



SCIENCE YEAR 8

LEARNING AND ASSESSMENT PROGRAMME



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Study Units (Core Curriculum Programme)

Code	Unit Title	Subject Focus	Page
SCI CCP LOF 8.1	tbc		
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SCIENCE LEARNING AND ASSESSMENT PROGRAMME (LAP)

Learning and Assessment Programme (LAP)

The **Learning Outcomes Framework (LOF)** promotes flexibility in teaching and learning, allowing educators to address specific needs and build on students' strengths within the diverse contexts of schools and colleges. This flexibility is central to the framework, which acknowledges the impact of external factors—such as poverty and social exclusion—on learner achievement. By fostering creativity, critical thinking, entrepreneurship, and innovation, the LOF aims to enhance the learning experience and make learning more meaningful and relevant to students' lives. This, in turn, helps develop a positive attitude toward learning and a deeper appreciation of its practical value.

The **Learning and Assessment Programme (LAP)** for Science includes:

- **Learning Outcomes Framework (LOF):** A set of subject Learning Outcomes (SLOs) that describe what learners are expected to know, understand, and be able to do following a learning process. These outcomes are designed for flexible implementation across various teaching contexts and delivery methods. They focus on the intended learning results rather than prescribing how learning should occur.
- **Notes on Pedagogy and Assessment:** These provide guidance on effective teaching and assessment strategies aligned with the learning outcomes. The outcomes are structured to support informed pedagogical decisions and set clear expectations for assessment. Educators are encouraged to adapt these guidelines to suit the needs of their learners while promoting best practices.

Cross-Curricular Themes

As outlined in the *National Curriculum Framework for All (2012)*, the cross-curricular themes for the Junior and Secondary school cycles include:

- Literacy
- Digital Literacy
- Learning to Learn and Co-operative Learning
- Education for Sustainable Development
- Education for Entrepreneurship, Creativity and Innovation
- Education for Diversity

5E Instructional Model

The Science programme supports these themes through an inquiry-based, student-centred approach, where experiments and other practical activities are kept at the heart of the teaching and learning process. All this follows the scientific process, grounded in the **5E instructional model**:

- **Engage:** Spark students' interest and curiosity.
- **Explore:** Encourage observation, questioning, prediction, planning, and hands-on investigation.
- **Explain:** Guide students to interpret data and communicate findings.
- **Elaborate:** Extend understanding by connecting prior knowledge to new concepts and applying them in different contexts.
- **Evaluate:** Encourage reflection and self-assessment. Teachers assess students' strengths and areas for improvement based on their performance.

Throughout, health and safety must be prioritised during all experimental work.

SCIENCE SKILLS AND COMPETENCIES

LEARNING OUTCOMES

Scientific Inquiry and Experimental Design

1. I can ask scientific questions that can be investigated through practical work.
2. I can investigate scientific questions both independently and as part of a group.
3. I can predict the outcome of an experiment and suggest scientific explanations.
4. I can carry out a fair test with guidance from my teacher.
5. I can discuss and carry out an experiment with my group, sharing tasks and results.
6. I can plan an investigation.
7. I can identify and describe the variables in an investigation.

Practical Skills and Safety

8. I can select suitable equipment for an investigation.
9. I can use common scientific equipment safely and correctly.
10. I can make accurate measurements using appropriate instruments and units.
11. I can use digital tools for measurement and data collection purposes.
12. I can assess basic health and safety risks and follow safety rules during practical work.

Data Handling and Communication

13. I can record my observations and results in a table.
14. I can draw a scientific diagram.
15. I can present and interpret data using bar graphs and pie charts.
16. I can describe patterns or relationships between two variables in an investigation.
17. I can complete a simple scientific report, including results and conclusions.
18. I can use digital tools, including AI, to research science ethically, while citing sources.

Science in Context

19. I can recognise how different branches of science work together in everyday contexts.
20. I can relate scientific knowledge, skills and competencies to STEM careers.

KEY WORDS

question, hypothesis, prediction, fair test, investigation, independent variable, dependent variable, control variable, method, procedure, plan

equipment, apparatus, measurement, volume, mass, length, time, temperature, accuracy, safety, risk assessment, digital tools, laboratory rules

observation, table, results, diagram, graph, bar chart, pie chart, pattern, relationship, conclusion, scientific report, interpret, data analysis

branches of science, STEM, STEAM, careers, application, technology, engineering, mathematics, real-world relevance.

Subject:

Science

Year:

8

LOF Subject Focus:

Cells and Body Systems

Unit Code:

SCI LOF 8.1



Unit 8.1

HEALTHY LIVING

This unit explores the impact of healthy lifestyle choices on the human body. Students will examine the human body as a biological machine, starting with how the digestive system processes the seven key nutrients for fuel. They will also explore the mechanics of the respiratory system and the circulatory system, which act as a vital transport network delivering oxygen and nutrients via the heart and blood vessels. The unit also evaluates how harmful lifestyle choices, such as smoking and vaping, impact these systems. Finally, students will study microbes and how they are spread. They will understand the importance of immunity and learn how natural barriers, vaccines, and antibiotics defend us against disease to sustain life.

UNIT OBJECTIVES

1. introduce health in terms of physical, mental, and social well-being.
2. explain how the seven nutrient groups and the digestive system collaborate to provide the body with energy, growth, and repair.
3. interpret nutritional information on food labels to plan a balanced diet.
4. describe the mechanics of gas exchange within the respiratory system and evaluate how lifestyle choices impact lung health.
5. investigate the body's response to physical activity by observing changes in heart and breathing rates.
6. identify the components of the circulatory system and explain their function in transporting substances and responding to physical activity.
7. categorise microbes as useful or harmful and explain the mechanisms by which infectious diseases spread.
8. analyse the body's natural defences and explain the role of hygiene, vaccines, and antibiotics in preventing infection.

POINTS TO NOTE

- Safety & Risk Management:
 - Allergies: verify and manage student food allergies before any practical involving food substances.
 - Dissections: use gloves, disinfect surfaces, and check for cultural as well as religious sensitivities when choosing the source of specimens.
 - Hygiene: use a bacterial amylase solution when experimenting with digestion.
 - Energy in food experiment: It is not necessary to calculate the exact amount of energy in the food. Keep it simple by focusing only on comparing the different temperature changes.
 - The fermentation experiment works best, if yeast is either freshly bought, properly stored and not expired.
- Sensitive Topics:
 - Body Image: frame discussions around 'healthy nutrition' and 'fuelling the body' rather than weight and aesthetics to avoid triggering body image issues.
 - Substance Use: address the use of tobacco, nicotine, and cannabis by maintaining scientific objectivity (such as a focus on biological damage to cells and systems) rather than delving into moral judgement, to avoid stigmatising students who may be exposed to these substances in their home or social environments.
- Emphasize the interdependence of body systems by highlighting how glucose from the digestive system and oxygen from the breathing system are dependent on the circulatory system for transport to the cells.

COMMON MISCONCEPTIONS

Be aware that students may hold the following common misconceptions:

- ✗ the digestive system is simply used for waste disposal rather than for breaking down and absorbing nutrients;
- ✗ food goes down the stomach by gravity;
- ✗ being thin equals being healthy;
- ✗ sugar-free energy drinks give you biological energy (like food) rather than chemically stimulating the nervous system;
- ✗ respiration and breathing are interchangeable terms;
- ✗ we breathe in only oxygen and breathe out only carbon dioxide, rather than understanding that we inhale and exhale a mixture of gases;
- ✗ the heart produces blood;
- ✗ deoxygenated blood inside the veins is blue;
- ✗ vaping is harmless because it is just water vapor;
- ✗ all bacteria are harmful;
- ✗ antibiotics are effective against viruses, such as those causing the flu or common cold.

RESOURCES

Lab coats, safety goggles, human torso model, heart model, lungs model, food labels, surgical gloves, pestle and mortar, cavity tile, pipette, spatula, boiling tubes, beaker, electronic balances, distilled water, iodine solution, bacterial amylase, dialysis tubing, stethoscopes, stop watches, scalpel, freshly made lime water, straws, yeast, sugar, smoking demo kit

USEFUL DIGITAL RESOURCES

This list of digital resources was deemed valid at the time of this document's original publication. Educators are encouraged to review and evaluate the relevance and suitability of these resources before use.

Body Systems: <https://apps.microsoft.com/detail/9wzdncrd91mw?hl=en-US&gl=AS>

Healthy Plate (Malta): https://hpdp.gov.mt/sites/default/files/2023-07/healthy_eating_the_mediterranean_way_en.pdf

Healthy Plate: <https://www.foodaactoflife.org.uk/eating-well-primary/>

Nutrient Groups: <https://www.youtube.com/watch?v=Go9z06z0V5U>

Food Label: <https://www.youtube.com/watch?v=OWMSJqnYFMY>
<https://www.fda.gov/media/89314/download?attachment>
<https://www.fda.gov/media/89325/download?attachment>

Digestive System: <https://www.scootle.edu.au/ec/viewing/L1/L1/index.html#>
https://www.sciencelearn.org.nz/labelling_interactives/14-label-the-human-digestive-system

Circulatory System: <https://www.ellenjmchenry.com/homeschool-freedownloads/lifesciences-games/documents/CirculationGame.pdf>

Breathing System: <https://www.footprints-science.co.uk/index.php?type=Breathing>

Vaping: <https://www.healthykidslearnmore.com/Healthy-Kids-Learn-More/Educator-Resources/Vaping/Classroom-Activities>
<https://vimeo.com/888901017/f7d7e696eb?fl=pl&fe=cm>
<https://www.health.nsw.gov.au/tobacco/Factsheets/vaping-factsheet-young.pdf>

Spreading of Disease: <https://www.cdc.gov/digital-social-media-tools/mobile/applications/sto/web-app.html>

Microbiology: <https://www.amnh.org/explore/ology/microbiology>

Resources to support inclusion: <http://www.communication4all.co.uk/>

SUGGESTED PRACTICAL ACTIVITIES

- Tests to identify the presence of starch or reducing sugars or proteins or lipids in various samples.
- Compare the energy content of different foods by measuring temperature changes during combustion.
- Model the process of absorption by using dialysis tubing to simulate the small intestine.
- Investigate the effects of physical activity on pulse and breathing rates.
- Use lime water to compare the concentration of carbon dioxide in inhaled versus exhaled air.
- Measure lung capacity to determine the volume of air in the lungs.
- Observe a smoking machine demo to visualize the accumulation of tar and pollutants in lung tissue.
- Dissecting a heart to identify the key structures.
- Investigate conditions for yeast fermentation.
- Explore the role of microbes in food production (making dough or cheeselets).
- Visit to a bakery, dairy facility, or winery to observe the industrial application of microbiology.
- Use UV germ-tracking lotion to investigate the effectiveness of different handwashing techniques.

[Unit 8.1] HEALTHY LIVING

LEARNING OUTCOMES

Nutrition & Digestion

1. I can explain that healthy living is a mixture of physical, mental, and social well-being.
2. I can identify carbohydrates, proteins, fats, vitamins, minerals, fibre, and water as the seven basic food nutrient groups, and name some uses and sources.
3. I can describe what a balanced diet is and identify unhealthy eating habits.
4. I can analyse food labels to make informed choices when planning a balanced diet.
5. I can state that energy is measured in joules (J).
6. I can identify reasons why dietary requirements and energy intake vary with age, gender, occupation and physical activity.
7. I can carry out a food test to identify the presence of a nutrient in a food sample, including the test for starch.
8. I can carry out and describe a fair test to investigate energy content in food.
9. I can label the human digestive system and describe the function of the main parts.
10. I can describe the role of enzymes and digestive juices in digestion.

Human Breathing System

11. I can label the structure of the human breathing system.
12. I can explain the role of the rib cage, rib muscles and diaphragm during breathing.
13. I can identify tar, nicotine and carbon monoxide as the main harmful components in cigarette smoke.
14. I can evaluate the health risks associated with smoking cigarettes, using e-cigarettes (vaping) and the consumption of cannabis.

KEY WORDS

physical well-being, mental well-being, social well-being, nutrients, basic food substances, carbohydrates (starch and sugar), proteins, fats, minerals, vitamins, fibre, water, balanced diet, food label, Joules (J), calories (cal), kiloJoules (kJ), kilocalories (kcal), malnutrition, obesity, iodine, digestion, absorption, digestive system, mouth, gullet, stomach, small intestine, large intestine, rectum, anus, enzymes, digestive juices, saliva, hydrochloric acid, alkali, large food molecule, small food molecule

breathing, breathing system, gas exchange, trachea, lungs, bronchi, bronchioles, alveoli (air sacs), diaphragm, ribs, rib cage, rib muscles, inhale, exhale, tar, nicotine, carbon monoxide, cigarettes, addiction, passive smoking, e-cigarettes, vaping, cannabis

Human Circulatory System

15. I can identify the main components of the circulatory system, including the heart, blood, arteries, veins and capillaries.
16. I can name red blood cells, white blood cells, platelets and plasma as the main components of blood and describe their functions.
17. I can investigate and interpret the effects of physical activity on pulse and breathing rate.

circulatory system, heart, arteries, veins, capillaries, blood vessels, breathing rate, pulse rate, oxygen, carbon dioxide, red blood cells, white blood cells, platelets, plasma

Microbes & the Immune System

18. I can identify viruses, bacteria and some fungi as microbes.
19. I can provide examples of useful microbes, including those involved in food and medicine production and the decay of waste, as well as harmful microbes (pathogens) including those that cause food poisoning and disease.
20. I can state that pathogens can be spread, through air, water, food, direct contact, and animals, and name one disease transmitted by each method.
21. I can identify the body's natural barriers that help us prevent diseases.
22. I can define the term 'immune' as being resistant to a specific disease.
23. I can identify basic hygiene procedures, use of disinfectants and antiseptics as ways of preventing the spread of microbes.
24. I can describe the importance of vaccines (immunisation) in protecting individuals from disease and reducing the spread of disease.
25. I can identify the use of antibiotics as a treatment for bacterial diseases.

microbe, micro-organisms, pathogen, bacteria, viruses, fungi, food poisoning, diseases, decomposers, decay, infection, spread in the air, droplet infection, contaminated food, contaminated water, direct contact, sexual transmission, insect bites, animal bites, natural barriers, skin, tears, sticky mucus, stomach acid, blood clotting, antibodies, immunity, vaccination, immunisation, resistance, hygiene, covering mouth and nose, antibiotic, antiseptic, disinfectant

Note: Other LO's related to broad skills and competencies in science can be found on page 5.

Subject:
Science

Year:
8

LOF Subject Focus:
Chemical Science

Unit Code:
SCI LOF 8.2



Unit 8.2

ELEMENTS, COMPOUNDS & MIXTURES

In this unit, students will explore elements, compounds, and mixtures. They will learn what elements are and how they are organised in the periodic table, as well as investigate the properties and uses of metals and non-metals. Students will develop skills in identifying elements found in everyday materials and recognising common mixtures. Through practical activities, students will observe both physical and chemical changes, identify the signs of chemical reactions, and represent simple chemical changes using word equations. By the end of the unit, they will also be able to interpret particle diagrams.

UNIT OBJECTIVES

1. guide students to explore the nature of matter by describing elements as substances made up of one type of particle called an atom.
2. expose students to the periodic table as an organised list of elements and illustrate some examples, properties and uses.
3. engage students in understanding compounds as substances formed when two or more elements join chemically.
4. facilitate the exploration of mixtures while distinguishing them from compounds.
5. support the interpretation of particle diagrams to help students visualize the arrangement of particles in elements, compounds, and mixture
6. guide students to explore examples of physical and chemical changes and distinguish between them.
7. guide students to explore examples of some chemical reactions.
8. guide students to represent simple chemical changes as word equations.

POINTS TO NOTE

- Refer to the introductory notes about the 5E approach to science teaching and learning.
- This unit directly builds upon the foundations laid in SCI LOF 7.4 'Understanding Matter'.
- If describing elements as 'pure substances' (i.e. made up of only one type of atom), clarify to students that the scientific meaning of 'pure' differs from its everyday use, for example, in terms like 'pure orange juice', where it does not mean made of a single substance.
- With reference to LO 4, no specific characteristics are required. It is sufficient for students to understand that elements are arranged in the periodic table following an organised pattern, rather than randomly.
- Some students may find it difficult to distinguish between:
 - mixtures and compounds (difference between substances that are physically mixed versus those that are chemically bonded)
 - physical and chemical changes (use the concept of reversibility carefully - for instance, while cutting paper is a physical change, it may be perceived as irreversible by students - focus on the production of a new substance as the primary indicator of a chemical change).
- When using magnesium ribbon in chemical reactions, it may need to be scraped to remove the magnesium oxide layer so that it reacts more readily.
- Atoms and molecules: While the term 'molecule' is not included in the Learning Outcomes, teachers should be prepared to address related questions. To avoid misconceptions, it is helpful to focus on compounds as substances made of two or more different elements chemically joined. If the issue is raised, clarify that while a molecule is defined as two or more atoms strongly joined, not all compounds consist of molecules, as some are made of ions. Although these details are beyond the scope of this unit, careful use of terminology will prevent misconceptions and the need for unlearning in later years.

COMMON MISCONCEPTIONS

Be aware that students may hold the following common misconceptions:

- ✗ atoms are solid, indivisible spheres with no internal structure;
- ✗ atoms expand or shrink when substances are heated or cooled, rather than changes occurring in the spacing and movement of the particles;
- ✗ the periodic table has no particular organisation and shows all substances that exist on earth;
- ✗ elements always exist as single atoms in nature;
- ✗ chemical symbols are simply abbreviations of English element names;
- ✗ changes of state (e.g. melting, boiling) are chemical changes, rather than physical changes;
- ✗ properties of a compound must be a blend of the properties of its constituent elements;
- ✗ during chemical reactions, atoms disappear, are created, or change into different atoms instead of being rearranged.

RESOURCES

lab coats, safety glasses, heat-proof mats, Bunsen burners, tripods, wire gauzes, wooden splints, test-tubes, boiling tubes, test-tube racks, beakers, conical flasks, stirring rods, spatulas, tongs, molecular model kits, periodic table chart, elements and compounds samples, dilute H₂O₂, manganese (IV) oxide, yeast.

USEFUL DIGITAL RESOURCES

This list of digital resources was deemed valid at the time of this document's original publication. Educators are encouraged to review and evaluate the relevance and suitability of these resources before use.

Elements and the Periodic Table: <http://www.chemicalelements.com>
<https://www.khanacademy.org/science/ms-chemistry/x370bc422b7f75fc:classifying-matter/x370bc422b7f75fc:elements-and-atoms/v/elements>

Animations and Quizzes: <https://www.footprints-science.co.uk/index.php>

Elements, Compounds and Mixtures: <https://www.bbc.co.uk/bitesize/articles/zngddp3-zbdxxbk>
<https://www.twinkl.com/teaching-wiki/elements-compounds-and-mixtures>

Chemical Reactions: <https://www.khanacademy.org/science/ms-chemistry/x370bc422b7f75fc:chemical-changes/x370bc422b7f75fc:chemical-reactions/v/chemical-reactions>

Oxygen: <http://www.sciencekids.co.nz/sciencefacts/chemistry/oxygen.html>

Carbon Dioxide: https://www.youtube.com/watch?v=j5vF4_ggLv8

Resources to support inclusion: <http://www.communication4all.co.uk/>

SUGGESTED PRACTICAL ACTIVITIES

- Compare the properties of a compound with its constituent elements (reacting magnesium ribbon element with oxygen to produce magnesium oxide)
- Observing chemical reactions
- Observing a rapid chemical reaction (preparing 'elephant toothpaste')
- Observing rusting and investigating how different conditions accelerate the formation of the compound iron oxide.
- Test for Oxygen
- Exploring Mixtures - separate common mixtures, (e.g., sand and salt or iron filings and sulfur), to demonstrate that they are not chemically joined

[Unit 8.2] ELEMENTS, COMPOUNDS AND MIXTURES

LEARNING OUTCOMES

Elements & Compounds

1. I can describe an element as a substance made up of one type of particle and identify these particles as atoms.
2. I can name examples of common elements and identify their chemical symbols.
3. I can describe the periodic table as the list of all elements, organised in rows and columns according to their characteristics.
4. I can locate areas of the periodic table that include metals, and areas that include non-metals.
5. I can identify some properties and uses of metals and non-metals.
6. I can describe a compound as a substance made up of two or more different elements chemically joined together.
7. I can identify the elements present in some simple compounds such as carbon dioxide, rust, salt and water.

Mixtures

8. I can describe mixtures as a group of substances not chemically joined together.
9. I can identify some common mixtures including air, sea water and steel.
10. I can interpret diagrams of particles' arrangement in elements, compounds and mixtures.
11. I can interpret a graphical representation of the components of air and state the approximate percentages of nitrogen, oxygen and carbon dioxide in our atmosphere.
12. I can describe some properties of oxygen and perform a chemical test to identify its presence.

Physical & Chemical Changes

13. I can distinguish between physical and chemical changes and give some examples of each.
14. I can identify a chemical change by observing different indicators, such as gas production, (effervescence), colour change, insoluble substance (precipitate) formation, pH change, temperature change, production of light or sound, and the production of a new substance.
15. I can represent simple chemical reactions, as word equations.

KEY WORDS

element, atom, chemical symbol, compound, chemical bond, chemical formula, periodic table, metal, non-metal, solid, liquid, gas, rust, properties, shiny, dull, ductile, malleability, conductivity (thermal and electrical), sonority, reactivity.

mixture, air, oxygen, nitrogen, carbon dioxide, water vapour, sea water, steel, glowing splint, colourless, odourless, tasteless, particle diagram.

chemical change, physical change, reversible, irreversible, reactants, products, word equation, combustion, rusting, precipitate, pH change, temperature, effervescence, fizzing, bubbling,

Note: Other LO's related to broad skills and competencies in science can be found on page 5.

Subject:
Science

Year:
8

LOF Subject Focus:
Chemical Science

Unit Code:
SCI LOF 8.3



Unit 8.3

SEPARATING MIXTURES

In this unit, students explore the differences between substances and mixtures, identifying water's vital role as a solvent. Learners will investigate how factors like temperature and stirring affect solubility and the formation of solutions. Through hands-on experimentation, students will master various separation techniques used in daily life, including filtration, chromatography, and evaporation. They will also examine the process of distillation to recover pure liquids. By accurately identifying residues and filtrates, students develop the practical skills required to select and apply the most effective methods for separating various components from complex mixtures.

UNIT OBJECTIVES

1. guide students to distinguish between soluble and insoluble substances
2. investigate factors affecting solubility
3. guide students to distinguish between general mixtures and solutions
4. explore practical methods of separating mixtures
5. explore techniques for separating components of a solution.

POINTS TO NOTE

- Refer to the introductory notes about the 5E approach to science teaching and learning.
- This unit links with 'SCI LOF 7.4 Understanding Matter' and 'SCI LOF 8.2 Elements, Compounds and Mixtures'.
- Be mindful that students often struggle to distinguish between mixtures (physically combined) and compounds (chemically joined). Use visual models or physical demonstrations to reinforce that substances in a mixture retain their individual properties.
- Reinforce that when a substance dissolves to form a solution, it has not 'disappeared'. The mass of the solution is equal to the mass of the solvent plus the mass of the solute. This helps address the misconception that dissolved solids lose their mass.
- When exploring 'suitability of different solvents' (LO 3), you might mention everyday examples like permanent markers or nail polish, which require solvents such as ethanol or acetone. In these instances, ensure you explicitly address the health and safety hazards associated with these chemicals, specifically focusing on flammability and the impact of strong fumes.
- When investigating factors like crushing or temperature, emphasize variable control. This is an excellent opportunity to teach the 'fair test' principle (changing one variable only while keeping others constant).

COMMON MISCONCEPTIONS

Be aware that students may hold the following common misconceptions:

- ✗ a solute disappears rather than it dissolves;
- ✗ water is the only solvent;
- ✗ dissolving (in Maltese 'jinħall') and melting (in Maltese 'idub') are the same;
- ✗ filtering water makes it 'pure' or safe to drink;
- ✗ all metals are magnetic.

RESOURCES

lab coats, safety glasses, beakers, boiling tubes, test tubes, test tube racks, Bunsen burners, heat-proof mats, tripods, wire gauzes, measuring cylinders, electronic balances, stopwatches, thermometers, funnels, filter paper, evaporating dishes, glass rods, chromatography paper, round-bottom flasks, Liebig condensers, magnets, sieves, pestles and mortars, spatulas, tongs, pipettes, distilled water, salt, sugar, sand, chalk, copper sulfate, iron filings, felt-tip pens, food colouring.

USEFUL DIGITAL RESOURCES

This list of digital resources was deemed valid at the time of this document's original publication. Educators are encouraged to review and evaluate the relevance and suitability of these resources before use.

Chemistry simulations: <http://phet.colorado.edu/en/simulations/category/chemistry/general>

Quiz on separating techniques: https://www.footprints-science.co.uk/index.php?quiz=Separating_mixtures

Separating mixtures test: <https://www.bbc.co.uk/bitesize/guides/zb2f3k7/test>

Separating techniques quiz: <https://quizizz.com/admin/quiz/5b34230ec94c55001a96845a/separation-techniques>

Make a water filter: <https://kids.nationalgeographic.com/books/article/water-wonders>

Chromatography: <https://www.footprints-science.co.uk/index.php?type=Chromatography>

Distillation: <http://www.purposegames.com/game/simple-distillation-quiz>

Resources to support inclusion: <http://www.communication4all.co.uk/>

SUGGESTED PRACTICAL ACTIVITIES

- Testing solubility to classify chemicals as soluble and insoluble in water
- Testing the effectiveness of different solvents
- Investigating factors affecting solubility
- Chromatography
- Filtration
- Recovery by evaporation
- Simple Distillation
- Separating a complex mixture (The Dirty Water Challenge)
- Identifying saturation point

[Unit 8.3] SEPARATING MIXTURES

LEARNING OUTCOMES

Mixtures, Solutions and Solubility

1. I can distinguish between substances that dissolve in water (soluble) and those that do not (insoluble).
2. I can identify water as a good solvent.
3. I can evaluate the suitability of different solvents for various situations.
4. I can investigate factors that affect solubility, including stirring, temperature and size of granules (crushing).
5. I can describe what a solution is and give some examples.
6. I can identify different examples of mixtures.

Separation Techniques

7. I can recognise separation techniques used in everyday life, including separation by hand.
8. I can identify situations in which a magnet can be used to separate components of a mixture.
9. I can carry out chromatography as a way of separating colours.
10. I can explain the movement of colours in chromatography in terms of solubility.
11. I can perform filtration to separate insoluble substances from water.
12. I can identify the filtrate and the residue in a filtration process.
13. I can obtain a soluble substance from a solution through evaporation.
14. I can describe the process of distillation and label a diagram showing the process.
15. I can separate the different components of a mixture using appropriate separation techniques.
16. I can analyse the components of a mixture and explain which separation technique would work best to separate them

KEY WORDS

substance, mixture, solution, solute, solvent, soluble, insoluble, dissolving, suspension, solubility, saturation, granules, salty water, fresh water, tap water, distilled water

by hand, magnet, sieve, chromatography, filtration, filter paper, funnel, filtrate, residue, evaporation, distillation, condenser, condensation

Note: Other LO's related to broad skills and competencies in science can be found on page 5.

Subject:
Science

Year:
8

LOF Subject Focus:
Physical Processes

Unit Code:
SCI LOF 8.4



Unit 8.4

EXPLORING ENERGY & ELECTRICITY

In this unit students explore energy and electricity through **project-based learning** (PBL). They will have the opportunity to explore different forms of energy, energy transfer, transformations, conservation, and efficiency in everyday contexts, and possibly design and interpret energy-transfer diagrams. They can also analyse useful and wasted energy in devices. In their project students might want to include concepts related to electricity generation, simple circuits, and the behaviour of components in series and parallel arrangements, alongside electrical safety. Throughout, students develop critical thinking, communication, teamwork, digital literacy, and reflective learning skills essential for scientific understanding.

UNIT OBJECTIVES

1. create learning experiences that encourage students to ask scientific questions and explore energy and electricity through real-life contexts.
2. guide students to connect prior knowledge with new learning through research, investigation, and discussion.
3. model and scaffold the use of evidence, critical thinking, problem-solving, and reflection throughout learning activities.
4. provide opportunities for students to test ideas, improve their work, and develop creativity, resilience, and adaptability.
5. structure collaborative tasks that develop communication skills, active listening, constructive peer feedback, and shared responsibility.
6. support students in planning, managing time, and carrying out safe practical work and project-based learning.
7. guide students in presenting scientific understanding clearly using speech, writing, diagrams, models, and digital tools, while promoting safe and responsible digital practices.
8. guide students to classify and recognise forms of energy, understand energy conservation, and analyse energy transfer, transformation, and efficiency in everyday contexts.
9. teach students to represent energy changes using diagrams and apply these ideas through practical and project work.
10. teach students to draw, interpret, construct, and compare simple series and parallel circuits, and predict the behaviour of components such as LEDs and motors.
11. explicitly teach the use of conductors, insulators, electrical safety procedures, and how electricity generation (including in Malta) links to energy transformations.

POINTS TO NOTE

- Project-Based Learning is a teaching approach, not just an activity. The focus is the scientific process rather than the final product. It begins with a driving question or a real-world problem that requires investigation and decision-making from the students' part. In groups, students are expected to draft, test and refine their ideas. Student groups will present a final product to their peers, followed by reflection on the whole process.
- This unit contributes 10% of the final global mark. Refer to the document 'Assessment in Science' for guidance about PBL and the assessment mark.
- Refer to the introductory notes about the 5E approach to science teaching and learning.
- It is suggested that the first task of this unit consists of assigning students a variety of research topics to create and deliver a variety of presentations.
- In this unit energy is treated as something that is found in various forms and is transferred to make things happen.
- Exploit opportunities to stress the fact that energy cannot be created nor destroyed.
- Be aware of health and safety considerations when using electricity. Consider interactive simulations as an alternative to potentially hazardous activities.
- Some concepts might simply require consolidation of primary-level knowledge. On the other hand, progression in complexity can be achieved through concepts related to parallel circuits, LEDs, and a basic concept of polarity.
- Distinguishing between cells and batteries is not required. Refer only to batteries.
- Local relevance should be emphasized by referring to electricity generation in Malta.
- This unit provides an excellent opportunity for cross-curricular themes, particularly Education for Sustainable Development.
- The inclusion of microchips serves as a bridge to digital literacy, helping students recognize that the complex technology they use daily is built upon the foundational circuit principles they are learning in class
- Keep in mind that when speaking in Maltese, students may colloquially use the term 'dawl' (light) to refer to electricity. Additionally some students use term plug ('plakka') for both the plug and the power socket.

COMMON MISCONCEPTIONS

Be aware that students may hold the following common misconceptions:

- ✗ a failed prediction requiring new testing implies that an experiment or a project has failed;
- ✗ the term technology refers only to digital devices like smartphones;
- ✗ energy is 'consumed', 'lost' or 'disappears' once it has been transferred;
- ✗ energy-efficient devices do not transfer energy to the surroundings;
- ✗ all metals are equally good conductors, and all non-metals are perfect insulators;

RESOURCES

safety goggles, clockwork toy, elastic bands, bicycle dynamo, torch, photovoltaic cell, small wind-turbine kits, insulating materials, filament bulb, energy saving bulb, LED, circuit boards, batteries, bulbs, holders switches, wires, motors, buzzers, crocodile clips, materials (including copper, iron, aluminium, graphite, wood, plastic, paper, glass), data loggers.

USEFUL DIGITAL RESOURCES

This list of digital resources was deemed valid at the time of this document's original publication. Educators are encouraged to review and evaluate the relevance and suitability of these resources before use.

Project-based learning: <https://www.youtube.com/watch?v=V2Oa4OkkTtw>

Scientific research: <https://www.sciencejournalforkids.org/>

Research (energy resources): <https://education.nationalgeographic.org/resource/energy-resources/>

Project ideas: <https://www.exploratorium.edu/snacks>

<https://www.sciencekids.co.nz/projects/electricity.html>

All about energy: <https://www.bbc.co.uk/bitesize/topics/zc3g87h>

<https://www.youtube.com/watch?v=FP2Wadht4Os>

<https://www.explainthatstuff.com/energy.html>

Energy conservation: <https://www.explainthatstuff.com/conservation-of-energy.html>

Forms of energy and energy changes: <https://www.eia.gov/kids/what-is-energy/forms-of-energy.php>

<https://phet.colorado.edu/en/simulations/energy-forms-and-changes>

Energy in Malta: <https://energywateragency.gov.mt/energy/>

All about electricity: <https://www.bbc.co.uk/bitesize/topics/zgy39j6>

<https://www.explainthatstuff.com/electricity.html>

Circuit (DC) construction kit: <https://phet.colorado.edu/en/simulations/circuit-construction-kit-dc>

Tinkering with circuits: <https://www.tinkercad.com/circuits>

How computers work: <https://code.org/en-US/resources/videos>

Using electricity safely: <http://www.switchedonkids.org.uk/>

Health and safety: <https://sparky.org/>

EXAMPLES OF POSSIBLE DRIVING QUESTIONS & PROJECTS

- How can we reduce energy loss from homes? (design an energy-efficient house, test single and double-glazed windows)
- Can we power useful devices using renewable energy? (build a solar-powered device; design a hybrid - e.g., solar and wind - renewable system model)
- How does height affect energy transfer? (build a roller coaster)
- How can blade design affect electrical output in a wind turbine? (build a wind turbine prototypes testing, blade's shape, number and angle)
- Which material keeps heat in best? (design the best thermal insulation; design a thermal lunch box; design the best ice bucket)
- Can we demonstrate multiple energy transfers in one system? (design a chain reaction; create a human-powered energy system)
- How can our school reduce energy waste? (conduct a mini school energy audit; create a student awareness campaign)
- Which renewable energy options work best in Malta? (research and draft a proposal; compare seasonal energy output)
- Which torch design works best? (build an efficient torch; balancing brightness and battery life)
- How can we design a safe and efficient lighting system? (design a lighting system for a model home)
- How can we design a game that uses circuits effectively? (build a steady-hand game; create an electric quiz board; build a reaction-time buzzer game)
- Are all metals equally good and efficient conductors? (build a circuit to test conductors; testing wire thickness effect on brightness)
- How can we design charging solutions for electric transport? (general research and presentation; study home vs public charging efficiency and safety)

[Unit 8.4] EXPLORING ENERGY AND ELECTRICITY

LEARNING OUTCOMES

Critical Thinking & Problem-Solving

1. I can ask clear scientific questions about the world around me.
2. I can apply what I already know and research new information to understand new situations.
3. I can use evidence to suggest solutions to scientific problems.
4. I can test my ideas and find creative ways to improve them when things do not go as predicted.
5. I can interpret scientific information critically.
6. I can reflect on my learning, identifying strengths and areas for improvement.

Collaboration & Communication

7. I can engage in a respectful discussion by listening to others' ideas and share my own.
8. I can work in a group to plan and carry out a scientific project safely.
9. I can take responsibility for my role in a team task.
10. I can manage my time and work efficiently with teammates.
11. I can present scientific ideas clearly through speaking, writing, and using visuals.
12. I can provide constructive feedback to my peers respectfully.

Digital Literacy

13. I can evaluate whether digital and AI sources of information are reliable.
14. I can use digital and AI tools safely, responsibly, and ethically for research and presentations, including giving credit when AI tools are used in my project.

KEY WORDS

scientific question, research, evidence, problem and solution, prediction, testing, interpret, data, critical thinking, reflection, strengths and weaknesses

idea, collaboration, planning, project, safety, responsibility, respectfully, time management, efficiency, presentation, constructive feedback

digital tool, digital source, reliability, online safety

IMPORTANT NOTE

The **primary aim** of this unit is to fulfil the learning outcomes above. These are to be reached by applying them through a project-based learning approach to a selection from the Energy and/or Electricity content knowledge learning outcomes below.

Science Skills and Competencies learning outcomes, found on page 5 of this document might also be tackled in this unit.

LEARNING OUTCOMES (Energy)

Forms and Sources of Energy

1. I can describe many forms of energy as either energy of motion (kinetic) or stored energy (potential).
2. *I can recognise examples of energy linked to motion (kinetic energy), such as electrical, light, heat (thermal), sound, and movement energy.
3. *I can recognise examples of stored energy (potential energy), such as chemical, nuclear, elastic, and gravitational energy.
4. I can match different forms of energy to the sources that produce them.

Energy Transfer, Use, and Efficiency

5. I can explain that energy is neither created nor destroyed but only transformed from one form to another.
6. I can use energy-transfer diagrams to show how energy flows and changes form in different situations.
7. I can explain that when energy is transferred, some of it is changed into less useful forms of energy.
8. I can describe what energy efficiency means and identify examples of inefficient energy transfers.
9. *I can identify the input energy, the useful output energy, and the wasted energy in common household devices.
10. I can use project work to explain energy storage, transfer, and transformation.

KEY WORDS

energy forms, kinetic energy (energy of motion), potential energy (stored energy), electrical energy, light energy, thermal (heat) energy, sound energy, movement energy, chemical energy, nuclear energy, elastic energy, gravitational energy, energy sources

energy transfer, energy-transfer diagrams, useful energy, less useful energy, energy efficiency, input energy, useful output energy, wasted energy, energy store, energy flow, energy transformation

LEARNING OUTCOMES (Electricity)

Electricity Generation

1. I can describe how electricity is generated in Malta and identify the main energy transformations involved.

Electrical Circuits

2. I can use symbols of a battery, wire, bulb and switch to draw, and understand simple electrical circuits.
3. *I can connect batteries, wires, bulbs and switches correctly in series and parallel circuits.
4. *I can compare series and parallel circuits and describe their main characteristics and everyday uses.
5. I can identify microchips as examples of complex circuits used in electronic devices.
6. I can predict that change in the current direction will influence LEDs and motors.
7. I can recognise LEDs as a more energy-efficient alternative to regular light bulbs.

Conductors, Insulators and Safety

8. I can describe how conductors and insulators are used in electrical systems and apply their use to issues of safety.
9. I can apply safe procedures when working with electricity and identify common electrical hazards.
10. I can apply my understanding of electrical circuits safely to practical project work.

KEY WORDS

electricity generation, power station, renewable energy, non-renewable energy, energy transformation, chemical energy, thermal (heat) energy, light energy, kinetic energy, electrical energy

electrical circuit, component, battery, wires, bulb, switch, circuit symbol, circuit diagram, complete/incomplete circuit, series circuit, parallel circuit, current, direction of current, voltage, positive terminal, negative terminal, LED (light-emitting diode), motor, filament bulb, microchip, energy-efficient

conductor, insulator, metal, plastic, rubber, electric shock, electrical hazard

IMPORTANT NOTE

None of the learning outcomes addressed exclusively within this unit are examinable. However, it is strongly recommended that, when developing a scheme of work for this unit, two additional double lessons are allocated at the end. These should be used by the teacher to explicitly teach those learning outcomes marked with an asterisk (*) if these would have not been addressed by the class through the PBL approach.

Subject:
Science

Year:
8

LOF Subject Focus:
What Do Scientists Do?

Unit Code:
SCI LOF 8.5



Unit 8.5

FORENSIC SCIENCE

The unit invites students to step into the shoes of investigators, using science to unlock the truth behind mysterious case scenarios. By bridging Biology, Chemistry, and Physics, this module transforms the classroom into a forensic lab, reinforcing critical scientific competencies. Students move beyond simple observation, learning to gather evidence, perform rigorous experiments, and interpret complex data to form logical, evidence-based conclusions. This engaging, inquiry-based approach demonstrates how scientific methodology is applied in the real world, empowering students to solve problems systematically while mastering the essential skills of accuracy, safety, and analytical thinking in a professional context.

UNIT OBJECTIVES

1. guide students to apply scientific inquiry to solve real-life forensic problems by gathering, analysing, and matching physical evidence.
2. support students in planning investigations.
3. facilitate the distinction between observation and evidence to reach logical, data-backed conclusions.
4. ensure students conduct experiments while adhering to strict laboratory safety and anti-contamination procedures.
5. reinforce the application of basic mathematical skills to make calculations using data obtained in an investigation.
6. integrate and apply biological knowledge and skills into forensic contexts focusing on human tooth types and functions and microscopy.
7. integrate and apply chemical knowledge and skills into forensic contexts covering chemical identification, chromatography and carrying flame tests.
8. integrate and apply knowledge of physical forces into forensic contexts investigating friction and air resistance.

POINTS TO NOTE

- Refer to the introductory notes about the 5E approach to science teaching and learning.
- The action verbs 'revisit' and 'reinforce' in some objectives suggest that students have previously encountered this subject matter through the Primary Science Curriculum or in other previously taught science units. These objectives offer an opportunity to consolidate their understanding or explore the content further.
- This topic provides an excellent opportunity for learners to recognise the links between material, physical and life sciences.
- Practical work is integral to the scientific process. Every concept taught should ideally be connected to a practical activity, demonstration, or observation.
- Take the opportunity to reinforce that science is not just about finding the right answer but also to eliminate possibilities. A negative result is still useful.
- Reinforce the concept of having a 'control'. Remind students that without a known sample for comparison, their investigative results lack validity.
- To mimic forensic science in the real world even more, most activities should be done in groups, just like a forensic investigator rarely works alone.
- Be aware of health and safety requirements when carrying out experiments.

COMMON MISCONCEPTIONS

Be aware that students may hold the following common misconceptions:

- ✗ forensic scientists chase criminals as seen on certain television series.
- ✗ any one forensic scientist is an expert in all areas such as fingerprints, chemical analysis, DNA profiling, and so on.
- ✗ one sample is enough – carrying a single test is sufficient to make a test reliable.
- ✗ crimes are always solved.
- ✗ friction is always bad.

RESOURCES

Lab coats, safety goggles, microscopes, magnifying lenses, models of human teeth, prepared pollen grain slides, distilled water, filter or chromatography paper, ink, ink pads, ink rollers, sheets of paper, carbon powder, fine dusting brushes, bite mark images, fingerprint images, flame test metal salts (sodium, potassium, calcium, lithium, and copper chlorides), nichrome wires, Bunsen burners, heat-proof mats, test tubes, test tube racks, Benedict's solution, various surface materials, toy car, trolley, cardboard, fans or blowers, reference databases for forensic comparison.

USEFUL DIGITAL RESOURCES

This list of digital resources was deemed valid at the time of this document's original publication. Educators are encouraged to review and evaluate the relevance and suitability of these resources before use.

The crime scene investigator: <https://www.youtube.com/watch?v=JgzdhUAJrBA>

Operation ouch. What is forensic science?: <https://www.youtube.com/watch?v=4u-pdQvAp3A>

An intro to forensics: The science of crime: <https://www.youtube.com/watch?v=h3-Pj-zbEq8>

What do forensic scientists do?: <https://www.youtube.com/watch?v=qESpv6bqBuU>

Interactive and stimulating activities: <https://thetrendyscienceteacher.com/category/forensics-2/>

Power points and worksheets: www.sciencespot.net/Pages/classforsci.html

Virtual case: https://www.youtube.com/watch?v=roACA5_6oK8

Resources to support inclusion: <http://www.communication4all.co.uk/>

SUGGESTED FORENSIC SCENARIOS AND PRACTICAL ACTIVITIES

A primary aim of this unit is to demonstrate in practice how in real life, the three sciences, Biology Chemistry and Physics are often applied together in an integrated manner to solve real-world problems. It is recommended that this unit is covered through various case scenarios. The following suggested scenarios should assist teachers to reach all learning outcomes of this unit.

SCENARIO 1: Prints Left Behind
Scientific Skill Focus: **Evidence-based Reasoning**
Learning Outcomes: **1, 2, 3, and 4**

A distressed homeowner reports that their house has been broken into. When police arrive, they find the house in shambles. They notice emptied drawers, scattered clothes and overturned furniture. They see no sign of forced entry. A forensic team is called in to investigate. While examining the scene, a detective notices a drinking glass with a partial, smudged thumbprint. The forensic scientist carefully lifts the print, analyses it and compares it to a database of known fingerprints. The forensic team also notices a shoeprint in the garden. Good quality pictures were taken, which were later compared to images in a shoeprint database. A potential suspect is identified.

Tasks:

- lift fingerprints using a soft brush and some tape;
- press a shoe in a shallow tray with flour and taking good photos of the print;
- examine and compare images of fingerprint patterns and shoeprints with those in a 'database';

Following this scenario:

Elaborate on the importance of moving away from guesswork, and that in science as exemplified by the context of forensics, an observation (such as a fingerprint or a chemical colour) is worthless without the ability to compare it to known data and form an evidence-based conclusion.

SCENARIO 2: Murder Mystery
Scientific Skill Focus: **Integrating Evidence**
Learning Outcomes: **1, 2, 3, 4, 5, 6, 7 and 8**

Police are called to a local shop where the owner has been found dead. The scene suggests there was a struggle. Forensic investigators observed a bite mark on the victim's arm revealing a missing incisor. They recorded the dead body's temperature at 32°C and calculated that based on the room temperature, the body had lost 1°C every 30 minutes. On the victim's clothing the investigators found pollen. Three suspects, a farmer, a gardener and a florist all miss one tooth and identifying the type of pollen found on the victim might confirm who the murderer is.

Tasks:

- research about human teeth;
- analyse bite marks and identify which type of tooth is missing in various suspects;
- research normal body temperature and estimate time of death;
- observe pollen under a microscope and compare it to a database of pollen images;

Following this scenario:

Consolidate types of human teeth and introduce their functions. Reinforce the mathematical skills involved by providing other examples where raw scientific data is processed in similar simple calculations.

SCENARIO 3: Leaving Their Mark
Scientific Skill Focus: **Analysing Patterns**
Learning Outcomes: **1, 2, 3, 4, 9 and 10**

A gang was performing a series of burglaries. They were careless, leaving behind clues to their identities. They used a fast sports car to make their escape during which they caused accidents and left traces of car paint behind. One of the robbers wrote a death threat using a felt-tip marker. The forensic scientist used chromatography to analyse the car paint and the ink comparing them to samples taken from suspects' belongings. They also found traces of DNA that could lead them to one of the burglars.

Tasks:

- perform chromatography on ink or paint;
- compare patterns in chromatograms;
- compare patterns in DNA profiles;

Following this scenario:

Reinforce the importance of repeated tests to consolidate our observations and identify patterns.

SCENARIO 4: Firework Factory Break-inScientific Skill Focus: **Experimenting Safely and Reliably**Learning Outcomes: **1, 2, 3, 4 and 11**

Police were called to a fireworks factory following reports of a break-in, where they discovered a slashed sack with chemical powder spilling onto the floor. Witnesses reported two men fleeing toward the outskirts of the village, and upon intercepting them, officers noticed suspicious powder trapped under the fingernails of one suspect. Investigators suspect the men are linked to a rival fireworks manufacturer that was missing some supplies. At the rival factory, police seized four unidentified chemical samples. You are the forensic team tasked with performing flame tests on the powder from the suspect's fingernails, the crime scene sack, and the four rival factory samples to determine if the suspects are connected to the stolen material.

Tasks:

- carry out flame tests on different chemicals;
- record observations in a table and compare results;

Following this scenario:

Reinforce the reasons why safety must be given top priority in the laboratory. Also, emphasise the importance of avoiding contamination in order to ensure that our results are valid and reliable.

SCENARIO 5: Suspicious Sugar LevelsScientific Skill Focus: **Observing Chemical Reactions**Learning Outcomes: **1, 2, 3, 4 and 12**

A person with diabetes was admitted to hospital after suddenly becoming unwell. Doctors discovered that their blood sugar levels were extremely high, suggesting they had consumed a significant amount of sugar. However, the patient's family explained that they normally follow a strict sugar-free diet. They suspect that one of the foods or drinks consumed that morning may have contained sugar, despite being labelled as 'sugar-free'. To investigate, forensic scientists were asked to carry a test for sugar on samples of a diet drink, sugar-free jelly, and a packet of artificial sweetener. The aim was to determine whether any of these products contained unexpected sugar.

Tasks:

- carry out a test on glucose and distilled water to establish how the test works;
- carry out a test for sugar using Benedict's solution on various food samples;
- (for a simpler chemical test, one could draft a scenario that leads to a test for starch with iodine, instead of sugar)
- record observations in a table, compare results and identify the odd one out;

Following this scenario:

Reinforce the important reasons why an experiment must have a 'control'. Students can experiment with other food tests such as the test for proteins or any other chemical reactions.

SCENARIO 6: Crash InvestigationScientific Skill Focus: **Tinkering**Learning Outcomes: **1, 2, 3, 4, 7, 13, 14 and 15**

During a Formula 1 race, a car loses control while taking a corner where loose gravel had collected on the track. The tyres fail to keep sufficient grip, and the car skids off the track. As it hits a small ramp, it went flying into the air before crashing. Race officials launch an investigation to understand whether the fault was of a dirty track, bad tyres or wrong car design.

Tasks:

- investigate how a toy car or a trolley behaves on different surfaces (smooth, sand, gravel, rubber);
- simulate an investigation with tyre materials (or tyre conditions) by wrapping toy car or trolley wheels with different materials (e.g., smooth plastic tape, thick rubber band, Velcro, sandpaper) and calculating stopping distance;
- investigate air resistance adding different shaped paper 'spoilers' to a trolley investigate how air flow affects movement.

Following this scenario:

Expand further on the importance of design in engineering, particularly streamlining. Define forces and revisit their unit of measurement. Give positive and negative examples of the application of friction in everyday life.

[Unit 8.5] FORENSIC SCIENCE

LEARNING OUTCOMES

Forensic Inquiry

1. I can recognise that science can be used to test evidence and solve problems.
2. I can describe ways in which science is used in forensic investigations to solve crimes, showing how science is applied in everyday life.
3. I can make observations and match pieces of evidence, such as fingerprints.
4. I can analyse data and results from research and investigations to draw conclusions and report any findings.

Cross-Disciplinary Outcomes

5. I can identify the four types of human teeth.
6. I can describe the function of each type of tooth.
7. I can use scientific data to make simple mathematical calculations.
8. I can use the microscope to observe details not seen with the naked eye, such as pollen.
9. I can perform chromatography and interpret its results.
10. I can apply the skill of identifying patterns to other situations, such as DNA profiling.
11. I can carry out a flame test to identify an unknown chemical by comparing results to given data.
12. I can perform a chemical test to identify the presence of a substance.
13. I can identify friction as a force that opposes motion.
14. I can investigate the effect of friction on different surfaces and its application in everyday life.
15. I can investigate the effect of air resistance on different shapes and its application in everyday life.

KEY WORDS

forensic, scientist, crime scene, evidence, observation, database, fingerprint, shoeprint, contamination, cross-contamination, valid, reliable, conclusion

separation technique, chromatography, pigment, solubility, solvent, incisor, canine, premolar, molar, microscope, microscope slide, body temperature, control, variable, flame test, metal ion, chemical analysis, force, Newton, friction, air resistance, streamline,

Subject:
Science

Year:
8

LOF Subject Focus:
Physical Processes

Unit Code:
SCI LOF 8.6



Unit 8.6

LIGHT AND SOUND

This unit introduces students to the properties and behaviour of light and sound. Students learn to identify luminous and non-luminous objects, describe how light travels in straight lines, and explain shadows, reflection, and transparency. The structure and function of the eye are explored, alongside the production, transmission, and detection of sound through vibrations in solids, liquids, and gases. Students also study the ear, hearing, loudness, noise pollution, and practical applications such as echoes, sonar, and ultrasound.

UNIT OBJECTIVES

1. guide students to use ray diagrams to show how objects are seen.
2. show the structure of the eye and guide students to explain how our eyes enable us to see.
3. revisit the properties of sound and identify sources of sound.
4. revisit the movement of sound through solids, liquids and gases.
5. guide students to use the particle theory to explain how sound travels through materials but not through a vacuum.
6. revisit the structure of the ear and how our ears enable us to hear.
7. explain practical uses of analysing sound reflection.

POINTS TO NOTE

- Refer to the introductory notes about the 5E approach to science teaching and learning.
- The term 'revisit' in some of the unit objectives indicates that this content features in the Primary Science curriculum.
- This unit has links with 'SCI LOF 7.6 Earth and Space'. Content such as sources of light, light travelling in straight lines, speed of light and sound travelling through a vacuum might have already been tackled in this unit.
- Link this unit with 'SCI LOF 7.4 Understanding Matter, particularly with the concept of matter being made up of tiny particles.
- Be mindful of health and safety considerations if experimenting with high light intensities or sounds that are too loud.

COMMON MISCONCEPTIONS

Be aware that students may hold the following common misconceptions:

- ✗ the eye sends out light to see objects;
- ✗ some students may think that sound waves are transverse waves (as seen on an oscilloscope screen);
- ✗ most students, initially, do not realise that it is the brain that interprets light and sound;
- ✗ some students may think that noise pollution is annoying but harmless;

RESOURCES

large convex lenses, ray box, torches, selection of lenses, mirrors, slit plates, eye model, ear model, transparent materials, translucent materials, opaque materials, cardboard boxes, aluminium foil, plastic bowl, uncooked rice, source of sound, water and glass bottles, rubber bands of varying thickness, 2 plastic cups, string, tuning forks, slinky springs, bell jar, vacuum pump, stethoscopes, sound measuring apps, decibel meters

USEFUL DIGITAL RESOURCES

This list of digital resources was deemed valid at the time of this document's original publication. Educators are encouraged to review and evaluate the relevance and suitability of these resources before use.

Light travels in a straight line: <https://www.youtube.com/watch?v=WvQsq8s8XzU>

Vibrating sound: <http://sciencekids.co.nz/videos/physics/soundvibrations.html>

Sound travelling in different media: <http://www.youtube.com/watch?v=IU3V6zNER4g>

Animals and sound – Pistol shrimp: <http://www.youtube.com/watch?v=XC6l8iPiHT8>

Humming bird: <http://www.youtube.com/watch?v=2n71TgeWXd0>

Making music with water: <https://www.sciencekids.co.nz/experiments/makemusic.html>

Changing sounds/pitch: <https://www.sciencekids.co.nz/gamesactivities/changingsounds.html>

Light pollution: <https://timesofmalta.com/article/academics-urge-authorities-reverse-course-dwejra-lighting-law.1124216>

Noise pollution: <https://timesofmalta.com/articles/view/20120229/editorial/All-noise-pollution-must-be-strictly-controlled.408965>

SUGGESTED PRACTICAL ACTIVITIES

- Classifying materials as luminous and non-luminous.
- Using ray boxes and mirrors to model how objects are seen.
- Investigating shadow formation using point and extended light sources.
- Classifying materials as transparent, translucent, or opaque using light sources.
- Building a pinhole camera to model eye function.
- Visualizing vibrations using tuning forks in water or rice on a drum.
- Demonstrating longitudinal waves using a slinky spring.
- Comparing sound transmission through solids, liquids, and gases.
- Observing the bell jar in a vacuum experiment.
- Mapping school noise levels using decibel meters.
- Testing materials for soundproofing to reduce noise pollution.

[Unit 8.6] LIGHT AND SOUND

LEARNING OUTCOMES

Light and Vision

1. I can identify luminous objects as those that give off light and non-luminous objects as objects that reflect light.
2. I can draw rays to demonstrate how objects are seen.
3. I can show that light travels in straight lines and apply this to describe the formation of shadows.
4. I can distinguish between transparent, translucent and opaque objects.
5. I can label the different parts of the eye and describe their functions.

Sound Production and Transmission

6. I can describe how sounds are produced by vibrations.
7. I can use a slinky spring to demonstrate sound waves.
8. I can describe the movement of sound through solids, liquids and gases in terms of particle theory.
9. I can explain why sound cannot travel in a vacuum.
10. I can compare the speeds of light and sound, using everyday examples.

Hearing, Measurement and Uses of Sound

11. I can label the different parts of the ear and describe their functions.
12. I can describe how hearing can be damaged.
13. I can state that loudness is measured in decibels.
14. I can take part in a debate about the benefits and problems of noise and light in my community and recommend ways of reducing noise and light pollution.
15. I can identify practical uses of sound reflection such as calculating distances (e.g. in stethoscopes and sonar) and producing images (e.g. ultrasound).

KEY WORDS

transparent, opaque, translucent, luminous, non-luminous, rays, straight line, ray diagrams, mirrors, reflection, the eye, pupil, iris, cornea, image, retina, optic nerve, brain, light energy.

sound energy, source, the ear, outer ear, ear canal, ear drum, 3 small bones, nerve, cochlea, detector, medium, vibration, speed of sound, particle movement, vacuum.

loudness, noise pollution, decibels, echo, ultrasound, sonar.

Note: Other LO's related to broad skills and competencies in science can be found on page 5.