Triple Science Revision: Summer Term 2024

3 assessments: Biology Paper 1, Chemistry Paper 1, Physics Paper 1. All 105 minutes (1 hour 45 minutes)

Calculator, ruler, pencil, protractor are required for all assessments.

Biology Topic 1: Cell Structure & Transport	R	A	G
Eukaryotes & Prokaryotes			
Animal and Plant Cells			
Required Practical: microscopy - observe, draw, and label plant and animal cells.			
Cell specialisation			
Cell differentiation			
Microscopy			
Chromosomes			
Mitosis and the cell cycle			
Stem cells & Meristems			
Diffusion & changing the rate of diffusion			
Osmosis			
Active Transport			
Required practical: effect of sugar or salt concentration on mass of plant tissue			
Reproduction of bacteria by binary fission.			
How to prepare an uncontaminated culture using aseptic technique.			
Required practical: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zone of inhibition.			

Biology Topic 2: Organisation	R	A	G
Principles of organisation			
Human Digestive system			
Enzymes – lock and key theory			
Enzymes – factors investigating rates of reaction (pH, temperature)			
Products of digestion: carbohydrates, proteins, lipids			
Required practical: food tests for starch, sugars, protein, and lipids.			
Required practical: the effect of pH on the rate of reaction of amylase enzyme.			
The heart and blood vessels			
Adaptations of the lungs for gaseous exchange			
The function of blood – plasma, red blood cells, white blood cells, and platelets			
Coronary heart disease – causes of and solution to (stents and statins)			
Factors that affect health			
Effect of lifestyle on non-communicable disease			
Cancer			
Plant tissues: structure of the leaf			
Xylem & phloem			
Role of the stomata			
Adaptations of the root hair cells			

Biology Topic 3: Communicable Diseases	R	A	G
Communicable (infectious) disease			
Viral diseases (measles, HIV, TMV)			
Bacterial diseases (salmonella, gonorrhoea)			
Fungal diseases (rose black spot)			
Protist diseases (malaria)			
Human defence systems (non-specific and specific)			
Vaccinations			
Antibiotics and painkillers			
Discovery and development of drugs (clinical trials)			
How monoclonal antibodies are produced and used.			
How plant diseases are detected			
How ion deficiencies damage plants (nitrates, magnesium ions)			
Physical and chemical defence responses in plants, including mechanical adaptations.			

Biology Topic 4: Bioenergetics	R	A	G
Photosynthesis reaction			
Changing the rate of photosynthesis			
Limiting factors of photosynthesis			
Economics of changing the rate of photosynthesis			
Required practical: investigating the effect of light intensity on the rate of photosynthesis using aquatic organisms such as pondweed.			
Uses of glucose from photosynthesis			
Aerobic respiration			
Anaerobic respiration in muscle cells			
Anaerobic respiration in yeast cells			
The body's response to exercise			
Metabolism as the sum of all reactions in the body.			

Chemistry Topic 1: Atomic Structure and Periodic Table	R	A	G
Atoms, elements, compounds			
Separation techniques: filtration, crystallisation, distillation, chromatography.			
How the model of the atom changed (Democritus, Dalton, Rutherford, Bohr, Chadwick)			
Relative charges of subatomic particles			
Size and mass of atoms			
Relative atomic mass and its calculation			
Electronic structures of elements with atomic numbers 1-20			
Arrangement of the modern periodic table			
Development of the periodic table			
Group 0 – electron structure, patterns and reasons for reactivity, boiling point			
Group 1 (alkali metals)– electron structure, patterns and reasons for reactivity, reactivity with water,			
Group 7 (halogens) - electron structure, patterns and reasons for reactivity, melting point, boiling point, displacement reactions of halogens.			
Transition metals: typical properties and comparison with group 1.			
Transition metal compounds are colourful compounds.			

Chemistry Topic 2 Bonding, structure, and the properties of matter	R	A	G
Ionic bonding (how positive and negative ions are made) (dot and cross diagrams)			
Covalent bonding in small molecules (dot and cross diagrams)			
Metallic bonding			
The three states of matter and explaining changes of state.			
Use of state symbols (s), (l), (g) and (aq)			
Properties of giant ionic compounds – high melting and boiling points, electrical conductivity as a solid, molten, and dissolved in water/aqueous solution.			
Properties of small covalently bonded molecules: low melting points, lack of conductivity.			
Polymers – what they are, explaining the high melting point.			
Diamond – why the high melting point, very hard, and no electrical conductivity.			
Graphite – why the higher melting point, very slippery, and electrically conductive.			

Chemistry Topic 2 Bonding, structure, and the properties of matter	R	A	G
Structure and properties of graphene and fullerenes: low density, high tensile strength.			
Giant metallic structures: why high melting point, electrically conductive, and malleable.			
Alloys – what is an alloy and why are they harder than pure metals.			
Nanoparticles are particles measured on the scale of 1-100nm in size with incrediblt high surface area to volume ratios.			
Uses and applications of nanoparticles: medicine, electrons, cosmetics, sun creams.			

Chemistry Topic 3: Quantitative chemistry	R	A	G
The conservation of mass			
Calculating relative formula mass			
Explaining mass changes when a reactant or product is a gas.			
Estimating uncertainty by distribution or about the mean.			
Calculating moles from a mass (moles = mass/formula mass)			
The mole as 6.02×10^{23} particles.			
Calculate the mass of product made or reactant required from a mass of product or reactant.			
Use experimental data to prove a balanced symbol equation.			
Finding the limiting reactant in a chemical reaction.			
Calculating concentration in g/dm^3.			
Yield as the measure of useful product against expected outcome.			
Atom economy as the measure of useful product made from starting materials.			
Using mol/dm^3 as a measure of concentration including converting to and from g/dm^3.			
Calculating the number of moles of a gas.			

Chemistry Topic 4: Chemical Reactions	R	A	G
Reactions of metals with oxygen to form metal oxides.			
Redox – oxidation is loss of electrons, reduction is gain of electrons.			
Reactivity series as the tendency of metals (including carbon and hydrogen) to lose their outer shell electrons.			
Predicting the outcome of displacement reactions using the reactivity series.			
Reactions of metals with water to produce metal hydroxide and hydrogen gas.			
Reactions of metals with acid to produce metal salt and hydrogen gas.			
Ores can be extracted from their ores by reduction using carbon.			
Explaining redox reactions in terms of ionic, and half equations.			
Reactions of acids and alkalis to produce salt and water (neutralisation).			
Reactions of acids with hydroxide, oxide and carbonate compounds.			
Required practical: preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate.			
Acid solutions contain hydrogen ions.			
Alkaline solutions contain hydroxide ions.			
pH scale as a measure of concentration of hydrogen ions.			
Ionic equation of neutralisation.			
Strong and weak acids caused by the dissociation of hydrogen ions.			
Predicting the outcomes of the electrolysis of a melt.			
Extracting aluminium from the ore: the need for cryolite, and continual replacement of the anode.			
Predicting the outcome of the electrolysis of aqueous solutions: competition at the electrodes.			
Required practical: investigate what happens when aqueous solutions are electrolysed using inert electrodes.			
Representing changes in an electrolysis using half equations.			
Titration as a technique to find the reacting volumes between acids and alkalis.			
Required practical: determination of the reacting volumes and concentration of solutions of a strong acid and a strong alkali by titration.			

Chemistry Topic 5: Energy changes	R	A	G
Exothermic reactions released energy from the chemical store to the heat energy store of the surroundings.			
Endothermic reactions absorb energy into the chemical store from the heat energy store of the surroundings.			
Examples of energy changes: self-heating cans, hand warmers, injury packs.			
Distinguish between exothermic and endothermic reactions by measuring temperature changes.			
Required practical: investigate variables that affect temperature changes in reacting solutions.			
Reaction profiles for exothermic and endothermic reactions including the activation energy.			
Calculating the energy change of a reaction using average bond energies.			
A simple cell is made by contacting two different metals connected by an electrolyte.			
Differences between rechargeable batteries and non-rechargeable batteries.			
Fuel cells and their use to reacting hydrogen and oxygen indirectly, including the half equations.			

Physics Topic 1: Energy stores and transfers	R	A	G
Changes in energy stores in common situations: projectiles, acceleration slowing down, boiling water.			
Energy transferred by heating, forces, electrical current flowing.			
Calculating kinetic energy of a moving object			
Calculating the elastic potential energy of a stretched or compressed object.			
Calculate the energy stored in an object held above the ground.			
Calculate the energy required to change the temperature (specific heat capacity)			
Required practical: determine the specific heat capacity of one or more materials.			
Power as the rate of work done or energy transferred.			
Energy dissipation during movement between stores.			
How unwanted energy dissipation can be reduced i.e. lubrication and insulation.			
Conductivity as the rate of energy transfer through a material.			
Efficiency as the ratio or percentage of useful energy output to total energy input.			
Non-renewable sources as ones which are being used up faster than they are replenished.			
Renewable sources as ones which can be replenished as they are used.			
Compare how different energy resources are used.			
Describe the environmental impact of energy resources.			

Physics Topic 2: Electricity	R	A	G
Static charge caused by the transfer of electrons from one insulating material to another.			
The electric field is the space around a charged object where it can apply a force.			
Draw the field diagrams for isolated electrically charged sphere.			
Use electric fields to explain non-contact forces and sparking.			
Standard symbols used in circuits			
Current is the rate of flow of charge			
Current depends on the potential difference and the resistance of the component. V=IR			
Required practical: use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits: length of wire at a constant temperature; combinations of resistors in series and parallel.			
Ohmic conductors at constant temperatures have a current directly proportional to the potential difference.			
How and why resistance changes through a filament lamp.			
How current flows through a diode.			
How thermistors change resistance at different temperatures.			
How light dependent resistors change resistance at different light intensity.			
Use circuit diagrams to construct appropriate circuits to investigate the IV characteristics of a variety of circuit elements including filament lamp, diode, resistor at constant temperature.			
How current and potential difference is shared in both series and parallel circuits.			
How resistance can be calculated by finding the sum of resistors in series.			
How resistors in parallel change the total resistance in a circuit.			
The difference between direct and alternating potential difference.			
Wiring of UK mains plugs and the functions of each wire.			
Power as the product of potential difference and current.			
Power as the product of the current squared and the resistance.			
Energy transfers involving electrical appliances.			
Work done as the product of charge and potential difference.			
The national grid as a system of cables and transformers linking power stations to consumers.			
Functions of step-up and step-down transformers.			

Physics Topic 3: Particle model of matter	R	A	G
Density as the ratio of mass to unit volume in kg/m^3.			
Recognise and draw the particle model of solids, liquids, and gases.			
Required practical: use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solids and liquids.			
How mass is conserved during phase changes.			
Internal energy as the sum of kinetic and potential energy of all particles.			
Changes in temperature cause changes to the internal energy of the system.			
The rate of temperature increase of a material depends on its specific heat capacity.			
Specific latent heat as the energy required to change the stage of one kilogram of material.			
Particles of a gas have random motion: how temperature relates to particle motion.			
Pressure as the net force of particles acting at right angles to the wall of a container or surface.			
At a constant temperature: explaining the relationship between the volume and pressure of a gas.			
Calculating the pressure or volume when either the pressure or volume changes.			
How doing work on a gas changes the internal energy and so the temperature of a gas.			

Physics Topic 4: Radioactivity	R	A	G
The basic structure of the atom: positive nucleus of protons and neutrons; orbiting electrons.			
Electrons changing shells due to absorbing electromagnetic radiation and emitting visible light.			
Mass number as the total number of protons and neutrons.			
How the model of the atom changed (Democritus, Dalton, Rutherford, Bohr, Chadwick)			
Radioactive decay as a random and spontaneous process.			
Measuring the rate of decay using a Geiger-Muller tube in Becquerels (Bq)			
Nuclear radiation as: alpha particles, beta particles, gamma radiation, neutrons.			
Differences in penetration power and ionising power of alpha, beta and gamma radiation.			
Nuclear equations of alpha, beta, gamma, and neutron radiation.			
Half-life as the time taken for the number of nuclei to half: determination by graph or calculation.			
Contamination and the presence of unwanted radioactive material.			
Irradiation as the exposure of nuclear radiation.			

Physics Topic 4: Radioactivity	R	A	G
Sources of background radiation and factors that affect how much background radiation is received.			
Hazards of using isotopes with different half-lives.			
Uses of nuclear radiation: medicine (exploration, gamma knife).			
Fission as the process of splitting a large of unstable nucleus with neutrons to cause chain reactions.			
Fusion as the joining of two light nuclei to form a heavier nucleus and the conversion of mass into energy.			

Other useful revision resources:

https://cognitoedu.org/home - revision videos and access to past papers and exam questions with mark schemes. Follow the list of topics above.

https://www.kayscience.com/ - more revision videos and quizzes to support your revision.

https://www.bbc.co.uk/bitesize/examspecs/zpgcbk7 - BBC Bitesize GCSE Biology

https://www.bbc.co.uk/bitesize/examspecs/z8xtmnb - BBC Bitesize GCSE Chemistry

https://www.bbc.co.uk/bitesize/examspecs/zsc9rdm - BBC Bitesize GCSE Physics

https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF - AQA GCSE Biology Specification – read section 4 for exam specific content.

https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF - AQA GCSE Chemistry Specification – read section 4 for exam specific content.

https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF - AQA GCSE Physics Specification – read section 4 for exam specific content.