cell eventually stops producing a voltage.	☐	☐	☐
	Recall the main features of a hydrogen–oxygen fuel cell.	☐	☐	☐
	Evaluate the use of fuel cells for different purposes.	☐	☐	☐

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SC17 Groups in the Periodic Table (Paper 2)

SC17a Group 1

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain the classification of alkali metals, halogens and noble gases, into groups in the periodic table.	☐	☐	☐
	Describe the main physical properties of alkali metals.	☐	☐	☐
	Describe the reactions of lithium, sodium and potassium with water.	☐	☐	☐
	Write word, balanced and **H** ionic equations (including state symbols) for the reactions of alkali metals.	☐	☐	☐
	Describe the pattern of reactivity of the alkali metals.	☐	☐	☐
	Explain how the electronic configurations of the atoms of alkali metals affect their reactivity.	☐	☐	☐

SC17b Group 7

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the appearance of chlorine, bromine and iodine at room temperature.	☐	☐	☐
	Describe the trends in colour, melting point and boiling point of chlorine, bromine and iodine down the group, and use these to predict physical properties of other halogens.	☐	☐	☐
	Describe the chemical test for chlorine gas.	☐	☐	☐
	Describe the trends in the reactions of halogens with metals, and use this to predict reactions of other halogens.	☐	☐	☐
	Write word and balanced chemical equations, including state symbols, for the reactions of halogens with metals.	☐	☐	☐
	Describe hydrogen halides and their chemical properties.	☐	☐	☐

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SC17c Halogen reactivity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the relative reactivity of halogens.	☐	☐	☐
	Explain how the reactivity of halogens can be worked out from displacement reactions.	☐	☐	☐
	Write balanced chemical equations, including state symbols, for the displacement reactions of halogens.	☐	☐	☐
	**H** Explain how displacement reactions are examples of redox reactions.	☐	☐	☐
	**H** Write ionic equations, including state symbols, for displacement reactions of halogens.	☐	☐	☐
	Explain the order of reactivity of halogens (using electronic configurations).	☐	☐	☐

SC17d Group 0

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain why noble gases are chemically inert by referring to their electronic configuration.	☐	☐	☐
	Describe uses of noble gases linked with their properties.	☐	☐	☐
	Describe the trends in the physical properties of the noble gases.	☐	☐	☐
	Use trends in physical properties to predict the physical properties of other noble gases.	☐	☐	☐

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SC18 Rates of Reaction (Paper 2)

SC18a Rates of reaction

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe different changes that can occur as a reaction proceeds.	☐	☐	☐
	Suggest different experimental methods to investigate rates of reaction (e.g. measurements of mass of reactants against time, volume of gas released against time, concentration of reactant or product against time).	☐	☐	☐
	Use graphs of changes (in mass, volume or concentration of reactant or product) against time, to interpret what is happening during reactions.	☐	☐	☐

SC18b Factors affecting reaction rates

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain what has to happen for reactions to take place.	☐	☐	☐
	Explain why changes in the energy of particles affect rates of reaction.	☐	☐	☐
	Explain why changes in the frequency of collisions between particles affect the rate of reaction.	☐	☐	☐
	Explain why changes in temperature, concentration, surface area and pressure affect the rate of reaction (surface area for solids, pressure for gases only).	☐	☐	☐
	Describe ways of speeding up or slowing down chemical reactions.	☐	☐	☐

SC18c Catalysts and activation energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what a catalyst does.	☐	☐	☐
	Explain how catalysts are useful.	☐	☐	☐
	Explain what the activation energy of a reaction is.	☐	☐	☐
	Explain how catalysts speed up chemical reactions.	☐	☐	☐
	Describe what enzymes are.	☐	☐	☐
	Name one or more examples of enzymes.	☐	☐	☐

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SC19 Heat Energy Changes in Chemical Reactions (Paper 2)

SC19a Exothermic and endothermic reactions

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall some examples of exothermic and endothermic changes.	☐	☐	☐
	Describe how heat changes in solution may be determined.	☐	☐	☐
	Describe the differences between exothermic and endothermic changes.	☐	☐	☐

SC19b Energy changes in reactions

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe exothermic and endothermic reactions in terms of energy changes when bonds are broken and formed.	☐	☐	☐
	**H** Use bond energies to calculate energy changes in reactions.	☐	☐	☐
	Explain the meaning of activation energy.	☐	☐	☐
	Draw and label reaction profiles.	☐	☐	☐

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SC20 Fuels (Paper 2)

SC20a Hydrocarbons in crude oil and natural gas

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the meaning of the term hydrocarbon.	☐	☐	☐
	Describe the compounds found in crude oil.	☐	☐	☐
	Describe the importance of crude oil for the petrochemical industry.	☐	☐	☐
	Explain why crude oil is a finite resource.	☐	☐	☐
	Recall the names of some common fossil fuels.	☐	☐	☐

SC20b Fractional distillation of crude oil

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how crude oil is separated by fractional distillation.	☐	☐	☐
	Explain how fractional distillation of crude oil works.	☐	☐	☐
	Recall the names and uses of fractions from crude oil.	☐	☐	☐
	Describe how fractions differ from each other.	☐	☐	☐
	Explain why the properties of different fractions differ.	☐	☐	☐

SC20c The alkane homologous series

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe that oil fractions mostly contain alkanes.	☐	☐	☐
	Describe the main features of an homologous series.	☐	☐	☐
	Explain why alkanes form an homologous series.	☐	☐	☐

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SC20d Complete and incomplete combustion

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the complete combustion of hydrocarbon fuels.	☐	☐	☐
	Explain the production of harmful products during the incomplete combustion of hydrocarbon fuels.	☐	☐	☐
	Explain why carbon monoxide is toxic.	☐	☐	☐
	Describe the problems caused by incomplete combustion.	☐	☐	☐

SC20e Combustible fuels and pollution

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how some hydrocarbon fuels produce sulfur dioxide in use.	☐	☐	☐
	Recall the names of the pollutants responsible for acid rain.	☐	☐	☐
	Describe some effects of acid rain.	☐	☐	☐
	Explain why oxides of nitrogen are produced when fuels are burned in engines.	☐	☐	☐

SC20f Breaking down hydrocarbons

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Evaluate hydrogen as an alternative fuel to petrol for cars.	☐	☐	☐
	Describe what happens during cracking.	☐	☐	☐
	Explain why alkanes are saturated and alkenes are unsaturated.	☐	☐	☐
	Explain why cracking is necessary.	☐	☐	☐

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SC21 Earth and Atmospheric Science (Paper 2)

SC21a The early atmosphere

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the Earth's early atmosphere was formed.	☐	☐	☐
	State the names and relative amounts of the gases found in the Earth's early atmosphere.	☐	☐	☐
	Draw conclusions from evidence about the Earth's early atmosphere.	☐	☐	☐
	Explain how the oceans are thought to have formed.	☐	☐	☐

SC21b The changing atmosphere

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the formation of the oceans influenced the composition of the atmosphere.	☐	☐	☐
	Explain how photosynthetic organisms (including plants) changed the composition of the atmosphere.	☐	☐	☐
	State the chemical test for oxygen.	☐	☐	☐

SC21c The atmosphere today

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the names of significant greenhouse gases.	☐	☐	☐
	Describe the processes involved in the greenhouse effect.	☐	☐	☐
	Describe how human activity increases the concentration of greenhouse gases.	☐	☐	☐
	Evaluate the correlation between atmospheric carbon dioxide concentrations and fossil fuel use.	☐	☐	☐
	Evaluate the evidence for increased atmospheric greenhouse gas concentrations being part of the cause of global warming and climate change.	☐	☐	☐

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SC21d Climate change

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Suggest possible effects on the climate of increased levels of carbon dioxide and methane.	☐	☐	☐
	Describe how human activity leads to increased carbon dioxide levels.	☐	☐	☐
	Describe how human activity leads to increased methane levels.	☐	☐	☐
	Describe the projected effects of climate change.	☐	☐	☐
	Describe how the potential harmful effects of climate change can be addressed and limited.	☐	☐	☐

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SC22 Hydrocarbons (Paper 2)

SC22a Alkanes and alkenes

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	State the names, formulae and structures of the first four members of the alkane homologous series.	☐	☐	☐
7th	Distinguish between saturated hydrocarbons and unsaturated hydrocarbons.	☐	☐	☐
6th	State the names, formulae and structures of the first four members of the alkene homologous series.	☐	☐	☐
6th	Define the term ‘functional group’ and describe the functional group in alkenes.	☐	☐	☐
8th	Describe the similarities and differences between butane, but-1-ene and but-2-ene.	☐	☐	☐

SC22b Reactions of alkanes and alkenes

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Describe what an ‘addition reaction’ is.	☐	☐	☐
7th	Describe the reaction of bromine with ethene and other alkenes.	☐	☐	☐
5th	Recall how bromine water is used to distinguish between alkanes and alkenes.	☐	☐	☐
7th	Explain how the bromine water test distinguishes between alkanes and alkenes.	☐	☐	☐
6th	Recall the products of complete combustion of alkanes and alkenes.	☐	☐	☐
7th	Explain why the products of the complete combustion of a hydrocarbon are carbon dioxide and water.	☐	☐	☐

SC23 Alcohols and Carboxylic Acids (Paper 2)

SC23a Ethanol production

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	State the name and formula of the alcohol in alcoholic drinks.	☐	☐	☐
6th	Describe how alcoholic drinks are made from carbohydrates.	☐	☐	☐
7th	Write word equations for the formation of ethanol from carbohydrates.	☐	☐	☐
9th	Write balanced equations for the formation of ethanol from carbohydrates.	☐	☐	☐
8th	Explain how fractional distillation can be used to produce more concentrated alcohol solutions.	☐	☐	☐

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SC23b Alcohols

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State the names, formulae and structures of the first four members of the alcohol homologous series.	☐	☐	☐
	State the functional group present in all alcohols.	☐	☐	☐
	Describe some chemical reactions of alcohols.	☐	☐	☐
	Explain why alcohols have similar chemical properties.	☐	☐	☐
	Use the chemical properties of the first four alcohols to predict the properties of other alcohols.	☐	☐	☐

SC23c Carboxylic acids

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State the names, formulae and structures of the first four members of the carboxylic acid series.	☐	☐	☐
	Recall the functional group present in all carboxylic acids.	☐	☐	☐
	Recall that carboxylic acids can be formed by the oxidation of alcohols.	☐	☐	☐
	Describe some chemical properties of carboxylic acids.	☐	☐	☐
	Explain why carboxylic acids take part in similar chemical reactions.	☐	☐	☐
	Use the properties of the first four carboxylic acids to predict the properties of other carboxylic acids.	☐	☐	☐

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SC24 Polymers (Paper 2)

SC24a Addition polymerisation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Recall the meaning of the term polymer.	☐	☐	☐
7th	Describe how ethene molecules join together to form poly(ethene).	☐	☐	☐
7th	Describe how alkenes undergo addition polymerisation.	☐	☐	☐
6th	Recall that DNA is a polymer made from four different monomers called nucleotides.	☐	☐	☐
6th	Recall that starch is a polymer made from sugars.	☐	☐	☐
6th	Recall that proteins are polymers made from amino acids.	☐	☐	☐

SC24b Polymer properties and uses

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	Describe how other addition polymers are formed from their monomers: poly(propene), poly(chloroethene) (PVC) and poly(tetrafluoroethene) (PTFE).	☐	☐	☐
8th	Deduce the structure of a polymer from the structure of a monomer.	☐	☐	☐
8th	Deduce the structure of a monomer from the structure of a polymer.	☐	☐	☐
8th	Explain how the uses of a polymer are related to its properties and vice versa.	☐	☐	☐

SC24c Condensation polymerisation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	H Explain what is meant by a condensation reaction.	☐	☐	☐
7th	H Draw the structure of a molecule with two carboxylic acid groups.	☐	☐	☐
7th	H Draw the structure of a molecule with two alcohol groups.	☐	☐	☐
8th	H Draw the structure of a polyester.	☐	☐	☐
8th	H Explain how a molecule of water is formed each time an ester link is formed.	☐	☐	☐

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SC24d Problems with polymers

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	State the starting material for most synthetic polymers.	☐	☐	☐
	Describe the problems associated with the production and disposal of synthetic polymers.	☐	☐	☐
	Describe some advantages of recycling polymers.	☐	☐	☐
	Describe some disadvantages of recycling polymers.	☐	☐	☐
	Evaluate the advantages and disadvantages of recycling polymers.	☐	☐	☐

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SC25 Qualitative Analysis: Tests for Ions (Paper 2)

SC25a Flame tests and photometry

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Recall flame test colours for some metal ions.	☐	☐	☐
5th	Describe how to carry out flame tests.	☐	☐	☐
6th	Describe the advantages of instrumental methods of analysis.	☐	☐	☐
7th	Use flame photometer data to determine the concentration of metal ions in solution.	☐	☐	☐
7th	Use flame photometer data to identify metal ions.	☐	☐	☐

SC25b Tests for positive ions

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Explain why the test for a given ion must be unique to that ion.	☐	☐	☐
5th	Recall some metal hydroxide precipitate colours.	☐	☐	☐
6th	Describe how to identify metal ions using sodium hydroxide solution.	☐	☐	☐
6th	Describe how to identify ammonium ions and ammonia.	☐	☐	☐

SC25c Tests for negative ions

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Describe how to identify carbonate ions.	☐	☐	☐
6th	Describe how to identify carbon dioxide.	☐	☐	☐
6th	Describe how to identify sulfate ions in solution.	☐	☐	☐
5th	Recall the colours of silver halide precipitates.	☐	☐	☐
6th	Describe how to identify halide ions in solution.	☐	☐	☐

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SC26 Bulk and Surface Properties of Matter Including Nanoparticles (Paper 2)

SC26a Choosing materials

Step	Learning outcome	Had a look	Nearly there	Nailed it!
3rd	Recall what glass ceramics and clay ceramics are.	☐	☐	☐
6th	Use data to compare the physical properties of ceramics, polymers and metals.	☐	☐	☐
5th	Explain why the properties of a material make it suitable for a given use.	☐	☐	☐
6th	Select suitable materials for a particular purpose using given data.	☐	☐	☐

SC26b Composite materials

Step	Learning outcome	Had a look	Nearly there	Nailed it!
4th	Recall what composite materials are.	☐	☐	☐
4th	Give some examples of composite materials.	☐	☐	☐
6th	Explain why the properties of a composite material make it suitable for a given use.	☐	☐	☐
7th	Select suitable materials, including composite materials, for a particular purpose using given data.	☐	☐	☐

SC26c Nanoparticles

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Recall what nanoparticles are.	☐	☐	☐
7th	Compare the relative sizes of nanoparticles, atoms and molecules.	☐	☐	☐
7th	Calculate the surface area to volume ratio of a nanoparticle.	☐	☐	☐
7th	Relate the uses of nanoparticulate materials to their properties.	☐	☐	☐
6th	Explain some possible risks associated with nanoparticles.	☐	☐	☐

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PHYSICS

SP1 Motion (Paper 1)

SP1a Vectors and scalars

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the difference between weight and mass.	☐	☐	☐
	Explain the difference between a vector and a scalar quantity.	☐	☐	☐
	Describe the difference between displacement and distance.	☐	☐	☐
	Describe the difference between velocity and speed.	☐	☐	☐
	Define the terms: acceleration, force, momentum, energy.	☐	☐	☐

SP1b Distance/time graphs

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall and use equations relating distance, speed and time.	☐	☐	☐
	Describe how speed can be measured in a school laboratory.	☐	☐	☐
	Recall typical speeds for walking, running, cycling and travelling by car.	☐	☐	☐
	Interpret distance/time graphs (including recognising what the steepness of the line tells you).	☐	☐	☐
	Represent journeys on distance/time graphs.	☐	☐	☐
	Determine speed from the gradient of a distance/time graph.	☐	☐	☐

SP1c Acceleration

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the formula relating acceleration, velocity and time.	☐	☐	☐
	Use the formula relating acceleration, velocity and time.	☐	☐	☐
	Recall the equation relating acceleration, velocity and distance.	☐	☐	☐
	Use the equation relating acceleration, velocity and distance.	☐	☐	☐
	Recall the acceleration in free fall.	☐	☐	☐
	Estimate the magnitudes of some everyday accelerations.	☐	☐	☐

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SP1d Velocity/time graphs

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Represent journeys on velocity/time graphs.	☐	☐	☐
	Interpret velocity/time graphs qualitatively.	☐	☐	☐
	Calculate uniform accelerations from the gradients of velocity/time graphs.	☐	☐	☐
	Determine the distance travelled from the area under a velocity/time graph.	☐	☐	☐

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SP2 Motion and Forces (Paper 1)

SP2a Resultant forces

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain the difference between scalar and vector quantities.	☐	☐	☐
	Use arrows to represent the direction and magnitude of forces.	☐	☐	☐
	Define a resultant force.	☐	☐	☐
	Calculate resultant forces.	☐	☐	☐
	Explain whether forces on an object are balanced or unbalanced.	☐	☐	☐

SP2b Newton's First Law

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the effect of balanced forces on moving and stationary objects.	☐	☐	☐
	Describe the effect of a non-zero resultant force on moving and stationary objects.	☐	☐	☐
	**H** Describe circular motion at constant speed as a changing velocity and hence as an acceleration.	☐	☐	☐
	**H** Describe the force needed to keep an object moving in a circular path.	☐	☐	☐
	**H** Give some examples of objects moving in circular paths and the type of centripetal force involved.	☐	☐	☐

SP2c Mass and weight

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the difference between mass and weight.	☐	☐	☐
	List the factors that determine the weight of an object.	☐	☐	☐
	Recall the equation for calculating weight.	☐	☐	☐
	Use the equation relating weight, mass and gravitational field strength.	☐	☐	☐
	Describe how weight is measured.	☐	☐	☐
	Describe how the weight of an object is affected by gravitational field strength.	☐	☐	☐

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SP2d Newton's Second Law

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what an acceleration is.	☐	☐	☐
	List the factors that affect the acceleration of an object.	☐	☐	☐
	Recall the equation that relates the factors affecting acceleration.	☐	☐	☐
	Use the equation relating force, mass and acceleration.	☐	☐	☐
	Change the subject of the equation relating force, mass and acceleration.	☐	☐	☐
	H Explain what inertial mass means.	☐	☐	☐

SP2e Newton's Third Law

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what Newton's Third Law says.	☐	☐	☐
	Recall the meaning of 'equilibrium situation'.	☐	☐	☐
	Identify action–reaction pairs in familiar situations.	☐	☐	☐
	Distinguish between action–reaction pairs and balanced forces.	☐	☐	☐
	H Describe how objects affect each other when they collide.	☐	☐	☐

SP2f Momentum

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the factors that affect the momentum of an object.	☐	☐	☐
	Calculate the momentum of moving objects.	☐	☐	☐
	Describe examples of momentum in collisions.	☐	☐	☐
	Use the idea of conservation of momentum to calculate velocities of objects after collisions.	☐	☐	☐
	Calculate the force needed to produce a change in momentum in a given time.	☐	☐	☐

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SP2g Stopping distances

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how human reaction times are measured.	☐	☐	☐
	Recall typical human reaction times.	☐	☐	☐
	Describe the link between stopping distance, thinking distance and braking distance.	☐	☐	☐
	Recall the factors that affect stopping distances.	☐	☐	☐
	Describe how different factors affect stopping distances.	☐	☐	☐

SP2h Braking distances and energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Estimate the braking distance of a road vehicle given its mass, speed and braking force.	☐	☐	☐
	Explain what ‘work done’ means.	☐	☐	☐
	Calculate the work done when a force moves through a distance.	☐	☐	☐
	Describe the factors that affect the kinetic energy of a moving object.	☐	☐	☐
	Calculate the kinetic energy of a moving object.	☐	☐	☐

SP2i Crash hazards

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Calculate the force needed to produce a change in momentum in a given time.	☐	☐	☐
	Explain the meaning of a ‘large deceleration’.	☐	☐	☐
	Describe the dangers caused by large decelerations.	☐	☐	☐
	Explain why large decelerations cause dangers.	☐	☐	☐
	H Recall some typical forces involved in road collisions.	☐	☐	☐
	H Use knowledge of changes in momentum to estimate the forces involved in road collisions.	☐	☐	☐

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SP3 Conservation of Energy (Paper 1)

SP3a Energy stores and transfers

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain, using examples, that energy is conserved.	☐	☐	☐
	Give examples of energy being moved between different stores.	☐	☐	☐
	Interpret diagrams that represent energy transfers.	☐	☐	☐
	Represent energy transfers using diagrams.	☐	☐	☐
	Describe what happens to wasted energy in energy transfers.	☐	☐	☐

SP3b Energy efficiency

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain some ways in which energy is transferred wastefully by mechanical processes.	☐	☐	☐
	Explain some ways of reducing unwanted energy transfers in mechanical processes.	☐	☐	☐
	Define what efficiency means.	☐	☐	☐
	H Explain how efficiency can be increased.	☐	☐	☐
	Recall and use the formula for calculating energy efficiency.	☐	☐	☐

SP3c Keeping warm

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the ways in which energy can be transferred by heating.	☐	☐	☐
	Describe ways of reducing unwanted energy transfers using thermal insulation.	☐	☐	☐
	Explain how different ways of reducing energy transfer by heating work.	☐	☐	☐
	Define the meaning of thermal conductivity.	☐	☐	☐
	Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling.	☐	☐	☐

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SP3d Stored energies

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how different factors affect the gravitational potential energy stored in an object.	☐	☐	☐
	Recall and use the equation for gravitational potential energy.	☐	☐	☐
	Describe how different factors affect the kinetic energy stored in an object.	☐	☐	☐
	Recall and use the equation for kinetic energy.	☐	☐	☐

SP3e Non-renewable resources

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	List the non-renewable energy resources in use today.	☐	☐	☐
	Describe the advantages and disadvantages of non-renewable energy resources.	☐	☐	☐
	Compare the advantages and disadvantages of non-renewable energy resources.	☐	☐	☐
	Explain how the use of non-renewable energy resources is changing.	☐	☐	☐

SP3f Renewable resources

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	List the renewable energy resources in use today.	☐	☐	☐
	Describe the source of energy for different renewable resources.	☐	☐	☐
	Describe the ways in which the different energy resources are used.	☐	☐	☐
	Explain why we cannot use only renewable energy resources.	☐	☐	☐
	Explain how the use of renewable energy resources is changing.	☐	☐	☐

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SP4 Waves (Paper 1)

SP4a Describing waves

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Recall that waves transfer energy and information but do not transfer matter.	☐	☐	☐
5th	Describe waves using the terms frequency, wavelength, amplitude, period and velocity.	☐	☐	☐
6th	Describe the differences between longitudinal and transverse waves.	☐	☐	☐
4th	Give examples of transverse and longitudinal waves.	☐	☐	☐

SP4b Wave speeds

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Recall the equation relating wave speed, frequency and wavelength	☐	☐	☐
8th	Use the equation relating wave speed, frequency and wavelength.	☐	☐	☐
6th	Recall the equation relating wave speed, distance and time.	☐	☐	☐
8th	Use the equation relating wave speed, distance and time.	☐	☐	☐
7th	Describe how to measure the velocity of sound in air.	☐	☐	☐
7th	Describe how to measure the velocity of waves on the surface of water.	☐	☐	☐

SP4c Refraction

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe what refraction is.	☐	☐	☐
5th	Describe how the direction of a wave changes when it goes from one material to another.	☐	☐	☐
6th	Explain some effects of the refraction of light (explanations in terms of changing speeds are not expected).	☐	☐	☐
7th	H Explain how a change in wave speed can cause a change in direction.	☐	☐	☐

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SP4d Waves crossing boundaries

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe some effects of waves being reflected.	☐	☐	☐
	Describe some effects of waves being refracted.	☐	☐	☐
	Describe some effects of waves being transmitted and absorbed.	☐	☐	☐
	Describe how changes in velocity, frequency and wavelength are related when sound waves go from one medium to another.	☐	☐	☐

SP4e Ears and hearing

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H List the parts of the human ear, in the order in which they transmit vibrations.	☐	☐	☐
	H Describe the functions of the parts of the ear.	☐	☐	☐
	H Describe how sound waves in air are converted to vibrations in solids.	☐	☐	☐
	H Describe some factors that affect how well sound waves transfer energy to solids.	☐	☐	☐
	H Explain why the human ear can only detect a certain range of frequencies.	☐	☐	☐

SP4f Ultrasound

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Calculate the depth of water from information about time and wave velocity.	☐	☐	☐
	H Recall that sound with frequencies greater than 20 000 Hz is called ultrasound.	☐	☐	☐
	H Explain how ultrasound is used in sonar.	☐	☐	☐
	H Describe uses of ultrasound in body scanning.	☐	☐	☐
	H Explain how ultrasound is used in foetal scanning.	☐	☐	☐

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SP4g Infrasound

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Recall that sound with frequencies less than 20 Hz is called infrasound.	☐	☐	☐
	H Describe some uses of infrasound.	☐	☐	☐
	H Recall that some seismic waves are infrasound waves.	☐	☐	☐
	H Describe P waves and S waves and the substances through which they can travel.	☐	☐	☐
	H Explain how seismic waves can help us to investigate the Earth's core.	☐	☐	☐

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SP5 Light and the Electromagnetic Spectrum (Paper 1)

SP5a Ray diagrams

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the law of reflection.	☐	☐	☐
	Draw ray diagrams to show how a mirror forms images.	☐	☐	☐
	Draw ray diagrams to show what happens when light is refracted.	☐	☐	☐
	Describe what total internal reflection is and when it happens.	☐	☐	☐
	Explain the significance of the critical angle in total internal reflection.	☐	☐	☐

SP5b Colour

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain the difference between specular and diffuse reflection.	☐	☐	☐
	Recall that white light is a mixture of different colours of light.	☐	☐	☐
	Explain why surfaces appear to have different colours in terms of differential absorption.	☐	☐	☐
	Explain how filters make coloured light in terms of absorption and transmission.	☐	☐	☐
	Explain the effect of viewing coloured objects in different colours of light.	☐	☐	☐

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SP5c Lenses

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define the power of a lens (in terms of a more powerful lens bending light through a greater angle – the formula relating power to focal length is not required).	☐	☐	☐
	Describe how the focal length and shape of a lens affect its power.	☐	☐	☐
	Use ray diagrams to show how converging and diverging lenses refract light.	☐	☐	☐
	Compare and contrast the way in which converging and diverging lenses refract light.	☐	☐	☐
	Explain how diverging lenses produce virtual images.	☐	☐	☐
	Explain the different types of image that can be formed by converging lenses.	☐	☐	☐

SP5d Electromagnetic waves

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall examples of electromagnetic waves.	☐	☐	☐
	Describe the common features of electromagnetic waves.	☐	☐	☐
	Describe the transfer of energy by electromagnetic waves.	☐	☐	☐
	Describe the range of electromagnetic waves that our eyes can detect.	☐	☐	☐
	**H** Describe an effect caused by the different velocities of electromagnetic waves in different substances.	☐	☐	☐

SP5e The electromagnetic spectrum

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the groups of waves in the electromagnetic spectrum in order.	☐	☐	☐
	Recall the colours of the visible spectrum in order.	☐	☐	☐
	Describe how the waves in the electromagnetic spectrum are grouped.	☐	☐	☐
	**H** Describe some differences in the ways that different parts of the electromagnetic spectrum are absorbed and transmitted.	☐	☐	☐
	**H** Describe some differences in the ways that different parts of the electromagnetic spectrum are refracted and reflected.	☐	☐	☐

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SP5f Using the long wavelengths

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe how long wavelength electromagnetic waves are affected by different substances.	☐	☐	☐
	H Explain the effects caused by long wavelength electromagnetic waves travelling at different velocities in different substances.	☐	☐	☐
	Describe some uses of radio waves.	☐	☐	☐
	Describe some uses of microwaves.	☐	☐	☐
	Describe some uses of infrared.	☐	☐	☐
	Describe some uses of visible light.	☐	☐	☐
	H Describe how radio waves are produced and detected by electrical circuits.	☐	☐	☐

SP5g Radiation and temperature

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the intensity and wavelength of emitted radiation depends on the temperature of the body.	☐	☐	☐
	H Explain that the power radiated and absorbed must be the same to maintain a body at a constant temperature.	☐	☐	☐
	H Explain what happens to the temperature of a body when the average power radiated is not balanced by the average power absorbed.	☐	☐	☐
	H Describe the factors that affect the energy absorbed and radiated by the Earth.	☐	☐	☐
	H Explain how these factors affect the temperature of the Earth.	☐	☐	☐

SP5h Using the short wavelengths

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe how short wavelength electromagnetic waves are affected by different substances.	☐	☐	☐
	H Explain the effects caused by short wavelength electromagnetic waves travelling at different velocities in different substances.	☐	☐	☐
	Describe some uses of ultraviolet radiation.	☐	☐	☐
	Describe some uses of X-rays.	☐	☐	☐
	Describe some uses of gamma rays.	☐	☐	☐

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SP5i EM radiation dangers

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the potential danger of electromagnetic radiation depends on its frequency.	☐	☐	☐
	Describe the harmful effects of microwave and infrared radiation.	☐	☐	☐
	Describe the harmful effects of ultraviolet radiation, X-rays and gamma rays.	☐	☐	☐
	Recall the nature of radiation produced by changes in atoms and their nuclei.	☐	☐	☐
	Recall that absorption of radiation can cause changes in atoms and their nuclei.	☐	☐	☐

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SP6 Radioactivity (Paper 1)

SP6a Atomic models

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	Describe the structure of an atom (in terms of nucleus and electrons).	☐	☐	☐
7th	State where most of the mass of an atom is found.	☐	☐	☐
7th	State the sizes of atoms and small molecules.	☐	☐	☐
8th	Describe an early model of the atom.	☐	☐	☐
8th	Describe how and why our model of the atom has changed over time, including the plum pudding model and the Rutherford alpha particle scattering.	☐	☐	☐

SP6b Inside atoms

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	State what is meant by an isotope.	☐	☐	☐
8th	Represent isotopes using symbols.	☐	☐	☐
8th	Explain how atoms of different elements are different (in terms of numbers of electrons and protons).	☐	☐	☐
7th	Recall the charges and relative masses of the three subatomic particles.	☐	☐	☐
8th	Explain why all atoms have no overall charge.	☐	☐	☐

SP6c Electrons and orbits

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	Describe where electrons are found inside atoms (in terms of shells).	☐	☐	☐
8th	Describe when electrons can change orbit.	☐	☐	☐
7th	Recall what an ion is.	☐	☐	☐
8th	Describe how ionisation occurs.	☐	☐	☐
8th	Describe some of the evidence for the Bohr model of the atom.	☐	☐	☐

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SP6d Background radiation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain what background radiation is.	☐	☐	☐
	Describe how radiation measurements need to be corrected for background radiation.	☐	☐	☐
	List some sources of background radiation.	☐	☐	☐
	Describe how photographic film can be used to detect radioactivity.	☐	☐	☐
	Describe how a Geiger-Müller tube works.	☐	☐	☐
	Describe how the amount of radioactivity can be measured (in terms of the darkness of photographic film or by attaching a counter to a GM tube).	☐	☐	☐

SP6e Types of radiation

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the relative masses and relative electric charges of protons, neutrons, electrons and positrons.	☐	☐	☐
	List five types of radiation that are emitted in random processes from unstable nuclei.	☐	☐	☐
	State that the five types of radiation are ionising radiations.	☐	☐	☐
	Describe what alpha and beta particles are.	☐	☐	☐
	Describe the nature of gamma radiation.	☐	☐	☐
	Compare the penetrating abilities of alpha, beta and gamma radiation.	☐	☐	☐
	Compare the ionisation abilities of alpha, beta and gamma radiation.	☐	☐	☐

SP6f Radioactive decay

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the process of β^- decay.	☐	☐	☐
	Describe the process of β^+ decay.	☐	☐	☐
	Explain how the proton and mass numbers are affected by different kinds of radioactive decay.	☐	☐	☐
	Describe what happens during nuclear rearrangement after radioactive decay.	☐	☐	☐
	Balance nuclear equations for mass and charge.	☐	☐	☐

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SP6g Half-life

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the activity of a substance changes over time.	☐	☐	☐
	State how half-life can be used to describe the changing activity of a substance.	☐	☐	☐
	Recall the unit of activity.	☐	☐	☐
	Describe how half-life can be used to work out how much of a substance will decay in a certain time.	☐	☐	☐
	Carry out calculations involving half-life.	☐	☐	☐

SP6h Using radioactivity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how radioactivity is used in smoke alarms.	☐	☐	☐
	Describe how radioactivity is used in irradiating food.	☐	☐	☐
	Describe how radioactivity is used in sterilising equipment.	☐	☐	☐
	Describe how radioactivity is used in tracing and thickness gauging.	☐	☐	☐
	Recall that radioactivity is used in cancer diagnosis and treatment.	☐	☐	☐

SP6i Dangers of radioactivity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the hazards of ionising radiation in terms of tissue damage and possible mutations.	☐	☐	☐
	Explain how the dangers of ionising radiation depend on the half-life.	☐	☐	☐
	Explain the precautions taken to reduce the risks from radiation and ensure the safety of patients exposed to radiation, and link these to the half-lives of the sources used.	☐	☐	☐
	Explain the precautions taken to reduce the risks from radiation and protect people who work with radiation.	☐	☐	☐
	Describe the differences between contamination and irradiation effects.	☐	☐	☐
	Compare the hazards of contamination and irradiation.	☐	☐	☐

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SP6j Radioactivity in medicine

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the advantages and disadvantages of treating tumours with radiation applied internally.	☐	☐	☐
	Describe the advantages and disadvantages of treating tumours with radiation applied externally.	☐	☐	☐
	Explain the use of radioactive tracers in diagnosis.	☐	☐	☐
	Explain the use of PET scanners in diagnosis.	☐	☐	☐
	Explain why isotopes used in PET scanners have to be produced nearby.	☐	☐	☐

SP6k Nuclear energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe some advantages of using nuclear power to generate electricity.	☐	☐	☐
	Describe some disadvantages of using nuclear power to generate electricity.	☐	☐	☐
	Evaluate the use of nuclear power to generate electricity.	☐	☐	☐
	Describe three types of nuclear reaction.	☐	☐	☐
	Recall that nuclear reactions can be a source of energy.	☐	☐	☐

SP6l Nuclear fission

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the products of the fission of U-235.	☐	☐	☐
	Describe what a chain reaction is.	☐	☐	☐
	Explain how a chain reaction is controlled in a nuclear power station.	☐	☐	☐
	Describe how the thermal energy from a chain reaction is converted to electrical energy.	☐	☐	☐
	Recall that the products of nuclear fission are radioactive.	☐	☐	☐

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SP6m Nuclear fusion

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what happens in nuclear fusion.	☐	☐	☐
	Recall that nuclear fusion is the energy source for stars.	☐	☐	☐
	Explain the difference between nuclear fusion and nuclear fission.	☐	☐	☐
	Explain why high temperatures and pressures are needed to make fusion happen.	☐	☐	☐
	Relate the conditions of fusion to the difficulty of making a practical and economic fusion power station.	☐	☐	☐

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SP7 Astronomy (Paper 1)

SP7a The Solar System

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the different bodies that make up the Solar System.	☐	☐	☐
	Recall the names and order of the planets in the Solar System.	☐	☐	☐
	Describe how ideas about the structure of the Solar System have changed over time.	☐	☐	☐
	Describe how methods of observing the Universe have changed over time.	☐	☐	☐

SP7b Gravity and orbits

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the factors that affect the strength of the gravitational field.	☐	☐	☐
	Explain why *g* has different values on different bodies in the Solar System.	☐	☐	☐
	Describe the orbits of moons, planets, comets and artificial satellites.	☐	☐	☐
	Explain why the velocity of a planet changes even if orbiting at a steady speed.	☐	☐	☐
	Describe how changing the speed of an orbiting body affects the radius of its orbit.	☐	☐	☐
	Explain how the radius of a stable orbit is affected by the orbital speed.	☐	☐	☐

SP7c Life cycles of stars

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the evolution of stars of similar mass to the Sun (including nebula, main sequence star, red giant, white dwarf).	☐	☐	☐
	Describe the forces acting on a star in terms of thermal expansion and gravity.	☐	☐	☐
	Explain how the balance of thermal expansion and gravity affects the life cycle of stars.	☐	☐	☐
	Describe the evolution of stars with a mass larger than the Sun.	☐	☐	☐

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SP7d Red-shift

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how the movement of a wave source affects the observed frequency and wavelength.	☐	☐	☐
	Describe the amount of red-shift observed in galaxies at different distances from Earth.	☐	☐	☐
	Explain why the red-shift of galaxies provides evidence that the Universe is expanding.	☐	☐	☐

SP7e Origin of the Universe

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the Steady State and Big Bang theories.	☐	☐	☐
	Compare the Steady State and Big Bang theories.	☐	☐	☐
	Describe the evidence supporting the Big Bang theory.	☐	☐	☐
	Explain why the Big Bang theory is the currently accepted model.	☐	☐	☐
	Explain how both theories of the origin of the Universe account for red-shift.	☐	☐	☐
	Explain how the discovery of the CMB radiation led to the Big Bang theory becoming the currently accepted model.	☐	☐	☐

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SP8 Energy – Forces Doing Work (Paper 2)

SP8a Work and power

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe some ways in which the energy of a system can be changed.	☐	☐	☐
	Measure the work done by a force.	☐	☐	☐
	Recall and use the equation linking work done, force and distance.	☐	☐	☐
	Explain what power means.	☐	☐	☐
	Recall and use the equation linking power, work done and time.	☐	☐	☐

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SP9 Forces and their Effects (Paper 2)

SP9a Objects affecting each other

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the effect of a gravitational field on objects.	☐	☐	☐
	Describe the effects of magnetic fields on objects.	☐	☐	☐
	Describe the forces that can occur when objects are in contact with each other.	☐	☐	☐
	Describe the effects of electrostatic fields on objects.	☐	☐	☐
	Describe how pairs of forces occur when objects affect each other.	☐	☐	☐
	Use examples to explain the difference between vector and scalar quantities.	☐	☐	☐

SP9b Vector diagrams

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how to resolve forces.	☐	☐	☐
	Use scale drawings to work out the net force on an object.	☐	☐	☐
	Draw free body diagrams to represent the forces on an object.	☐	☐	☐
	Explain what happens in situations where several forces are acting on an object.	☐	☐	☐

SP9c Rotational forces

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe situations where forces can cause rotation.	☐	☐	☐
	Recall and use the equation: moment of a force (newton metre, N m) = force (newton, N) × distance normal to the direction of the force (metre, m).	☐	☐	☐
	Use the principle of moments to calculate forces and distances in equilibrium situations.	☐	☐	☐
	Explain how levers transmit the rotational effects of forces.	☐	☐	☐
	Explain how gears transmit the rotational effects of forces.	☐	☐	☐

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SP10 Electricity and Circuits (Paper 2)

SP10a Electric circuits

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the basic structure of an atom (positions, relative masses and relative charges of protons, neutrons and electrons).	☐	☐	☐
	Recognise the circuit symbols for a range of common electrical components (cells, including batteries, switches, voltmeters, ammeters and lamps).	☐	☐	☐
	Draw diagrams for circuits containing common electrical components, using conventions for positive and negative terminals.	☐	☐	☐
	Describe and explain the difference between the brightness of identical lamps in series and parallel circuits.	☐	☐	☐
	Describe and explain the effects of different numbers of identical lamps, cells and switches in series and parallel circuits.	☐	☐	☐

SP10b Current and potential difference

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how to measure voltage.	☐	☐	☐
	Define the term ‘potential difference’.	☐	☐	☐
	Describe how to measure current.	☐	☐	☐
	Describe the conditions needed to produce an electric current. (A complete circuit and a source of voltage/potential difference.)	☐	☐	☐
	Describe the behaviour of current at a junction.	☐	☐	☐

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SP10c Current, charge and energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain the link between the potential difference (voltage) across a battery or a component, the charge passing through it and the amount of energy transferred.	☐	☐	☐
	Recall that the unit of potential difference is the volt and explain it in terms of units of energy and charge (a potential difference of one joule per coulomb).	☐	☐	☐
	Recall and use the equation to calculate the energy transferred, the charge that flows or the potential difference. ($E = Q \times V$)	☐	☐	☐
	Explain the link between electric current and electric charge.	☐	☐	☐
	Explain electric current in metals in terms of electrons.	☐	☐	☐
	Recall and use the equation to calculate the charge that flows, the current or the time the current flows. ($Q = I \times t$)	☐	☐	☐

SP10d Resistance

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain the link between resistance and current in a circuit.	☐	☐	☐
	Define the resistance of a component or circuit ($R = V/I$).	☐	☐	☐
	Recall and use the equation to calculate the potential difference, the current or the resistance ($V = I \times R$).	☐	☐	☐
	Explain the difference in resistance when two resistors are connected in series or in parallel.	☐	☐	☐
	Calculate the currents, potential differences and resistances in series circuits.	☐	☐	☐
	Explain the design and construction of series circuits for testing and measuring.	☐	☐	☐

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SP10e More about resistance

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how current changes with potential difference in fixed resistors.	☐	☐	☐
	Explain how current and resistance change with potential difference in filament lamps.	☐	☐	☐
	Explain how current and resistance change with potential difference in diodes, including light-emitting diodes (LEDs).	☐	☐	☐
	Describe how the resistance of a light-dependent resistor (LDR) varies with changing light intensity.	☐	☐	☐
	Describe how the resistance of a thermistor varies with changing temperature. (negative temperature coefficient only)	☐	☐	☐
	Describe the uses of diodes, LDRs and thermistors.	☐	☐	☐

SP10f Transferring energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the energy transfer that occurs when a current passes through a resistor.	☐	☐	☐
	Use the electron and ion model and the idea of electrical work to explain the energy transfer in a resistor and the resulting dissipation of energy in the surroundings.	☐	☐	☐
	**H** Explain how unwanted energy transfers in wires can be avoided.	☐	☐	☐
	Recall the advantages of the heating effect of an electric current.	☐	☐	☐
	Recall the disadvantages of the heating effect of an electric current.	☐	☐	☐
	Use the equation $E = I \times V \times t$ to calculate the energy transferred, the current, the potential difference or the time.	☐	☐	☐

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SP10g Power

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Define power and the units used to measure it. (energy transferred per second in watts)	☐	☐	☐
	Recall and use the equation to calculate the power, the energy transferred or the time taken. ($P = E/t$)	☐	☐	☐
	Explain how power transfer depends on the potential difference across a device and the current through it.	☐	☐	☐
	Recall and use the equation to calculate the electrical power, the current or the potential difference. ($P = I \times V$)	☐	☐	☐
	Recall and use the equation to calculate the electrical power, the current or the resistance. ($P = I^2 \times R$)	☐	☐	☐

SP10h Transferring energy by electricity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe energy transfers from d.c. batteries and the a.c. mains supply to motors and heaters.	☐	☐	☐
	Explain the difference between direct and alternating voltage.	☐	☐	☐
	Compare alternating and direct current (in terms of movement of charge).	☐	☐	☐
	Recall the frequency and voltage of the UK domestic supply.	☐	☐	☐
	Describe the power ratings of some domestic electrical appliances and changes in stored energy when they are in use.	☐	☐	☐

SP10i Electrical safety

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain the difference between the functions of the live and the neutral wires.	☐	☐	☐
	Explain how circuit breakers make circuits safer.	☐	☐	☐
	Explain how the earth wire and the fuse make circuits safer.	☐	☐	☐
	Explain why switches and fuses are connected in the live wire.	☐	☐	☐
	Recall the potential differences between the live, neutral and earth wires.	☐	☐	☐
	Explain the danger of a connection between the live wire and earth.	☐	☐	☐

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SP11 Static Electricity (Paper 2)

SP11a Charges and static electricity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how rubbing an insulator transfers electrons.	☐	☐	☐
	Recall the charged particles found in an atom.	☐	☐	☐
	Explain why, when certain materials are rubbed together, they end up with opposite charges.	☐	☐	☐
	Recall the rules of attraction and repulsion between charges.	☐	☐	☐
	Explain how attraction by induction occurs.	☐	☐	☐

SP11b Dangers and uses of static electricity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe what earthing is.	☐	☐	☐
	Explain how earthing works.	☐	☐	☐
	Explain how lightning occurs and why we sometimes get shocks from everyday objects.	☐	☐	☐
	Explain how electrostatic sprayers work.	☐	☐	☐
	Describe some hazards caused by charged objects discharging, and how earthing can be used to reduce risks.	☐	☐	☐

SP11c Electric fields

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall what an electric field is.	☐	☐	☐
	Recall how the direction of an electric field is defined.	☐	☐	☐
	Interpret information shown by field lines.	☐	☐	☐
	Describe the shape and direction of the electric field around a point charge and between charged electrical plates.	☐	☐	☐
	Explain how static electricity effects can be explained using the idea of an electric field.	☐	☐	☐

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SP12 Magnetism and the Motor Effect (Paper 2)

SP12a Magnets and magnetic fields

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe how magnets affect each other.	☐	☐	☐
	Explain the difference between permanent and induced magnets.	☐	☐	☐
	Describe the uses of permanent and temporary magnetic materials.	☐	☐	☐
	Describe the shapes of magnetic fields, including variations in strength.	☐	☐	☐
	Describe how the shape of magnetic fields can be shown using plotting compasses.	☐	☐	☐
	Explain how a magnetic compass can be used as evidence for the Earth's magnetic core.	☐	☐	☐

SP12b Electromagnetism

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall that a current can create a magnetic effect.	☐	☐	☐
	Relate the shape and direction of the magnetic field around a straight wire to the direction of the current.	☐	☐	☐
	Recall the factors that affect the strength of the magnetic field around a wire.	☐	☐	☐
	Describe the magnetic field inside and outside a coil of wire carrying a current.	☐	☐	☐
	Explain the shape and strength of the magnetic field around a solenoid.	☐	☐	☐

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SP12c Magnetic forces

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Recall that forces are produced when a current flows in a magnetic field.	☐	☐	☐
	H Explain what causes the forces produced when a current flows in a magnetic field.	☐	☐	☐
	H Recall Fleming's left-hand rule.	☐	☐	☐
	H Use Fleming's left-hand rule.	☐	☐	☐
	H Use the formula relating force, magnetic field strength, current and length.	☐	☐	☐
	H Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors.	☐	☐	☐

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SP13 Electromagnetic Induction (Paper 2)

SP13a Electromagnetic induction

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Describe how to produce an electric current by induction on a small scale.	☐	☐	☐
	H Describe how electromagnetic induction is used in alternators and dynamos.	☐	☐	☐
	H Describe how different factors affect the size and direction of an induced current.	☐	☐	☐
	H Describe how the magnetic field produced by an induced potential difference opposes the original change.	☐	☐	☐
	H Explain how microphones work in terms of changing pressure variations into variations in electric current.	☐	☐	☐
	H Explain how loudspeakers change variations in current to variations in air pressure.	☐	☐	☐

SP13b The national grid

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Explain how a transformer works.	☐	☐	☐
	H Recall that transformers can change the voltage of an alternating current.	☐	☐	☐
	H Use the turns ratio equation for transformers.	☐	☐	☐
	Describe how the national grid transmits electricity around the country.	☐	☐	☐
	Explain why step-up and step-down transformers are used in the national grid.	☐	☐	☐

SP13c Transformers and energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the law of conservation of energy.	☐	☐	☐
	Recall that the power of an electric current is given by the current multiplied by the voltage.	☐	☐	☐
	Use the power equation for transformers.	☐	☐	☐
	H Recall and use equations relating current, voltage, power and resistance.	☐	☐	☐
	H Use equations to explain the advantages of power transmission in high-voltage cables.	☐	☐	☐

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SP14 Particle Model (Paper 2)

SP14a Particles and density

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Describe the arrangements of particles in solids, liquids and gases.	☐	☐	☐
	Use the particle model to explain the different properties of solids, liquids and gases.	☐	☐	☐
	Recall the formula relating density, mass and volume.	☐	☐	☐
	Use the formula relating density, mass and volume.	☐	☐	☐
	Use the particle model to explain why solids, liquids and gases have different densities.	☐	☐	☐
	Describe what happens to the mass of a substance when it changes state.	☐	☐	☐

SP14b Energy and changes of state

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how heating affects the particles in a substance or object, including changes of state.	☐	☐	☐
	Describe how the temperature of an object changes with time while being heated or cooled to make it change state.	☐	☐	☐
	Define the term specific heat capacity.	☐	☐	☐
	Define the term specific latent heat.	☐	☐	☐
	Explain the difference between specific heat capacity and specific latent heat.	☐	☐	☐
	Explain ways of reducing unwanted energy transfer through thermal insulation.	☐	☐	☐

SP14c Energy calculations

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Use the formula relating change in thermal energy, mass, temperature change and specific heat capacity.	☐	☐	☐
	Use the formula relating thermal energy, mass and specific latent heat.	☐	☐	☐
	Recall that the value of specific latent heat for a substance is different for melting/solidifying and for evaporating/condensing.	☐	☐	☐

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SP14d Gas temperature and pressure

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how the movement of particles causes gas pressure.	☐	☐	☐
	Explain how changing the temperature of a gas affects the speed of its particles.	☐	☐	☐
	Explain how temperature affects the pressure of a fixed mass of gas at constant volume.	☐	☐	☐
	Explain the significance of absolute zero.	☐	☐	☐
	Convert temperatures between the Kelvin and Celsius temperature scales.	☐	☐	☐

SP14e Gas pressure and volume

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain how gases can be compressed or expanded by pressure changes.	☐	☐	☐
	Explain how the pressure of a gas produces a force at right angles to any surface.	☐	☐	☐
	Explain why changing the volume of a gas changes the pressure.	☐	☐	☐
	Use the formula relating pressure and volume changes in a gas of fixed mass at constant temperature.	☐	☐	☐
	**H** Explain why doing work on a gas can increase its temperature.	☐	☐	☐

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SP15 Forces and Matter (Paper 2)

SP15a Bending and stretching

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Explain that more than one force is needed to distort an object.	☐	☐	☐
	Describe the difference between elastic and inelastic distortion.	☐	☐	☐
	Describe the relationship between force and extension for a spring.	☐	☐	☐
	Describe the relationship between force and extension for a rubber band.	☐	☐	☐
	Compare the force–extension relationship for different objects.	☐	☐	☐

SP15b Extension and energy transfers

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Recall the equation that links force, extension and the spring constant.	☐	☐	☐
	Use the formula relating force, extension and spring constant.	☐	☐	☐
	Recall that work has to be done to stretch a spring.	☐	☐	☐
	Use the formula relating the energy transferred to the extension of a spring.	☐	☐	☐

SP15c Pressure in fluids

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	Use a model of the Earth's atmosphere to explain why pressure varies with height.	☐	☐	☐
	Describe the pressure in a fluid as being due to the fluid and atmospheric pressure.	☐	☐	☐
	Explain how pressure is related to area and a force normal to the surface.	☐	☐	☐
	Recall the formula relating force, pressure and area.	☐	☐	☐
	Use the formula relating force, pressure and area.	☐	☐	☐
	Describe how pressure in fluids increases with depth and density.	☐	☐	☐

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SP15d Pressure and upthrust

Step	Learning outcome	Had a look	Nearly there	Nailed it!
	H Explain why the pressure in a liquid depends on density and depth.	☐	☐	☐
	H Use the equation relating pressure in a fluid to height, density and gravitational field strength.	☐	☐	☐
	H Explain how upthrust occurs.	☐	☐	☐
	H Relate the upthrust to the floating or sinking of objects immersed or partially immersed in fluids.	☐	☐	☐
	H Recall that the upthrust is equal to the weight of fluid displaced.	☐	☐	☐
	H Explain the factors that determine whether or not an object will float or sink.	☐	☐	☐