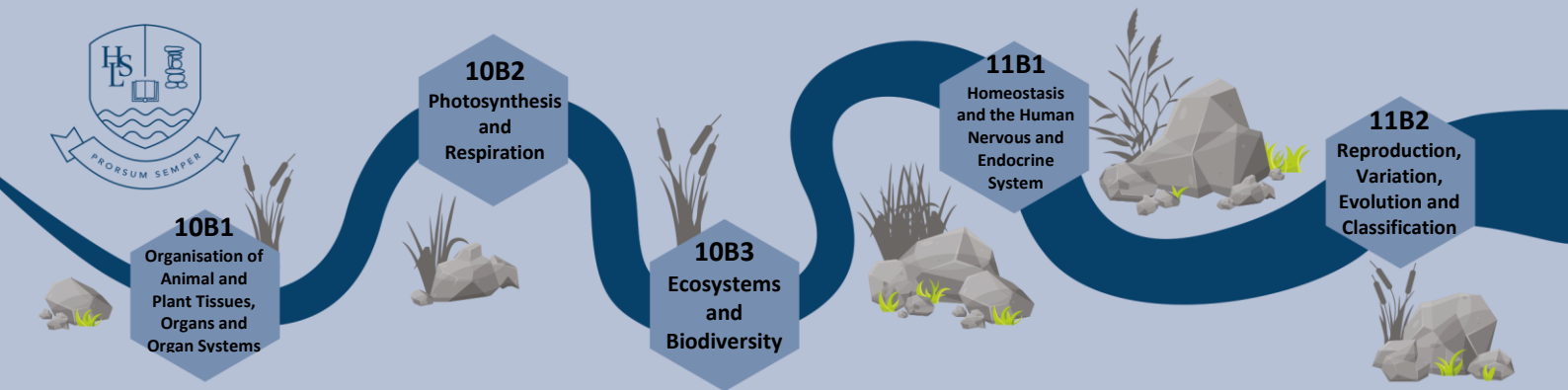


Science	Year 10	Autumn Term

10B1 Biology Topic 1 – Organisation of Animal and Plant Tissues, Organs and Organ Systems

Topic Outline & Aims (Intent)

1. Organisation: How are cells organised?
2. Enzymes: What are enzymes?
3. Enzyme Activity: Why do enzymes denature?
4. Enzymes in Digestion: What is the function of the digestive system?
5. Food Tests: How can we test for the presence of nutrients?
6. Investigating Enzymatic Reactions: How can we investigate the effect of pH on enzymes?
7. The Lungs: What is the function of the respiratory systems
8. Blood Vessels: How is blood transported around the body?
9. Blood: What is blood made of?
10. The Heart: Why do humans have a double circulatory system?
11. Coronary Heart Disease: What can cause a heart attack?
12. Cardiovascular Diseases: How can we prevent and treat cardiovascular diseases?
13. Health: What does it mean to be in 'good health'?
14. Risk Factors: What are risk factors?
15. Cancer: What can cause cancer?
16. Plant Tissues: What is the structure of a leaf?
17. Transpiration and Translocation: How are nutrients transported around the plant?
18. Transpiration: What affects the water loss of a plant?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Understand size and scale relating to cells, tissues, organs and organ systems.
- ✓ Explain the lock and key theory of enzyme action; Explain why enzymes catalyse specific reactions.
- ✓ Explain how pH affects enzymes; Explain how temperature affects enzymes.
- ✓ Label parts of the digestive system; Give the site of production and action of amylase, protease and lipase; Explain what the products of digestive enzymes are used for; Describe where bile is made and stored and what it is used for.
- ✓ Describe the qualitative reagents and positive results used to identify biological molecules.
- ✓ Carry out rate calculations for chemical reactions.
- ✓ Describe the structure and function of the lungs, including how they are adapted for gaseous exchange.
- ✓ Explain how blood vessel structure relates to their functions.
- ✓ Describe the structure and function of the human heart; Calculate blood flow using rate calculations; Describe what controls the normal resting heart rate; Describe what an artificial pacemaker is.
- ✓ Describe what blood is made from; Recognise different types of blood cells in a photograph or diagram; Explain how blood cells are adapted to their functions.
- ✓ Explain what coronary heart disease is; Explain how stents and statins are used to treat CHD; Evaluate methods of treating cardiovascular disease.
- ✓ Describe faulty heart valves and how they can be replaced; Describe how donor organs and artificial hearts are used.
- ✓ Define health; State factors that may affect health; Explain how different types of disease can interact; Explain how sampling is used in epidemiological data; Describe human & financial cost of non-communicable disease.
- ✓ Explain how lifestyle factors affect the incidence of diseases (including diabetes, alcohol, smoking).
- ✓ Identify the causal mechanism for the risk factors of cancer.
- ✓ Explain how leaves are adapted to exchange materials; Describe how epidermal tissues, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem tissues are adapted for their functions.
- ✓ Explain how root hair cells are adapted to their function; Describe transpiration and translocation; Describe the role of xylem, phloem and stomata; Describe how roots are adapted to exchange materials.
- ✓ Explain how changing temperature, humidity, light levels and air movement affects transpiration rate

Prior Learning (Context)

KS3: Science Programmes of Study

- ➢ Cells and Organisation (page 5)
- ➢ Nutrition and digestion (page 5)
- ➢ Gas exchange systems (page 6)
- ➢ Health (page 6)

Future Learning (Context)

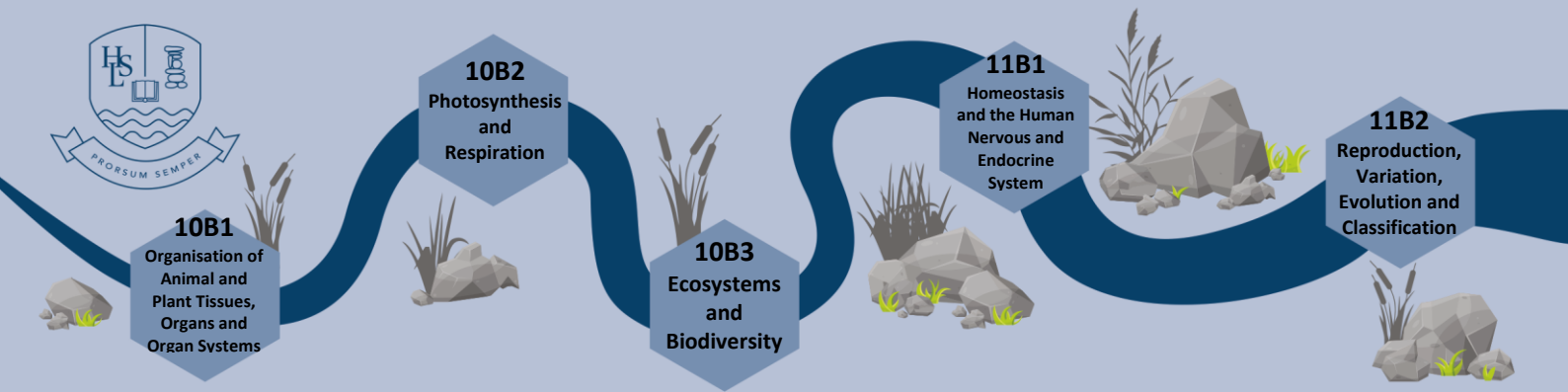
KS4: Science Programmes of Study

- ➢ Photosynthesis (page 9)
- ➢ Ecosystems (page 9)

National Curriculum Links (Context)

KS4: Science Programmes of Study

- ➢ Cell Biology (page 7)
- ➢ Transport systems (page 8)
- ➢ Health, disease and the development of medicines (page 8)



Science	Year 10	Autumn Term

10B1 Biology Topic 1 – Organisation of Animal and Plant Tissues, Organs and Organ Systems

RRSA Links

ARTICLE 6: Life, survival and development. ARTICLE 24: Health, Water, Food, Environment.
ARTICLE 28: Right to education. ARTICLE 29: Goals of education.

British Values Links

INDIVIDUAL LIBERTY: Learn about the impact of lifestyle choices, empowering them to make informed decisions about their health.
RULE OF LAW: Highlights the role of government regulations, such as laws on food safety and smoking bans.
DEMOCRACY: How medical advancements rely on scientific evidence and public engagement.
TOLERANCE OF DIFFERENT FAITHS AND BELIEFS: Some medical procedures, such as organ transplants, are influenced by religious and cultural beliefs.

Eco-Schools Links

HEALTHY LIVING: Importance of balanced diet and active lifestyle, key elements of focus on well-being.
SUSTAINABLE FOOD CHOICES: Understanding the role of nutrients and digestion connects to sustainable eating habits, such as choosing locally sourced, organic or plant-based foods to reduce carbon footprints.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10B1 Standard Homework 1, 2, 3 and 4 with Feedback lesson
- 10B2 Topic Test with Revision and Feedback lessons

Reading / Enrichment

The Body: A guide for Occupants – Bill Bryson
Eat Well and Fell Great – Tina Lond-Caulk
The Science of Plants: Inside their Secret World – DK Secret World Encyclopaedias
Recommended Reading List.

Key Vocabulary (Literacy)

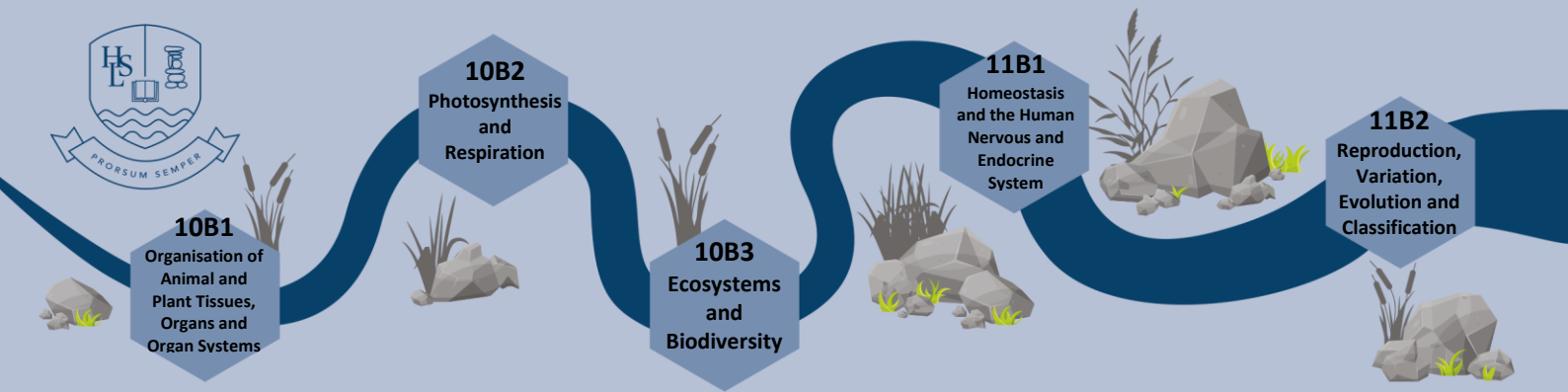
Active Site; Arteries; Cancer; Carcinogen; Cell; Communicable Disease; Digestion; Enzyme; Gas Exchange; Health; Non-Communicable Disease; Organ; Organism; Organ System; Protein; Risk Factor; Tissue; Vein.
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Comparing size; Converting units; Calculating averages and percentages; Rounding results; Drawing and analysing figures, results tables and scatter graphs.

Career Links

Doctor; Nurse; Paramedic; Dietitian; Nutritionist; Sports Scientist; Physiotherapist; Biomedical Scientist; Pharmacist; Clinical Research; Ecologist; Food Scientist; Public Health Officer; Environmental Health Officer.



Science	Year 10	Spring Term

10B2 Biology Topic 2 – Photosynthesis and Respiration

Topic Outline & Aims (Intent)

1. Photosynthesis: What is the process of photosynthesis?
2. Limiting Factors in Photosynthesis: How can the rate of photosynthesis be limited?
3. Rate of Photosynthesis: How can the rate of photosynthesis be calculated?
4. Photosynthesis Investigations: How can photosynthesis be investigated?
5. Respiration: What is the process of respiration?
6. Anaerobic Respiration: What is the process of anaerobic respiration?
7. Response to Exercise: How does the human body respond to exercise?
8. Investigations into the Effect of Exercise: How can the effect of exercise be investigated?
9. Metabolism: What are metabolic processes?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Define photosynthesis; State the word equation and balanced symbol equation for photosynthesis; Describe the uses of glucose made in photosynthesis.
- ✓ Identify factors that can limit the rate of photosynthesis; Explain how the rate of photosynthesis can be controlled; Interpret graphs showing the rate of photosynthesis.
- ✓ Calculate rates of photosynthesis; Calculate light intensity using the inverse square law; Interpret data investigating the rate of photosynthesis.
- ✓ Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism.
- ✓ Describe how to test a plant for the presence of starch; Explain how the wavelength of light affects the rate of photosynthesis.
- ✓ Define respiration; State the word equation and balanced symbol equation for aerobic respiration; Describe how organisms use the energy transferred by respiration.
- ✓ Define anaerobic respiration; State the word equation for anaerobic respiration in muscles and some bacteria, and in plant and yeast cells; Describe the importance of fermentation; Compare aerobic and anaerobic respiration.
- ✓ Describe how the human body responds to exercise; Describe how anaerobic respiration affects muscles; Describe how the human body recovers from a period of anaerobic respiration.
- ✓ Investigate the effect of exercise on the human body.
- ✓ Define metabolism; Describe metabolic processes.

Prior Learning (Context)

KS3: Science Programmes of Study

- ➢ Photosynthesis (page 6)
- ➢ Cellular respiration (page 7)
- ➢ Gas exchange systems (page 6)
- ➢ Skeletal and muscular systems (page 5)

Future Learning (Context)

KS4: Science Programmes of Study

- ➢ Coordination and Control (pages 8-9)
- ➢ Ecosystems (page 9)
- ➢ Evolution, inheritance and variation (pages 9-10)

National Curriculum Links (Context)

KS4: Science Programmes of Study

- ➢ Photosynthesis (page 9)
- ➢ Cell Biology (pages 7-8)

RRSA Links

ARTICLE 6: Life, survival and development. ARTICLE 12: Respect for the views of the child.
ARTICLE 24: Health, Water, Food, Environment. ARTICLE 31: Leisure, play and culture.
ARTICLE 28: Right to education. ARTICLE 29: Goals of education.

British Values Links

MUTUAL RESPECT: Working together with tolerance and mutual understanding, treating each other with respect.
THE RULE OF LAW: Understanding and following lab rules and the laws of nature.
INDIVIDUAL LIBERTY: Thinking independently and expressing views appropriately with confidence in a safe, supporting environment.

Eco-Schools Links

BIODIVERSITY: Maintaining a high level of plant, insect and animal life locally and globally.
HEALTHY LIVING: Addressing your, and our planet's health.
TRANSPORT: Promoting and encouraging sustainable transport.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10B2 Standard Homework 1 and 2 with Feedback lesson
- 10B2 Topic Test with Revision and Feedback lessons

Reading / Enrichment

Cells, Genes, and DNA – Richard Walker
The Martian – Andy Weir
This Book is Not Garbage: 50 Ways to Ditch Plastic, Reduce Trash, and Save the World! – Isabel Thomas
Recommended Reading List.

Key Vocabulary (Literacy)

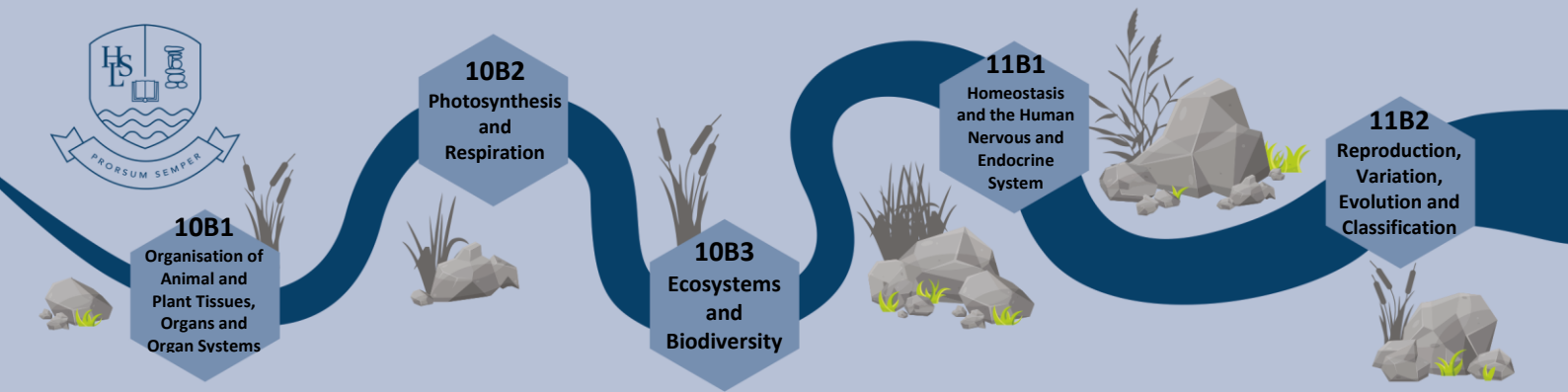
Photosynthesis; Chloroplast; Endothermic; Carbon dioxide; Oxygen; Glucose; Respiration; Cellulose; Starch; Lipids; Proteins; Limiting factor; Rate of reaction; Palisade cell; Inverse square law; Exothermic; Oxidation; Aerobic; Metabolism; Anaerobic; Ethanol; Lactic acid; Pulse; Fermentation.
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Comparing size; Converting units; Balancing chemical equations; Calculating averages and percentages; Rounding results; Drawing and analysing figures, results tables and scatter graphs.

Career Links

Dietician; Nutritionist; Baker; Chef; Brewer; Winemaker; Zoologist; Conservationist; Plant physiologist; Forest manager; Biotechnologist; Horticulturist; Ecologist; Botanist; Physiotherapist; Athlete; Personal trainer; Doctor; Nurse; Teacher; Research Scientist.



Science	Year 10	Summer Term

10B3 Biology Topic 3 – Ecosystems and Biodiversity

Topic Outline & Aims (Intent)

1. Food Chains: What do food chains show?
2. Competition and Interdependence: How can the rate of photosynthesis be limited?
3. Ecosystems: What do ecosystems contain?
4. Adaptations: How do adaptations help organisms to survive?
5. Using Quadrats and Transects: How are quadrats and transects used?
6. Field Investigations: Measure the population size of a common species in a habitat; Use sampling techniques to investigate the effect of a factor on the distribution of this species.
7. Material Cycles: How are materials cycled through ecosystems?
8. Biodiversity and Conservation: How and why should we maintain biodiversity?
9. Deforestation and Land Use: How is land used by humans?
10. Global Warming: What are the causes and effects of global warming?
11. Pollution and Waste Management: How can pollution occur?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Describe what food chains show; Identify keywords used to describe organisms in a food chain; Describe and explain predator-prey cycles in a stable community.
- ✓ Identify what organisms compete for; Describe what food webs show; Define interdependence; Describe the effects of interdependence; Define a stable community.
- ✓ Define keywords relating to ecosystems; Identify examples of abiotic and biotic factors.
- ✓ Define the types of adaptation; Identify examples of types of adaptation; Define extremophiles.
- ✓ Explain how quadrats are used to investigate abundance; Explain how transects are used to investigate distribution.
- ✓ Describe how water is cycled through ecosystems; Describe how carbon is cycled through ecosystems; Explain the importance of the water and carbon cycles to organisms; Explain the role of microorganisms in cycling materials.
- ✓ Define biodiversity; Explain why biodiversity is important; Identify how a growing human population is reducing biodiversity; Evaluate programmes put in place to maintain biodiversity.
- ✓ Identify how humans use land; State the reasons for deforestation; Describe the effects of deforestation; Explain the importance of peat bogs.
- ✓ Describe the causes and process of global warming; Draw a labelled diagram of global warming; Explain the consequences of global warming.
- ✓ State why more waste is being produced; Describe how pollution can occur; Explain the effect of pollution on biodiversity; Describe how organisms can be used as indicators of pollution.

Prior Learning (Context)

KS4: Science Programmes of Study

- ➢ Photosynthesis (page 9)
- ➢ Cell Biology (pages 7-8)

Future Learning (Context)

KS4: Science Programmes of Study

- ➢ Coordination and Control (pages 8-9)
- ➢ Evolution, inheritance and variation (pages 9-10)

National Curriculum Links (Context)

KS4: Science Programmes of Study

- ➢ Ecosystems (page 9)

RRSA Links

ARTICLE 6: Life, survival and development. ARTICLE 12: Respect for the views of the child.
ARTICLE 24: Health, Water, Food, Environment. ARTICLE 31: Leisure, play and culture.
ARTICLE 28: Right to education. ARTICLE 29: Goals of education.

British Values Links

MUTUAL RESPECT: Working together with tolerance and mutual understanding, treating each other with respect.
THE RULE OF LAW: Understanding and following lab rules and the laws of nature.
INDIVIDUAL LIBERTY: Thinking independently and expressing views appropriately with confidence in a safe, supporting environment.

Eco-Schools Links

BIODIVERSITY: Maintaining a high level of plant, insect and animal life locally and globally.
HEALTHY LIVING: Addressing your, and our planet's health.
TRANSPORT: Promoting and encouraging sustainable transport.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10B3 Standard Homework 1 and 2 with Feedback lesson
- 10B3 Topic Test with Revision and Feedback lessons

Reading / Enrichment

How Bad Are Bananas – Mike Berners-Lee
Stuff: The Life of a Cool Demented Thing – John Ryan and Steve Parker
Recommended Reading List.

Key Vocabulary (Literacy)

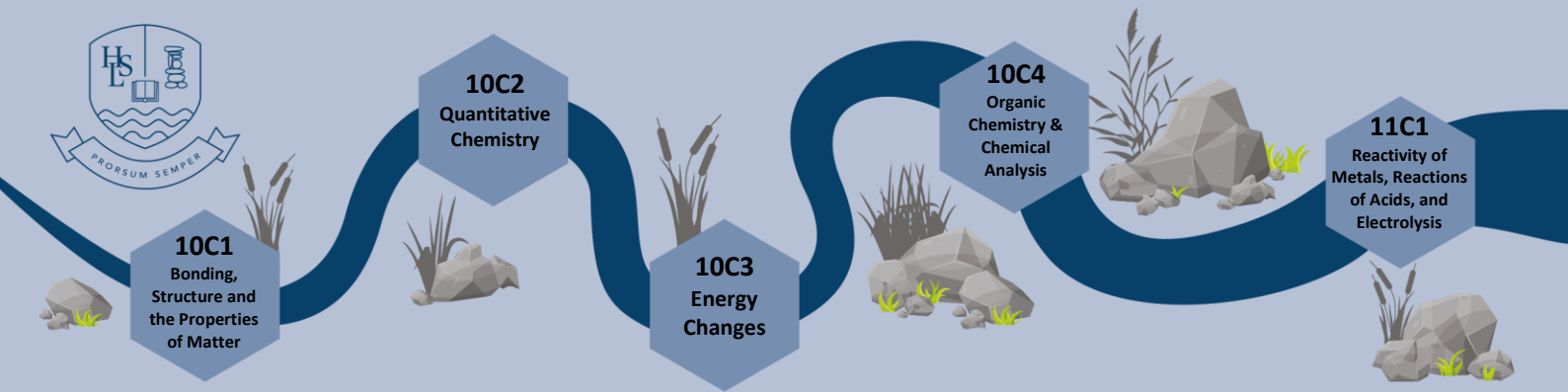
Abiotic factors; Abundance; Adaptations; Biodiversity; Biomass; Biotic factors; Community; Competition; Decay; Decomposers; Distribution; Ecosystem; Peat.
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Comparing size; Converting units; Calculating averages and percentages; Rounding results; Drawing and analysing figures, results tables and scatter graphs.

Career Links

Ecologist; Teacher; Environmental Consultant; Conservation Officer; Wildlife Conservationist; Policy Advisor; Marine Biologist; Park Ranger.



Science	Year 10	Autumn Term

10C1 Chemistry Topic 1 – Bonding, Structure and the Properties of Matter

Topic Outline & Aims (Intent)

1. **States of Matter** – Reviewing the particle model and using data to predict the state of matter.
2. **Ions** – What are ions and how do they form?
3. **Ionic bonding** – How do ionic compounds form?
4. **Ionic compounds and their properties** – What are the common properties of ionic compounds and how do they relate to the structure and bonding?
5. **Metallic bonding and the properties of metals** – How does the bonding in metals work and how does this relate to the properties?
6. **Alloys** – What are alloys and why are they so useful?
7. **Covalent bonding** – How does the bonding in non-metals work and how can we represent it in diagrams?
8. **Small molecules** – What are the typical properties of small covalent molecules and how can they be represented?
9. **Polymers** – What are polymers and what are their properties?
10. **Giant covalent structures** – How can larger covalent structures form and what are some examples?
11. **Graphene and fullerenes** – What are graphene and fullerenes? How might they be used in the technologies of the future?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Be able to describe the 3 states of matter using a simple particle model.
- ✓ HT: Recognise limitations in the simple model.
- ✓ Be able to explain differences in melting and boiling points in terms of the strength of the forces present.
- ✓ Predict the state of a substance given appropriate data.
- ✓ Be able to use appropriate state symbols
- ✓ Describe how metals form ions
- ✓ Describe how non-metals form ions
- ✓ Be able to work out the charge on the ions from the group number of the element, limited to Groups 1, 2, 6 and 7
- ✓ Be able to work out the empirical formula of an ionic compound
- ✓ Describe how ionic bonding occurs and represent ionic compounds with dot-cross diagrams.
- ✓ Describe the limitations of models of a giant ionic structure
- ✓ Be able to explain the properties of ionic compounds
- ✓ Be able to describe the structure and bonding in metals.
- ✓ Recognise and draw a representation of the bonding in a metal.
- ✓ Be able to explain the properties of a metal
- ✓ Know what an alloy is.
- ✓ Explain why metals can be bent or shaped.
- ✓ Understand why alloys can be better than a pure metal
- ✓ Be able to explain why alloys are harder than pure metals
- ✓ Be able to describe covalent bonding
- ✓ Recognise and draw diagrams of covalent bonds
- ✓ Deduce the molecular formula of a substance
- ✓ Be able to describe the limitations of diagrams
- ✓ Be able to draw covalent dot and cross diagrams
- ✓ Be able to describe the typical properties of small molecules
- ✓ Be able to explain the properties of small molecules
- ✓ Be able to able to identify a small molecule from its properties or formula
- ✓ Know that polymers are very large covalent molecules
- ✓ Be able to explain why polymers are solids
- ✓ Be able to recognise and draw a polymer repeat unit
- ✓ Describe the structure and bonding in graphite, diamond and silicon dioxide
- ✓ Be able to recognise giant covalent structures from diagrams
- ✓ Be able to describe and explain the properties of giant covalent substances
- ✓ Describe the structure and bonding in graphene and fullerenes
- ✓ Be able to describe and explain the properties of graphene
- ✓ Recognise diagrams and descriptions of graphene and fullerenes and be able to give examples of their uses

Prior Learning (Context)

KS3: Science Programmes of Study

- ➢ The particulate nature of matter (page 8)
- ➢ Atoms, elements and compounds (page 8)
- ➢ The Periodic Table (Page 9)

Future Learning (Context)

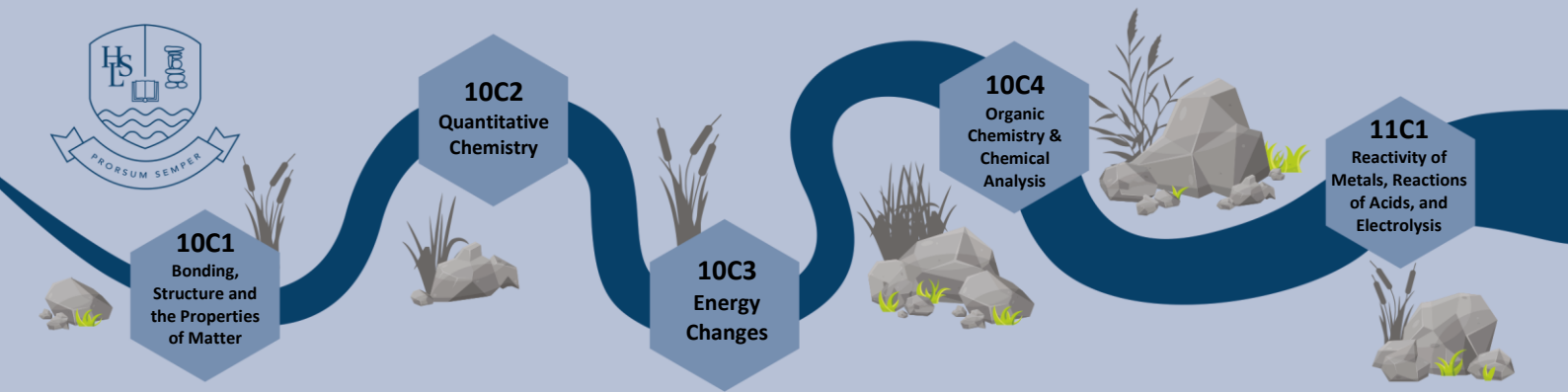
KS4: Science Programmes of Study

- ➢ Chemical changes (page 12)
- ➢ Rate and extent of chemical change (page 13)

National Curriculum Links (Context)

KS4: Science Programmes of Study

- ➢ Structure, bonding and the properties of matter (page 12)



Science	Year 10	Autumn Term

10C1 Chemistry Topic 1 – Bonding, Structure and the Properties of Matter

RRSA Links

ARTICLE 12 – Respect for the Views of the Child ARTICLE 24: Health, Water, Food, Environment.
ARTICLE 17 – Access to Information ARTICLE 29: Goals of education.

British Values Links

INDIVIDUAL LIBERTY: Students investigate **the choice of materials in everyday products**, such as choosing BPA-free plastics for water bottles.
RULE OF LAW: Exploring **the legal restrictions on the use of different materials e.g. asbestos** due to its harmful effects.
DEMOCRACY: When discussing **the use of polymers vs biodegradable alternatives**, students can debate which materials should be prioritised in manufacturing.
TOLERANCE OF DIFFERENT FAITHS AND BELIEFS: Looking at **how different cultures use natural materials** (e.g. clay, bamboo, or metals) in construction or tools, based on their bonding and properties.

Eco-Schools Links

Waste - Teaching about **polymers and plastics**, especially their long-lasting nature due to strong covalent bonds, helps students understand why plastic waste is a major environmental issue.
Global Citizenship - Discussing **ethical sourcing and sustainability of materials** (e.g. mining for metals used in alloys) helps students understand global supply chains and their environmental impact.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10C1 Standard Homework 1, 2 with Feedback lesson
- 10C1 Topic Test with Revision and Feedback lessons

Reading / Enrichment

What's Chemistry All About?
Alex Frith
Discover the Amazing Effect Chemistry Has on Every Part of Our Lives
Ann Newmark
Chemistry DeMYSTiFieD
Linda D. Williams
Recommended Reading List.

Key Vocabulary (Literacy)

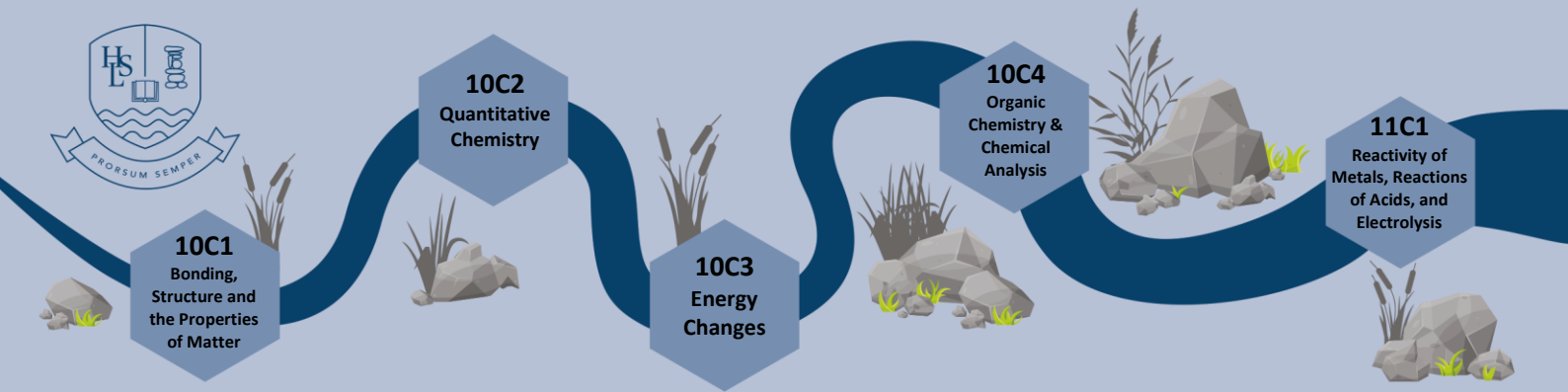
Ionic bonding, covalent bonding, metallic bonding, electrostatic forces, delocalised electrons, lattice structure, giant ionic lattice, simple molecular, giant covalent, metallic structure, polymer, nanoparticles, fullerenes, graphene, allotropes.
Complete topic glossary provided.

Numeracy Opportunities

Using ratios, calculating charges, balancing equations, counting electrons, interpreting graphs, reading data tables, comparing numerical values, estimating energy changes, calculating density, converting units, calculating surface area to volume ratios.

Career Links

Chemical engineer, materials scientist, nanotechnologist, pharmacologist, forensic scientist, environmental scientist, metallurgist, polymer technologist, cosmetic chemist, food scientist, ceramics engineer, battery technologist, research chemist, quality control analyst.



Science	Year 10	Autumn Term

10C2 Quantitative Chemistry

Topic Outline & Aims (Intent)

1. **Chemical formulae and conservation of mass** – How can chemical compounds be represented and what is the law of conservation of mass?
2. **Reacting masses when a reactant or product is a gas** – How and why does the mass sometimes appear to change in a chemical reaction?
3. **Relative formula mass** – What is the relative formula mass and how can it be calculated?
4. **Concentration of solutions** – How is concentration measured and calculated?
5. **Chemical Measurements and Uncertainty** – What kind of measurements can we make in Chemistry and how confident in them can we be?
6. **Moles** – What is a mole and how can they be calculated?
7. **Amount of substance from equations** – How can the amount of a reactant or product be calculated from a chemical equation?
8. **Using moles to balance equations** – How can moles help us to balance equations?
9. **Limiting reactants** – Why is it that chemical reactions come to an end?
10. **Calculating limiting reactants** – How can we tell which reactant will run out first and what will be left over at the end?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Explain what relative atomic mass is in terms of isotopes.
- ✓ Calculate relative atomic mass of an element.
- ✓ State the law of conservation of mass.
- ✓ Explain how the law of conservation of mass relates to symbol equations for chemical reactions.
- ✓ State what multipliers in equations in normal script before a formula mean.
- ✓ State what subscript within a formula or equation means.
- ✓ Define relative formula mass.
- ✓ Calculate the percentage by mass in a compound given the Relative formula mass and the relative atomic masses.
- ✓ Describe what happens to the sum of the relative formula masses of products and reactants in a balanced chemical equation.
- ✓ Explain why some reactions involving a gas may appear to show a change in mass (for a decrease or increase in mass).
- ✓ Explain observed mass changes in non-enclosed systems during a chemical reaction given the balanced symbol equation for the reaction.
- ✓ Explain the effect of a limiting reactant on amount of product produced (HT).
- ✓ Determine the limiting reactant in a reaction (HT).
- ✓ Make estimations of uncertainty of results.
- ✓ Use the range of a set of measurements about the mean as a measure of uncertainty.
- ✓ Can give the unit and symbol for what chemical amounts are measured in (HT).
- ✓ State what a mole is in terms of relative formula mass.
- ✓ Explain what one mole of different substances contain in terms of particles (HT).
- ✓ Explain what Avogadro's constant is (HT).
- ✓ Understand the measurement of amounts in moles can apply to atoms, molecules, ions, electrons, formulae and equations (HT).
- ✓ Explain what a limiting reactant is (HT).
- ✓ Use the relative formula mass of a substance to calculate the number of moles in a given mass of that substance (HT).
- ✓ Use the number of moles of a substance to calculate the relative formula mass in a given mass of that substance (HT).
- ✓ Calculate the mass of reactants and products from balanced symbol equations.
- ✓ Interpret chemical equations in terms of moles (HT)
- ✓ Calculate masses of reactants and products from the balanced symbol equation and the mass of a given reactant or product (HT).
- ✓ Calculate balancing numbers in a symbol equation by converting masses of reactants and products from amounts in moles to whole number ratios (HT).
- ✓ Balance an equation given masses of reactants and products.
- ✓ Covert a volume from cm3 to dm3.
- ✓ Calculate the mass of solute in a solution from a given volume and concentration.
- ✓ Calculate the concentration of solution from a given mass and volume.
- ✓ Explain how mass of a solute and volume of a solution is related to solution concentration (HT).

Prior Learning (Context)

KS3: Science Programmes of Study

- ➢ The particulate nature of matter (page 8)
- ➢ Atoms, elements and compounds (page 8)
- ➢ The Periodic Table (Page 9)

Future Learning (Context)

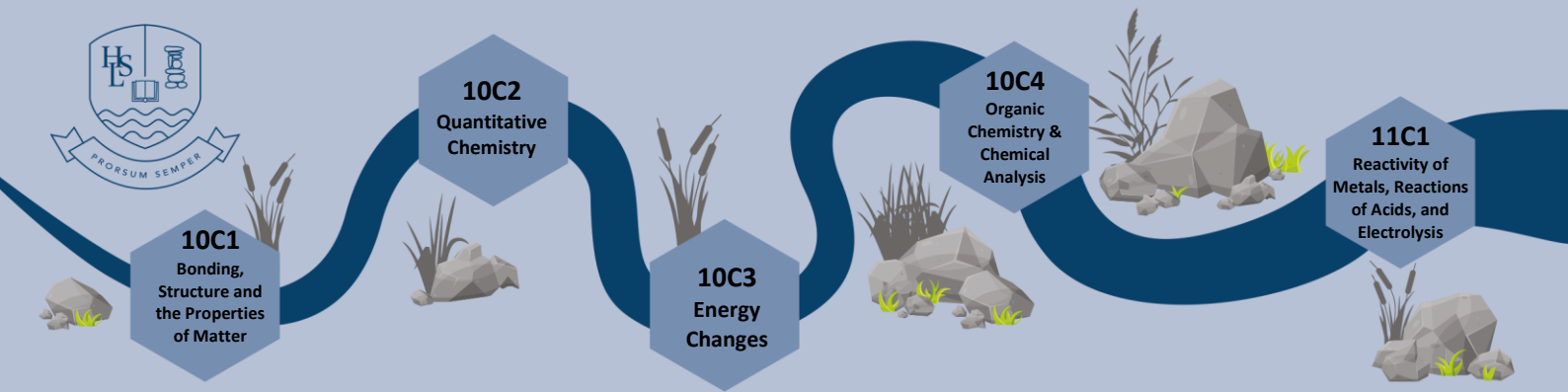
KS4: Science Programmes of Study

- ➢ Chemical changes (page 12)
- ➢ Rate and extent of chemical change (page 13)

National Curriculum Links (Context)

KS4: Science Programmes of Study

- ➢ Working scientifically (pages 5,6)



Science	Year 10	Autumn Term

10C2 Quantitative Chemistry

RRSA Links

ARTICLE 6 – Right to Life, Survival and Development ARTICLE 24: Health, Water, Food, Environment.
ARTICLE 17 – Access to Information ARTICLE 29: Goals of education.

British Values Links

INDIVIDUAL LIBERTY: Students explore different approaches to chemical problems. Make informed decisions about careers, sustainability, and personal health based on evidence.
RULE OF LAW: Exploring the legal restrictions on Chemical industries who must follow strict legal regulations to ensure public safety (e.g. handling hazardous substances).
DEMOCRACY: In a democracy, citizens need scientific literacy to make informed decisions on issues like; Environmental policy or Sustainable industry.
TOLERANCE OF DIFFERENT FAITHS AND BELIEFS: Some chemical applications (e.g. use of substances in food, cosmetics, medicine) may intersect with religious or cultural beliefs.

Eco-Schools Links

Waste - Students learn about **limiting and excess reactants**. These concepts promote **more efficient use of chemicals**, reducing waste in industrial processes. Helps students understand why industry must **minimise by-products** to avoid pollution.

Global Citizenship - Discussing **ethical sourcing and sustainability of materials** (e.g. mining for metals used in alloys) helps students understand global supply chains and their environmental impact.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10C2 Standard Homework 1, 2 with Feedback lesson
- 10C2 Topic Test with Revision and Feedback lessons

Reading / Enrichment

What's Chemistry All About?
Alex Frith
Discover the Amazing Effect Chemistry Has on Every Part of Our Lives
Ann Newmark
Chemistry DeMYSTiFieD
Linda D. Williams
Recommended Reading List.

Key Vocabulary (Literacy)

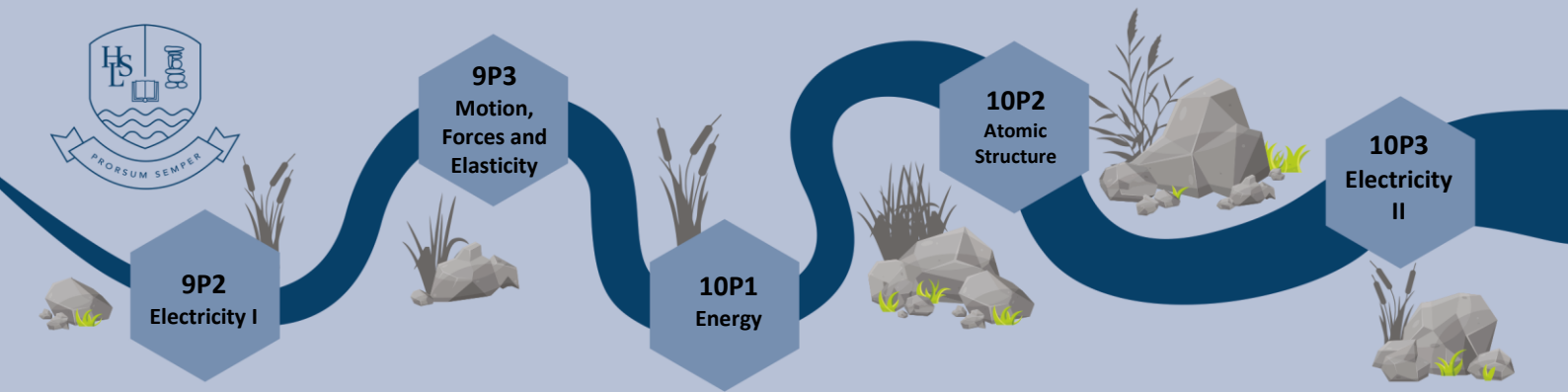
Conservation of mass, relative formula mass, molecular mass, moles, Avogadro constant, molar mass, balanced equation, limiting reactant, excess reactant, concentration, volume, mass, percentage yield, theoretical yield, actual yield, atom economy.
Complete topic glossary provided.

Numeracy Opportunities

Arithmetic and numerical computation, use of ratios, use of fractions, use of percentages, rearranging equations, substitution into equations, significant figures, standard form, interpreting data, unit conversions, scaling, estimation, proportional reasoning, using units consistently, calculating with moles, interpreting balanced chemical equations, calculating concentrations.

Career Links

Chemical engineer, analytical chemist, industrial chemist, environmental scientist, pharmacist, pharmacologist, toxicologist, forensic scientist, materials scientist, laboratory technician, water quality scientist, food technologist, quality control analyst, waste management specialist, health and safety officer, biochemist, cosmetic scientist, energy consultant.



Science	Year 10	Autumn Term

10P1 Physics Topic 1 – Energy

Topic Outline & Aims (Intent)

1. How can work done be calculated?
2. How can gravitational potential energy be calculated?
3. What is kinetic energy?
4. What is elastic potential energy?
5. How do describe energy stores in systems?
6. How is energy transferred between stores?
7. How does power relate to energy?
8. How does energy get wasted?
9. How do we calculate energy efficiency?
10. How do we describe energy transfers?
11. Revision and review.

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Experiment and calculate values for work done, gravitational potential energy, kinetic energy and elastic potential energy.
- ✓ Manipulate (transform) equations.
- ✓ Describe energy transfers in systems.
- ✓ Describe examples of energy dissipation.
- ✓ Calculate efficiency.
- ✓ Calculate physical values using a range of values and units.

Prior Learning (Context)

KS3: Science Programmes of Study

- Energy (page 9)
- Energy changes and transfers (page 10)
- Changes in systems (page 10)
- Forces (page 10)

Future Learning (Context)

KS4: Science Programmes of Study

- Energy (page 14)

National Curriculum Links (Context)

KS3: Science Programmes of Study

- Energy (page 9)
- Energy changes and transfers (page 10)
- Changes in systems (page 10)
- Forces (page 10)

KS4: Science Programmes of Study

- Energy (page 14)

RRSA Links

ARTICLE 1: Definition of the child.
ARTICLE 6: Life, survival and development.
ARTICLE 12: Respect for the views of the child.
ARTICLE 13: Freedom of expression.
ARTICLE 24: Health, Water, Food, Environment
ARTICLE 28: Right to education.
ARTICLE 29: Goals of education.

British Values Links

MUTUAL RESPECT: Working together with tolerance and mutual understanding, treating each other with respect.
THE RULE OF LAW: Understanding and following lab rules and the laws of nature.
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Eco-Schools Links

Energy efficiency in transfers and systems.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10P1 Standard Homework 1 and 2 with Feedback lesson
- 10P1 Topic Test with Revision and Feedback lessons

Reading / Enrichment

City of Ember – Jeanne DuPrau
Tesla's Attic (Accelerati Trilogy) – Neal Shusterman & Eric Elfman
Powering the Future – Robert B. Laughlin

Recommended Reading List.

Key Vocabulary (Literacy)

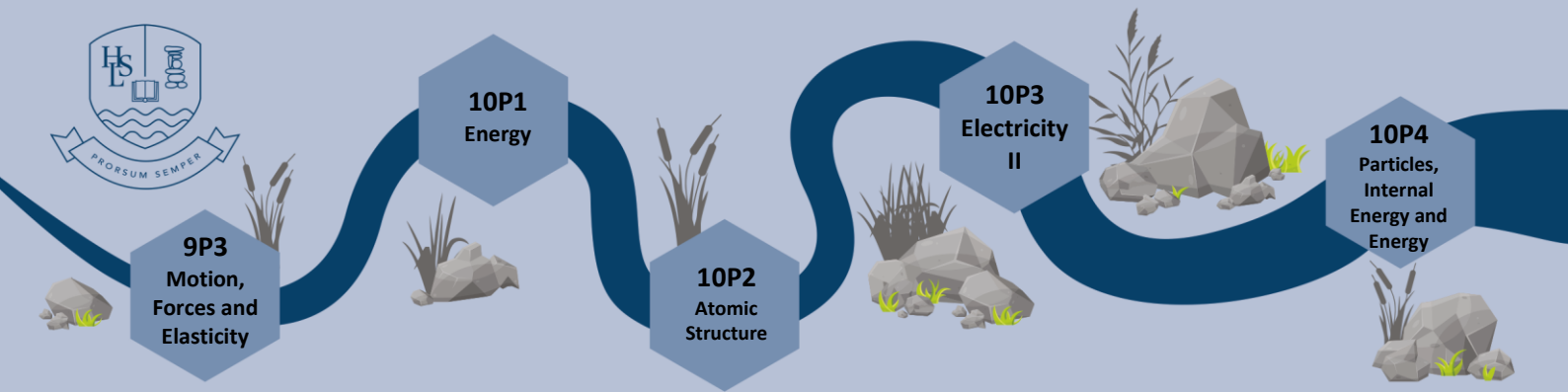
Energy; joules (J); magnetic store; internal (thermal) store; chemical store; kinetic store; electrostatic store; elastic potential store; gravitational potential store; nuclear store; system; energy transfer; mechanical work; electrical work; heat flow; radiation; conduction; thermal conductivity; convection; potential difference; emit; work done.
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Comparing size; Converting units;
Using and rearranging equations;
Calculating averages, resultant forces and percentages;
Rounding results;
Drawing and analysing accurate scientific diagrams, results tables, and scatter graphs.

Career Links

Electric Vehicle Designer; Aerospace Engineer; Robotics Engineer; Architect (Sustainable Design); Sound / Lighting Engineer; Renewable Energy Engineer; Energy Analyst; Sustainability Consultant; Battery Technologist; Smart Grid Specialist; Mechanical Engineer; Nuclear Engineer; Energy Systems Engineer.



Science	Year 10	Autumn Term

10P2 Physics Topic 2 – Atomic Structure

Topic Outline & Aims (Intent)

1. How has the model of the atom changed?
2. What is the current model of an atom?
3. Where does nuclear radiation come from?
4. What types of nuclear radiation are there?
5. Do radioactive materials stay radioactive forever?
6. What are the uses and dangers of radiation?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Recall which scientist developed each model. Describe each model. Explain evidence leading to new models.
- ✓ Recall relative sizes and charges of basic subatomic particles. Understand what mass and atomic number mean and how these numbers are found on atomic notation. Describe what happens when the numbers of electron and/or neutrons in an atom change.
- ✓ Describe the characteristics of different nuclear decays. Write nuclear equations to describe nuclear decay.
- ✓ Recall what each nuclear radiation type consists of. Describe the penetrating power and ionizing power of each nuclear radiation.
- ✓ Describe 'activity', 'count rate' and 'half-life'. Determine the half-life of a radioactive isotope from given data.
- ✓ Describe irradiation, its uses and dangers.

Prior Learning (Context)

KS3: Science Programmes of Study

- Atoms, elements and compounds (page 8)
- Particle model (page 13)

Future Learning (Context)

KS4: Science Programmes of Study

- Atomic structure and the Periodic Table (page 11-12)
- Wave motion (page 15)
- Atomic Structure (page 16)

National Curriculum Links (Context)

KS3: Science Programmes of Study

- Atoms, elements and compounds (page 8)
- Particle model (page 13)

KS4: Science Programmes of Study

- Atomic structure and the Periodic Table (page 11-12)
- Wave motion (page 15)
- Atomic Structure (page 16)

RRSA Links

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ARTICLE 12: Respect for the views of the child.
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ARTICLE 29: Goals of education.

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Eco-Schools Links

Waste – dealing with radioactive materials.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10P2 Standard Homework 1 and 2 with Feedback lesson
- 10P2 Topic Test with Revision and Feedback lessons

Reading / Enrichment

A Short History of Nearly Everything – Bill Bryson
The Particle Zoo – Gavin Hesketh
The Making of the Atomic Bomb – Richard Rhodes
Big Bang: The Origin of the Universe – Simon Singh
On the Beach – Nevil Shute

Recommended Reading List.

Key Vocabulary (Literacy)

Ionising Radiation; Isotope; Radioactive Decay; Half-Life; Contamination; Irradiation; Background Radiation; Nuclear Fission; Nuclear Fusion.

Chain Reaction

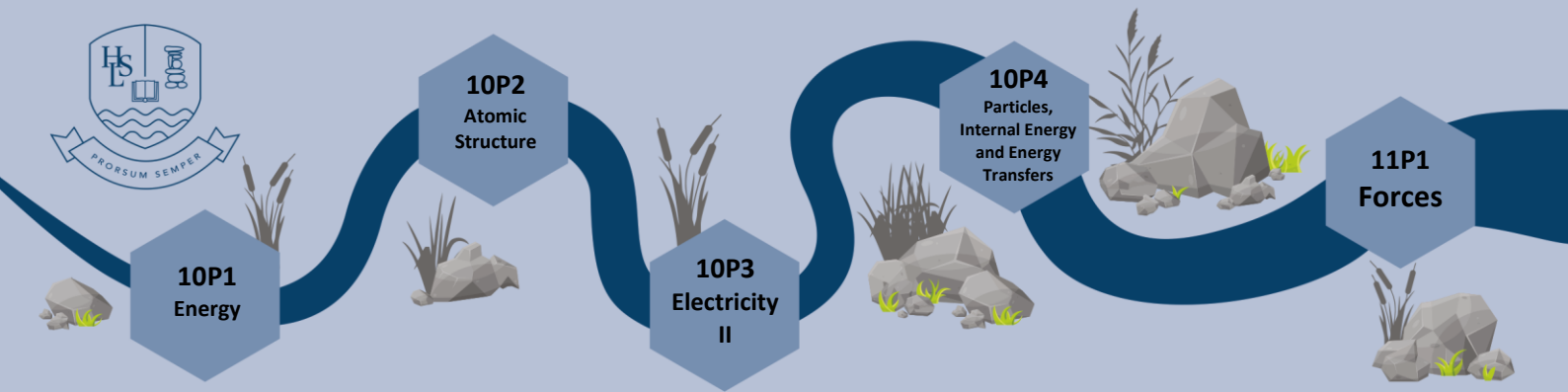
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Comparing size; Converting units; Using and rearranging equations; Calculating averages; Rounding results; Drawing and analysing accurate scientific diagrams, results tables, and scatter graphs.

Career Links

Materials Scientist; Archaeological Scientist; Astrophysicist / Cosmologist; Forensic Scientist; Nuclear Engineer; Nuclear Power Plant Operator; Fusion Scientist; Radiation Protection Specialist; Radiographer; Radiation Therapist; Nuclear Medicine Technologist; Health Physicist; Medical Physicist; Radiochemist.



Science	Year 10	Spring Term

10P3 Physics Topic 3 – Electricity II

Topic Outline & Aims (Intent)

1. How do resistors affect a circuit?
2. How do we investigate resistance?
3. What do I-V characteristics tell us?
4. How do we use thermistors in sensing circuits?
5. How do we use LDRs in sensing circuits?
6. How does a plug work?
7. What is the role of the National Grid?
8. Why are transformers important to the National Grid?
9. How can we use electricity equations?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Use electrical circuit symbols, draw and make simple circuits.
- ✓ Describe resistance, explain how resistors behave when placed in series and in parallel.
- ✓ Use a thermistor in a circuit to detect changes in temperature.
- ✓ Use an LDR in a circuit to detect changes in light intensity.
- ✓ Explain the role of the National Grid.
- ✓ Use and transform equations relating to electricity.

Prior Learning (Context)

KS3: Science Programmes of Study

- Current electricity (page 12)

Future Learning (Context)

KS4: Science Programmes of Study

- Electricity (page 15 and 16)

National Curriculum Links (Context)

KS3: Science Programmes of Study

Current electricity (page 12)

KS4: Science Programmes of Study

- Electricity (pages 15 and 16)

RRSA Links

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ARTICLE 24: Health, Water, Food, Environment ARTICLE 28: Right to education.
ARTICLE 29: Goals of education.

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Eco-Schools Links

Consider how electrical usage is controlled and energy wasted through heating. Generating electricity efficiently.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10P3 Standard Homework 1 and 2 with Feedback lesson
- 10P3 Topic Test with Revision and Feedback lessons

Reading / Enrichment

Electricity & Circuits - Greg Hughes
Mad About Physics: Brainteasers, Paradoxes, and Curiosities - Christopher Jargodzki & Franklin Potter
Nikola Tesla: Imagination and the Man That Invented the 20th Century - Sean Patrick
Recommended Reading List.

Key Vocabulary (Literacy)

Charge; Coulomb; Ammeter; Voltmeter; Current; Ampere; Potential difference; Volt; Resistance; Ohm; Ohmic; Watts; Resistor; thermistor; Light-dependent resistor
.

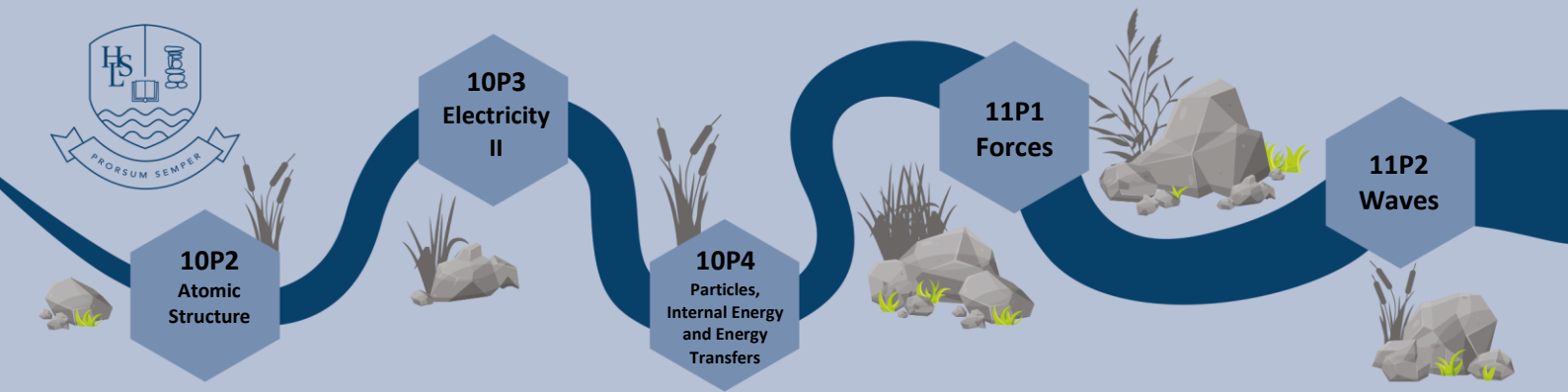
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Comparing size; Converting units;
Using and rearranging equations;
Calculating averages, resultant forces and percentages;
Rounding results;
Drawing and analysing accurate scientific diagrams, results tables, and scatter graphs.

Career Links

Electrician; Electrical Technician; Railway Technician; Telecommunications Engineer; Medical Physicist; Electrical Engineer; Electronics Engineer; Power Systems Engineer; Renewable Energy Engineer; Automotive Electrician; Civil / Building Services Engineer; Materials Scientist



Science	Year 10	Summer Term

10P4 Physics Topic 4 – Particles, Internal Energy and Energy Transfers

Topic Outline & Aims (Intent)

1. How can we calculate the density of regular objects?
2. How can we calculate the density of irregular objects?
3. What do heating curves tell us?
4. What does specific heat capacity tell us?
5. How do we measure specific heat capacity?
6. How do we measure specific latent heat?
7. What happens as a substance cools?
8. What happens as a substance cools?
9. What affects the internal energy?
10. How does gas exert a pressure?
11. How can one bike tyre feel soft and another feel hard?
12. Revision and review.

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Define density. Calculate density for different materials. Describe how different density fluids will interact.
- ✓ Identify that a Eureka can be used to measure the volume of irregular objects. Describe how to determine the density of irregular objects.
- ✓ Identify the changes of state on a heating curve.Describe that the internal energy and the temperature of a substance increases with time on a heating curve. Explain no change of temperature during a change of state.
- ✓ State the definition of Specific Heat Capacity (SHC). Calculate specific heat capacity. Rearrange the SHC equation to calculate mass, temperature, and SHC.
- ✓ Experimentally calculate the specific heat capacity of different metal blocks.
- ✓ Recall the definition of specific latent heat of vaporisation and state the equation. Experimentally calculate the specific latent heat of vaporisation for a substance evaporating and condensing. Rearrange the equation for the specific latent heat of vaporisation to calculate energy or mass.
- ✓ Identify the changes of state on a cooling curve graph. Describe how the temperature and the internal energy of the substance on a cooling curve changes.
- ✓ State the equation for the specific latent heat of fusion. Calculate the specific latent heat of fusion for a substance melting and freezing. Rearrange the equation for the specific latent heat of fusion to calculate energy or mass.
- ✓ State that internal energy is the total kinetic energy and potential energy of all the particles that make up a system. Describe the motion of particles inside a solid, liquid and gas. Explain how heating changes the energy stored within the system by increasing the energy of the particles in the system.
- ✓ Describe how the pressure of a gas increases as the temperature increases for a fixed (constant) volume. Explain why the pressure of a gas increases as the temperature increases. Explain how the motion of the molecules in a gas is related to both its temperature and its pressure.
- ✓ State which two variables affect pressure. Describe how these variables affect the pressure. Explain why these variables affect the pressure.

Prior Learning (Context)

KS3: Science Programmes of Study

- The particulate nature of matter (page 8)
- Energetics (page 8)
- Energy changes and transfers (page 10)
- Changes in systems (page 10)
- Particle model (page 13)
- Energy in matter (page 13)

Future Learning (Context)

KS4: Science Programmes of Study

- Structure, bonding and the properties of matter (page 12)
- Energy changes in chemistry (page 12)
- Energy (page 14)
- The structure of matter (page 16)

National Curriculum Links (Context)

KS3: Science Programmes of Study

- The particulate nature of matter (page 8)
- Energetics (page 8)
- Energy changes and transfers (page 10)
- Changes in systems (page 10)
- Particle model (page 13)
- Energy in matter (page 13)
- KS4: Science Programmes of Study
- Structure, bonding and the properties of matter (page 12)
- Energy changes in chemistry (page 12)
- Energy (page 14)
- The structure of matter (page 16)

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Eco-Schools Links

Waste – dealing with radioactive materials.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 10P4 Standard Homework 1 and 2 with Feedback lesson
- 10P4 Topic Test with Revision and Feedback lessons.

Reading / Enrichment

A Short History of Nearly Everything – Bill Bryson
Seven Brief Lessons on Physics – Carlo Rovelli
Recommended Reading List.

Key Vocabulary (Literacy)

particle theory; internal energy; temperature; conservation of energy; system; specific heat capacity; thermal energy; specific latent heat; gas pressure.
Complete topic glossary provided.

Numeracy Opportunities

Making measurements; Converting units; Using and rearranging equations.

Career Links

Materials Scientist; Nanotechnologist; Energy Systems Engineer; Medical Physicist; Robotics Engineer.