

Learning Outcomes Y11 Science (4 period)

1.1 Demonstrate understanding of aspects of mechanics

Motion

1. Draw distance time graphs from data obtained in motion experiments
2. Use the slope (gradient) of distance/time graphs to describe and/or calculate the speed of an object
3. Draw speed/time graphs from given data
4. Use the slope/gradient of a speed/ time graph to describe and/or calculate the acceleration of an object
5. Calculate acceleration from speed/time data and speed/time graphs
6. Relate acceleration to everyday contexts such as journeys, sport, getting going
7. Calculate the distance covered by an object using a speed/time graph

Forces

1. Identify forces and represent them in diagrams
2. Describe the effects of balanced and unbalanced forces on the motion of an object in the context of everyday experiences such as being stationary, moving at constant speed, accelerating etc
3. Use the relationship $F = ma$ to calculate the net force, mass or acceleration of an object
4. Define the weight of an object as the force of gravity acting on it, or the acceleration due to gravity
5. Use a balance to compare mass and weight
6. Use the relationship $P = F/A$ and apply it to everyday situations

Work and Power

1. Define the concept of work
2. Use the relationship $W = Fd$ to calculate the work done on an object
3. Use the relationship $E_p = mgh$ to calculate changes in gravitational potential energy of a falling object due to height.
4. Use the relationships $W = FD$ and $E_p = mgh$ to determine amounts of energy transfer
5. Define the concept of power, and use the formula $P = W/t$ to calculate the power of a device from given data.

1.2 Investigate implications of electricity and magnetism for everyday life

1. Recognise and use symbols for the following components in circuit diagrams
Connecting wires

cells

switches

voltmeters

lamps

ammeters

resistors

batteries

2. Recognise and use symbols for the following electrical terms and units
current

voltage

volt

ampere

ohm

3. Connect circuits in series and parallel
4. Draw circuit diagrams
5. Determine by experiment using ammeters and voltmeters how current behaves in series and parallel circuits
6. Use a voltmeter and ammeter to investigate the relationship between voltage and the resulting current through a conductor
7. Calculate answers to given problems using the relationships $V = IR$, $P = IV$, and $P = E/t$ and from experimental data

This is an internal assessment

- 1 The implication of electricity and magnetism in everyday life could relate to issues involving individuals, groups of people, society in general, the environment, natural phenomena.
- 2 *Investigate* requires the student to show awareness of how science is involved in an issue that they encounter in their everyday lives. This requires at least one of:
 - the collection of primary evidence from an investigation and relating it to the scientific theory relevant to the issue
 - the collection of secondary evidence and the identification of the scientific theory relevant to the issue under investigation. The issue must involve two different views / positions / perspectives / arguments / explanations / opinions etc.

Investigate in depth requires the student to provide reasons for the way science is involved in this issue. This requires at least one of:

- the collection of primary evidence from an investigation and relating it to the scientific theory relevant to the issue in order to give an explanation of the issue being investigated
- the collection of sufficient relevant secondary evidence and the application of the identified scientific theory relevant to the issue to explain the different views / positions / perspectives / arguments / explanations / opinions etc. of the issue under investigation.

1.5 Acids and Bases Learning outcomes

Atomic structure

1. Distinguish between elements and compounds and mixtures. Describe isotopes
2. Describe the difference in structure of isotopes.
3. Accurately draw diagrams to show the relative location of protons, neutrons and electrons in an atom.
4. Draw diagrams to show electron arrangement of the 1st 20 elements.
5. Describe how ions are formed.
6. Use a table of ions to write ionic formulae.
7. Describe the attraction between ions (ionic bonding).

Rates of reaction

8. Use Collision theory to describe rates of reaction.
9. Discuss the effects of changes in concentration, surface area, temperature and use of a catalyst.

Acids and bases

10. Identify acids and bases using litmus paper and universal indicator.
11. Use the pH scale to determine if a substance is an acid or a base.
12. Describe acids as releasing hydrogen ions in water.
13. Reactions of acids with bases to form salts.
Acid + base → salt + water
Acid + carbonate → salt + carbon dioxide + water
Acid + bicarbonate → salt + carbon dioxide + water
14. Practical applications of acids and bases, in terms of neutralisation, carbon dioxide formation, salt formation.

1.7 Properties of Metals and their uses (ALP students only)

THROUGH PRACTICAL WORK STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE FOLLOWING;

Physical properties of metals

1. Describe the physical properties of metals.
2. Explain why metals are;
Good conductors of electricity and heat
Malleable and ductile
Shiny
Dense
Hardness
Melting point
Colour
3. Apply the physical properties of metals to some of their common uses.

Chemical reactions of metals.

4. Reaction of metals with oxygen.
5. Reactions of metals with water.
6. Reactions of metals with acid (HCl and H₂SO₄).
7. Apply the chemical properties of metals to some of their common uses.

1.9 Demonstrate an understanding of biological ideas relating to genetic variation

BIOLOGICAL IDEAS	STUDENT LEARNING OBJECTIVES
1. THE NATURE OF DNA AND THE CONTINUITY OF LIFE	*Describe the structure of DNA
	*Explain how DNA is inherited.
	*Describe the “chromosome model”.
	*Give a simple explanation of the link between DNA and phenotype. (How simple? How complicated? Protein Synthesis?)
	*Describe the process of meiosis in terms of chromosome “behaviour”. *Explain the difference between haploid & diploid. *Distinguish between meiosis & mitosis
2. DNA IS LINKED TO VARIATION IN PHENOTYPES	*Describe types of mutations.
	*Explain how mutations may occur
	*Identify alleles as alternatives for a given gene
	See above –
	*Recognise the random nature of events that occur during meiosis & during fertilisation.
	*Explain how these random events increase variation.
	*Describe a simple monohybrid cross. *Solve monohybrid problems. *Explain how the inheritance of sex chromosomes determines sex.
3. VARIATION IN PHENOTYPES AS ADAPTIVE FEATURES	See above
	*Explain how “favoured” adaptations may improve survival rate (Natural Selection)
	*Relate survival of species to variation and adaptation to changes in the environment
	*Compare sexual reproduction with asexual reproduction

1.11 Investigate biological ideas relating to interactions between humans and microbes

1. Draw and label a typical fungus using the terms hyphae, spores and sporangium
 2. Draw and label a typical virus and draw a diagram of the main stages of its reproductive cycle
 3. Draw and label a typical bacterium
 4. Culture bacteria and fungi by controlling factors such as moisture, temperature, pH, nutrients and oxygen available
 5. Compare and contrast feeding, reproduction and size of typical bacterium, fungi and viruses
 6. Describe and label the components of the carbon and nitrogen cycle
 7. Describe how micro-organisms are used in food production
 8. Name some harmful and useful micro-organisms
 9. Distinguish between aerobic and anaerobic respiration
- 1 *Micro-organisms* will be selected from bacteria, fungi and viruses.

This is an internal assessment Criteria to do well

Investigate means describe observations or findings, and describe how humans use or are affected by micro-organisms.

Investigate in depth means using their findings and biological ideas to give a reason how or why humans use or are affected by micro-organisms.

Comprehensively investigate means using their findings and biological ideas to make significant links about the interactions between humans and micro-organisms, including the implication of their understanding on personal actions or everyday life. It may involve elaborating, applying, justifying, relating, evaluating, comparing and contrasting, and analysing.