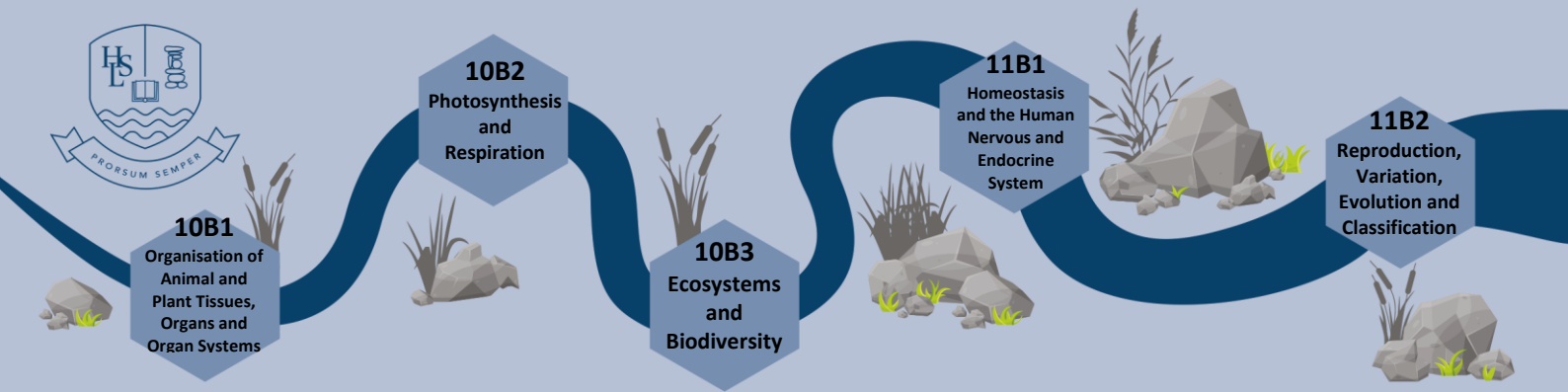


Science	Year 11	Autumn Term

10B1 Biology Topic 1 – Homeostasis

Topic Outline & Aims (Intent)

1. **Nervous System:** What structures make up the nervous system?
2. **Reflex Arc:** How does the reflex arc protect us?
3. **Reactions:** How can we investigate reaction time?
4. **Homeostasis:** How does the human body maintain a stable environment?
5. **Endocrine System:** Where are hormones produced and released from?
6. **Blood Glucose Levels:** How are blood glucose levels controlled?
7. **Diabetes:** What is diabetes and how is it treated?
8. **Puberty & The Menstrual Cycle:** What hormones are involved in managing the menstrual cycle?
9. **Contraception:** How can pregnancy be prevented?
10. **Fertility Treatments:** How can fertility be increased?
11. **Negative Feedback:** How is the fight or flight response coordinated?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Describe the function of the nervous system in humans
- ✓ Describe how information is passed through the nervous system
- ✓ Explain how the structure of the nervous system is adapted to its functions
- ✓ Explain how structures in a reflex arc relate to their functions
- ✓ Explain the importance of reflex actions.
- ✓ **Required Practical 6:** Describe a method to investigate the effect of a factor on human reaction time
- ✓ Extract and interpret data about the functioning of the nervous system from graphs, charts and tables
- ✓ Translate information about reaction times between numerical and graphical forms
- ✓ Give a definition of the term homeostasis
- ✓ Explain why homeostasis is important for the body
- ✓ Give examples of conditions in the body that are automatically controlled by nervous or chemical responses
- ✓ Describe the role of receptors, coordination centres and effectors in automatic control system
- ✓ Name and identify the main glands that make up the human endocrine system
- ✓ Describe the function of the human endocrine system
- ✓ Describe how hormones are transported to a target organ
- ✓ Compare the effects of the endocrine system to the effects of the nervous system in terms of speed and length of action
- ✓ Describe the function of the pituitary gland
- ✓ Name the gland that monitors and controls blood glucose concentration
- ✓ Explain the changes that take place in the body if the blood glucose concentration is too high
- ✓ Compare the causes of Type 1 and Type 2 diabetes and explain how they can be treated
- ✓ Extract information and interpret data from graphs that show the effect of insulin on blood glucose levels in both people with diabetes and without
- ✓ Describe the role of male and female reproductive hormones in puberty
- ✓ Describe the main stages of the menstrual cycle
- ✓ Name the hormones involved in the menstrual cycle, and describe their roles
- ✓ Give examples of hormone and non-hormonal contraception and evaluate them
- ✓ **Explain the changes that take place in the body if blood glucose concentration is too low**
- ✓ **Explain how glucagon interacts with insulin in a negative feedback cycle to control blood glucose levels in the body**
- ✓ **Explain the interactions of female reproductive hormones**
- ✓ **Explain the use of hormones in modern reproductive technologies to treat infertility**
- ✓ **Describe the main steps in the process of IVF**
- ✓ **Explain how the development of microscopy techniques has enabled IVF treatments to develop**
- ✓ **Name the glands that produce thyroxine and adrenaline, and describe their role.**

Prior Learning (Context)

KS3: Science Programmes of Study

- ➢ Cells and Organisation
- ➢ Coordination and response
- ➢ Chemical control in organisms
- ➢ Interactions and systems

Future Learning (Context)

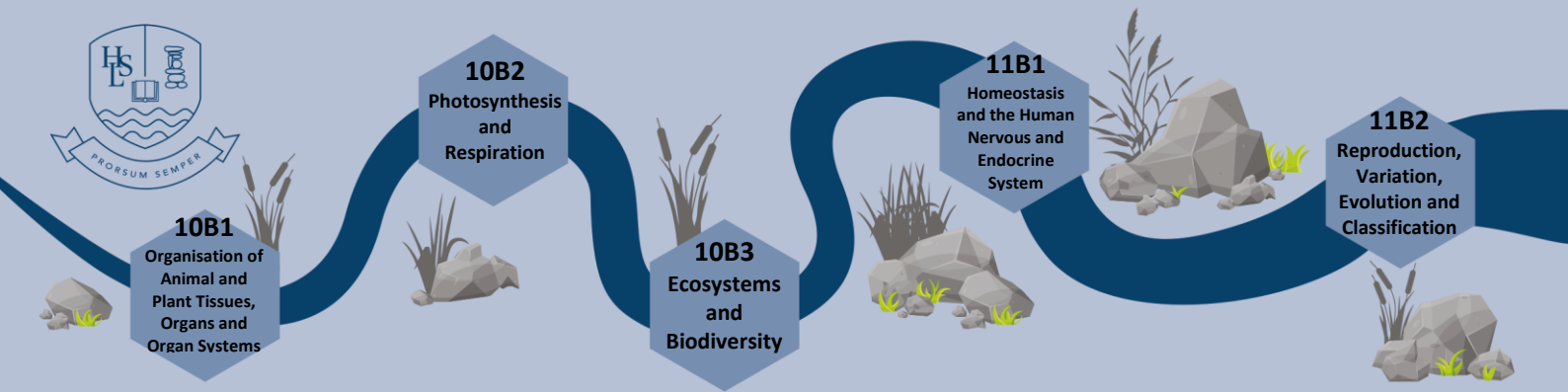
AQA A-Level Specification

- ➢ Organisms respond to changes in their internal and external environment

National Curriculum Links (Context)

KS4: Science Programmes of Study

- ➢ Nervous coordination and control
- ➢ Structure and function of human nervous system
- ➢ Reflex arc



Science	Year 11	Autumn Term

11B1 Biology Topic 1 – Homeostasis

RRSA Links

ARTICLE 12: Right to be heard. ARTICLE 24: Health, Water, Food, Environment.
ARTICLE 28: Right to education. ARTICLE 29: Goals of education.

British Values Links

INDIVIDUAL LIBERTY: Choice over lifestyle factors that impact homeostasis (diet, exercise, drug use)
RULE OF LAW: How laws regulate the use of medical technology (IVF, hormone treatments)
DEMOCRACY: How laws regulate the use of medical technology (IVF, hormone treatments)
TOLERANCE OF DIFFERENT FAITHS AND BELIEFS: Respecting cultural/religious views about fertility treatment or hormone use

Eco-Schools Links

HEALTHY LIVING: Impact of processed vs fresh foods on blood glucose regulation.
SUSTAINABLE LIFESTYLES: Promoting active travel as both healthy and eco-friendly

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 11B1 Standard Homework 1 and 2 with Feedback lesson

Reading / Enrichment

Me and My Hormones – May Ng
The Biology Book: Big Ideas Simply Explained – DK
The Idiot Brain – Dean Burnett

Recommended Reading List.

Key Vocabulary (Literacy)

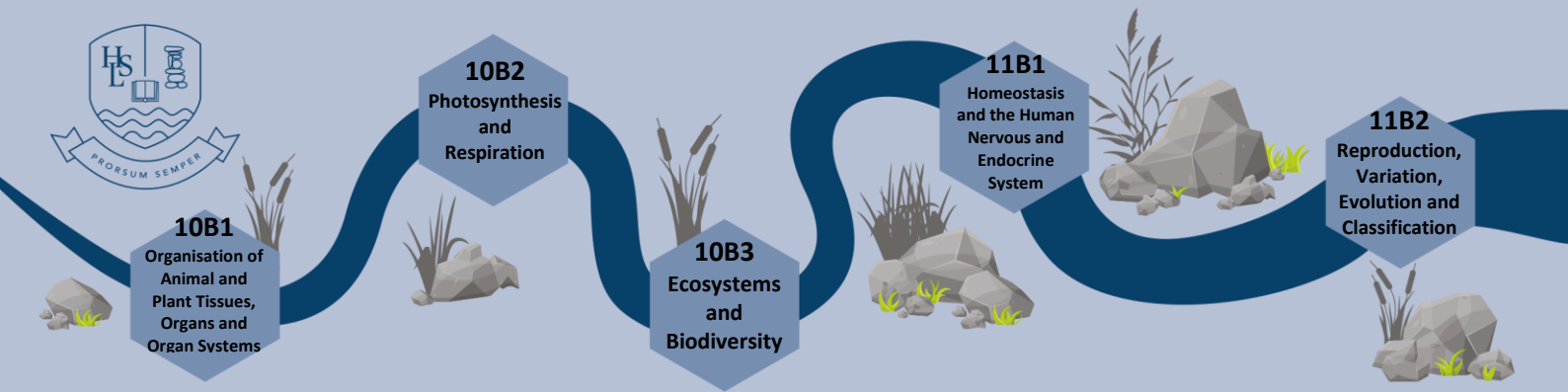
Neuron, synapse, neurotransmitter, stimulus, receptor, effector, reflex arc, gland, hormone, insulin, adrenaline, thyroxine, oestrogen, testosterone, negative feedback, thermoregulation, osmoregulation, blood glucose, metablism

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

Endocrinologist, neurologist, diabetes specialist nurse, dietitian, biomedical scientist, neuroscientist, pharmacologist, genetic engineer, sports scientist, physiotherapist, occupational therapist



Science	Year 11	Spring Term

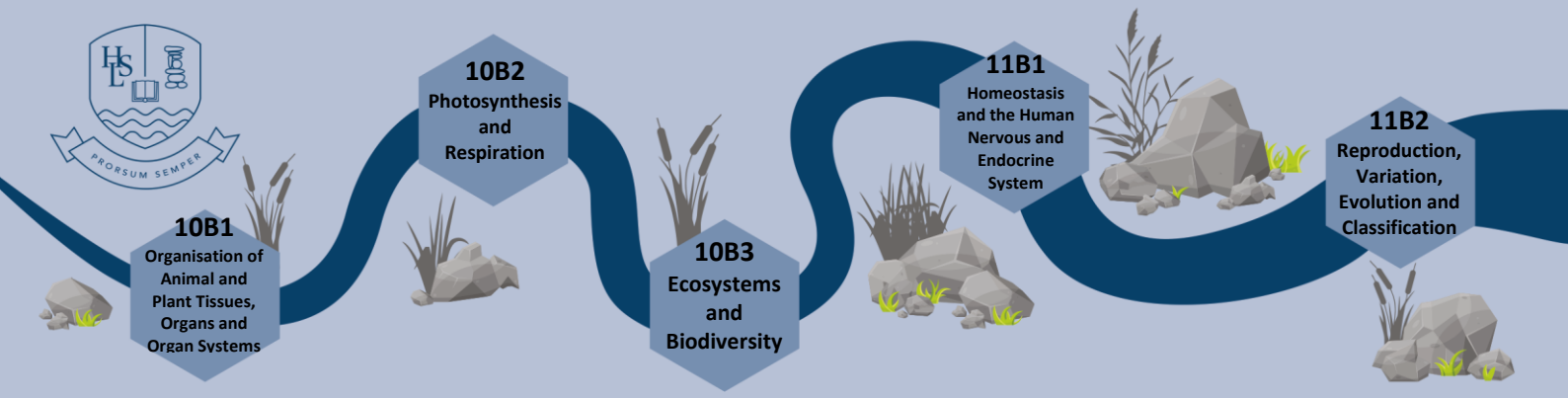
11B2 Biology Topic 2 – Reproduction, Variation, Evolution and Classification

Topic Outline & Aims (Intent)

1. Classification of Living Things: How are organisms classified?
2. Sexual and Asexual Reproduction: How can organisms reproduce?
3. DNA and the Genome: What is the importance of DNA?
4. Meiosis: How do humans reproduce?
5. Genetic Inheritance and Genetic Crosses: How are characteristics inherited?
6. Sex Determination and Family Trees: What determines sex?
7. Inherited Disorders: How are genetic disorders inherited?
8. Embryo Screening: Why screen embryos?
9. Variation: How can organisms differ?
10. Natural Selection: How can species evolve naturally?
11. Selective Breeding: How can species evolve artificially?
12. Genetic Engineering I: What is genetic engineering?
13. Genetic engineering II: Should genetic engineering be allowed?
14. Evidence for Evolution I: How do fossil show evidence of evolution?
15. Evidence for Evolution II: How do resistant bacteria show evidence of evolution?
16. Extinction: How can we protect species?

Key Skills and Knowledge taught through this topic (Intent)

- ✓ Describe the system of classification Linnaeus developed; Explain what the binomial system is; Explain how developments in biology led to new systems of classification; Describe the three-domain system of classification.
- ✓ Describe what sexual reproduction involves in animals and flowering plants in terms of gametes; Describe why sexual reproduction leads to offspring variety; State what type of cell division formation of gametes involves; Describe why asexual reproduction leads to identical offspring; State what cell division type the asexual reproduction involves
- ✓ Discuss the importance of understanding the human genome; Explain how understanding the human genome is important in searching for genes linked to different diseases; Explain how understanding the human genome is important in understanding and treating inherited disorders; Explain how understanding the human genome is important in tracing past human migration patterns.
- ✓ Explain what a gamete is; Explain what a chromosome is; Explain what a gene is; Explain what an allele is; Explain what a dominant allele is; Explain what a recessive allele is; Explain what homozygous means; Explain what heterozygous means; Explain what a genotype is; Explain what a phenotype is.
- ✓ Understand the concept of probability in predicting the results of a single gene cross; State that most phenotype features are the result of multiple genes rather than single gene inheritance; Use direct proportion & simple ratios to express outcome of a genetic cross; Complete a Punnett square diagram; Extract and interpret information from genetic crosses and family trees; Construct a genetic cross by Punnett square diagram; Use this genetic cross to make predictions using the theory of probability.
- ✓ State what polydactyly is and how it is caused; State what cystic fibrosis is and how it is caused.
- ✓ Make informed judgements about economic, social and ethical issues concerning embryo screening
- ✓ State the number of chromosomes in a human body cell; State what 22 pairs do and what the other pair does; State the female and male sex chromosomes; Carry out a genetic cross to show sex inheritance.
- ✓ State what variation is; State what differences in characteristics of individuals in a population may be due to; State that there is usually extensive genetic variation within a population of a species; Recall that all variants arise from mutations and how amounts of mutation affect the phenotype; Describe how mutations can lead to a relatively rapid change in a species.
- ✓ State the theory of evolution by natural selection; Explain how evolution occurs through natural selection; Describe how two new species can be formed from one species.
- ✓ Explain impact of selective breeding of food plants and domesticated animals; Explain what selective breeding is and when and what humans first selectively bred; Explain how selective breeding produces desired characteristics; Describe what desired characteristics are chosen for; Describe what inbreeding is.
- ✓ Describe how genetic engineering produces a desired characteristic; State how plant crops have been genetically engineered; State how bacterial cells have been genetically engineered; Explain potential benefits and risks of genetic engineering in agriculture and medicine; Explain some people have objections to genetic engineering; Describe the process of "cutting out" genes in genetic engineering; Describe what GM crops are; Describe the features of GM crops; Describe the concerns about GM crops; State why modern medical research is exploring genetic modification; Describe the main steps in the process of genetic engineering.
- ✓ Describe the evidence for evolution; Describe what a fossil is; Describe the three ways fossils may be formed; Describe why many early forms of life have not left fossil evidence; Describe why scientists cannot be certain how life began on Earth; Describe what we can learn from fossils about life on Earth; Extract and interpret information from charts, graphs and tables e.g. evolutionary trees; Describe factors which may contribute to a specie's extinction.
- ✓ State why bacteria can evolve rapidly; State how new strains of bacterial pathogens are produced: Explain why a resistant bacterial strain can spread: State a bacteria that is resistant to antibiotics; Describe what can be done to reduce the rate of development of antibiotic resistant strains; Explain why we are unlikely to keep up with emergence of new resistant strains.



Science	Year 11	Spring Term

11B2 Biology Topic 2 – Reproduction, Variation, Evolution and Classification

Prior Learning (Context)

KS3: Science Programmes of Study

- Cells and organisation (page 5)
- Reproduction (page 6)
- Inheritance, chromosomes, DNA and genes (page 7)

KS4: Science Programmes of Study

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

Future Learning (Context)

KS5: A-Level Biology

- AQA A-Level Biology
- Edexcel Salters-Nuffield Biology A
- Edexcel Biology B
- OCR A Biology
- OCR B Biology
- Eduqas A-Level Biology

National Curriculum Links (Context)

KS4: Science Programmes of Study

- Health, disease and the development of medicines (page 8)
- Coordination and control (pages 8-9)
- Evolution, inheritance and variation (pages 9-10)

RRSA Links

ARTICLE 6: Life, survival and development.
ARTICLE 12: Respect for the views of the child.
ARTICLE 13: Freedom of expression.
ARTICLE 31: Leisure, play and culture
ARTICLE 24: Health and health services.
ARTICLE 23: Children with a disability.
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.
GLOBAL CITIZENSHIP: Taking an active role in your community and making our planet more peaceful, sustainable and fair.
LITTER: Reducing litter, which harms wildlife and costs millions to clear every year.
MARINE: Protecting and conserving water-based ecosystems.
WASTE: Refusing, reducing, reusing, repairing, recycling.

Assessment of Learning (Impact)

- Individual questioning, lesson and homework activities
- Classwork in student folders with Review lesson
- Practical activities carried out throughout topic
- 11B2 Standard Homework 1 and 2 with Feedback lesson
- Mock Biology Paper 2 Exam in March.

Reading / Enrichment

A Brief History of Everyone Who Ever Lived: The Stories in Our Genes – Adam Rutherford
The Selfish Gene – Richard Dawkins
Beyond DNA: How Epigenetics is Transforming our Understanding of Evolution – Benjamin Oldroyd
Recommended Reading List.

Key Vocabulary (Literacy)

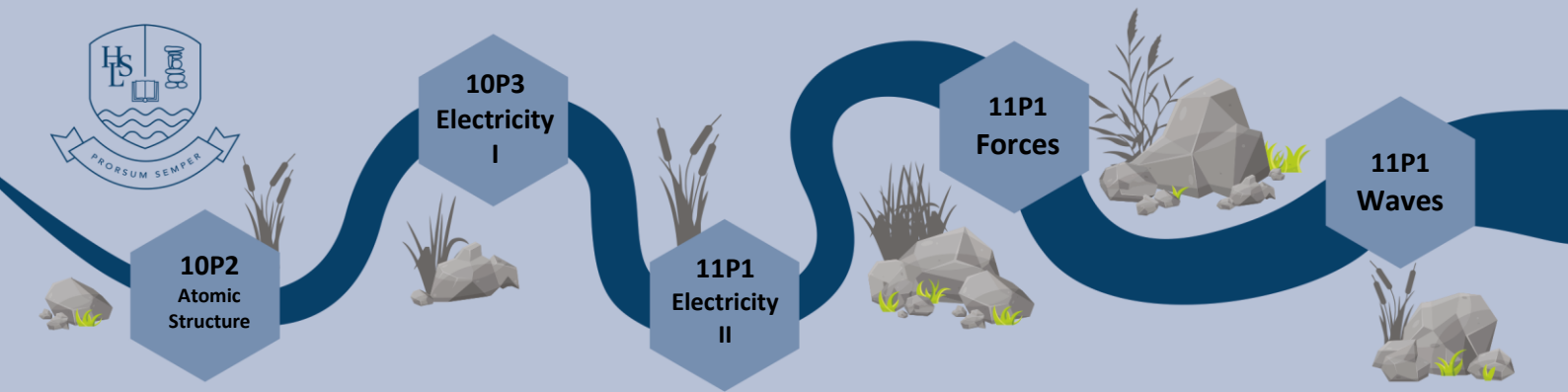
DNA; Gene; Chromosome; Allele; Genotype; Phenotype; Dominant; Recessive; Homozygous; Heterozygous; Gamete; Fertilisation; Mutation; Variation; Genetic Engineering; Selective Breeding; Evolution; Natural Selection; Extinction; Classification.
Complete topic glossary provided.

Numeracy Opportunities

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

Career Links

Geneticist; Biotechnologist; Genetic Counsellor; Evolutionary Biologist; Bioinformatician; Molecular Biologist; Embryologist; Taxonomist; Conservation Biologist; Forensic Scientist; Agricultural Scientist; Animal Breeder; Teacher; Biomedical Scientist; Zoologist; Ecologist.



Science	Year 11	Autumn Term

11P1 Physics Topic 1 – 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

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.
INDIVIDUAL LIBERTY: Thinking independently and expressing views appropriately with confidence in a safe, supporting environment.

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
- 11P1 Standard Homework 1 and 2 with Feedback lesson
- 11P1 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