# **CURRICULUM ROADMAP** - Nursery to Year 13 Science





Year 13 (SPR)

Gene technology & ecology Acids and bases; electrode potentials

Magnetic fields; thermal physics; opher unit, astro or turning

# Year 12 (SUM)

Photosynthesis, Respiration

Group chemistry; organic analysis

Nuclear physics; further mechanics: SHM, circular motion

# Year 12 (AUT)

Cell structure + observation; biological molecules; DNA structure & replication; immunity; protein synthesis; meiosis Microscopy use + mag calcs: root tip saugsh practical: enzymes practical: calibration curves: biological drawing

Organic; quantitative; atomic structure; bonding

Particle physics; waves; photoelectric effect

# Year 11 (SPR) 🔴

Ecology in act ips; trophic levels & transferring biomass; carbon cyde & decay use; global wa Earth's Resources

ces; corrosion & its prevention; es; Haber process & equilibric

Electromagnetism ntial; generator; uses of

**Space Physics** & Bia Ban

# Year 10 (SUM)

ain: pathogens/communicable diseases; viral, fungal, bacterial diseases; malaria; defence against di n; medicines use nt; bacterial resistance to antibiotics; required practical bacterial growth; monoclonal antibody use; plant defence against disease (SEPS) **Energy Changes** 

Apply knowledge of moles to a different scenario having calculated energy changes

Explain: transverse, longitudinal & wave characteristics; wave speed; sound waves, ultrasou Electricity electricity; AC/DC; Nat Explain: circuits & components; charge, measuring current & p.d.; series & parallel; energy tr

Grid: static (danaers/uses)

# Year 10 (AUT) •

**Photosynthesis** Build upon KS3 knowledge: theory behind greenhouses & how we can use them to increase yield. Explain: photosynthesis equation & derivation uses of glucose in plants; leaf structure related to function; increasing photosynthesis efficiency; increasing food production; photosynthesis required practical transpiration translocation mineral uses in plants **Quantitative Chemistry** 

Multi-step calculations; use molar ratios to quantify amounts of solids, gases & aqueous solutions; familiarise with exam questi

Energy Explain: energy stores, transfers & efficiency; potential (grav & elastic) energy; kinetic energy; work done & power; energy resources; conduct

# Year 9 (SPR)

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**Year 13** (SUM) Exam technique including essay writing

# Year 13 (AUT)

Bio-genetics; ecology: control of water content (kidneys); control of blood; nervous system; muscles

Chemistry - transition metals; rate equations Organic - amines, DNA etc. aromatic

Capacitors; gravitational fields; electric fields; nuclear physics

# Year 12 (SPR)

Variation, taxonomy & biodiversity; exchange surfaces: digestion; circulation, blood & haemoglobin; plant mass transport Transpiration practical; heart & lung dissection; exam technique

Rates: equilibria: energetics: alcohols: halogen - alkanes

Mechanics motion / forces; electricity; materials

# **Year 11** (SUM)

Explain: DNA, genes (Trilogy only); human genome; structure of DNA (SEPS only); protein synthesis (SEPS only); genetic mutations (SEPS only); types sis; Gregor Mendel & his discovery (SEPS only); intro to genetics/terminology; genetic cr **Chemical Analysis** 

atography; testing for gases, cations & anions; instrumental methods; flame emission; spectroscop Organic Chemistry

ude oil, hydrocarbons, alkanes; fractional distillation; properties of hydrocarbons; combustion; cracking & alkenes; reactions of alkenes; alcohols; carboxylic acids; addition & condensation polymerisation; amino acids; DNA & other naturally occurring polymers

# **Year 11** (AUT)

riation and Evolu uls/plants; what is variation; theory of evolution & evolutionary trees; natural selection; fossils & evolution; Darwin & Wallace (SEPS only); speciation (SEPS only); selective breeding; genetic engineering; GM debate pros/cons; cloning techniques; classification; causes of extinction Chemical Changes

Practical unit; develop skills of balancing equations; intro to half & redox ionic equations; describe methods for making a range of salts Forces

Explain: scalars/vectors (with scale diagrams); contact/non-contact forces; gravity, weight, mass (W=mg); resultant forces (F=ma); work done & energy transfer; Hooke's Law & elasticity; moments; pressure; speed, distance, time (with d-t and v-t graphs); velocity & acceleration; Newton's laws of motion; forces & braking; mo

# Year 10 (SPR)

. Explain: digestive system structure & function; digestive enzyme structure & function; factors mes pH required practical Structure and Bonding

entify the type of bon Atomic Structure

Explain: the atom & development over time; ions & isotopes; alpha, beta, gamma & neutron emission & Decay equations; nuclear fission & fusion; background radiatio alf-life: irradiation & contamination & uses/danaers of radia Particle Model of Matter

ain: states of matter/changes of state; density/measuring density of reg/irreg shapes; specific heat capacity/latent heat; particle ma essure in gases

#### Year 9 (SUM) Health Matters

Repetition of research skills surrounding different diseases, their symptoms & causes, Learn about disease they're familiar with in more detail and some less so, e.g. malaria & lifecycle of the plasmodium parasite. Locate key info, present clearly/concisely. Importance of verifying data & not using first set found on internet. Explain: what is a non-communicable disease; intro idea of communicable diseases.

**Moving and Changing Materials** Explain: diffusion; osmosis; osmosis experiment; active transport; heart structure & Cardiac cycle; blood structure & function; blood vessels & circulatory system; coronary heart disease causes & treatment; gas exchange surfaces in a variety of organisms Atmosphere

#### Particle Model of Matter

Explain: solids, liquids, gases; density; measuring density of regular & irregular shapes; state changes; specific heat capacity; specific latent heat; particle motion & internal energy; particle motion in gases; pressure; pressure; in gases; complete equations with multi-step calculations (e.g. use spec heat & latent heat together in heating liquid to gas)

# Year 8 (SUM)

Ecology Explain: food chains/webs; insects - pollination & food security (link to Y7); interdependence; nutrient cycles; effect of diseases/toxins on a food web; effect of modern farming on diversity; the future of food production for a growing population **Earth's Resources** 

Awareness of importance of sustainability having conducted lifecycle assessments (LCAs) for wide range of everyday products/events. Address importance of preserving finite resources e.g. metals/crude oil. Importance of recycling; single-use plastic; conservation of oceans/landscapes Electromagnetism

Explain: permanent magnets & their magnetic field; magnetic interactions; Earth's magnetic field; magnetic effect of a current; electromagnets & their application; kicking wire; motors; F=BII mathematical skills; practical skills of complex practicals

### Year 8 (AUT)

**Photosyn** on; plant disease

Movement Explain: parts of the skeleton: structure & function of joints: skeletal problems i.e. arthritis: basic structure & function of muscle: respiration: angerabic respiration in anir nals; effect of exercise on resp

Explain: leaf structure: diff types of leaf: photosynthesis equation & experiment: limiting factors: stomata structure & function/experiment: tr

Fuels, Combustion and Energy Changes Complete & incomplete combustion, calorimetry, exothermic & endothermic reactions, environmental pollutants. Global concerns: global warming, acid rain, carbon monoxide poisoning. Compare the energy content of crisps, endothermic ice cream in a bag

Explain: work done & energy transferred; gravitational potential energy (Ep); energy stores; kinetic energy (Ek); Ep to Ek transfers; Ep=mgh, W=Fs & Ek=0.5mv<sup>2</sup>

#### Year 7 (SPR) Reproductio

ACIDS & ALKALIS

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Explain: male & female reproductive systems; puberty; fertilisation & foetal development; factors effecting foetal development; parts of a flowering plant; pollination & fertilisation in plants; bees & problems with pollination

#### Acids, Alkalis and Equations

Most Y7 students are already aware that acidic foods are sour in taste. Develop understanding of the nature of acids & alkalis, pH, neut reactions of acids & how to balance symbol equations for these reactions. Be more aware of uses of household acids & alkalis & their dangers. Continue to work scientifically & practically to develop love of chemistry, incl. growing crystals activity. Electricity

Explain: atoms & their charges; static charges; moving charges; measuring current & potential difference; the test circuit to calculate resistance; electrical energy; Q=It, V=IR and E=QV mathematical skills; practical circuit building & linking to theory

#### Year 6 (SUM) 🌑

#### Animals incl. humans

Identify and name the main parts of the human circulatory system and explain the functions of the heart, blood vessels and blood Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function Describe the ways in which nutrients and water are transported within animals incl. humans

# Year 6 (AUT)

**Evolution and inheritance** Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago Recognise that living things produce offspring of the same kind but normally offspring vary and are not identical to their parents Identify how animals and plants are adapted to suit their environment in different ways and that adaption may lead to evolution Electricity

Associate the brightness of a lamp or the volume of a buzzer with the number of voltage and cells used in the circuits. Compare and give reasons for variations on how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position

# Year 5 (SPR)

of switches

SPR 1: Forces Explain that unsupported objects fall towards the Earth because of the force gravity acting between Earth and the falling object.

Identify the effects of air resistance, water resistance and friction that act between moving surfaces.

Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller for to have a greater effect.

SPR 2: Earth in Space

Describe the movement of the Earth & other planets relative to the sun in the solar system: describe the movements of the Moon relative to Earth Describe the Sun, Earth & Moon as approx. spherical bodies; use the idea of Earth's rotation to explain day/night & the apparent movement of the sun across the sky

# Year 4 (SUM) 🔵

#### SUM 1: States of matter

Compare/group materials together, acc. to if solids, liquids, gases; observe that some materials change state when heated/cooled, and measure/research temp. at which this happens in degrees Celsius

Identify the part played by evaporation & condensation in the water cycle and associate the rate of evaporation with temperature SUM 2: Sound

Identify how sounds are made, associating some with something vibrating; recognise that sound vibrations travel through a medium to the ear. Find patterns between the pitch of a sound and features of the object that produced it & patterns between volume & strength of vibrations. Recognise that sounds get fainter as the distance from the sound source increases

#### Year 4 (AUT)

All Living things

Recognise that living things can be grouped in various ways; explore/use classification keys to help group, identify, name various living things in he local/wider environment; recognise that environments can change and that this can sometimes pose dangers to living things Electricity

Identify common appliances that run on electricity; construct a simple series electrical circuit, identifying/naming its basic parts, incl. cells, wires, bulbs, switches & buzzers; identify if a lamp will light in a simple series circuit based on if the lamp is part of a complete loop with battery; recognise that a switch opens/closes a circuit & associate with if a lamp lights in a simple series circuit Recognise some common conductors and insulators and associate metals with being good conductors

# Year 3 (SPR)

SPR 1: Animals incl. humans

Identify that animals incl. humans, need right types/amount of nutrition; they cannot make own food; they get nutrition from what they eat; that humans/some animals have skeletons/muscles for support, protection & movement. Identify/describe functions of different parts of flowering plants; explore requirements for life & growth (air, light, water, nutrients from soil and room to grow) and identify how the y vary from plant to plants. Investigate the way in which water is transported within plants.

Explore the part that flowers play in the life cycle of flowering plants, incl. pollination, seed formation and seed dispersal. SPR 2: Forces and Magnets

Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract or repel each other and attract some materials and not others. Compare/group together a variety of everyday materials on basis of whether they're attracted to a magnet, identify some magnetic materials. Describe magnets as having two poles

#### Rates of Reaction

New lab techniques used to investigate various factors which can affect a reaction rate, limited to: altering temperature, concentration. surface area & presence of a catalyst. Predict the outcome of investigations; plan/carry out investigations; analyse/evaluate data to come to conclusions

# Year 9 (AUT)

Cell Biology Explain: eukaryotic & prokaryotic cell structure; microscopy to include cell size calculations; mitosis; cell differentiation & specialised cells; cancer; STEM cells; aerobic and

#### Atomic Structure and The Periodic Table

Build on knowledge of particles from Y7/8 to include: atoms, compounds, elements, ions & isotope. Knowledge of the history of the atom & that of the periodic table & scientist involved. Appreciate importance of scientific questioning. Consider the periodic table as the toolkit for a chemist. Atomic Physics

Explain: the atom; historical development of the atom; ions & isotopes; alpha, beta, gamma radiation; decay equations; nuclear fission & fusion; background radiation; half-life; graphical calculations mathematical skills; research techniques.

# Year 8 (SPR)

#### Reactivity Series

Practical & theoretical teaching strategies to gain understanding of the reactivity series of metals & its applications; practical work on displacement reactions, halogen displacement, reacting alkali metals with water & quantifying a metal's reactivity based on its reaction with acid. Gain in-depth understanding of human history as having addressed topics such as historical discovery of metal extraction via carbon reduction. Waves

Explain: what a wave is; sound & longitudinal waves; light & transverse waves; reflection & refraction (wave properties); electromagnetic spectrum; how do we see colour; wave equation mathematical skills; practical reflection & refraction putting theory into practice.

# Year 7 (SUM)

mass transport systems Explain: lung structure & function; mechanism of breathing; gas exchange at the alveoli; effects of disease & lifestyle on lungs; heart structure & unction; blood vessel structure & function; the circulatory system; blood structure & function; heart disease Particle theory and Physical Changes

Develop a solid foundation/understanding of particle theory, be able to classify different substances as solid, liquid or gas based on properties. Develop a love of chemistry, contemplating Qs such as 'is toothpaste a liquid or solid?' and 'can you walk on custard?' Develop practical skills & graph drawing skills in topics: latent heat, conservation of mass & diffusion.

Space Explain: planets in the solar system; Earth, seasons, axis; natural & artificial satellites; forces involved in take-off; life on other planets; Sun is a star; alaxies & the universe; W=mg and resultant forces recap; women in space

### Year 7 (AUT)

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State Life Cycle 🥦

Of A Frog

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Explain: structure of plant & animal cells; parts and use of microscope; specialised cells; unicellular organisms; diffusion in biology; organisation of ulticellular organism; the digestive system as an example; healthy diet & food groups

Mixing, dissolving & separating Familiarisation with a range of practical techniques of previously unfamiliar lab apparatus. Broaden vocab of essential topics e.g. dissolving, evaporating, chromatography & distillation. Develop method writing, analysing & evaluating skills. Introduce to local industries e.g. Northwich salt mines & Stanlow oil refinery & forensic investigation. Forces

Explain: what a force is; resultant forces; Newton's laws; the difference between weight & mass; Hooke's law; motion - speed, distance & time; ma, W=mg and s=d/t mathematical skills; practical skill development; recording & analysing results.

#### Year 6 (SPR)

All Living Things

Describe how living things are classified into broad groups according to common observable characteristics & based on similarities/differences, incl. micro-organisms, plants & animals; give reasons for classifying plants/animals based on specifics Light

Understand that light travels in straight lines; use this to explain that objects are seen because they give out/reflect light into the eye; that we see things because light travels from light sources to our eyes or from light sources to objects then our eyes; explain why shadows have same shape as object that casts them; predict size of shadows when position of light source changes

#### Year 5 (SUM)

#### All Living Things

Explain the differences in life cycles of mammals, amphibians, insects & birds; describe the life process of reproduction in some plants & animals (inc. human reproduction)

#### Animals incl. Humans

Describe the changes as humans develop from birth to old age (incl. puberty)

# Year 5 (AUT)

#### Properties and changes of materials

Compare/group together everyday materials on basis of properties, incl. hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets; know that some will dissolve in liquid to form a solution and describe how to recover a substance from a solution Use knowledge of solids, liquids and gases to decide how mixtures might be separated including through filtering, sieving and evaporating Give reasons. based on evidence from comparative/fair tests, for the particular uses of everyday materials, including metals, woods and plastic Demonstrate that dissolving, mixing and changes of state are reversible changes

Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible , including changes associated with burning and the action of acid on bicarbonate of soda

#### Year 4 (SPR)

#### <u>Animals incl. humans</u>

Describe the simple functions of the basic parts of the digestive system in humans Identify the different types of teeth in humans and their simple functions Construct and interpret a variety of food chains, identify producers, predators and prey

# Year 3 (SUM)

#### SUM 1: Plants

Identify & describe the functions of different parts of flowering plants (roots, stem/trunk, leaves & flowers); explore the requirements of plants for life & growth (air, light, water, nutrients from soil, room to grow) & how they vary from plant to plant; investigate the way in which water is transported within plants; explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation & seed dispersal SUM 2: Light

Recognise that we need light in order to see things; that dark is the absence of light; that light is reflected from surfaces; that light from the sun can be dangerous & there are ways to protect our eyes; that shadows are formed when the light from a light source is blocked by an opaque object; find patterns in the way that the size of shadows change.

# Year 3 (AUT)

Rocks: Compare/group together different kinds of rocks given appearance/simple physical properties Describe in simple terms how tossils are formed when things hat have lived are trapped within rock Recognise that soils are made from rocks and organic matter

Year 2 (SUM)

# Plants:

Observe and describe how seeds & bulbs grow into mature plants Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy

# Year 2 (AUT)

#### Uses of everyday materials:

Identify/compare the suitability of a variety of everyday materials, incl. wood, metal, plastic, brick, rock, paper & cardboard for particular uses

Find out how the shales of solid objects made from some materials can be changed by squashing, bending, twisting & stretching

# Year 1 (SPR) 🌑

#### Animals including humans:

Identify/name various common animals (birds, fish, amphibians, reptiles, mammals & invertebrates) Identify/name various animals that are carnivores, herbivores & omnivores

Identify, name, draw & label basic parts of the human body & say which part is associated with which sense Seasonal Change

# Reception (SUM)

Plants: conditions for growth The environment

# Reception (AUT)

Senses Body parts Habitats and animal diets

# Nursery (SPR)

Cold places-bird feeders, clothing needed Investigating textures, including ice

# Year 2 (SPR)

#### All living things and their habitats:

Explore/compare differences between things that are living, dead & things that have never been alive Identify that most living things live in habitats to which they are suited & how they provide for the basic needs of different kinds of animals/plants, and how they depend on each other. Identify/name various plants/animals incl. micro-habitats. Describe how animals obtain their food from plants/other animals using the idea of a simple food chain. Identify/name different sources of food

# Year 1 (SUM)

#### <u>Plants</u>:

Identify and name various common wild & garden plants, incl. deciduous & evergreen trees Identify & describe the basic structure of various common flowering plants, incl. trees **Seasonal Change** 

# Year 1 (AUT)

#### **Everyday materials:**

Distinguish between an object & the material from which it is made Identify and name a variety of everyday materials, incl. wood, plastic, metal, water & rock Describe the simple physical properties of a range of everyday materials Compare and group various everyday materials on the basis of their simple physical properties Seasonal Change

# **Reception** (SPR)

Floating and sinking Space: planets Cold places: habitats Melting (solids) Plants and animals

# Nursery (SUM)

Shadows Sun safety Floating and sinking Water/sand play

# Nursery (AUT)

Ourselves-physical characteristics The seasons

KEY: BIOLOGY CHEMISTRY **PHYSICS**