

Integrated Science Curriculum Form 2



Directorate for Quality and Standards in Education
Department of Curriculum Management

To access the pages click on the page title below

INTEGRATED SCIENCE CURRICULUM UNITS – FORM 2

SCI 8.1	<i>Healthy Living (I) – Go for Everest.</i>
SCI 8.2	<i>Healthy Living (II) – Life Cycle Challenge</i>
SCI 8.3	<i>Elements, Compounds and Mixtures (I)</i>
SCI 8.4	<i>Elements, Compounds and Mixtures (II)</i>
SCI 8.5	<i>Separating Mixtures</i>
SCI 8.6	<i>Light and Sound</i>
SCI 8.7	<i>Forensic Science</i>
SCI 8.8	<i>Climate Change (I) - Energy and the Environment</i>
SCI 8.9	<i>Climate Change (II) – Environmental Chemistry</i>
SCI 8.10	<i>Fieldwork</i>
SCI 8.11	<i>Earth and Space (I)</i>
SCI 8.12	<i>Earth and Space (II)</i>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.1 HEALTHY LIVING (I) – GO FOR EVEREST**

Strand 1: Life Processes and Living things

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to identify the basic food substances and their use and describe the importance of a balanced diet.
2. illustrate the digestive system and guide students to describe the process of digestion.
3. guide students to describe the breathing process
4. illustrate the blood circulatory system.

Key Words	Points to Note	Resources
Basic food substances, carbohydrates, proteins, fats, minerals, vitamins, fibre, water, balanced diet, starch, digestive system, mouth, gullet, stomach, small intestine, large intestine, anus, digestion, absorption, breathing, respiration, lungs, blood circulatory system, heart, arteries, veins.	<p>This curriculum promotes an inquiry based and student centred methodology based on the 5E approach to teaching and learning of science in which students are encouraged to engage, explore, explain, elaborate and evaluate.</p> <p>Link this unit to <i>SCI 7.3</i> re vital functions, <i>SCI 7.11</i> re body systems. For the sake of unitised curriculum this topic was divided into two units. Consider SCI 8.1 and SCI 8.2 as one continuous topic.</p> <p>Note the following misconceptions:</p> <ul style="list-style-type: none">- The word 'diet' is often used in the context of 'going on a diet' to lose body mass rather than 'what you eat'.- Some students – and even books! – may confuse respiration with breathing <p>Go for Everest – besides promoting this feat by <i>Challenge2000</i> Everest team, the three Maltese participants tried to create awareness re healthy lifestyles, clean air, etc.</p>	<p>Food labels, starch (potato or rice), iodine solution, human torso or organ tunic, heart model</p> <p>Food substances/ Balanced diet: http://idahoptv.org/dialogue4kids/season11/nutrition/</p> <p>Digestive system/digestion: human torso or organ tunic, http://kidshealth.org/kid/</p> <p>Breathing simulation: http://teachhealthk-12.uthscsa.edu/curriculum/pulmonary/pulmonary-breathsimulation.asp</p> <p>School.co.uk – a number of presentations: http://lgfl.skool.co.uk/keystage3.aspx?id=63</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1. guide students to identify the basic food substances and their use and describe the importance of a balanced diet.</p>	<p><u>Starter suggestion:</u> Introduce the feat done by Challenge2000 Everest team and recall that on 17th May 2010 Gregory Attard, Marco Cremona and Robert Gatt were the first Maltese to climb Mount Everest (do not ask students to remember these details). Ask students to think about the kind of preparation that needs to be done. Give time to students to share their views. Show that these activities (and most sports participation) require a healthy body.</p> <p><u>Main activity:</u> Show that the aim of this unit is to promote healthy lifestyles...e.g healthy eating habits. Ask students to give reasons why we need food. Refer to growth, repair and energy production. Give a list of food items and ask students to work in groups to sort these items in groups – ask students to explain their sorting. Guide students to use the food packets / labels to identify the main food substances i.e. carbohydrates, proteins, fats, minerals, vitamins, fibre and water. Ask students to link food packets with the main type of food substance present in it (e.g. meat – proteins) and this should lead students to give examples of food sources (e.g. pasta, rice – carbohydrates). Describe the function of each food substance. Guide the students to define a balance diet – show that this contains all the food substances in the correct amounts.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Use a ‘drag and drop’ interactive exercise to link common foods to the most appropriate food type box. - May ask students to discuss any of the following: the benefits and dangers of following certain diets; the importance of having a breakfast; junk food; salts in our diet; misleading food labels and consumer rights; allergies to some foods such as nuts, milk and gluten. - May demonstrate the food test used to identify starch. 	<p>STUDENTS CAN:</p> <p>show that a balanced diet changes with age and occupation. (Level 8)</p> <p>identify the seven basic food substances, their use, sources. (Level 7)</p> <p>identify some food substances and their sources. (Level 6)</p> <p>link certain foods with healthy or unhealthy diets. (Level 5)</p>

<p>2. illustrate the digestive system and guide students to describe the process of digestion.</p>	<p><u>Starter suggestion:</u> Revisit the previous lessons and ask students to give reasons why we need food. Students may refer to growth, repair and energy production.</p> <p><u>Main activity:</u> Present some food and ask students to suggest ways how this food may become available for body cells. Students may identify the need to break down food to small molecules – refer to <i>SCI 7.5 Understanding Matter</i> – things are made up of tiny particles.</p> <p>Link the above question to the digestive system. Ask students to describe what happens to food once it has been eaten – and what happens to liquids as they pass through the digestive system. Give time to students to share their answers. Note any misconceptions which might be addressed at a later stage. Redirect their questions and answers to other students.</p> <p>Use an interactive simulation and the human torso/organ tunic to describe the structure and function of the digestive system. Refer to the mouth (role of teeth and saliva), gullet, stomach (role of acid and enzymes), small intestine, large intestine and anus. Show that physical/chemical changes break down food into smaller soluble pieces. Build up their suggestions into a sequence of events starting with feeding, digestion, absorption and ending with elimination of food material which cannot be digested (faeces). Go through the process of digestion through Digestion Animation: www.kitses.com/animation/swfs/digestion.swf</p> <p>Note:</p> <ul style="list-style-type: none"> - Different types of teeth will be dealt with in <i>SCI 8.7 Forensic Science</i> - There is no need to refer to names of products of digestion such as glucose, amino acids but show that products are small soluble molecules. <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Describe how food is absorbed into the blood and carried round the body. - As a revision ask students to link different stages of the process of digestion to the different parts of the digestive system (e.g. absorption – small intestine). 	<p>describe what happens to food as it passes through the digestive system. (Level 8)</p> <p>describe the function of the digestive system. (Level 7)</p> <p>identify the structure of the digestive system. (Level 6)</p> <p>link the digestive system to food. (Level 5)</p>
--	---	--

<p>3. guide students to describe the breathing process.</p>	<p><u>Starter suggestion:</u> Show a clip of an athlete breathing heavily or a diver. Ask students to suggest reasons why we breathe. Note any misconceptions which might be addressed later on.</p> <p><u>Main activity:</u> Ask students to identify the organ which introduces air in our bodies. Use diagrams / simulations / human torso / models to describe the structure and function of the lungs. Some diagrams may show the alveoli but DO NOT ask students to remember these details. Guide students to explore the importance of the rib cage and diaphragm during breathing.</p> <p>Briefly explain the effect of smoking on lungs. Identify nicotine, tar and carbon monoxide as the main chemical hazards. Relate smoking to lung disease. Some students may ask about asthma. Note that one of the aims of Challenge2000 Everest Team was to create awareness re Asthma and air pollution.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - May ask students to use a straw and bubble into a small sample of lime water. Link the result with CO₂ present in exhaled air. - Ask students to predict the consequences re breathing of punctured rib cage or broken ribs. - May ask students to measure their breathing rate when at rest and after exercise. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Extend to other situations where there may be a reduced oxygen supply e.g. through illness, mountaineering, divers, etc. - Can refer to quiz on asthma www.kidsworld.com/quiz/quiz-test-your-asthma-trivia - Some students may be able to link breathing to energy production in cells (respiration). 	<p>explain the role of rib cage and diaphragm during breathing. (Level 8)</p> <p>describe the effect of smoking on lungs. (Level 7)</p> <p>describe the structure of the lungs and the breathing process. (Level 6)</p> <p>link lungs to breathing. (Level 5)</p>
---	---	---

<p>4. illustrate the blood circulatory system</p>	<p><u>Starter suggestion:</u> Ask students to identify the way oxygen and food products reach the body cells.</p> <p><u>Main activity:</u> Show that blood transports the products of digestion to every cell in the body. Explain that the heart pumps blood around the body. Use diagrams / interactive presentations / human torso to show the position of the heart and the circulatory system. Describe that blood flows through blood vessels (arteries and veins).</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - May ask students to measure the pulse rate at rest and after some exercise and note patterns in their results. Ask students to predict the reason why pulse rate increases during exercise. - Explore the effect of eating habits, lack of exercise and smoking on blood circulation. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - May illustrate the structure of the human heart through a pig/cow heart dissection. Students are NOT expected to know the parts of the heart. - Can ask students to measure the pulse rate at home at different times of the day, after a big meal, when at rest, etc. <p><u>Other notes:</u></p>	<p>identify the main function of each component of the circulatory system. (Level 8)</p> <p>identify the main components of the circulatory system – the blood, heart, arteries and veins. (Level 7)</p> <p>identify bad eating habits, lack of exercise and smoking as unhealthy habits. (Level 6)</p> <p>state that the heart beats faster during exercise. (Level 5)</p>
---	--	---

SCI 8.1 Healthy Living (I) – Go for Everest

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. Digestion Animation: www.kitses.com/animation/swfs/digestion.swf is an animation that shows different foods that students can follow as they travel through the digestive system. Digestion of the various food substances is explained in a simplified way including absorption and egestion.
2. Nutrition: www.healthyfridge.org/kids4.html is a fun quiz about nutrition and about the various factors which can lead to heart disease.
3. Food substances and balanced diet: <http://www.woodlands-junior.kent.sch.uk/revision/science/living/humanbody.html#heart> can be by students at start of topic to check their current habits, and then compare once they've learnt about the topic. <http://www.nourishinteractive.com/nutrition-education-printables> has a lot of ideas and printable activities which could also be used as a basis for IWB interactive activities, but is more suitable for levels 6 and below.
4. Digestive system: http://www.familylearning.org.uk/balanced_diet.html can be used as learning activities in class or at home, or can be used to help students check what they have learnt during the topic. <http://science.pppst.com/humanbody/human-digestive-system.html> contains a number of PowerPoint presentation and activities that can be used as learning objects for students at different levels. Teachers need to sift through the list and select level-appropriate content. www.youtube.com/watch?v=tTZUBOhm6xw&feature=related is a simple video about the organs in the digestive system. Note that the digestive system simulation: <http://junior.edumedia-sciences.com/en/n117-the-digestive-system> requires purchase.
5. Lungs/Respiratory system: <http://www.lawrencehallofscience.org/familyhealth/activities/breathing/BreathingInvestigations.pdf> - worksheets are available. http://lung.ca/children/index_kids.html contains content which is graded so it can be easily used for mixed ability classes, with each student choosing his/her own level. http://www.henry.k12.ga.us/cur/mybody/resp_lessons.htm contains a set of experiments which can be linked to other subjects as well. www.youtube.com/watch?v=ps64D3Juv5A is a simple video about the human respiratory system.
6. www.kidsworld.com/quiz/quiz-test-your-asthma-trivia is a quiz about asthma. It contains 10 multiple choice questions with interesting information about asthma which kids should know.
7. Circulatory system/Circulation: heart model, <http://www.sciencekids.co.nz/gamesactivities/keephealthy.html> is an interactive activity that allows students to learn about the heart, the circulatory system and the heart rate. It can easily serve as an introductory activity in which students learn or consolidate information about this topic. http://www.kscience.co.uk/animations/blood_system.swf is a good animation which illustrates the concept of a double circulatory system simply but effectively.

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.1 HEALTHY LIVING (I) – GO FOR EVEREST**

Strand 1: Life Processes and Living things

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

Teacher will:

1. Guide students to identify the basic food substances and their use and describe the importance of a balanced diet
2. Illustrate the digestive system and guide students to describe the process of digestion
3. Illustrate the structure of the lungs, guide students to describe the breathing process
4. Illustrate the blood circulatory system

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

- 1.1 Guide the student to understand the importance of a healthy lifestyle, including health eating habits
- 1.2 Illustrate the digestive system and guide students to understand some of the concepts of the digestion process
- 1.3 Guide the students towards an understanding of the breathing process
- 1.4 Illustrate the main components of the blood circulatory system, i.e., heart and blood vessels

Key words	Points to note	Resources
carbohydrates, proteins, fats, minerals, vitamins, fibre, water, balanced diet, digestive system, mouth, stomach, small intestine, large intestine, anus, digestion, absorption, breathing, respiration, lungs, blood circulatory system, heart, arteries, veins	Refer to notes re 5E approach to teaching and learning of science In activities targeting eating habits and digestion be aware of feeding problems and possibility of choking. For those students that are tube fed then this activity may be covered using smell or a drop of the food on the tongue Special attention needs to be given to students suffering from asthma and allergies.	Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/ Food substances/ Balanced diet: http://idahoptv.org/dialogue4kids/season11/nutrition/ Digestive system/digestion: human torso or organ tunic, http://kidshealth.org/kid/ Breathing simulation: http://teachhealthk-12.uthscsa.edu/curriculum/pulmonary/pulmonary-breathsimulation.asp

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1.1 Guide the student to understand the importance of a healthy lifestyle, including health eating habits</p>	<p>The teacher guides the students to experience a variety of foods from the different food groups, textures and consistencies, by using the students' senses of taste and smell,</p> <p>The teacher encourages students to participate in grouping foods according to their likes and dislikes. Food grouping may also take place on the basis of some food groups s e.g. dairy, fruit and vegetables, meat etc. A poster indicating which foods within the groups they can eat a lot of or a little of may be created.</p> <p>The students are guided to assemble healthy meals, such as breakfast and meals that are balanced.</p> <p>Discuss the idea of exercise and why we need food – why we sometimes feel tired - and why the body needs food.</p> <p>Help the students Identify different forms of exercise and discuss why we need exercise e.g. to keep our heart healthy, to avoid becoming overweight, to make us strong and give us muscles..</p> <p>Participate in an appropriate form of exercise e.g. physiotherapy, walking in a frame, rolling on a large ball etc and observe changes in the way they feel, before and after</p> <p>Experience exercise through a physiotherapy or hydrotherapy session.</p>	<p>STUDENTS CAN:</p> <p>sort foods using simple criteria and communicate their observations of foods in terms of their properties. (Level 4)</p> <p>sort and group foods in terms of simple features. (Level 3)</p> <p>start exploring various food groups in terms of simple criteria. (Level 2)</p> <p>co-operate in shared exploration and supported participation. (Level 1)</p>

<p>1.2 Illustrate the digestive system and guide students to understand some of the concepts of the digestion process</p>	<p>The teacher shows pictures and small clips about the human body</p> <p>The teacher links with the concept of the digestion process by introducing the students to what happens to food once it has been eaten</p> <p>Using an interactive simulation and the human torso/organ tunic, the teacher describes some of the structures and functions of the digestive system. Refer to the mouth (role of teeth and saliva), gullet, stomach small intestine, large intestine and anus.</p>	<p>answer simple scientific questions about the digestive system. (Level 4)</p> <p>observe and become aware of some of the body parts related to the digestive system. (Level 3)</p> <p>join in activities focusing on the different characteristics of the human body. (Level 2)</p> <p>co-operate in shared exploration and supported participation. (Level 1)</p>
<p>1.3 Guide the students towards an understanding of the breathing process</p>	<p>The teacher helps the students explore where the heart, lungs and ribs are on a human torso /skeleton, and discusses their function.</p> <p>Make a model of heart, lungs and ribs using balloons and straws and strong materials like doweling or chicken wire for the ribs to show their protective function.</p> <p>Students are asked and guided to feel the ribcage move in and out as we breathe and also feel natural sponge being squeezed in air and under water, point out all the air bubbles which come out. Use coloured water.</p> <p>The nature of lungs is explored by looking at pieces of sponge which have been sliced. Look at how sponges can hold little bubbles of air and find out, using secondary sources, how the air then gets into our bodies. Consider variations in breathing e.g. playing a musical instrument.</p> <p>Other activities: Make lungs out of straws and balloons and see how they work. The teacher asks students to use a straw and bubble into a small sample of water.</p>	<p>answer simple scientific questions about the breathing system. (Level 4)</p> <p>recognise some of the features of organs and ribs and their related function. (Level 4)</p> <p>join in activities focusing on the different characteristics of the human body. (Level 2)</p> <p>experience that certain actions produce predictable results. (Level 1)</p>

<p>1.4 Illustrate the main components of the blood circulatory system, i.e., heart and blood vessels</p>	<p>A model of the heart, lungs and ribs is shown to the students. Students experience a heart beat, hearing womb sounds and the beat of a heart played on a drum (by another student if possible).</p> <p>Students feel their pulse on their wrist or neck or that of an adult.</p> <p>Awareness of the students' heartbeat using a stethoscope and feel their ribs move by breathing in and out.</p> <p>Observe veins and arteries in their body and in a video.</p> <p>A pump is used to move red coloured water through a series of connecting tubes and water containers to mimic blood vessels.</p> <p>Diifferent kinds of pumps in action are observed e.g. bicycle pump, foot pump, fish tank pump and dropper using water with red food colouring to resemble blood.</p> <p>Balloons are inflated using the students' breath, when possible, to show how the lungs work.</p>	<p>understand some simple scientific vocabulary and communicate related ideas about the function of the heart (Level 4)</p> <p>show an interest and actively participate in activities involving the working of the heart (Level 3)</p> <p>begin to anticipate and join in activities the working of the heart (Level 2)</p> <p>experience that certain actions produce predictable results (Level 1)</p>
--	--	---

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.2 HEALTHY LIVING (II) – LIFE CYCLE CHALLENGE**

Strand 1: Life Processes and Living Things

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to identify different microbes and explore ways in which they can be useful.
2. describe how harmful microbes cause diseases and how infections can be spread.
3. guide students to identify (natural) ways of preventing and fighting infections
4. guide students to explore the use of medicines in preventing illnesses and fighting infections.

Key Words	Points to Note	Resources
microbe, micro-organisms, pathogen, diseases, bacteria, viruses, fungi, infection, infectious disease, immunity, poisoning, vaccination, immunisation, antibiotic,	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit to the previous unit. As in the previous units, some scenarios were placed in a context, namely the LifeCycle Challenge. Besides promoting this event, the LifeCycle participants try to create awareness re healthy lifestyles, illnesses, etc.</p> <p>Note the following misconceptions that you might come across:</p> <ul style="list-style-type: none">- Some students may think that all micro-organisms are harmful.- Some students might mix antibodies with antibiotics. <p>Be aware of the need for sensitivity to pupils and their families who may have or have had, a particular illness or condition.</p>	<p>Finding microbes: http://www.sciencekids.co.nz/gamesactivities/microorganisms.html http://lovebacteria.com</p> <p>Microbes: http://www.microbeworld.org http://kidshealth.org/PageManager.jsp?lic=1&article_set=59296&cat_id=20607 http://www.bam.gov/sub_diseases/index.html</p> <p>Infectious disease simulations: http://www.hhmi.org/biointeractive/disease/animations.html</p> <p>Vaccination http://www.youtube.com/watch?v=sGKrs1ED_rw</p> <p>Antibiotics: (contains a short clip) http://www.nhs.uk/Video/Pages/take-care-not-antibiotics-hedgehog.aspx</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1. Guide students to identify different microbes and explore ways in which they can be useful.</p>	<p><u>Starter suggestion:</u> Ask students what they know about the Life Cycle Challenge. Link with the previous unit and ask students to explore in groups the fitness level they should obtain prior and during the challenge. Students may refer to training, diet, etc. Refer to their responses to the above question and explain that the Life Cycle Challenge is an annual event (started in 1999) to raise funds for and awareness of renal problems. Explain the aim of this unit: Healthy living in terms of prevention of disease and cure.</p> <p><u>Main activity:</u> Ask students to work in groups and produce a concept map about microbes. Use the following link and ask students to identify where in the diagram micro-organisms are found http://www.sciencekids.co.nz/gamesactivities/microorganisms.html Guide students to identify types of microbes such as bacteria, fungi (including yeast and mould) and viruses. Explain that these are very small organisms which can be observed under the microscope. Use images or simulations to describe the relative size of these microbes.</p> <p>Ask students to use the above activity to identify where microbes are beneficial or harmful. Elaborate on useful/beneficial uses of microbes such as in the making of bread and wine, cheese and yoghurt, medicines such as penicillin.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students may explore further the production of bread and wine. Link this to <i>SCI 7.10 Focus on gases</i> re test for CO₂ - Ask students to use www.fooddetectives.com site and act as detectives in search of bacteria. Students may print their own certificates if successful. - Some students may explore the function of yeast. Use a plastic bottle, warm water, yeast and sugar. Place a balloon on the neck of the bottle. - Some students may explore the function of bacteria in making yoghurt and cheese. 	<p>STUDENTS CAN:</p> <p>describe an example of how one beneficial microbe work to produce useful products. (Level 8)</p> <p>recognise that microbes can be useful and harmful and identify examples of beneficial microbes. (Level 7)</p> <p>identify three types of microbes (bacteria, fungi and viruses). (Level 6)</p> <p>recognise that microbes exist. (Level 5)</p>

<p>2. describe how harmful microbes cause diseases and how infections can be spread</p>	<p><u>Starter suggestion:</u> Ask students to describe why sometimes we get sick. Note any use/misuse of words such as type of microbe (viruses/bacteria), linking some diseases with particular microbes, the distinction between symptoms/disease/microbe causing the disease. At this point do not correct their responses but note any misconceptions which might be addressed at a later stage.</p> <p><u>Main activity:</u> Ask students to work in groups and prepare a list of diseases/illnesses that they know of. Pool results on the IWB and divide them in two groups: ask students to identify what is common in each group. Some students may note that the lists show infectious and non-infectious diseases.</p> <p><i>Scenario: Present the following scenario from the LifeCycle Challenge: Half way through the challenge three participants are sick – one suffering from high fever, a second one from athlete’s foot and a third one suffering from diarrhoea. Ask students to work in groups and identify the possible source of infection, mode of transmission, etc. Give time to students to share their responses and elicit further details.</i></p> <p>Elaborate on the infectious diseases list to include the type of microbe causing each disease and how it is spread. Introduce the term pathogen as the microbe causing the disease. Some examples of diseases may include sore throat/diarrhoea (caused by bacteria); flu/common cold/AIDS by viruses and athlete’s foot/thrush by fungi</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Some students may carry out research on the Maltese fever (deni irqiq) - Show a clip showing sneezing in slow motion - May ask students to research information about Sir Temi Zammit, Joseph Lister and Alexander Fleming. <p><u>Other notes:</u></p>	<p>describe how some common diseases are spread. (Level 8)</p> <p>link a disease with its microbe. (Level 7)</p> <p>link some diseases with microbes. (Level 6)</p> <p>identify some common diseases. (Level 5)</p>
---	--	---

<p>3. guide students to identify (natural) ways of preventing and fighting infections</p>	<p><u>Starter suggestion:</u> Ask students whether they are concerned sitting near three different persons with flu, AIDS and cancer respectively.</p> <p><u>Main activity:</u> Guide students to link the above question to the previous lesson and find out how these diseases spread. Explore the students' ideas of why people are seldom ill despite surroundings rich in harmful microbes and ask students to think about ways how our bodies prevent the spread of infectious diseases and fight infections. Students may identify some natural barriers that prevent the entry of microbes such as the skin, hair in nostrils, tears, stomach acid, mucus, etc. Ask students to elaborate and explain how the body fights microbes which enter our bodies. Refer to the blood clotting and the formation of a scab as a way of stopping entry of microbes and preventing further loss of blood. Use a simulation / animation to show the action of white blood cells on microbes. Explain that one type of white blood cells surrounds and digests microbes. Other types produce antibodies (to destroy microbes) and antitoxins (to neutralise toxins). Explain that these mechanisms of defence are called the body's immune system.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Illustrate methods of personal /home/everyday life hygiene which can reduce the risk of infection. - Some students may ask why young children are sometimes less resistant to infections than older children and why breastfeeding can help. - Some students may refer to allergies – an overreaction produced by our immune system as a reaction to some substances such as dust, pollen, nuts, etc. This link www.hhmi.org/coolscience/forkids/airjunk/index.html has an activity related to air junk collecting. - Refer to the term 'immune system' and ask students to describe AIDS and the consequences. Use the following link re the role of white blood cells: http://lgfl.skool.co.uk/keystage3.aspx?id=63 <p><u>Other possible activities:</u></p>	<p>explain 'immune' as meaning resistant to disease and describe white blood cells' action against infections. (Level 8)</p> <p>describe how natural barriers act to prevent disease. (Level 7)</p> <p>identify natural barriers which act to prevent disease. (Level 6)</p> <p>identify basic hygiene procedures as a way of preventing infections. (Level 5)</p>
---	--	--

<p>4. guide students to explore the use of medicines in preventing illnesses and fighting infections.</p>	<p><u>Starter suggestion:</u> Present the following scenario from the <i>Life Cycle Challenge</i>. As a way of preventing illnesses and fighting infections the medical team had a selection of antiseptics, disinfectants and antibiotics available. Ask students to discuss in groups the difference between the three. Note any misconceptions which might be addressed later on.</p> <p><u>Main activity:</u> Identify ways how infections are treated or prevented. Students may refer to common household antiseptics and the use of medicines (especially antibiotics and vaccines). Present the scenario in which <i>Life Cycle</i> members were asked to take a number of vaccines against disease. Ask students to share their knowledge of vaccines. (Note that form 2 students are usually tested re their immunity to TB). Guide students to elaborate further on the role of this vaccine against disease. Some students may refer to other vaccines which they might have come across (such as tetanus, MMR, etc). Explain that a vaccine triggers the immune system to respond and the body arms itself with antibodies. The defence system remembers the microbe and protects the body in future encounters with the microbe.</p> <p>Ask students about the role of antibiotics when fighting illnesses and infections. Explain that antibiotics are effective against bacteria but not viruses.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Ask students to predict what happens when someone re-encounters a microbe against which they have been immunised. - Some students may ask about allergy to penicillin. - Ask students to group examples of antiseptics (wipes, mouthwash, <i>Dettol</i>) and disinfectants (such as bleach). Refer to pasteurization of milk - Some students may go through the history of penicillin discovery by Fleming - Draw a concept map showing how the immune system works. 	<p>explain how the body’s immune system can be enhanced in different ways. (Level 8)</p> <p>describe how immunisation protects the body against some diseases. (Level 7)</p> <p>identify examples of antiseptics, disinfectants and antibiotics. (Level 6)</p> <p>link the use of antiseptics, disinfectants and antibiotics as ways of fighting infections. (Level 5)</p>
---	--	--

SCI 8.2 Healthy Living (II) – Life cycle challenge

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. Microbes: http://kidshealth.org/PageManager.jsp?lic=1&article_set=59296&cat_id=20607 is an animation that explains how our immune system works. It contains some details which are more than required, but it is very clearly explained. <http://www.pkids.org> contains detailed information about vaccination. It is a useful as a source of information for teachers, but probably too complex for most students at this age without editing down content. <http://www.fightbac.org/> is another source of information and materials that can be used by teachers to create activities related to correct handling of food at home. http://www.bam.gov/sub_diseases/index.html contains self-paced learning objects suitable for use by pupils of different levels as it allows progress according to individuals.
2. A mind map consists of a central word or concept, around which one draws the 5 to 10 main ideas that relate to that word. Each of those child words is then split into 5 to 10 main ideas that relate to each of those words. Mind Maps primarily improve clarity of thinking and allow students to manage information without being overwhelmed. In this case, students can be asked to draw a concept map diagram to show the importance of the Sun in their lives, each step in the concept map being built through the effort of all the students in the class. This can then be used to introduce the idea of a food chain which starts from the sun and goes round a number of items mentioned by the students. This activity can be done on an IWB using mind/concept map software like Spicynodes (<http://www.spicynodes.org>), Mindmeister (<http://www.mindmeister.com/>), IHMC (<http://cmap.ihmc.us/>), Compendium (<http://compendium.open.ac.uk/institute/>), Freeplane (http://freeplane.sourceforge.net/wiki/index.php/Main_Page) and Freemind (http://freemind.sourceforge.net/wiki/index.php/Main_Page).
3. The teacher can set up wikis about selected scientists (e.g Sir Temi Zammit, Joseph Lister and Alexander Fleming) and get students to contribute small bits of information about their work in order to create a complete picture of the work performed by these scientists. Class in the following years could also use these or expand on them.
4. Use a sorting game (Promethean, Smartboard and Starboard software offer possibility of setting this up) in which students sort images/labels of infectious and non-infectious diseases into specific containers/areas on IWB or PC screens.
5. Most of the links in the resources section can be used as introductions to different parts of the unit. Some are too difficult for use by students and but can serve as sources of information for teachers (<http://www.amnh.org/exhibitions/epidemic>, <http://www.microbe.org> and <http://www.hhmi.org/biointeractive/disease/animations.html>).

Unit code and title: **SCI 8.2 HEALTHY LIVING (II) – LIFE CYCLE CHALLENGE**

Unit duration: Approx. 9 sessions of 40 minutes Total 6 hours

Strand: Life Processes and Living Things

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to identify different microbes and explore ways in which they can be useful.
2. describe how harmful microbes cause diseases and how infections can be spread.
3. guide students to identify (natural) ways of preventing and fighting infections
4. guide students to explore the use of medicines in preventing illnesses and fighting infections

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

- 2.1 guide students to develop an awareness of microbes including their harmful and beneficial effects
- 2.2 explore how infections can be spread
- 2.3 guide students to identify ways of preventing the spread of harmful microbes
- 2.4 familiarise students with the basic uses of medicine in preventing illness and keeping our body healthy

Key words

Microbe, diseases, bacteria, viruses, fungi, infection, infectious disease, immunity, poisoning, vaccination, immunisation, antibiotic

Refer to notes re 5E approach to teaching and learning of science.

Link this unit to the previous unit. As in the previous units, some scenarios were place in a context, namely the Life Cycle Challenge.

Be aware of the need for sensitivity to pupils and their families who may have or have had a particular illness or condition.

Refer to resources found in Communication 4 All: Resources to support inclusion

<http://www.communication4all.co.uk/>

Finding microbes:

<http://www.sciencekids.co.nz/gamesactivities/microorganisms.html>

<http://llovebacteria.com>

Microbes: <http://www.microbe.org>

Infectious disease simulations:

<http://www.hhmi.org/biointeractive/disease/animations.html>

Vaccinationhttp://www.youtube.com/watch?v=sGKrs1ED_rw

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>2.1 guide students to develop an awareness of microbes, including their harmful and beneficial effects</p>	<p>The teacher can demonstrate pictures or real samples of dirty pond water and filtered drinking water with the aim of eliciting that the difference between the pictures is that one of them is dirty. This leads to introducing the concept of microbes and germs – tiny living things that may make us sick</p> <p>The teacher may also illustrate some of the beneficial uses of microbes: making of bread and wine, cheese and yoghurt, medicines such as penicillin</p> <p>Some students may explore the function of yeast in making dough by preparing dough with/out yeast and observe the difference</p>	<p>STUDENTS CAN:</p> <p>understand that a lack of cleanliness encourages the growth of microbes (Level 4)</p> <p>actively join in activities related to developing an awareness of microbes. (Level 3)</p> <p>co-operate in shared exploration and supported participation (Level 2)</p> <p>these activities may not be appropriate for (Level 1)</p>
<p>2.2 explore how infections can be spread</p>	<p>The teacher recapitulates what germs are – that they are everywhere, they are small and can make you sick.</p> <p>The teacher shows a picture or a video clip of a person coughing and sneezing and explains that this is one of the ways that germs are spread</p> <p>As an activity the teacher may spray water on each student’s hands using a spray bottle. Explain that the water on their hands represents germs which come out of their mouth and nose when they cough and sneeze. Now have the students touch an object. Ask them what happens to the object they touched (it becomes damp) Explain that this is what happens when we sneeze into our hands and then touch an object (the germs on our hands get on the object). It is important to explain that if these germs spread from hands to eyes, nose, mouth, or food going into mouth, then we can get sick.</p> <p>The teacher explains that one of the main ways of getting rid of germs is by cleaning and washing your hands properly. Appropriate hand washing may be demonstrated.</p>	<p>develop a basic understanding of what germs are and that they are spread through a series of actions (Level 4)</p> <p>show interest in a wide range of objects and start to record their own findings. (Level 3)</p> <p>show an interest in a range of activities related to the spread of infections, such as appropriate hand washing. (Level 2)</p> <p>begin to show interest in objects presented to them in the development of visual pursuit and the permanence of objects. (Level 1)</p>

<p>2.3 guide students to identify ways of preventing the spread of harmful microbes</p>	<p>The teacher illustrates methods of personal /home/everyday life hygiene which can reduce the risk of germ spreading</p> <ul style="list-style-type: none"> • Hand washing • Covering our mouths when we cough or sneeze • Wash our dishes before we use them again • Keep food that needs to be cold in the fridge • Cook foods thoroughly, especially meats <p>The teacher reviews method of hand washing:</p> <ol style="list-style-type: none"> a. Rinse your hands with water b. If available, scrub your hands together with soap c. Scrub your hands together, on top, underneath, between fingers for 20 seconds d. Rinse off the soap e. Dry hands on a clean towel or wave them in the air (hands should not be dried on clothes) <p>The teacher elicits and illustrates situations when hands are washed:</p> <ul style="list-style-type: none"> - after bathroom use - handle uncooked food (particularly raw meat, poultry or fish) - change a diaper - blow your nose cough or sneeze - play with or touch a pet - handle garbage - after tending to someone who is sick <p>Other activities: Students may create a poster about hand washing</p>	<p>communicate their responses in relation to identifying ways of preventing the spread of harmful disease (Level 4)</p> <p>actively join in activities related to reducing the risk of germ spreading (Level 3)</p> <p>respond consistently to objects; know certain actions produce predictable results (Level 2)</p> <p>co-operate with shared exploration and supported participation development of operational causality. (Level 1)</p>
---	--	---

<p>2.4 guide students to explore the use of medicines in preventing illnesses and keeping our body healthy.</p>	<p>The teacher may illustrate pictures of various healthcare professionals together with pictures of medicine/vaccines and ask students to identify them and possibly aspects of their role in preventing illness</p> <p>The teacher may use the students' own experiences to get discussion started about the different purposes of medicines (cure, prevent, relieve). For example, where possible, the students' vaccine experiences are a good starting point to discuss the preventive use of medicines.</p> <p>By means of visuals, the teacher can help the students explore ways of helping our body stay healthy:</p> <ul style="list-style-type: none"> - getting plenty of sleep - dressing appropriately for weather conditions - washing hands - adopting a healthy lifestyle including healthy food - drinking water - avoiding smoking 	<p>show an understanding of ways which can help keep our bodies healthy. (Level 4)</p> <p>understand some simple vocabulary related to the topic and communicate related ideas using simple phrases. (Level 3)</p> <p>respond consistently to objects know certain actions produce predictable results. (Level 2)</p> <p>co-operate with shared exploration and supported participation development of operational causality. (Level 1)</p>
---	---	---

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.3 ELEMENTS, COMPOUNDS AND MIXTURES I**

Strand 1: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to explore that materials are made up of elements and describe what elements are.
2. illustrate some examples of elements and guide students to understand how elements are sorted out in the periodic table.
3. guide students to identify examples of mixtures.

Key Words	Points to Note	Resources
element, compound, atom, molecule, symbol, names of some elements, compounds and mixtures, periodic table, metals, non-metals,	<p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>This unit links with units <i>SCI 7.5 (Understanding Matter)</i> and <i>SCI 7.10 Focus on gases</i>. For the sake of unitised curriculum this topic was divided into two units. Consider SCI 8.3 and SCI 8.4 as one continuous topic.</p> <p>Be aware that the ideas of the meaning of 'pure' when applied to a material may vary when used with reference to elements, compounds and mixtures.</p> <p>Some students may find it difficult to distinguish mixtures and compounds.</p>	<p>Molecular model kits, periodic table chart, samples of different elements,</p> <p>Interactive elements game and the Periodic Table of elements: http://www.chemicalelements.com/</p> <p>Compounds and mixtures: http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/compounds_mixtures/activity.shtml</p> <p>School.co.uk – a number of presentations: Chemistry content including uses of elements, metals and non-metals: http://lgfl.skool.co.uk/keystage3.aspx?id=64</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>The teacher will:</p> <p>1. guide students to explore that materials are made up of elements and describe what elements are.</p>	<p><u>Starter suggestion:</u> Ask students to look around them and identify materials around them. Elaborate on their list and ask some students to identify an important property of that material – e.g. glass – transparent.</p> <p><u>Main activity:</u> Add some other materials to the list (include wood, gold, iron, salt, glass, oxygen, granite, plastic, etc) and ask students to work in groups and classify these materials according to state (solids, liquids or gases) and type (whether they are natural or synthetic). Students may also refer to an important property of that material. Give time for students to discuss and share their responses. Guide students to discover that some materials are made up of two or more chemicals. Ask students to give examples of chemicals made up of two or more chemicals (elements).</p> <p>Explain that people have always been excited by gold. Ask students whether it is possible to produce gold from other substances. Show that early scientists (alchemists) tried to turn other substances into gold e.g. by mixing mercury with sulphur. They never managed to produce gold in this way. Ask students why this has happened. Show that pure gold is a substance (element) that cannot be broken down into anything simpler.</p> <p>Refer to the starter activity and ask students to give their responses and then sort materials into two groups – pure substances (elements) and mixture of substances. Show that there is a huge variety of materials but materials are made up of a relatively small number of ‘pure’ substances called elements.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Revisit SCI 7.5.1 to show that elements are made up of one type of particle. Give some examples and identify particles as atoms or molecules. - Ask for examples of elements. Show that there are around 92 naturally occurring elements. - Introduce the idea of a chemical symbol representing an element. Give some examples of commonly used elements and their symbol. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Use molecular model kits to build models of some elements. 	<p>STUDENTS CAN:</p> <p>know that chemical symbols are used to represent elements and identify some of them. (Level 8)</p> <p>describe elements as materials made up of one type of particle, identify an atom and a molecule and give some examples of elements. (Level 7)</p> <p>name the materials that make up some common objects. (Level 6)</p> <p>understand that objects are made up of different materials. (Level 5)</p>

<p>2. illustrate some examples of elements and guide students to understand how elements are sorted out in the periodic table.</p>	<p><u>Starter suggestion:</u> Give a list of materials...ask students to identify the elements and explain what elements are.</p> <p><u>Main activity:</u> Explain that there are around 92 natural occurring elements. Give some examples. Give examples of metals, reactive / unreactive elements, gases and so on.</p> <p>Present the Periodic Table of the Elements as the list of elements. Identify elements as metals and non-metals and give some examples. Identify some properties of metals and non-metals. The following link identifies some properties: http://lgfl.skool.co.uk/keystage3.aspx?id=64</p> <p>Ask student to think about advantages of sorting elements - show that the periodic table helps scientists as it groups elements according to their properties.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Give groups of students the names of around five elements. Ask them to find this element in the periodic table and identify its symbol, its state at room temperature, metal/non-metal and explore some of their common characteristics <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students may go through the history of Dalton and Mendeleev who created the first Periodic table. - Ask students to evaluate their previous knowledge of what elements are. <p><u>Other notes:</u></p>	<p>describe some properties of metals and non-metals. (Level 8)</p> <p>describe the periodic table as the list of element and identify metals and non-metals. (Level 7)</p> <p>identify one property of some common elements. (Level 6)</p> <p>sort different materials according to appearance. (Level 5)</p>
--	---	--

<p>3. guide students to describe mixtures.</p>	<p><u>Starter suggestion:</u> Ask students to separate iron filings from rice. Some students may try sieving and others may use a magnet.</p> <p><u>Main activity:</u> Ask students to give possible explanations of the starter activity and think about the way chemicals come together. Revisit SCI 7.10 about air and ask about gases present in it and their approximate percentage. Show that air is a mixture of gases. Introduce mixtures as a group of two or more chemicals that are not chemically joined together – mixtures retain the properties of the chemicals present in them e.g. Air as a mixture - oxygen in air can be used during burning and breathing, CO₂ is used by plants, etc).</p> <p>Ask students to give some further examples of mixtures. Check understanding by presenting three different items - sand and water; a bowl of different marbles; iron filings and rice. Ask students to identify a common thing between these three – guide students to show that these are examples of mixtures because the substances are not chemically joined together but just mixed.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Use molecular model kits to build models of some elements and mixtures. Identify particles as atoms or molecules. - Revisit SCI 7.10 <i>Focus on gases</i> re test for oxygen. - Some students may explore and elaborate about the air tanks used by divers, fire-fighters and mountaineers. - Some students may refer to other types of mixtures such as alloys (mixture of metals), salt present in the Dead Sea, etc <p><u>Other notes:</u></p>	<p>describe and draw diagrams to illustrate particles in a mixture. (Level 8)</p> <p>describe mixtures as a group of chemicals not chemically joined together. (Level 7)</p> <p>identify the components of some mixtures such as air. (Level 6)</p> <p>identify some common mixtures. (Level 5)</p>
--	---	---

SCI 8.3 Elements, Compounds and Mixtures I

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/compounds_mixtures/activity.shtml is an interactive activity with revision which can be followed independently by students to introduce compounds and mixtures, or as a follow-up revision activity after the topic is done.
2. ActivInspire (Promethean IWB software) has a very good activity resource for the Periodic Table. It can be found in the Resource browser (Subjects/Chemistry/Periodic table). This can also be used by students to find extra information about groups of elements, maybe during group work with students rotating onto IWB.
3. Teachers can setup games (e.g. wordsearch, crosswords, jigsaw puzzles). <http://www.proprofs.com/games/> can be used to set up online games for students to do in class or at home. Free software like Hotpotatoes (<http://hotpot.uvic.ca/>) allows offline preparation.
4. Sorting games (Promethean, Smartboard and Starboard software offer possibility of setting this up) in which students group different materials according to state (solid, liquid, gas) and whether they are natural or synthetic .
5. Use Flashcards (e.g. <http://www.flashcardmachine.com/>) on the IWB to help students identify symbols for different elements. This can also be used as an exercise in which students create their own flashcards with information about the elements. Also useful as a revision tool.

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.3 ELEMENTS, COMPOUNDS AND MIXTURES I**

Strand 1: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to explore that materials are made up of elements and describe what elements are.
2. illustrate some examples of elements and guide students to understand how elements are sorted out in the periodic table.
3. guide students to identify examples of mixtures.

Objectives 1-3 have been grouped into two objectives

Objectives at attainment levels 1,2,3,4

3.1 guide students to explore that materials are made up of elements and familiarise themselves with examples of elements

3.2 guide students to identify and investigate mixtures

Key words	Points to note	Resources
element, compound, atom, molecule, symbol, names of some elements, compounds and mixtures, periodic table, metals, non-metals,	<p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>This unit links with units SCI 7.12 (Understanding Matter) and SCI 7.8 (Chemical Changes)</p> <p>Be aware that the ideas of the meaning of 'pure' when applied to a material may vary when used with reference to elements, compounds and mixtures.</p> <p>Some students may find it difficult to distinguish mixtures and compounds.</p>	<p>Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/</p> <p>Molecular model kits, periodic table chart, samples of different elements,</p> <p>Interactive elements game: http://www.chemicalelements.com/</p> <p>Compounds and mixtures http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/compounds_mixtures/activity.shtml</p>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>3.1 guide students to explore that materials are made up of elements and familiarise themselves with examples of elements</p>	<p>Experience a range of different types of balls in a feely bag as a way of experiencing molecules e.g. smooth, jingle ball, foam, bumpy.</p> <p>For students performing at lower levels, be aware of a favourite object of theirs and show awareness of its presence when encountering it in a selection of similar and different objects in a string bag or a box.</p> <p>Put a selection of balls (or similar objects) into groups of colour order. Arrange Lego bricks into a selection to show the difference between elements and compounds e.g.</p> <ul style="list-style-type: none"> - bricks of one colour or joined = element - two or more different coloured bricks joined together = compound <p>Get the class to pick out the bricks of the same colour – these are the elements. You can move on to get them to identify compounds if thought appropriate.</p>	<p>STUDENTS CAN:</p> <p>sort materials using simple criteria and communicate their observations. (Level 4)</p> <p>communicate their awareness of changes. (Level 3)</p> <p>respond to options and choices with actions or gestures. (Level 2)</p> <p>co-operate in shared exploration and supported participation. (Level 1)</p>
<p>3.2 guide students to identify and investigate mixtures</p>	<p>As a starter activity students may experience a mixture of objects of the teacher’s choice e.g. a mixture of foods, a mixture of various activities. For example, after making a trifle, taste each component separately and then a combination of trifle ‘elements’ together and then the whole mixture.</p> <p>Pick out a specific type of sweet out of pick and mix mixture and using photographic reference, begin to sort into groups. Participate in changing the texture of salt dough or clay by adding other materials such as sand, leaves, paper.</p> <p>Make a variety of mixtures such as salt/water, sugar/water, sand/water to compare and contrast. Use the Lego bricks to set up a mixture of elements and compounds. Get the students to pick out and describe named items. Use vocabulary cards with key words and appropriate pictures on to assist if necessary.</p> <p>Experiment with Iron and Sulphur (heat in a crucible and observe the changes). Use photo cards of the colours black and yellow to match up to colours of chemicals. Know that at the start they are elements and at the end they are compounds.</p>	<p>sort materials using simple criteria and communicate their observations. (Level 4)</p> <p>explore and observe similarities, differences, patterns and changes. (Level 3)</p> <p>explore objects and materials provided changing some materials by physical means. (Level 2)</p> <p>co-operate in shared exploration and supported participation. (Level 1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.4 ELEMENTS, COMPOUNDS AND MIXTURES (II)**

Strand 1: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to understand what compounds are.
2. guide students to explore examples of chemical changes and present them as word equations.

Key Words	Points to Note	Resources
element, compound, atom, molecule, symbol, names of some elements, compounds and mixtures, periodic table, metals, non-metals, chemical and physical change	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit with <i>SCI 8.3 Elements, Compounds and Mixture (II)</i> and consider as one topic. This unit builds upon units <i>SCI 7.5 (Understanding Matter)</i> and <i>SCI 7.10 (Focus on gases)</i>.</p> <p>Be aware that the ideas of the meaning of 'pure' when applied to a material may vary when used with reference to elements, compounds and mixtures. Some students may find it difficult to distinguish mixtures and compounds.</p>	<p>Molecular model kits, periodic table chart, samples of different elements,</p> <p>Chemical reactions animations: http://bio-alive.com/animations/chemistry.htm</p> <p>Elements and Compounds: http://eduwight.iow.gov.uk/curriculum/core/science/keystage3/17SUBJECT.asp</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1. guide students to understand what compounds are.</p>	<p><u>Starter suggestion:</u> Show students samples (or pictures) of sulphur, iron, zinc and water. Ask students to identify the odd one out and why. Some students may refer to the state of matter but some may refer to the fact that water is not found in the periodic table,</p> <p><u>Main activity:</u> Relate the above activity to what happens when elements, such as magnesium or iron are burnt and the product collected. Give some examples of common compounds. Ask students to work in groups and write a list of common compounds such as salt, rust, wood, water, carbon dioxide, paper, plastics, etc. Show that these are all products of chemical reactions. Ask student to discuss whether the properties of a compound are different from those of its elements. e.g. salt (sodium / chlorine) ; carbon dioxide (carbon / oxygen); water (oxygen / hydrogen); rust (iron / oxygen) – ask students to identify some characteristics of the compound and of its elements. Guide students to understand that compounds have different properties from its elements.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Name the elements present in some simple compounds such as water, carbon dioxide, salt, rust, hydrochloric acid, etc. - May use a particle kit model to represent particles in an element, mixture or compound. Ask students to use a fill in work sheet and draw diagrams of particles in a compound. <p><u>Other possible activities:</u></p>	<p>STUDENTS CAN:</p> <p>illustrate particles in a compound. (Level 8)</p> <p>identify the elements present in some simple compounds. (Level 7)</p> <p>describe that compounds are chemicals made up of two or more elements joined together. (Level 6)</p> <p>identify some common compounds. (Level 5)</p>

<p>2. guide students to explore examples of chemical changes and present them as word equations.</p>	<p><u>Starter Suggestion:</u> Give examples of changes (melting ice, burning of wood, burning of oil, melting chocolate, etc). Ask students to sort changes into groups...some students may identify reversible / irreversible changes. Identify these changes as physical and chemical changes and identify differences.</p> <p><u>Main activity:</u> Students work in groups and carry out some test tube chemical reactions in which visible changes occur, e.g.</p> <ul style="list-style-type: none"> - Mixing sodium carbonate solution and iron (III) chloride solution - a brown precipitate of iron (III) carbonate is formed. - Adding dilute hydrochloric acid to solid magnesium carbonate – effervescence is observed (carbon dioxide is produced) - Adding dilute ammonia solution to copper sulphate solution – a gelatinous blue precipitate of copper hydroxide is formed. - Heating sucrose (sugar)...caramelization of sugar i.e. sugar turns brown with a characteristic colour and flavour. <p>NOTE: At this point ask for visible changes (which are indicative of chemical changes). Students are NOT expected to know the name of the product formed but to take note and record visible changes. Ask students to record their observations carefully and look for evidence that chemical reactions have taken place.</p> <p>Revisit SCI 7.10.2 re chemical changes and guide students to write the word equation of simple chemical reactions e.g.</p> <ul style="list-style-type: none"> - Burning of magnesium, rusting, making of salt, reaction between some acids and alkalis, etc. - May use the IWB to show the burning of sulphur. - Revisit any of the previous reactions and present them as word equations. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students may explore other reactions such as the reaction of metals with acids. Identify patterns e.g. production of Hydrogen. 	<p>present simple chemical changes as word equations. (Level 8)</p> <p>use set criteria (such as production of a gas, change in colour, production of an insoluble substance) and identify other changes such as heat, light and sound as an indicator of a chemical change. (Level 7)</p> <p>Identify chemical and physical changes and state the differences. (Level 6)</p> <p>identify visible changes taking place during a chemical change. (Level 5)</p>
--	---	--

SCI 8.4 Elements, Compounds and Mixtures II

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. When students carry out the test tube chemical reactions in which visible changes occur, they can use a digital camera to record the procedure followed and results obtained. They can use these to enhance their lab report writeups.
2. Free software like <http://www.education.vic.gov.au/languagesonline/games/matching/index.htm> can be used to set up matching games on the IWB to allow students to link statements to different elements, mixtures and compounds.
3. Since this unit involves a number of revision sessions or links to previous topics done in Form 1, the teacher can prepare IWB files (Starboard, Promethean or Smartboard) depending on availability and use rub and reveal features to allow students to revise topics.

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.4 ELEMENTS, COMPOUNDS AND MIXTURES (II)**

Strand 1: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to understand what compounds are.
2. guide students to explore examples of chemical changes and present them as word equations.

Objectives at attainment levels 1,2,3,4

4.1 guide students to explore examples of chemical reactions

<p>element, compound, symbol, names of some elements, compounds and mixtures, metals, non-metals, chemical and physical change</p>	<p>Refer to notes re 5E approach to teaching and learning of science. This unit links with units SCI 7.12 (Understanding Matter) and SCI 7.8 (Chemical Changes)</p> <p>Be aware that the ideas of the meaning of 'pure' when applied to a material may vary when used with reference to elements, compounds and mixtures. Some students may find it difficult to distinguish mixtures and compounds.</p> <p>As part of this unit students are asked to carry out a presentation <i>The Story of making ...</i>. During the presentation students are expected to give details re the use, production, etc of a particular chemical but they are not expected to remember/study this information for their annual examination. Guide students to develop skills re research, presenting their work, group work, etc.</p>	<p>Molecular model kits, periodic table chart, samples of different elements,</p> <p>Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/</p> <p>Chemical reactions animations: http://bio-alive.com/animations/chemistry.htm</p> <p>Elements and Compounds: http://eduwight.iow.gov.uk/curriculum/core/science/keystage3/17SUBJECT.asp</p>
--	---	--

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL: 4.1 guide students to explore examples of chemical reactions</p>	<p>Encounter chemical reactions first hand by finding out what happens when vinegar and bicarbonate of soda are mixed.</p> <p>Carry out a number of test tube chemical reactions in which visible changes occur. If chemicals not available then put four drops of food colouring in corners of a tray of milk. Put drop of washing up liquid in middle and watch for marbling. Notice the changes that happened.</p> <p>Explore the differences in appearance before and after a chemical reaction.</p> <p>Students may observe experiments demonstrated by the teacher. (Note safety precautions.) Experience the reaction of small amounts of:</p> <p>Sodium and cold water Lithium and cold water Calcium and cold water.</p> <p>Students are encouraged to make appropriate comments about the 'biggest' reaction and the 'smallest' reaction. The students may wish to use the terms 'most' or 'least' reactive.</p> <p>Discuss and demonstrate some useful/non-useful chemical reactions.</p>	<p>STUDENTS CAN:</p> <p>describe ways in which materials are changed (Level 4)</p> <p>explore and observe similarities, differences, patterns and changes (Level 3)</p> <p>explore objects and materials provided changing some materials by physical means (Level 2)</p> <p>experience and respond to chemical change (Level 1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.5 SEPARATING MIXTURES**

Strand: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to identify soluble and insoluble substances and factors affecting solubility
2. guide students to distinguish between mixtures and solutions
3. explore ways of separating different mixtures
4. explore ways of separating solutions.

Key Words	Points to Note	Resources
Salty water, tap water, soluble, insoluble, solvent, solute, solution, mixture, dissolving, chromatography, filtration, filter paper, evaporation, distillation, making crystals	<p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>Link this unit with <i>SCI 7.5 Understanding matter</i> and <i>SCI 8.3 & 8.4 Elements, Compounds and Mixtures</i>. Note that the idea of mixtures is developed in both <i>SCI 8.3, 8.4</i> and this unit. Many students may find the difference between mixtures and compounds difficult to understand and remember.</p> <p>Note that students often mix dissolving (in Maltese 'jinħall) with melting (in Maltese 'idub').</p> <p>With regards to separating by magnets, some students may think that all metals are magnetic.</p>	<p>Salt (coarse and fine), soil, sand, sugar, rice, marble chips, wood shavings, copper sulphate, ink, filter paper, chromatography paper, funnels, crucible, Bunsen burner, Liebig condenser for distillation</p> <p>Compounds and Mixtures and separating mixtures: http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/compounds_mixtures/activity.shtml</p> <p>Chemistry simulations: http://phet.colorado.edu/en/simulations/category/chemistry/general</p> <p>Distillation: http://www.purposegames.com/game/simple-distillation-quiz</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <ol style="list-style-type: none"> 1. guide students to identify soluble and insoluble substances and factors affecting solubility 	<p><u>Starter suggestion:</u> Present students with a beaker of water and a beaker of muddy water. Ask the students to indicate the difference between the two.</p> <p><u>Main activity:</u> Repeat the same activity above with salty water and tap water. Ask the students whether they see any difference in appearance. Guide the students to identify the two main substances present in each beaker (i.e. soil + water and salt + water). Introduce the terms soluble and insoluble. Identify water as the solvent and the solid substances as the solute.</p> <p>Ask students to explore ways to help substances dissolve. They may suggest stirring or using hot water. Students work in groups to find out examples of soluble or insoluble substances. Some examples may include soil, sand, salt, sugar, marble chips, wood shavings and copper sulfate. Ask students to write their results in a prepared table. Ask students to investigate the effect of heat and particle size on the rate of dissolving. Elicit students to suggest an experimental set up. Provide hot / cold water and fine / coarse salt. Discuss the results and guide the students to identify the factors that increased the rate of salt dissolving.</p> <p>Identify this kind of mixture as a solution where the dissolved substance seems to disappear. Probe with further questions and ask students for evidence that it is still there.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Guide the students to use the particle theory to explain why heat, stirring and size of particle help things to dissolve faster. <p><u>Other possible activities:</u></p>	<p>STUDENTS CAN:</p> <p>describe the factors which affect solubility. (Level 8)</p> <p>recall some soluble and insoluble substances in water and describe what is a solution. (Level 7)</p> <p>identify water as a good solvent. (Level 6)</p> <p>know that some substances dissolve in water and others do not. (Level 5)</p>

<p>2. guide students to explore ways of separating mixtures.</p>	<p><u>Starter suggestion:</u> Ask a few students to describe the contents of their pencil case. Show that they have a mixture of things that can be easily seen and thus identify their pencil case as a mixture of different things.</p> <p><u>Main activity:</u> Show pictures of other mixtures or ask students to give other examples. Make a solution of salt or sugar in water. Ask the students to identify the number of substances present in each beaker and how many they can see. Present a list of mixtures and solutions used in everyday life and ask students to separate them into two groups. Ask students to name mixtures made up of two solids and mixtures made up of two liquids.</p> <p>Show that colours are usually a mixture of different 'pure' colours. Explain how chromatography is a way of separating substances (e.g. colours) in a mixture and how this is done. Use different colours and filter paper. Ask students to work in groups to identify the colours present in each mixture. Allow a couple of minutes for this activity and in the mean time ask students to write their observations, etc on their workbook.</p> <p>Discuss their results and guide students to link the movement of the colours to their solubility.</p> <p><u>Other possible activities:</u></p>	<p>explain the movement of colours in chromatography in terms of solubility. (Level 8)</p> <p>Identify chromatography as a way of separating colours and carry out the experiment with minimum help. (Level 7)</p> <p>Identify some examples of mixtures. (Level 6)</p> <p>recognise visible things in a mixture. (Level 5)</p>
--	---	---

<p>3. explore other ways of separating mixtures.</p>	<p><u>Starter suggestion:</u> Ask students to work in groups to identify the contents put in a beaker. Contents may include paperclips, rice, sand, salt and marbles.</p> <p><u>Main activity:</u> Ask students to suggest ways in which the above contents may be separated. Students work in groups to identify the steps needed to separate the contents. Ask each group of students to choose the apparatus needed. All students will manage to separate the paperclips and marbles by hand and/or magnet. Ask students to identify other things which can be separated by a magnet. Guide students to identify the apparatus / method needed to separate the remaining rice, sand and salt. Most students will use a sieve to collect the rice.</p> <p>Some students may link the previous lessons with this activity and identify the difference between sand and salt re solubility. Guide students to use this information to separate the two. Through questions help students to identify the need of a sieve with very small holes (i.e. the filter paper). Show the proper way of using the filter paper and a funnel to separate sand and salt. Introduce the terms filtrate and residue. Ask students to write an experiment report of their findings.</p> <p>Ask students to think about ways of obtaining back the salt from the remaining solution....this will be dealt with in the next lesson.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Some students may explore different types of filters used at home e.g. tea bag, coffee machine, water filter, aquarium filter 	<p>explain why different methods can be used to separate mixtures according to the properties of the contents. (Level 8)</p> <p>identify the best way to separate a mixture. (Level 7)</p> <p>separate a mixture using sieve or filter paper correctly. (Level 6)</p> <p>separate a mixture by separating objects by hand or magnet. (Level 5)</p>
--	--	--

<p>4. explore ways of separating solutions.</p>	<p><u>Starter suggestion:</u> Link this lesson with the previous one and ask students to suggest ways how to separate the water and the salt. Give time to students to share their responses.</p> <p><u>Main activity:</u> If necessary guide student to think about how salt is obtained from seawater. Then they work in groups to design the experiment needed to obtain salt from the solution. Go through safety precautions needed and if necessary revise the steps how to light and use the Bunsen burner. Ask student to record their observations.</p> <p>Ask students to suggest ways how the water can also be obtained back. If necessary revisit <i>SCI 7.5.3 Understanding Matter</i> re the change of state and revise the steps involved in a water cycle, namely evaporation and condensation.</p> <p>Describe the process of distillation, show the apparatus and explain how it works. Demonstrate distillation of salt water. Students label a prepared diagram of the distillation apparatus clearly indicating the solid and the liquid in separate containers.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students may research the formation of salt rocks, stalagmites and stalactites. - Note that some students might ask about the process of reverse osmosis - Students explore other examples where evaporation takes place to leave a solid behind (eg. Inside a kettle) - Students may read about the formation of the Dead Sea. - May refer to salt collection in salt pans around Malta. 	<p>link evaporation and distillation to everyday natural processes. (Level 8)</p> <p>identify when to use evaporation or distillation to separate a solution. (Level 7)</p> <p>understand what happens when a solution is evaporated. (Level 6)</p> <p>recall the meaning of evaporation. (Level 5)</p>
---	---	---

SCI 8.5 SEPARATING MIXTURES

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. A sorting game (on the IWB) can be used to identify soluble and insoluble substances or to sort solid and liquid mixtures. Use of 'containers' in Promethean software or 'Category Sort' Lesson activity in SMART Software can help achieve this. Alternatively A drag and drop exercise can be set up on Starboard Software.
2. <http://quizlet.com/> is a free flash-card maker which can be used to make double sided flash cards for quizzing students. As it also has game features, it could be used in class to revise material in a fun way.
3. Internet research (e.g. mixtures like crude oil and air, solutions like saline, brine and food syrup, formation of the Dead Sea, formation of salt rocks, stalagmites and stalactites, etc) can be directed via Google Custom Search (<http://www.google.com/cse/>), which offers teachers the possibility of setting up a customised search for their students, leading them to specific sites of the teacher's choosing. Alternatively, sites like <http://www.zunal.com/index.php>. can be used to setup a webquest.
4. The suggested resource <http://www.purposegames.com/game/simple-distillation-quiz> can be used to revise distillation after it is covered in class.

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.5 SEPARATING MIXTURES**

Strand: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to identify soluble and insoluble substances and factors affecting solubility
2. guide students to distinguish between mixtures and solutions
3. explore ways of separating different mixtures
4. explore ways of separating solutions.

Mainstream objective 2 may not be relevant at this level of attainment

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

5.1 guide students towards an understanding of soluble and insoluble substances

5.2 explore ways of separating different materials, mixtures and solutions

5.3 experience dissolving, evaporation and chromatography as ways of separating solutes

Keywords	Points to Note	Resources
<p>Salty water, tap water, soluble, insoluble, solvent, solute, solution, mixture, dissolving, chromatography, filtration, filter paper, evaporation, distillation, making crystals</p>	<p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>Link this unit with SCI 7.12 Understanding matter and SCI 8. Elements, Compounds and Mixtures. Note that the idea of mixtures is presented in both SCI8. and this unit. Many students may find the difference between mixtures and compounds difficult to understand and remember.</p> <p>Note that students often mix dissolving (in Maltese 'jinħall) with melting (in Maltese 'idub').</p> <p>With regards to separating by magnets, some students may think that all metals are magnetic.</p>	<p>Salt (coarse and fine), soil, sand, sugar, rice, marble chips, wood shavings, copper sulphate, ink, filter paper, chromatography paper, funnels, crucible, Bunsen burner,</p> <p>Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/</p> <p>Compounds and Mixtures and separating mixtures: http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/compounds_mixtures/activity.shtml</p> <p>Chemistry simulations: http://phet.colorado.edu/en/simulations/category/chemistry/general</p> <p>Distillation: http://www.purposegames.com/game/simple-distillation-quiz</p>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>5.1 guide students towards an understanding of soluble and insoluble substances</p>	<p>The teacher encourages students to experience dissolved liquids e.g. jelly in water, tea, coffee, milkshake, saltwater, juice.</p> <p>The teacher helps students participate in mixing solids with liquids to see if they dissolve.</p> <p>Group the solids that dissolve using objects or photos.</p> <p>The teacher guides students to look at a mixture of solutions and help group solutions according to solids that are insoluble and solids that are soluble.</p>	<p>STUDENTS CAN:</p> <p>use simple equipment and materials provided and make related observations. (Level 4)</p> <p>observe the simple properties of solids and begin to record their findings. (Level 3)</p> <p>show an interest in activities related to soluble and insoluble substances. (Level 2)</p> <p>begin to respond consistently to familiar people, events and objects and react to new activities and experiences. (Level 1)</p>
<p>5.2 explore ways of separating different materials</p>	<p>The teacher helps students experience mixing different solids and sieving e.g. marbles and rice, sand and Lego bricks, jelly babies and rainbow crystals.</p> <p>Extract one solid from another by physical means or sieving e.g. bobbing for apples in water, removing marshmallows and other sweets from sugar using their mouths, picking raspberries out of jelly, peas from flour. Mix then sieve the above mixtures to extract the larger solid.</p> <p>Discuss whether the process of sieving is completely efficient i.e. is any solid left in the sieve, is the larger solid the same as before or is it coated in the smaller solid. Take before and after pictures using a camera to compare results.</p>	<p>observe and start to recognise differences, patterns and changes. (Level 4)</p> <p>closely observe the changes that occur and record them. (Level 3)</p> <p>engage in experimentation related to separating different materials. (Level 2)</p>

	<p>Experiment with solids of similar grain size to see if sieving is an effective form of separating. The students experience and participate in filtering different insoluble solids from a solution e.g. tea leaves from a cup of tea, sand from water.</p> <p>Filter an insoluble solid from water in a measuring cylinder using the following filters: muslin, filter papers, kitchen paper and paper towels. Talk about which is most effective by comparing the amount of water collected.</p>	<p>co-operate with shared exploration and supported participation in the development of operational causality. (Level 1)</p>
<p>5.3 experience dissolving, evaporation and chromatography as ways of separating solutes</p>	<p>The teacher helps the students participate in mixing solids with liquids to see if they dissolve. Complete the above activity and then watch the process of evaporation, then evaporate their mixtures as a group with adult assistance. Observe the solids through a microscope or viewer to see if crystals have formed.</p> <p>The teacher shows the students a demonstration of evaporation and then evaporate the solutions they have identified as having dissolved solids. Draw their evaporated solids using a microscope.</p> <p>Chromatography: The teacher guides students to use felt tips and draw on strips of chromatography paper. Place the ends of their strips (just below their felt tip mark) in water. What colours appear above their felt tip mark?</p> <p>Make a colour chart to see what combinations make up different colours. Use this chart to create the same colours using paints.</p> <p>The teacher may extend the above activity and include Smarties (for example) and other coloured sweets and food colourings. Discuss that chromatography separates different dissolved solids from each other.</p> <p>The teacher may review students' work by matching card's naming and illustrating the processes used e.g. melting, sieving, chromatography.</p>	<p>begin to make generalisations, connections and predictions from regular experience. (Level 4)</p> <p>actively join in activities related to separating solutes. (Level 3)</p> <p>know that certain actions produce predictable results. (Level 2)</p> <p>co-operate with shared exploration and supported participation in the development of operational causality. (Level 1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.6 LIGHT AND SOUND**

Strand 1: Physical Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

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. guide students describe sound and identify sound sources.
4. guide students to use the particle theory to explain how sound travels through materials but not through a vacuum.
5. show the structure of the ear and guide students to explain how our ears enable us to hear.

Key Words	Points to Note	Resources
Transparent, opaque, reflection, luminous, non-luminous, rays, straight line, ray diagrams, mirrors, reflection, the eye, light energy, sound energy, source, detector, medium, vibration, speed of sound, high pitch, low pitch, loudness, particle movement	<p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>Link this topic to <i>SCI 8.11 & 8.12 Earth and Space</i>. Revisit sources of light, light travelling in straight lines, speed of light and sound travelling through a vacuum. Link this topic to <i>SCI 7.5 Understanding matter</i> re matter is made up of tiny particles.</p> <p>Note that</p> <ul style="list-style-type: none">- 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.	<p>Large convex lenses, ray box, selection of lenses and mirrors, eye and ear models, selection of transparent/translucent and opaque materials, plastic bowl, uncooked rice, source of sound, water and glass bottles, rubber bands of varying thickness, 2 plastic cups, string, tuning fork</p> <p>Light travels in a straight line : https://www.youtube.com/watch?v=WtQsq8s8XzU</p> <p>Animals and sound - musical insects http://www.primaryupd8.org.uk/activity.php?actid=185</p> <p>Vibrating sound http://sciencekids.co.nz/videos/physics/soundvibrations.html</p> <p>Sources of sound and loudness http://www.engineeringinteract.org/resources.htm</p> <p>Sound travelling through different media (Evelyn Glennie) http://www.youtube.com/watch?v=IU3V6zNER4g</p> <p>Ear and hearing http://lgfl.skool.co.uk/content/primary/science/ears_and_hearing/index.html</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1. guide students to use ray diagrams to show how objects are seen.</p>	<p><u>Starter suggestion:</u> Organise the students in groups and ask each group of students to sort the following objects in two sets: torchlight, sun, radio, bulb, lightning during a storm, chair, table, boy/girl, tree, pen, fire: Set 1 (objects that one can see easily in the dark) and Set 2 (objects that one cannot see in the dark). Ask each group of students to discuss why some objects can be seen in the dark whilst others cannot and whether the 'moon' should be placed in set 1 or 2.</p> <p><u>Main activity:</u> Use a torch light (a ray box or laser beam) to show a beam of light travels across the room. <u>Note re safety:</u> Laser light can be damaging to the eyes. Elicit their observations. Ask students to explain why a student standing behind a corner in the room can be heard but not be seen. Guide students to conclude that light travels in straight lines. Ask students to explore how the direction of a beam of light can be changed (using a mirror or a reflective surface). Guide students to draw ray diagrams on the board and on their copybooks. Introduce the notion that rays of light are represented as a straight line drawn from the source and that the direction of the light is shown as an arrow drawn on the line.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Some students may investigate objects which produce a shadow and others which allow light to pass through. Students explore how the distance of the torch from the object effects the sharpness of the shadow and report their findings on their copybooks. - may explore the behaviour of different materials such as transparent, translucent and opaque materials - Use a handout where students are asked to draw simple ray diagrams. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Refer to the starter activity and sort objects as luminous and non-luminous. 	<p>STUDENTS CAN:</p> <p>describe the formation of shadows and explain the difference between transparent, translucent and opaque objects. (Level 8)</p> <p>draw simple ray diagrams and describe that light travels in a straight line. (Level 7)</p> <p>identify luminous objects as objects that give off light and non-luminous objects as object that reflect light. (Level 6)</p> <p>identify objects that give off light and objects that do not. (Level 5)</p>

<p>2. show the structure of the eye and guide students to explain how our eyes enable us to see.</p>	<p><u>Starter suggestion:</u> Ask students to look at a distant object through a convex lens (magnifying glass) and share their observations. Some students may note that objects seem to be inverted.</p> <p><u>Main activity:</u> Ask students to look at each other's eye and observe the external features of the eye. Encourage the students to draw their observations and share their ideas about how the eye functions.</p> <p>Use the IWB to show a large picture of the eye and use the eye model to go through their responses. Build upon the information provided using such terms as....pupil, cornea, lens, iris, retina, image and optic nerve. Describe the retina as the light sensitive layer (or screen) upon which an inverted image is formed. Through questioning, elicit from the students the idea that the eye lens behaves in the same way as the convex lens i.e. it produces an inverted image of an object on the retina of the eye. Some students may observe how the eye reacts when a torch is directed towards the eye. Discuss the protective role of the eye lids. Different handouts to be filled in by the students may be prepared related to one/more than one of the above suggested activities.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Use an interactive simulation to match the structure and function of the eye. - Some students may ask about the use of glasses and sunglasses. Note that some students may be sensitive to their need to use glasses. An interactive simulation may be used to explain the effect of using the glasses. - Some students may ask about colour blindness...a sex linked condition affecting around 10% of males. - Ask students think about what it would be like to be completely blind. Link with PSD to create awareness re problems faced by these people. 	<p>explain how an image is produced on the retina and the function of the brain to invert the image. (Level 8)</p> <p>describe the structure and the function of the eye and how light rays produces an image. (Level 7)</p> <p>identify the external parts of the eye. (Level 6)</p> <p>understand that the eye is sensitive to light. (Level 5)</p>
--	--	---

<p>3. guide students to describe sound and identify sound sources.</p>	<p><u>Starter suggestion:</u> Ask students to work in groups, listen and identify a number of sounds recorded sound bites.</p> <p><u>Main activity:</u> Elicit from the students examples of sources of sound (e.g. some musical instruments, a bell, etc) and ask the students to describe how sounds are produced. Note any misconceptions which may be addressed at a later stage. Write the main concepts on the board for future reference, with particular attention to terms as loud/soft sound, high/low sound. Ask students who may play a musical instrument to relate their knowledge about how sounds are emitted from the instrument they play.</p> <p>Ask students to observe demonstrations e.g. a vibrating tuning fork immersed in water or put on the bench, a flame in front of a loudspeaker, small polystyrene balls on a loudspeaker or Rubens’ tube. Use clips to show other examples. Build upon the students’ previous knowledge to show that sounds are the result of vibrations. Ask students to identify the source of vibration. Use clips or simulations to demonstrate how a vibrating source makes the air around the source to move. These vibrations reach our ears. Either use a slinky spring to demonstrate how sound travels from one place to another through vibrations in air or use a simulation to show how the air particles vibrate from the source of the sound until they reach the ear.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students may carry out some research re Maltese musical instruments like iz- Zaqq and Zafzafa and explain how sounds are produced. - Explore animal sounds – they may present their findings re ‘Musical Insects.’ - Some students may use a data logger and sound sensor or an oscilloscope and signal generator to explore different sounds. They can note that sounds may vibrate faster (frequency) and have larger amplitude (louder). Low frequency produces a bass note (low pitch) and high frequency produces a high pitch. 	<p>identify types of sound such as loud/soft and high/low and relate this to vibrations. (Level 8)</p> <p>recognise and identify different vibrating sources and use the slinky spring to illustrate sound waves. (Level 7)</p> <p>recognise that sounds are produced as a result of vibrations. (Level 6)</p> <p>identify different sources which emit sound. (Level 5)</p>
--	--	--

<p>4. guide students to use the particle theory to explain how sound travels through different materials but not through a vacuum.</p>	<p><u>Starter suggestion:</u> Ask students to discuss in groups a series of questions: Can you hear through closed doors? Can animals hear under water? Can an astronaut hear the sound of a falling rock? Give time to students to share their responses. Do not comment or correct their observations.</p> <p><u>Main activity:</u> Use a clip to show how Evelyn Glennie, a deaf musician, listens to music with her body. Engage students in a class discussion to describe whether sound travels through solids, liquids and gases. Use clips and discuss communication between dolphins or whales and astronauts in space. Ask a couple of students to relate their experience when they hear sounds whilst swimming under the sea. Do sounds appear to be louder or nearer to us when swimming under the sea? Revisit SCI 7.5.4 and ask students to think about the arrangement of particles in solids, liquids and gases and predict the relative speed of sound in solids, liquids and gases. Use the IWB to help students understand that sounds travel faster in solids because particles are closer together. Ask the students to predict the movement of sound through a vacuum. Use the bell jar demonstration – ask students to state and explain their observations. Revisit their previous prediction re sound travelling through a vacuum and link their observations to the presence / absence of particles.</p> <p>Use the slinky spring to represent how sound travels from one place to another by means of waves.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Give examples of speed of sound in different materials. - Compare the speed of sound with the speed of light...use examples such as thunderstorms and fireworks. - Ask students to predict the presence of sounds in space, on the Moon, etc. - Relate this teaching objective to games such as making a telephone from two plastic cups and string. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students may explore the use of echo-sounder (to find the depth of the sea) or ultrasound. 	<p>relate the movement of sound in different media to the particle model. (Level 8)</p> <p>describe the movement of sound in solids, liquids and gases and the absence of sound in a vacuum. (Level 7)</p> <p>recognise that light travels faster than sound. (Level 6)</p> <p>know that sound can travel through objects. (Level 5)</p>
--	---	--

<p>5. show the structure of the ear and guide students to explain how our ears enable us to hear.</p>	<p><u>Starter suggestion:</u> Elicit ideas from students about how we hear sounds. .</p> <p><u>Main activity:</u> Use an interactive simulation and a large ear model to build upon the knowledge that the students have already demonstrated. Illustrate the structure and function of the human ear. The following words may be used to describe the ear structure...outer ear, ear canal, ear drum, 3 small bones, nerve and cochlea containing liquid and nerve cells. Explain how the eardrum vibrates as a result of sound entering the ear, and the transmission of vibrations to the inner ear.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Elicit students’ knowledge about ways how the ear may be damaged. Students may identify loud sounds, infections and tearing of the ear drum. - Explore students’ awareness about noise pollution and ways of reducing it. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Use an interactive simulation/worksheet to match the structure and function of the ear. - Some students may point out another function of the human ear i.e. balance. Elicit students’ knowledge how the internal structure of the ear helps to keep the body in balance and what may happen if this balance is disturbed. - Elicit students’ knowledge about the use of hearing aids. Ask students to identify factors which decrease the hearing level of ears. These may include such variable as aging people, workers exposed to loud sounds, ear defects, etc. Allow students to relate their experiences about this area and build upon their knowledge. Note: Be aware and sensitive to the fact that some students (or their close relatives) may have hearing difficulties. 	<p>identify the ear as organ of hearing and balance (Level 8)</p> <p>describe the structure and function of the ear and ways how the ear can be damaged. (Level 7)</p> <p>recognise that loud sounds can damage the ear and identify ways of protecting the ears from loud sounds. (Level 6)</p> <p>know the outer parts of the ear and that sound enters the ear. (Level 5)</p>
---	---	--

SCI 8.6 Light and Sound

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. Students can watch a step by step dissection of an eye: http://www.exploratorium.edu/learning_studio/cow_eye/step01.html
2. Eyes are amazing parts of the human body, students can learn how we see as they experiment with light & mirrors in this fun science game for kids. Students will love the challenge of this cool, interactive activity: <http://www.sciencekids.co.nz/gamesactivities/howweseehow.html>
3. Students can be divided in groups and encouraged to play the reflection game. This game can help students understand reflection: http://www.bbc.co.uk/schools/ks2bitesize/science/physical_processes/light/play.shtml
4. The teacher can use a very simple quiz to find out whether the students have actually understood the main concepts being delivered to them. <http://www.bbc.co.uk/apps/ipl/schools/ks2bitesize/science/quizengine?quiz=howweseethings&templateStyle=science> is a very simple quiz which one can use at the end of the lesson. It can also be given as homework.
5. Some other resources that can be used:
 - <http://www.ibnalhaytham.net/> contains some information about the scientist that discovered that light travelled in a straight line.
 - https://www.youtube.com/watch?v=iletCKDCt_0 is a video that includes a history of light and a simple explanation of the way in which we can see by reflection.
 - Animals and sound – Pistol shrimp: <http://www.youtube.com/watch?v=XC6l8iPiHT8>
 - Humming bird: <http://www.youtube.com/watch?v=2n71TgeWXd0>
 - Vibrating sound: http://www.bbc.co.uk/schools/scienceclips/ages/5_6/sound_hearing.shtml
 - Making music with water: <http://sciencekids.co.nz/experiments/makemusic.html>
 - Ear and hearing: <http://www.youtube.com/watch?v=0jyxhozq89g>
 - Changing sounds/pitch: <http://sciencekids.co.nz/gamesactivities/changingsounds.html> and <http://www.engineeringinteract.org/resources/oceanodyssey/flash/concepts/pitch.htm>
 - Noise pollution: <http://www.timesofmalta.com/articles/view/20120229/editorial/All-noise-pollution-must-be-strictly-controlled.408965>

Objectives at attainment levels 5,6,7,8

Teacher will:

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. guide students to describe sound and identify sound sources
4. guide students to use the particle theory to explain how sound travels through materials but not through a vacuum
5. show the structure of the ear and guide students to explain how our ears enable us to hear

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

- 6.1 guide the students to develop an awareness of how our eyes enable us to see and understand how objects are seen
- 6.2 help students become aware of different sounds and identify sound sources
- 6.3 guide students to explore the concept of sound travelling through materials but not through a vacuum
- 6.4 guide students to explain how our ears enable us to hear, with a focus on pitch and loudness

<p>Key words:</p> <p>Transparent, opaque, reflection, luminous, non-luminous, rays, straight line, ray diagrams, mirrors, reflection, the eye, light energy, sound energy, source , detector, medium, vibration, speed of sound, high pitch, low pitch, loudness, particle movement</p>	<p>Points to Note:</p> <p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>Link this topic to SCI Earth and Space. Revisit sources of light, speed of light and sound travelling through a vacuum.</p> <p>Link this topic to SCI 7.12 Understanding matter re matter is made up of tiny particles.</p> <p>Be aware of sensitivity to loud sounds as it may distress students. Bright colours may also distress some students.</p>	<p>Resources</p> <p>Large convex lenses, ray box, selection of lenses and mirrors, eye and ear models, selection of transparent/translucent and opaque materials, plastic bowl, uncooked rice, source of sound, water and glass bottles, rubber bands 2 plastic cups, string, tuning fork</p> <p>Light travels in a straight line : https://www.youtube.com/watch?v=WwQsq8s8XzU</p> <p>Animals and sound - musical insects http://www.primaryupd8.org.uk/activity.php?actid=185</p> <p>Vibrating sound http://sciencekids.co.nz/videos/physics/soundvibrations.html</p> <p>Sources of sound and loudness http://www.engineeringinteract.org/resources.htm</p> <p>Sound travelling through different media (Evelyn Glennie) http://www.youtube.com/watch?v=IU3V6zNER4g</p> <p>Ear and hearing http://lgfl.skool.co.uk/content/primary/science/ears_and_hearing/index.html</p>
--	---	---

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>6.1 guide the students develop an awareness of how our eyes enable us to see and to understand how objects are seen</p>	<p>Experience a variety of pieces of equipment that emit light.</p> <p>Set up a variety of pieces of equipment around the room e.g. lightening balls, disco balls, optical fibres etc. Let the students explore them as a way of probing discussion.</p> <p>Set up bulb/other light sources and a piece of card with a slit. Discuss the idea that light travels in straight lines. Where possible, get the students to investigate with a variety of numbers and sizes of slits. Show/Hide a light source behind an object to further demonstrate this</p> <p>Encourage the student to track a light through a transparent medium and then try to predict its movements through an opaque medium.</p> <p>Group a variety of items as opaque and transparent</p>	<p>STUDENTS CAN:</p> <p>begin to understand that light travels in straight lines. (Level 4)</p> <p>show they know some sources of light. (Level 3)</p> <p>pupils communicate their awareness of changes in light. (Level 2)</p> <p>begin to respond consistently to familiar people, events and objects and react to new activities and experiences. (Level 1)</p>
<p>6.2 help students become aware of different sounds and identify sound sources</p>	<p>Introduce students to this lesson by showing a range of (pictures of) musical instruments and encourage sorting into groups. This could be by the way the instrument is played or the kind of sound it makes.</p> <p>Ask students to suggest everyday sounds, some loud, others quieter. Draw images of these sound sources on the board and, with the children's help, sequence these sounds from quietest to loudest. This could also be done using the instruments mentioned above.</p> <p>Play a range of different sounds and make a list of all the sounds heard.</p> <p>Get students to sort the sounds in a variety of ways - eg. sounds we make ourselves/sounds other things make; loud sounds/quiet sounds; long sounds/short sounds.</p>	<p>know there are different ways to describe sound (Level 4)</p> <p>start to understand that that sound is generated in a variety of ways and from different sources (Level 3)</p> <p>show an interest in sounds varying in tone and loudness (level 2)</p> <p>cooperate with shared exploration and supported participation in the development of operational causality (Level 1)</p>

<p>6.3 guide students to explore the concept of sound travelling through materials but not through a vacuum</p>	<p>Playing musical instruments made of metal, wood and plastic e.g. guitar, trumpet, recorder, drum.</p> <p>Remind students of the properties of solids, liquids and gases. Ask students to predict through which medium, sound will travel best.</p> <p>Investigate this by placing their ear on the following objects: - to hear the ticking of a watch</p> <ul style="list-style-type: none"> - a bench (watch on other side of bench) - a metal tray (as above) - a glass (watch under glass). <p>Record findings using a sound sensor and make a bar chart of their results.</p> <p>Students could make the same instruments using different materials to compare sounds.</p> <p>Use the bell jar experiment to demonstrate that sound does not travel through a vacuum.</p>	<p>compare the pitch of sounds and start to record their findings in different ways. (Level 4)</p> <p>explore materials in increasingly complex ways and listen to results of their actions with interest. (Level 3)</p> <p>anticipate and join in activities focused on enquiry. (Level 2)</p> <p>experience the sounds of musical instruments. (Level 1)</p>
<p>6.4 guide students to explain how our ears enable us to hear with a focus on pitch and loudness</p>	<p>Elicit student’s responses regarding the function of the ear.</p> <p>Ask a student to make a sound that can be heard outside the classroom where the students cannot see him/her - such as a chime bar. Discuss why they could still hear the sound even though they could not see the person making it. The teacher may relate this to road safety and emphasise the importance of listening as well as looking when crossing the road.</p> <p>Experience different levels in loudness and pitch of sound e.g. keyboard, chime bars.</p> <p>Investigate pitch and levels of sound e.g. close their eyes then raise their hand when they can hear a song being played as the volume is increased slowly.</p> <p>Order students according to who heard sound first. This activity may be repeated with different pitches played on an instrument.</p> <p>Other: The students may be accompanied to go for a listening walk..</p>	<p>recognise differences and similarities between sounds of and start to sort sounds into common groups. (Level 4)</p> <p>start sorting sources of sound frequency using simple criteria. (Level 3)</p> <p>anticipate and join in activities focused on enquiry into sound frequency. (Level 2)</p> <p>accept and engage in co-active exploration. (Level 1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.7 FORENSIC SCIENCE**

Strands: Physical Properties
Life Processes and Living Things
Materials and Their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to describe the importance of forensic science to solve crimes and relate observation skills to forensic science
2. guide students to collect and process evidence from a crime scene
3. guide students to use separation techniques to provide evidence.
4. guide students to collect and process evidence from a fire

Key Words	Points to Note	Resources
evidence, contamination, DNA, genetic material, fingerprints, chromatography, extraction, names of human teeth, flame tests	<p>Refer to notes re 5E approach to teaching and learning of science. This unit is presented through a number of case studies. Guide students to take an inquiry approach.</p> <p>This topic provides an excellent opportunity for learners to:</p> <ul style="list-style-type: none">• Recognise the links between material, physical and life sciences• Understand the applications and implications of science in everyday life• Use investigative approaches• Work critically with evidence• Become motivated to learn about scientific ideas which they may not be too enthusiastic about.• Work as a group <p>Link this unit to other related units.</p> <p>Before suggesting relevant websites, vet websites for any images which may be unsuitable for students of this age.</p>	<p>Microscopes, magnifying lenses, model of the human teeth, hair samples, filter/chromatography paper, ink, ink pads, sheets of paper, bite marks images, fingerprint images</p> <p>Clips from popular drama should be used with care as they tend to give an impression of instant, easy crime solving.</p> <p>http://www.youtube.com/watch?v=U-ZkMfrTxwQ http://www.youtube.com/watch?v=qESpv6bqBuU http://www.youtube.com/watch?v= 58XsN6XJWQ&feature=related.</p> <p>http://www.genomicseducation.ca/files/PDF/education_resources/DNA_extraction_text.pdf</p> <p>Interactive and stimulating activities, games and mysteries for students to solve www.forensicscience.org/resources/forensics-for-kids</p> <p>Website for teachers – ppt and worksheets: www.sciencespot.net/Pages/classforsci.html</p>

Teaching Objective		Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1. guide students to describe the importance of forensic science to solve crimes and relate observation skills to forensic science.</p>	<p><u>Starter suggestion:</u> Show a short clip on the work of a forensic scientist. Ask students to describe their understanding of Forensics or CSI. Give time to students to express their ideas. Note any ideas or misconceptions which might be addressed at a later stage.</p> <p><u>Main activity:</u> Explain that forensic science is the application of science to solve crimes and that this has a long history that relies heavily on scientific principles, technology and laws. Display a number pictures showing forensic scientists at work. Ask students to work in groups and identify the type of activity being carried out by the scientists. Refer to safety measures /protective clothing used by forensic scientists. Give time for students to share their responses. Show that crimes are usually solves as a result of the investigations carried out by the forensic scientists.</p> <p><u>Scenario:</u> <i>Present the following situation: A telephone call reported that thieves entered a house. When the police arrive on the scene, the house is in shambles. Clothes are scattered all around the room, lamps are overturned and there's no sign of the thieves. The police asked the forensic scientist to help. One of the detectives picks up a glass. On its side is a smudged, thumbprint. He takes it down to the lab, where it's analyzed and matched to a recorded set of prints.</i></p> <ul style="list-style-type: none"> - Ask students to identify the clues that might help the detectives. Explain how these clues may be used. Students may identify clues such as footprints, fingerprints, marks left by the thieves, etc. - The above scenario indicates that fingerprints may be the best clue to identify the thief. Elaborate on fingerprints' patterns as unique to each person. Show some examples. <p>Can ask students to print their own fingerprint by using an ink pad and a sheet of paper.</p> <ul style="list-style-type: none"> - Ask students to make two copies of each - Set A: print includes the name of the student. 	<p>STUDENTS CAN:</p> <p>use observations and scientific skills to explain conclusions. (Level 8)</p> <p>identify some forensic activities which may be used to solve crimes. (Level 7)</p> <p>recognise that scientists use different tests to find evidence. (Level 6)</p> <p>recognise that science can be used to solve problems. (Level 5)</p>

	<ul style="list-style-type: none"> - Set B: print with no names. - Randomly choose one print from set B. Ask students to study the patterns and match one print from set A with the one chosen from set B. 	
<p>2. guide students to collect and process evidence from a crime scene</p>	<p><u>Starter suggestion:</u> Present the following scenario and ask students to work in groups as forensic scientist to solve the following crime.</p> <p><u>Scenario:</u> <i>The police received a report of a robbery and a murder which took place in a shop, earlier in the day. The forensic scientists noticed the following: The dead body of the shop owner and a bite mark on the victim’s arm. Further investigations led the scientists to notice that</i></p> <ul style="list-style-type: none"> - <i>the body temperature of the victim was 32^oC</i> - <i>long strands of hair were found on the body of the victim.</i> - <i>no fingerprints were found.</i> - <i>the bite mark shows a missing front tooth.</i> <p>Ask students to work in groups and:</p> <ul style="list-style-type: none"> - find the estimated time of death taking into consideration that in those circumstances the body temperature of the victim went down 2^oC per hour. - compare hair with that of two suspects – provide students with hair samples and a sample from crime scene. Students can use magnifying glass/microscope to compare hair samples and match. (Note that this activity may prove difficult) - compare bite marks- show images of two bite marks (or give two samples of bite marks – this can be done by biting gently on a polystyrene cup. Ask students to compare the bites. e.g. size of teeth, shape of bite (missing teeth, etc), depth of bite, overlap between upper and lower bites. Explain the different types of human teeth and their function. Ask students to draw and label the types of human teeth. - write a short report of their findings. Report can take the form of a table which includes the clues found (e.g. body temperature 32^oC) and the conclusions (evidence) produced (e.g. victim was killed.....earlier). 	<p>plan how to use clues to produce evidence. (Level 8)</p> <p>identify the four types of human teeth and their function. (Level 7)</p> <p>match pieces of evidence. (Level 6)</p> <p>make simple observations of a situation. (Level 5)</p>

<p>3. guide students to use separation techniques to provide evidence.</p>	<p><u>Starter suggestion:</u> Present the following scenario and ask students to work in groups as forensic scientist to solve the following crime.</p> <p><i><u>Scenario:</u> 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 even wrote messages on the wall. The forensic scientist used chromatography to analyse the car paint and the ink on the wall. They also looked for traces of blood. (adapted from KS3 Collins Bk 2 p70)</i></p> <p>Ask students to work in groups and</p> <ul style="list-style-type: none"> - use chromatography skills to distinguish between different inks. May link to www.sciencespot.net/pages/classforsci.html re chromatography. - think about why different solvents may be required for car paint and the ink - identify different solvents that may be used - think about other clues that might help the police to solve the crime. - write a short report of their findings. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - - some students may ask about blood groups, DNA and DNA fingerprinting. <p><u>Other notes:</u></p>	<p>explain the basic scientific principles underlying chromatography as a separating technique. (Level 8)</p> <p>match samples to reach a conclusion and communicate findings effectively. (Level 7)</p> <p>perform chromatography under supervision. (Level 6)</p> <p>make simple observations of a situation (Level 5)</p>
--	--	--

<p>4. guide students to collect and process evidence from a fire.</p>	<p><u>Starter suggestion:</u> Use a clip which shows the aftermath of a fireworks explosion and present the following scenario.</p> <p><u>Scenario:</u> <i>The fire fighters were called to the scene. They noted areas where the flames were mostly yellow and other areas with green flames. They took some time to bring the fire under control and remove further danger. No casualties were reported but the forensic scientists were called in to investigate the cause of the explosion.</i></p> <p>Ask students to work in groups and</p> <ul style="list-style-type: none"> - identify different ways of putting out a fire. Students may draw the fire triangle and explain how this may be used to put out a fire. What possible precautions are necessary? - identify possible causes of explosion and suggest ways of testing the students' ideas. Students might refer to air temperature, types of chemicals involved and different ways how the fire might have started. Ask students to measure room temperature and predict the temperature on a hot day. <p>Demonstrate ways of identifying chemicals through flame tests. Give the students an unlabelled chemical and ask them to work in groups to identify the chemical. Compounds containing chemicals such as sodium, potassium, calcium and copper may be used. Identify which chemicals may have been present in the fireworks explosion. Identify safety precautions.</p> <ul style="list-style-type: none"> - think about other clues that might help the scientist to find the cause. - may use www.sciencespot.net/Pages/classforsci.html re arson investigation. - write a short report of their findings. 	<p>explain the basic scientific principles underlying the fire triangle and the flame tests. (Level 8)</p> <p>identify an unknown chemical by matching to known results. (Level 7)</p> <p>understand that heat, air (oxygen) and a fuel are needed to start a fire. (Level 6)</p> <p>recognise that some chemicals are explosive. (Level 5)</p>
---	---	---

Unit code and title: **SCI 8.7 FORENSIC SCIENCE**

Unit duration: Approx. 9 sessions of 40 minutes Total 6 hours

Strand: **Physical Properties; Life Processes and Living Things; Materials and Their Properties**

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to describe the importance of forensic science to solve crimes and relate observation skills to forensic science
2. guide students to collect and process evidence from a crime scene
3. guide students to use separation techniques to provide evidence.
4. guide students to collect and process evidence from a fire

Mainstream objectives 2 and 4 may not be relevant at this level of attainment

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

- 7.1 guide students to develop an awareness of basic investigations related to forensic science concepts
- 7.2 guide students to engage in simple separation techniques

Key words

evidence, DNA, genetic material, fingerprints, chromatography, extraction,

Refer to notes re 5E approach to teaching and learning of science. This unit is presented through a number of case studies. Guide students to take an inquiry approach.

This topic provides an excellent opportunity for learners to:

- Recognise the links between material, physical and life sciences
- Understand the applications and implications of science in everyday life
- Use investigative approaches
- Work critically with evidence
- Become motivated to learn about scientific ideas which they may not be too enthusiastic about.
- Work as a group

Link this unit to other related units.

Before suggesting relevant websites, vet websites for any images which may be unsuitable for students of this age.

Resources

Microscopes, magnifying lenses, model of the human teeth, hair samples, filter/chromatography paper, ink, ink pads, sheets of paper, bite marks images, fingerprint images

Clips from popular drama should be used with care as they tend to give an impression of instant, easy crime solving.

<http://www.youtube.com/watch?v=U-ZkMfrTxwQ>

<http://www.youtube.com/watch?v=qESpv6bqBuU>

<http://www.youtube.com/watch?v=58XsN6XJWQ&feature=related>.

http://www.youtube.com/watch?v=TbuTirBdZjQ&feature=player_embedded

Refer to resources found in Communication 4 All: Resources to support inclusion

<http://www.communication4all.co.uk/>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>7.1 guide students to develop an awareness of basic investigations related to forensic science concepts</p>	<p>In small groups, the teacher helps the students to participate in making and lifting fingerprints by using ink pads, black powder, brushes, and other materials whilst highlighting the fact that fingerprints are a unique.</p> <p>The teacher presents 'spot the difference' activities of varying degrees of difficulty by means of printed pictures or the IWB, encouraging observation and problem solving skills</p> <p>Mini mysteries: The teacher may read a short story or show a picture of a situation and encourages students to analyse and use their investigative skills to solve a particular case</p>	<p>STUDENTS CAN:</p> <p>recognise differences between situations presented to them and communicating responses related to investigative skills. (Level 4)</p> <p>understand some simple vocabulary related to the topic and start to communicate related ideas using simple phrases. (Level 3)</p> <p>respond consistently to objects and know certain actions produce predictable results. (Level 2)</p> <p>co-operate with shared exploration and supported participation development of operational causality. (Level 1)</p>
<p>7.2 guide students to engage in simple separation techniques</p>	<p>As a starter activity, the teacher initiates the unit by encouraging students to mix colours in order to make new colours, using paint to create colours and shades.</p> <p>The teacher presents a selection of black marker pens and gets the students to draw marks on a plain piece of paper. Where this is not possible, the teacher may demonstrate the experiment. Have students look closely at the marks to see if they can see any colours other than black. A magnifying glass may be used for this.</p> <p>Have the students half fill each of the beakers with water</p> <p>Have the students colour in a large dot in the middle of each circle of blotting paper with the markers. Make sure that one pen per circle of blotting paper is used. The blotting</p>	<p>communicate and share their findings in relation to their own investigations related to chromatography. (Level 4)</p> <p>explore and actively join in activities related to the separation of colours in water. (Level 3)</p> <p>show an interesting activities related to mixing and separating colours (Level 2)</p>

	<p>paper is then placed on the beaker with the “tongue” just hanging in the water. The pens are put beside the appropriate beaker.</p> <p>Students watch as the water travels up the blotting paper as it is absorbed to the black dots. They then observe the different colours separate and spread. The teacher encourages student recording in the form of a graph - which pen was used and which colours appear and in what order.</p> <p>The above investigation may be used with different coloured markers.</p>	<p>begin to show interest in objects presented to them in the development of visual pursuit and the permanence of objects. (Level 1)</p>
--	--	--

Subject: Integrated Science

Form 2

Unit code and title: SCI 8.8 CLIMATE CHANGE (I) – ENERGY AND THE ENVIRONMENT

Strand 1: Physical Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to understand energy production and its implications.
2. engage students to investigate the products of burning fuels.
3. help students to identify the environmental implications of using fossil fuels and issues re climate change
4. guide students to identify examples of renewable and non-renewable sources of energy and the advantages and disadvantages of each source of energy.

Key Words	Points to Note	Resources
fuel, crude oil, climate change, greenhouse effect, global warming, renewable, non-renewable, sustainable living, solar panel, wind turbine, pollution, photovoltaic cells, carbon dioxide, water vapour, energy, carbon footprint	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit with <i>SCI 7.6 Energy around us</i> <i>SCI 7.7 Electricity</i> and <i>SCI 7.9 Acids and Alkalis</i>. Link this unit with <i>SCI 8.10 The Environment</i> as one theme (Climate Change). The subject of energy resources is very topical in the media. It would be useful to look for cross-curricular links (for example with geography), news websites and websites of fuel companies.</p> <p>The term non-renewable can be misleading as it does not mean that no more fossil fuels will ever be formed but that we are using up our resources much faster than they are forming. The discussion of reducing fossil fuels use should lead to less air pollution and making our supplies of fuels last longer. Note that greenhouse effect is one of the causes of global warming. Note that most students usually mix both terms.</p>	Bunsen burner or spirit burner, solid or liquid fuel, lime water, wind turbine and solar panels models, pictures showing non-sustainable living episodes, local water & electricity bills, video clips Climate change: http://www.epa.gov/climatechange/kids/ Global warming - interactive http://environment.nationalgeographic.com/environment/global-warming/gw-impacts-interactive/ http://environment.nationalgeographic.com/environment/global-warming/gw-overview-interactive.html Science behind climate change: http://www.bbc.co.uk/sn/hottopics/climatechange/climate_challenge/aboutgame.shtml Arctic climate change – interactive: http://www.cbc.ca/news/background/climatechange/interactive/index.html

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>The teacher will:</p> <p>1. guide students to understand energy production and its implications.</p>	<p><u>Starter suggestion:</u> Ask students to identify the main local source of electricity – most students will be able to identify the power stations at Delimara/Marsa. A few of the students may relate their experience if they have visited any of the power stations on one of the open days that are organized from time to time.</p> <p><u>Main activity:</u> Show a bicycle dynamo. Guide the students to describe the use of a bicycle dynamo and identify the starting energy and the finishing energy. Compare a power station to a bicycle dynamo. Discuss briefly various methods which are usually used to rotate the large coils/turbines and ask students to identify the various forms of starting energy. At this point describe the use of burning fossil fuels such as oil or coal and ask students to link this with environmental issues. Give time for students to discuss this in groups and ask them to share their findings. Some students may talk about their ideas and other may use images or drawings. Some students may refer to production of gases which are making the Earth warmer – this will be explored later on.</p> <p>Link this activity with climate change and ask students share their understanding of Climate Change. (This theme is being explored throughout two units.) Pool their responses on the IWB. Then use the following clip http://www.epa.gov/climatechange/kids/ (or any other relevant clip) which describes climate change. Ask students to evaluate their previous responses and elaborate further. Guide students to identify signs of climate change in action such as changing weather patterns such as increasing temperatures, extreme weather situations, rising sea levels, melting of the ice, earlier flower blooming, etc. Show that the Earth's climate has changed before, but now these changes are happening faster.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - some students may describe the use of a small generator of electricity 	<p>STUDENTS CAN:</p> <p>explain what is climate change and identify some signs of climate change. (Level 8)</p> <p>describe how electricity is produced in a power station and its environmental implications. (Level 7)</p> <p>describe that power stations are one of the main sources energy and recognise that various forms of energy can be used to generate electricity. (Level 6)</p> <p>identify the power station as the main local source of electricity. (Level 5)</p>

<p>2. engage students to investigate the products of burning fuels.</p>	<p><u>Starter suggestion:</u> Use a video clip showing the burning of fuels in an industrial environment. Ask students to work in groups and identify products of burning. Give time for student to share and pool their observations. Some students may refer to gases, heat, dust (carbon) particles, oxides, etc. Note any misconceptions which might be addressed later on.</p> <p><u>Main activity:</u> Some students may have referred to air quality. Ask students to predict some of the chemicals produced when fuels are burnt. Identify some of these chemicals. Guide the students to describe a way how these products can be identified and tested. Burn a small amount of (liquid) fossil fuel (such as kerosene) in the laboratory and test for CO₂ using lime water. (Note: safety precautions). Discuss briefly health and safety issues re some of these products. Ask students fill in a prepared worksheet in which they label the setup, describe what they observe and write a word equation for the burning of the fuel. Consolidate the concept that fuels are stores (sources) of energy.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Go back to the points shared by the students during the starter activity. Refer to other relevant points such as the burning of fuels by cars. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - testing for carbon dioxide - one of the products of combustion of fuels – ask one student from each group to blow into prepared test tubes containing lime water. Transparent lime water goes milky. <p><u>Other notes:</u></p>	<p>link the burning of fuels with air quality and describe some examples. (Level 8)</p> <p>describe an experiment to test the products of combustion of a fuel and write a chemical word equation for this reaction. (Level 7)</p> <p>identify some products of combustion of a fuel. (Level 6)</p> <p>recall that heat energy is given out when fuels burn. (Level 5)</p>
---	--	--

<p>3. help students to explore the environmental implications of using fossil fuels and issues re climate change.</p>	<p><u>Starter suggestion:</u> Present a number of pictures which show some characteristics of the lifestyles in 1st world countries. Ask for any environmental implications of these lifestyles. Pictures or clips may include the use of vehicles and aeroplanes, examples of air pollution, the frequent use of air-conditioners, etc. Students are asked to reflect on these practices and to give their opinions.</p> <p><u>Main activity:</u> Carry out a brainstorming activity in which students are asked to name the consequences of burning fossil fuels to produce energy. Identify key terms such as 'greenhouse effect', 'pollution', 'global warming' and 'climate change'. Put key words on the board. (Note that some students mix 'greenhouse effect' and 'global warming'.) Students, in mixed ability groups, are then presented with different pictures/photos related to the above terms and asked to choose one of the pictures. Ask the students to discuss the item within their group and share their conclusions to the whole class. Provide further information and ask questions to enrich the discussion. Highlight the issue of sustainable living.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Elaborate further this issue by presenting data re increasing CO₂ levels, average Earth's temperature, examples of large scale deforestation and so on. - Make the students aware of the idea of carbon footprint. Explain the issue through the story of buying local mineral water bottled in recycled plastic. The process of recycling plastic resulted in plastic being transported across Europe. Give other examples. - Ask students to link air quality with asthma and other breathing disorders. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Some students might discuss suggestions for reducing energy use (electrical, cars, etc). Put these ideas as a poster on the lab notice board. <p><u>Other notes:</u></p>	<p>explain the implications of some changes in lifestyle on the environment and identify action on a larger scale. (Level 8)</p> <p>describe that the CO₂ produced by burning fossil fuels contributes to an increase in air pollution, the greenhouse effect and global warming and state examples of how to reduce their personal carbon footprint. (Level 7)</p> <p>be aware that the way we use energy in our daily life has consequences on the amount of fossil fuels burned and on the amount of pollution that is created. (Level 6)</p> <p>link the burning of fuels with air pollution. (Level 5)</p>
---	--	--

<p>4. guide students to identify examples of renewable and non-renewable sources of energy and the advantages and disadvantages of each source of energy.</p>	<p><u>Starter suggestion:</u> Ask students to list fossil fuel energy sources and about the consequences of long term use of fossil fuels (re environmental pollution and availability). Guide students to suggest alternative measures. Give time for students to discuss and pool their ideas. Write the alternative sources of energy identified by the students on the IWB.</p> <p><u>Main activity:</u> Ask the students to sort all energy sources into two groups - ‘renewable’ and ‘non-renewable’ and work in groups to discuss and describe one alternative source of energy such as solar, wind, biofuel, nuclear, geothermal and hydroelectric. If possible make available resources such as the internet, books and so on. Some students/groups may present pictures or some ppt slides and others may talk about the source of energy. Others may use models of solar and wind driven devices available in the school lab. Ask questions about the advantages and disadvantage of each source of energy.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Use a drag and drop exercise to link starting energy forms with types of renewable forms of energy. - Link a number of statements with examples of renewable and non-renewable forms of energy. - Ask students to put forward a number of arguments to persuade people to use renewable sources of energy. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Students who have a photovoltaic panel at home may speak about how sunlight is trapped and converted to electrical energy. Other students may describe how wind energy is converted to electrical energy. Ask students to suggest the best options to be used in Malta. - Present short clips which show large renewable energy resources. Point out issues of cost and the use of a range of energy resources. Note that some students may think that a main advantage of renewable sources of energy is that it comes at no cost at all rather than environmental issues! 	<p>suggest ways of persuading people to use renewable sources of energy even though these will not necessarily come cheaper than using fossil fuels. (Level 8)</p> <p>describe the main advantages and disadvantages of using different types of renewable sources of energy. (Level 7)</p> <p>state that the use of renewable sources of energy reduces pollution but that even these sources create challenges for the users. (Level 6)</p> <p>state that energy sources can be classified as renewable or non-renewable. (Level 5)</p>
---	---	---

Unit SCI 8.8 – Climate change - Energy and the Environment

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. Assuming internet access is available in class/lab, students can work in groups to look up different types of fuels and write a brief description of each. Images can be added. Such material can be presented simply using word-processing or DTP software, or online tools like Glogster (<http://www.glogster.com/>).
2. Mind mapping software as listed below can be used for concept map activity suggested in this lesson. This activity can be done on an IWB or at home: Spicynodes: <http://www.spicynodes.org>, Mindmeister: <http://www.mindmeister.com/>, Compendium: , <http://compendium.open.ac.uk/institute/>, Freeplane: http://freeplane.sourceforge.net/wiki/index.php/Main_Page, Freemind: http://freemind.sourceforge.net/wiki/index.php/Main_Page, Cmap Tools: <http://cmap.ihmc.us/>
3. As a follow-up to the practical investigation carried out in class, students can be asked to carry out research about pollutants resulting from burning of commonly used fuels. Results can be presented in a variety of formats. For e.g. Students can be asked to design an online poster (e.g. <http://www.glogster.com/>) highlighting dangers of particular fuels.
4. Students may be asked to learn about key concepts like “global warming” and “greenhouse effect” via a webquest or custom search set up by the teacher. Try Google Custom Search (<http://www.google.com/cse/>) or webquests at <http://www.zunal.com/index.php>.
5. http://www.planet-positive.org/how_2_calculator.php is a carbon-footprint calculator which can be used online by students. Even though it is UK based, it can still give students a good idea of how they can save energy by changing their common practices. An alternative carbon footprint calculator can be found at <http://www.carbonfootprint.com/calculator.aspx>
6. Student can work collaboratively on alternative sources of energy by using <http://prezi.com/learn/work-together-real-time-prezi-meeting/>.
7. Students can be asked to create stories which compare families using non-renewable and renewable sources of energy to highlight differences. Research can be done as remote preparation for this activity. Students can use online animated-movie makers like <http://www.xtranormal.com/>.
8. Global warming: <http://environment.nationalgeographic.com/environment/global-warming/gw-overview.html>

Unit code and title: **SCI 8.8 CLIMATE CHANGE (I) - ENERGY AND THE ENVIRONMENT**

Strand: Physical Processes

Unit duration: Approx. 9 sessions of 40 minutes: Total 6 hours

OBJECTIVES at attainment levels 5,6,7,8

The teacher will

1. guide students to understand energy production and its implications.
2. engage students to investigate the products of burning fuels;
3. help students to identify the environmental implications of using fossil fuels;
4. guide students to identify examples of renewable and non-renewable sources of energy and the advantages and disadvantages of each.

OBJECTIVES at attainment levels 1,2,3,4

8.1 help students to understand energy production and to recognize what a fuel is;

8.2 introduce the nature and origin of fossil fuels and non-renewable sources of energy and how their use has implications for the environment

8.3 teach students to identify examples of renewable and non-renewable sources of energy

Key words	Points to Note	Resources
<p>fuel, global warming, renewable, sustainable living, solar panel, wind turbine, pollution greenhouse effect, , energy.</p> <p>For students working within level 1 – 4, symbols should be used together with the spoken words</p>	<p>Refer to notes re 5E approach to teaching and learning of science. The subject of energy resources is very topical in the media. It would be useful to look for cross-curricular links (for example with geography), news websites and websites of fuel companies.</p> <p>Note safety issues when burning fuels. The below sessions can be carried out by the teacher and/or the learning support assistant/s in class.</p> <p>It is very important for the teacher to allow time for the students to respond. This response can take the form of unaided and/or aided means of communication and the teacher needs to provide adequate scaffolding techniques to enable the students to respond affectively and/or intentionally.</p>	<p>wind turbine and solar panels models, pictures showing non-sustainable living episodes, local water & electricity bills, video clips, computer animations.</p> <p>Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/ Green house effect http://environment.nationalgeographic.com/environment/global-warming/gw-overview-interactive.html Global warming: http://environment.nationalgeographic.com/environment/global-warming/gw-overview.html Climate change: http://epa.gov/climatechange/kids/global_warming_version2.html Energy sources: http://www.uwsp.edu/cnr/wcee/keep/Resources/Internet_Links/Links_for_students.html</p>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>TEACHER WILL:</p> <p>8.1 help students to understand energy production and to recognize what a fuel is.</p>	<p>Ask the students to discuss from where does electricity originate. Lead the discussion to the power stations at Delimara/Marsa as being the local source of electrical energy in Malta. Show a couple of photos of the local power stations. A few of the students may relate their experience if they have visited any of the power stations on one of the open days that are organized from time to time.</p> <p>Demonstrate the use of a bicycle dynamo which generates electrical energy. Compare this to a large power station which uses fuels. Identify examples of fuels. Use internet links to find different types of fuels. Put pictures/drawings on the IWB and guide students to match the name of the fuel with its picture. Use a drag and drop exercise to sort the types of fuels according to state (solid, liquid or gas).</p>	<p>STUDENTS CAN:</p> <p>know about a range of physical phenomena and recognise and describe similarities and differences associated with them. (Level 4)</p> <p>show interest in a wide variety of objects, handling and observing them begin to record their findings. (Level 3)</p> <p>begin to show interest in a wide range of objects. (Level 2)</p> <p>start to respond consistently to objects and activities means of obtaining desired environmental events. (Level 1)</p>
<p>8.2 introduce the nature and origin of fossil fuels and non-renewable sources of energy and how their use has implications for the environment.</p>	<p>Present a number of pictures or clips which show some characteristics of the first world countries lifestyles. Pictures or clips may include the use of vehicles and aeroplanes, examples of air pollution etc. Guide students to identify or show examples of pollution. If possible ask students to give their opinion re these lifestyles.</p> <p>Link the use of fossil fuels with examples of pollution. May use drawings, diagrams or symbols. Guide students to link clean air with healthy living and polluted air with unhealthy living. Show that human activity is partly responsible for climate change. Some students may be able to identify and link some terms with the use of fossil fuels. Put key words on the board using flashcards and pictures. (Do not mix 'greenhouse effect' and 'global warming'.)</p> <p>May use a drag and drop exercise and ask students to link different pictures/photos. May ask the students to identify the item within their group and share their conclusions to the</p>	<p>will start to recognise that burning fuels produces air pollution. (Level 4)</p> <p>show interest in a wide variety of objects, handling and observing them and record their findings. (Level 3)</p> <p>begin to show interest in a wide range of the objects that are shown. (Level 2)</p> <p>identify (by touch or pointing towards)</p>

	<p>whole class. May use a set of photographs and movie clips of different energy sources and show them to the students. Ask students to observe. May use real examples of fuels such as coal or wood and the student is asked to reach out to grasp them.</p>	<p>fuels such as wood or coal. (Level 1).</p>
<p>8.3 teach students to identify examples of renewable and non-renewable sources of energy.</p>	<p>The teacher begins the lesson with a set of fuels and asks the students to identify them. Present the issue that fossil fuels will one day dry up. May show a dead battery and ask students about it. In such circumstance, what alternatives do we have? Link this to fuels - students at level 4 may be able to relate this to fuels and think about what happens if there is no more fuel or coal left. The teacher could suggest the alternative sources of energy (Some may be identified by the students) on the IWB.</p> <p>Main activity: Ask the students to sort all energy sources into two groups. May Introduce the terms 'renewable' and 'non-renewable'.</p> <p>Students working in same ability groups are asked to identify examples of alternative source of energy such as solar, wind. Make available different resources, diagrams, drawings and if possible models. Ask students to present the pictures they found to the rest of the class. May use models of solar and wind driven devices available in the school lab to reinforce the activity. Questions about the advantages and disadvantage of each source of energy will be asked and discussed.</p> <p>Other possible activities: The teacher could ask the students who have a photovoltaic panel at home to relate what they know about this equipment. Briefly explain that the solar panel works uses sunlight to produce electrical energy. It may also be possible to search out computer based animations to actively interact with the different sources of energy. The students can watch the video and be encouraged to ask questions. This teaching objective is of limited value to level 1 students.</p>	<p>learn about different energy sources. (Level 4)</p> <p>show interest in a wide variety of objects, handling and observing them begin to record their findings. (Level 3)</p> <p>begin to show interest in a wide range of objects. (Level 2)</p> <p>these activities may not be appropriate for (Level 1).</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.9 CLIMATE CHANGE (II) – ENVIRONMENTAL CHEMISTRY**

Strand 1: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to explore sources of air pollution and their effects.
2. guide students to explore sources of land pollution and their effects.
3. guide students to explore sources of water pollution and their effects.

Key Words	Points to Note	Resources
<p>Acid rain, greenhouse gases, carbon footprint, ozone, asthma, deforestation, separation of waste, landfill, bring-in-site, 3R's, waste management, biodegradable, oil spill, sewage treatment,</p>	<p>Link this unit with Climate Change – Energy and the Environment. This unit builds upon <i>SCI 7.9 Acids and Alkalis</i>, <i>SCI 7.10 Focus on gases</i>. Re sustainable use of water link with the Geography teachers as this theme is extensively covered within the form 2 Geography Curriculum (<i>GEO 8.2 Water, Water Everywhere</i>). Can link this unit with a visit to a waste management site (e.g. Sant'Antnin, M'Scala), Ta' Kandja underground water galleries; Reverse Osmosis Plant (Contact Water Services Corporation). DO NOT attempt to go through all sources of pollution. The learning outcomes should guide your line of thought.</p>	<p>Marble chips, dilute hydrochloric acid, posters and other resources by Wasteserve. Cooking oil</p> <p>WasteServ: http://www.wasteservmalta.com/</p> <p>Water Services Corporation: http://www.wsc.com.mt/</p> <p>Air pollution: http://www.nrdc.org/air/</p> <p>Recyclable household items: http://greenliving.nationalgeographic.com/list-recyclable-household-items-2952.html?source=glhottopic</p> <p>3R's: http://www.recycling-guide.org.uk/rrr.html</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>The teacher will:</p> <p>1. guide students to explore sources of air pollution and their effects.</p>	<p><u>Starter suggestion:</u> Use a clip to show air pollution in an industrialised city. Clip may show car exhaust, smoke coming out chimneys, people moving around with masks on their faces, smog over large cities, etc. Ask students to work in groups and pool down their comments and reactions. Give time for students to share their responses. Note any misconceptions which might be addressed at a later stage.</p> <p><u>Main Activity:</u> Go through their responses to the above starter activity and guide students to group responses under themes. These may include acid rain, asthma, greenhouse gases, carbon footprint, ozone depletion, dust from construction industry, etc</p> <p>Ask students to work in groups and choose one of the above themes. Give time for students to discuss and prepare a small presentation on their theme. Provide students with some resources which might help each group.</p> <p>Guide students to identify:</p> <ul style="list-style-type: none"> - sources of pollution (e.g. car exhaust, smoke from chimneys, dust, deforestation) - possible effects (e.g. breathing problems, damage to buildings, cancer) - ways of reducing the source of pollution. (e.g. efficient cars, use of cleaner fuels, reducing fuel consumption, planting more trees) <p>Link accumulation of CO₂ to multiple factors such as increasing rate of CO₂ production and deforestation.</p> <p>Students may think about activities/experiments which may be used to make their presentation more clear e.g. reaction of marble with dilute acid to show the effect of acid rain on limestone; putting up of sticky paper to show the amount of dust particles in air.</p>	<p>STUDENTS CAN:</p> <p>explain alternate ways of doing things and thus reducing the sources of air pollution. (Level 8)</p> <p>describe some sources of air pollution and possible effects. (Level 7)</p> <p>identify some sources of air pollution. (Level 6)</p> <p>link clean air with healthy living. (Level 5)</p>

<p>2. guide students to explore sources of land pollution and their effects.</p>	<p><u>Starter suggestion:</u> Use a clip which may include items related to land pollution such as separation of waste, landfill, bring-in-site, etc. Ask students to work in groups and pool down their comments and reactions. Give time for students to share their responses. Note any misconceptions which might be addressed at a later stage.</p> <p><u>Main Activity:</u> Go through their responses to the above starter activity and guide students to group responses under themes. These may include the use of plastics, the 3 R's, landfill, waste management, production and use of gas from engineered landfill, use of biodegradable material, etc.</p> <p>Ask students to work in groups and choose one of the above themes. Give time for students to discuss and prepare a small presentation on their theme. Provide students with some resources which might help each group.</p> <p>Guide students to identify:</p> <ul style="list-style-type: none"> - sources of waste (e.g. plastic, chemicals, organic, metals, cardboard) - possible effects (e.g. incorrect disposal may result in air pollution, contamination of soil and water reserves, waste dumps as landfill) - ways of reducing the source of pollution (e.g. 3R's) <p>Guide students to form links between the various themes – show that the type of waste or mismanagement of waste may result in land pollution. Elaborate on their presentations and elicit examples how the 3R's may be implemented (on a personal and national level). Show that the success of waste management depends on legislations and initiatives taken on a national level and on the co-operation of each citizen.</p> <p>Students may be encouraged to use waste material to make a new object. This can be linked with art lessons as part of an art-science activity. May include a write up of this activity. Some students may investigate the use of biodegradable plastic bags....and the time taken by this plastic to decompose.</p>	<p>explain different themes related to land pollution and link together as one issue of waste management. (Level 8)</p> <p>identify and describe the 3 R's as the basis of waste management to avoid pollution. (Level 7)</p> <p>identify some sources of land pollution. (Level 6)</p> <p>link a clean place with healthy living. (Level 5)</p>
--	--	--

<p>3. guide students to explore sources of water pollution and their effects.</p>	<p><u>Starter suggestion:</u> Show a clip of an oil spill. Ask students to identify the possible consequences of the spill. Give time for students to share their responses. Ask students to explain their responses, elaborate on their answers and think about long-term effects of the spill.</p> <p><u>Main activity:</u> Demonstrate an oil spill by using cooking oil and coloured water. This shows the immiscibility of oil with water. Create a slick on a tray of water. Guide students to identify some effects of an oil spill and ways of clearing it. Help the students to appreciate how difficult this may be when the spill is kilometres long and the weather is rough.</p> <p>Identify some other sources of water pollution. Ask students to think about swimming in a closed sea (e.g. harbour area, Msida or Vittoriosa Marina or Mgarr Harbour. What makes the sea polluted?</p> <p>Some students may identify sewage as a possible source of pollution. Briefly describe sewage treatment and guide students to identify the advantages of treating sewage. Some advantages may include cleaner (and safer) seas and re-use of water.</p> <p>Some students may identify other sources of pollution (e.g. antifouling agents used by boat owners). The family of some students might own a boat or live near the harbour area – ask these students to identify examples of pollution and go through their experiences. Some students may think about the long term effects of some sources of sea pollution. Effects may include health, biodiversity and economy issues.</p> <p><i>Fresh water:</i> This is dealt in more detail in Geography form 2 curriculum (<i>GEO 8.2 Water, Water Everywhere</i>). Issues may include contamination of water sources by fertilisers and wastes; over-extraction of water from the water table and sustainable use of water resources.</p>	<p>describe the long term effects of some sources of sea pollution. (Level 8)</p> <p>describe some sources of sea pollution and their effects. (Level 7)</p> <p>identify some sources of sea pollution. (Level 6)</p> <p>link a clean sea with healthy living. (Level 5)</p>
---	--	--

SCI 8.9 CLIMATE CHANGE (II) – Environmental Chemistry

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. The group work related to the starter activities about air and land pollution can be carried out in the Computer Lab so that students can work in groups to set up a presentation on their allocated theme. Prezi or Powerpoint are two possible applications that can be used for this, with prezi offering the advantage of allowing collaborative work from different PCs.
2. The suggested resource <http://www.recycling-guide.org.uk/rrr.html> is a student-friendly site which can be used to allow students to explore the 3R concept and learn about different aspects at their own pace.
3. Students can be asked to prepare short anti-pollution campaigns. They can use online sites like <http://www.voki.com/> or <http://www.xtranormal.com/>. Alternatively they can use <http://www.glogster.com/> to make an online poster, which can also be saved to pdf format for printing and display.
4. Students can be asked to use their digital cameras or mobile phones to snap shots of different kinds of pollution in Malta. The photos can be collected into a single presentation (PowerPoint, Prezi, etc) or movie (Photostory, Moviemaker, etc) and uploaded to the school website.

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.9 CLIMATE CHANGE (II) – ENVIRONMENTAL CHEMISTRY**

Strand 1: Materials and their Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to explore sources of air pollution and their effects.
2. guide students to explore sources of land pollution and their effects.
3. guide students to explore sources of water pollution and their effects.

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

- 9.1 guide students to explore sources of air pollution and their effects.
- 9.2 guide students to explore sources of land pollution and their effects.
- 9.3 guide students to explore sources of water pollution and their effects.

Keywords	Points to Note	Resources
Acid rain, greenhouse gases, carbon footprint, ozone, asthma, deforestation, separation of waste, landfill, bring-in-site, 3R's, waste management, biodegradable, oil spill, sewage treatment	<p>Refer to notes re 5E approach to teaching and learning of science.</p> <p>Link this unit with Climate Change – Energy and the Environment. This unit builds upon <i>SCI Acids and Alkalis</i>, <i>SCI Chemical Reactions</i>. Re sustainable use of water link with the Geography teachers as this theme is extensively covered within the form 2 Geography Curriculum.</p> <p>Can link this unit with a visit to a waste management site (e.g. Sant'Antnin, M'Scala), Ta' Kandja underground water galleries; Reverse Osmosis Plant (Contact Water Services Corporation).</p> <p>DO NOT attempt to go through all sources of pollution. The learning outcomes should guide your line of thought.</p>	<p>Marble chips, dilute hydrochloric acid, posters and other resources by Wasteserve. Cooking oil</p> <p>Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/</p> <p>WasteServ: http://www.wasteservmalta.com/</p> <p>Water Services Corporation: http://www.wsc.com.mt/</p> <p>Air pollution: http://www.nrdc.org/air/</p> <p>Recyclable household items: http://greenliving.nationalgeographic.com/list-recyclable-household-items-2952.html?source=glhottopic</p> <p>3R's: http://www.recycling-guide.org.uk/rrr.html</p>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>9.1 guide students to explore sources of air pollution and their effects.</p>	<p>As an introduction, the teacher may use a clip to show air pollution in an industrialised city. Clip may show car exhaust, smoke coming out chimneys, people moving around with masks on their faces, smog over large cities, etc</p> <p>Students may be shown pictures of clean and polluted environments and asked to differentiate between one and the other.</p> <p>Guide students to start recognising the following, by use of visuals and clips:</p> <ul style="list-style-type: none"> - sources of pollution (e.g. car exhaust, smoke from chimneys, dust) - possible effects (e.g. breathing problems, damage to buildings) - ways of reducing the source of pollution. (e.g. efficient cars, reducing fuel consumption, planting more trees) <p>Other activities:</p> <p>The teacher helps the students take two sheets of white paper and smear them with petroleum jelly on one side. The sheets are placed on a window sill and pasted on the outer wall of the classroom/school, side by side. The side with the jelly should be exposed. Ask or help students to take in one sheet at the end of one day and to observe how dirty it looks compared with any other clean sheet. Keep this dirty sheet in a safe place (for e.g. in a paper bag or between two blank/plain paper. Take the other sheet in after a week. Help students compare it with the first sheet.</p>	<p>STUDENTS CAN:</p> <p>recognise basic sources of air pollution. (Level 4)</p> <p>communicate their awareness of changes. (Level 3)</p> <p>respond to options and choices with actions or gestures. (Level 2)</p> <p>co-operate in shared exploration and supported participation. (Level1)</p>

<p>9.2 guide students to explore sources of land pollution and their effects</p>	<p>As a started activity, the teacher can present a ‘spot the difference’ activity relating to land pollution</p> <p>The teacher may use a clip which can include items related to land pollution such as separation of waste, landfill, bring-in-site, etc.</p> <p>Students can be given a set of pictures of different materials and guided to separated them according to waste separation procedures. This may also be done with rela objects. School waste separation may also be encouraged</p> <p>The teacher may also guide students to a basic understanding of the 3R’s</p>	<p>recognise some sources of land pollution. (Level 4)</p> <p>explore and observe similarities, differences, patterns and changes. (Level 3)</p> <p>engage in experimentation with a range of equipment. (Level 2)</p> <p>communicate consistent preferences and effective responses. (Level 1)</p>
<p>9.3 guide students to explore sources of water pollution and their effects.</p>	<p>The teacher can show picture of an oil spill by using cooking oil and coloured water. This shows the immiscibility of oil with water. Create a slick on a tray of water.</p> <p>Identify some other sources of water pollution. What makes the sea polluted? Choice of pictures and/or short clips can be presented to the students to reinforce the concept.</p> <p>Some students may identify sewage as a possible source of pollution. Students are guided to differentiate between clean and polluted water and helped to identify some reasons why clean water is safer and more beneficial.</p>	<p>recognise possible sources of water pollution (Level 4)</p> <p>actively join in activities related to exploring sources of water pollution (Level 3)</p> <p>engage in experimentation with a range of equipment (Level 2)</p> <p>co-operate in shared exploration and supported participation (Level1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.10 FIELDWORK**

Strand 1: Life Processes and Living things

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. guide students to investigate a habitat and identify the human impact on this habitat through a fieldwork activity.

Key Words	Points to Note	Resources
<p>shore, woodland, garigue, sea, sandy seashore, rocky seashore, cliffs, valleys, endemic, endangered, hibernation, producer, consumer, food chain, herbivore, carnivore, omnivore,</p>	<p>Refer to 5E approach to teaching and learning of science.</p> <p>Be aware of health and safety issues if students are to handle some animals or plants.</p> <p>Link this unit with SCI 7.4.4.</p> <p>May also consider a visit to Simar, Ghadira Nature Reserve, Majjistral Park, Xrobb I-Ghagin field study centre or the Mdina Natural History Museum.</p> <p>Refer to the websites of local NGOs for information re local environment. http://www.naturetrustmalta.org/ http://www.birdlifemalta.org/ http://www.bicref.org/ http://www.faa.org.mt/home?!=1 http://www.ramblersassociation.blogspot.com/ http://www.foemalta.org/home/</p>	<p>Plant & Animal adaptations http://www.ecokids.ca/pub/eco_info/topics/climate/adaptations/index.cfm http://animal.discovery.com/tv/a-list/creature-countdowns/adaptations/adaptations.html http://www.mbgnet.net/bioplants/adapt.html</p> <p>Adapting to climate change http://www.livescience.com/3863-animals-plants-adapting-climate-change.html</p>

<p>THE TEACHER WILL:</p> <p>1. guide students to investigate a habitat and identify the human impact on this habitat through a fieldwork activity.</p>	<p><u>Starter suggestion:</u> Revisit SCI 7.4.4 and link this with their previous fieldwork experiences.</p> <p><u>Main activity:</u> Students use prepared worksheets to guide them through this activity.</p> <p>Activities may include: Students think about the human impact on the environment. Activities may include</p> <ul style="list-style-type: none"> - role of rubble walls - the effect of urbanisation (road / building construction – destruction of habitats - identification of different examples of pollution - introduction of alien species (and thus competition with local species) - measurement of some environmental conditions such as the temperature, humidity, pH, wind speed, etc - animal and plant identification - identification of some endemic or indigenous species - silent exercise - studying an area by using a quadrat, line/belt transect - observing man-made or natural features in the environment - identification of conservation initiatives - the role of environmental NGOs - visit to nature reserves <p>Re Marine fieldwork activities may include</p> <ul style="list-style-type: none"> - water visibility, pH, temperature - observing living things 	<p>STUDENTS CAN:</p> <p>explain conservation and the role of local NGOs. (Level 8)</p> <p>identify and explain links between the human behaviour and the environment. (Level 7)</p> <p>identify examples of human positive impact on the environment. (Level 6)</p> <p>identify examples of human negative impact on the environment. (Level 5)</p>
--	--	---

	<p>Think about: places</p> <ul style="list-style-type: none"> - school ground or nearby area - valleys - areas such as Buskett, Mizieb, Majjistral Park, Xrobb I-Ghagin, Dwejra (Gozo) Ramla I-Hamra / Ghajn Tuffieha sand dunes, rocky sea shore, Yacht Marinas <p>Think about: duration of activity</p> <ul style="list-style-type: none"> - half day/ whole day - overnight stay (2 or 3 day live-in) <p>This activity may be carried out in co-operation with geography, history depending on the locality of fieldwork activity.</p> <p>Ask students to find links between human activity and the environment.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Students may use other resources to find more information on local environmental NGOs and their work. 	
--	---	--

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.10 FIELDWORK**

Strand 1: Life Processes and Living things

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

Teacher will:

1. guide students to investigate a habitat and identify the human impact on this habitat through a fieldwork activity.

OBJECTIVES ATTAINMENT LEVELS 1,2,3,4

- 10.1 illustrate examples of habitats, and identify the human impact on this habitat through a fieldwork activity.

Keywords	Points to Note	Resources
Food chain, predator, prey, seashore, cliffs, valleys, habitats, extinct, fieldwork	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit with SCI 7.3 Living things and SCI 7.4 Our Environment.</p> <p>This unit consists of a fieldwork activity. Emphasise observations skills and try to identify the link between the habitat and organisms. Identify the human impact on the environment. Link this unit with the previous two units (Climate Change).</p> <p>Think about linking this activity with other subjects such as Geography, History, Social Studies, PSD. Might visit a nature park.</p>	<p>Pictures of organisms (especially local ones), pictures of local habitat, apparatus for fieldwork (depends on type of activities).</p> <p>Refer to resources found in Communication 4 All: Resources to support inclusion http://www.communication4all.co.uk/</p> <p>Ecology http://www.nclark.net/Ecology</p> <p>Food chains/webs http://www.chaffeetrailibrary.org/foodchains.htm http://www.gould.edu.au/foodwebs/kids_web.htm</p> <p>Predator – Prey http://www.globalchange.umich.edu/globalchange1/current/lectures/predation/predation.html</p> <p>Nature Reserves http://www.visitmalta.com/ghadira-nature-reserve http://www.visitmalta.com/simar-nature-reserve</p>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>10.1 guide students to investigate a habitat and identify the link between the organisms and this habitat through a fieldwork activity</p>	<p>The teacher creates different habitats for the students to experience:</p> <ul style="list-style-type: none"> - arctic conditions with containers of snow and ice and white material - desert conditions with heaters, sand and cacti - rainforest conditions with lots of plants, animal soundtracks and water sprays - ocean conditions using bubble tubes, projections of fish and whale song on tape - set up their own habitat from a choice of materials - in each introduce the types of animals to be found in that habitat <p>Together with the students, the teacher creates a mini-habitat for woodlice/snails/worms so students can experience the environmental conditions living things prefer. Students are asked to look after a mini-habitat and try to find the animals from a choice of different environments.</p> <p>Encourage the class to make a prediction based on a study of habitats in the wild as to which environments animals prefer to inhabit and extend this to their own mini-habitat. They also look at other living things and the environments they prefer to inhabit within a given habitat e.g. worms, tadpoles.</p> <p>The teacher takes the students outside at regular intervals to experience environmental changes. e.g. increase in wind, sun, rain. Students are also shown videos of different climate and weather. Students are encouraged to set up data-logging equipment e.g. light probes, temperature sensors, rain gauges, wind socks etc. and record hourly changes in the environment pictorially.</p> <p>Identify examples of human impact on that particular habitat.</p>	<p>STUDENTS CAN:</p> <p>recognise that different living things are found in different places and identify human impact on that habitat. (Level 4)</p> <p>start to understand some simple, scientific vocabulary and communicate related ideas and observations using simple phrases. (Level 3)</p> <p>show interest in a wide range of living things, handling them and observing them. (Level 2)</p> <p>react to new activities and experiences. (Level 1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.11 EARTH AND SPACE (I)**

Strand 1: Physical Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. illustrate the movement of the Earth around the Sun and help students describe day/night and a year.
2. help students to explain the causes of seasons.
3. guide students to explore the movement of the Moon around the Earth.
4. engage students to explain what happens during an eclipse.
5. engage students to explore the main features of the Solar System.

Key Words	Points to Note	Resources
Earth, tilt of Earth, axis, orbit, year, spinning, leap year, Northern Hemisphere, Southern Hemisphere, direct sunlight, full Moon, new Moon, phases of the Moon, natural satellite, solar eclipse, lunar eclipse, planet, dwarf planet, asteroids, telescope,	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit to <i>SCI 7.8 On the Move (Forces)</i> and <i>SCI 8.6 Light and Sound</i>.</p> <p>Link this unit to <i>SCI 8.12 Earth & Space II</i>. Consider as one topic but for unitised curriculum this topic was divided into two units.</p> <p>Students may find difficulty in describing the phases of the Moon. Note that</p> <ul style="list-style-type: none">- Pluto is no longer classified as a planet (due to its small size) but older resources will refer to Pluto as a planet.- the terms weight, mass and gravity may cause problems. Some sources may even confuse mass and weight. Be aware that primary school maths textbooks refer to weight in terms of kg (e.g. what is the weight of this block? 10kg).	<p>Rotating model of the Sun, Earth and moon system. Source of light, 2 balls of different sizes, polystyrene ball and a stick, darkened room. Focus Educational Software (KS3 Physics) or other simulations available. Use photographs and clips showing the phases of the Moon, Earth from the Moon, eclipses</p> <p>Planetariums : Slovak site, but has translation option http://veda.sme.sk/planety/ site to download freeware http://www.stellarium.org/</p> <p>Night and day, year, seasons: http://www.engineeringinteract.org/resources/astroadventure/fl_ash/concepts/earth.htm http://www.bbc.co.uk/schools/scienceclips/ages/9_10/earth_sun_moon_fs.shtml</p> <p>Seasons : http://www.youtube.com/watch?v=DuiQvPLWziQ</p> <p>Moon game : http://www.schoolsobservatory.org/activ/moonsaic</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>The teacher will:</p> <p>1. illustrate the movement of the Earth around the Sun and help students describe day/night and a year.</p>	<p><u>Starter suggestion:</u> Show a clip of the space shuttle, rocket or the International Space Station. Ask students to think about and share ideas why humans were always fascinated and interested in space.</p> <p><u>Main activity:</u> Ask students questions about the shape and relative size of the Earth, the Moon and the Sun. Encourage students to elaborate further and discuss whether these three are fixed or moving. Use models / two different sized balls and elicit further response to describe the movement of Earth round the sun. Ask students to evaluate their previous answers and understand that we are part of a moving Earth.</p> <p>Use a tilted spinning model of the Earth/simulations and ask students to demonstrate night and day. Ask pupils to show where night and day are and select cities at night or day. Guide students to appreciate that it takes a day for the Earth to spin on its own axis and that the Earth takes a year to orbit the Sun.</p> <p>Ask students to think about the length of Winter and Summer days - Use <i>Stellarium</i> free ware to watch a sunrise and sunset in a locality in Malta during a Summer day (Northern Hemisphere). Do the same for a place in the Southern Hemisphere. Guide students to understand that Summer days are longer than a Winter days.</p> <p>Ask students to explain terms like sun 'rising' and 'setting' and evaluate whether these statements are correct.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - some students may use models to describe day/night and the movement of Earth round the Sun but others may draw diagrams to show day / night and the orbit of the Earth around the Sun. - use IWB resources to support the fact that the Earth spinning on its axis takes 24 hours, and the Earth round the Sun takes 365¼ days . <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - some students may be able to describe and explain a leap year. 	<p>STUDENTS CAN:</p> <p>evaluate terms like sun 'rising' and sun 'setting' and describe that days are longer in Summer and shorter in Winter. (Level 8)</p> <p>illustrate the orbit of the Earth around the Sun and describe day and night. (Level 7)</p> <p>describe day/night in terms of a spinning Earth and explain what an orbit is. (Level 6)</p> <p>know that there are 365 days in a year. (Level 5)</p>

<p>2. help students to explain the causes of seasons.</p>	<p><u>Starter suggestion:</u> Show a picture of a Christmas BBQ on a beach in Australia and ask students to describe the picture and stimulate a discussion re seasons.</p> <p><u>Main activity:</u> Ask students to name the four seasons and identify weather patterns in each (re heat, rain, length of day, higher or lower Sun, etc). Encourage students to elaborate further and ask them to explain how seasons are produced. Use models to evaluate their previous response and build on their knowledge to relate the orbiting of the Earth around the sun to seasons. Give students time to watch a video clip explaining the tilt of the Earth and how the tilt causes seasons to change. If necessary ask students to relate the amount of heat with distance (Sun – Earth) and angle of sunlight. Some students may be able to use models or diagrams to reason in which season the Earth is when placed at different positions around the Sun. Some higher level students may be able to relate this to having direct sunlight in Summer.</p> <p>Support these activities with prepared fill in worksheets.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - ask students to describe seasons in planets with no, smaller or larger tilt. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Students can research about Summer or Winter in the North Pole - Use Stellarium software to watch a night sky from Malta in June and December. - Can Investigate change in the shadow length during the year. In the school yard fix a stick in the same place and observe the shadow across a stretch of time at noon. The shadow is shorter in Summer because the Sun is higher but shadow is longer in Winter because the Sun is lower. <p><u>Other notes:</u></p>	<p>explain how the tilt of the earth causes seasons. (Level 8)</p> <p>link seasons with the tilt of the Earth. (Level 7)</p> <p>describe and identify patterns in seasonal variation (Level 6)</p> <p>identify the four seasons (Level 5)</p>
---	---	---

<p>3. guide students to explore the movement of the Moon around the Earth.</p>	<p><u>Starter suggestion:</u> Use a clip to show the human landing on the Moon or the Moon as seen from the Earth. Ask students to comment on the clip and share any information they know about the Moon. Note any misconceptions which might be addressed at a later stage.</p> <p><u>Main activity:</u> Divide students in groups and ask each group to draw one diagram of the Moon in the night sky. Give time for each group to share their results. Possibly students come up with various shapes - ask for possible explanation why this is so. Ask students to comment on the drawings. Some students may point out that the Moon shows up in different shapes – explain that these shapes are often referred to as <i>Phases of the Moon</i>. Ask students to think about why the shape of the Moon seems to change. Use models to explain the movement of the Moon around the Earth. Demonstrate that the Moon spins on its own axis.</p> <p>Use models or polystyrene balls to investigate and show the phases of the Moon. Use <i>Focus Educational Software</i> provided in schools on CD to simulate these phases (or any other interactive simulation). Give time for students to recognise the different phases of the Moon. Be aware that some students may think that the real shape of the Moon is changing and not the visible shape of the Moon from the Earth! A prepared fill-in worksheet might help. Show that 28 days pass from one full Moon to the next. Refer to the Moon as a natural satellite.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - may refer to the first pictures of the back of the Moon taken by Lunik 3 - Some students may research the first landing on the moon by Apollo 11 .Why do astronauts have to wear space suits? Is it possible to live on the moon? 	<p>describe why the shape of the Moon appears to change during its orbit of the Earth. (Level 8)</p> <p>refer to the different shapes of the Moon as Phases of the Moon. (Level 7)</p> <p>describe that the orbit of the Moon around the Earth takes 28 days. (Level 6)</p> <p>show that the shape of the Moon is a sphere. (Level 5)</p>
--	---	---

<p>4. engage students to explain what happens during an eclipse.</p>	<p><u>Starter suggestion:</u> Show a clip of a solar eclipse. Ask students to share their knowledge of an eclipse.</p> <p><u>Main activity:</u></p> <p>A Solar Eclipse: In a dark room setting, use a lamp and polystyrene balls and ask students to demonstrate a solar eclipse. (Safety: take care if using mains electrical equipment.) Guide the students to understand that for a solar eclipse to happen, the Sun, Moon and Earth must be exactly lined up and that the Moon’s shadow falls on the surface of the Earth. If necessary repeat the above clip of a solar eclipse and ask students to explain what was happening. Use a fill-in worksheet to draw a diagram of a solar eclipse.</p> <p>A Lunar Eclipse: Show a clip of a lunar eclipse. Ask students to explain their observations. Explain that eclipses of the Moon happen more frequently. The Moon passes through the Earth’s shadow and it becomes very dark. Anyone on the night side of the Earth will see the eclipse. In a dark room setting, use a lamp and polystyrene balls and ask students to demonstrate a lunar eclipse. If necessary repeat the above clip of a lunar eclipse and ask students to explain what was happening. Use a fill-in worksheet to draw a diagram of a lunar eclipse.</p> <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - possibly link to History and explain that the Hagar Qim temple set up is linked to natural phenomena (such as the position of the Sun on 21st March and 21st September). This shows that these people already followed patterns of natural phenomena. 	<p>describe what happens during a solar or a lunar eclipse. (Level 8)</p> <p>draw diagrams to explain a solar or a lunar eclipse and indicate the correct position of the Sun, Earth and Moon in both eclipses. (Level 7)</p> <p>use models to show how a solar or a lunar eclipse take place. (Level 6)</p> <p>recognise pictures of an eclipse. (Level 5)</p>
--	--	---

<p>5. engage students to explore the main features of the Solar System.</p>	<p><u>Starter suggestion:</u> Ask students to work in groups and make a list of things found in our Solar System. Give time for students to discuss and share their results. Note any misconceptions which might be addressed at a later stage.</p> <p><u>Main activity:</u> Guide the students to evaluate the above results and identify the main objects making up the Solar System - the Sun, planets, moons and lumps of rock (asteroids). Identify the Solar System as the Sun and all the planets orbiting it. Give access to resources and ask students to work in pairs and give some information about one planet. Give time to share their findings and use the IWB and a prepared work sheet to fill-in details about each planet. Use pictures of planets to consolidate their findings. Students may explore information related to composition, size, distance from the Sun, temperature, time to travel round the Sun, number of moons and one other curious information about this planet. Guide students to look for relevant information and be brief.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Plan an interactive quiz about the Solar System. - Use a 'drag and drop' exercise to link names and properties. - Ask students to describe what it would be like living in other planets. - Explain why Pluto is not considered a planet anymore, <p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Students may build a scale model of the Solar System to appreciate relative size and distances between them. - Some students might ask about the stars which are visible at the night sky. This will be explored in further detail at a later stage in the next unit Earth & Space II. - Students may research how astronomers obtained evidence of planets and other bodies in the Solar System using telescopes and probes. - Some students may ask about the possibility of life on other planets. For your info refer to 'Goldilocks' planet and Gliese 581c which has conditions which are 'just right' for potential life. 	<p>explain the scientific concepts underlying the main features of the Solar System. (Level 8)</p> <p>describe the Solar System as made up of the Sun and all the planets orbiting it and identify some of their features. (Level 7)</p> <p>identify the Sun and the planets as the main components of the Solar System. (Level 6)</p> <p>name some planets (Level 5)</p>
---	---	---

SCI 8.11 Earth and Space (I)

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. A Moon calendar that allows students to see the moon cycle for any date they wish: <http://www.paulcarlisle.net/mooncalendar/>. Could be used to encourage students to observe moon phases during a particular range of dates.
2. Using the video <http://www.youtube.com/watch?v=wiY7fw71Lr8&feature=related> (which shows a phases of the moon demo in class) students can be asked to re-create the activity themselves.
3. http://www.youtube.com/watch?v=vIIn_LXV_J8 is a video entitled 'The Moon for all Mankind' by Leonard Ellul-Mercer that shows images of the Moon from all over the world. More information about this project can be found at <http://iya2009malta.page.tl/The-moon-for-all-mankind.htm>.
4. Some information about the Summer Solar Eclipse 2006 viewed at Hagar Qim: http://www.maltastro.org/eclipse_march_06.htm.
5. Instructions for building a scale model of the Solar System: <http://www.astro.ucla.edu/~outreach/solar-system-bead.pdf> or http://www.exploratorium.edu/ronh/solar_system/. Either one can be used to help students appreciate the scale and structure of the solar system.
6. A video explaining why Pluto isn't a planet anymore: <http://www.youtube.com/watch?v=FqX2YdnwtRc>. This can be used to set of a discussion as to why Pluto was downgraded to dwarf planet and whether this was justified

Objectives at attainment levels 5,6,7,8

The teacher will:

1. illustrate the movement of the Earth around the Sun and help students describe day/night and a year.
2. help students to explain the causes of seasons
3. guide students to explore the movement of the Moon around the Earth.
4. engage students to explain what happens during an eclipse.
5. engage students to explore the main features of the Solar System.

Mainstream objective 3 may not be relevant at this level of attainment

Objectives at attainment levels 1,2,3,4

- 11.1 illustrate the movement of the Earth around the Sun and help students describe day and night
- 11.2 guide students to develop an awareness of the four seasons
- 11.3 guide students to develop a basic awareness of what happens during an eclipse
- 11.4 guide students to explore the main features of the Solar System

<p>Earth, orbit, year, spinning, leap year, hemisphere, direct sunlight, full Moon, new Moon, phases of the Moon, natural satellite, solar eclipse, lunar eclipse, planet, asteroids, telescope</p>	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit to SCI 7.6 Forces and SCI 8. Light and Sound.</p> <p>Link this unit to SCI 8 Earth & Space II. Consider as one topic but for unitised curriculum this topic was divided into two units.</p> <p>Students may find difficulty in describing the phases of the Moon. Note that</p> <ul style="list-style-type: none"> - Pluto is no longer classified as a planet (due to its small size) but older resources will refer to nine planets. <p>the terms weight, mass and gravity may cause problems. Some sources may even confuse mass and weight. Be aware that primary school maths textbooks refer to weight in terms of kg (e.g. what is the weight of this block? 10kg).</p>	<p>Rotating model of the Sun, Earth and moon system, source of light, 2 balls of different sizes. polystyrene ball and a stick, darkened room. Focus Educational Software (KS3 Physics) or other simulations available, photographs/clips showing the phases of the Moon, Earth from the Moon, eclipses</p> <p>Planetariums : Slovak site, but has translation option http://veda.sme.sk/planety/ site to download freeware http://www.stellarium.org/</p> <p>Night and day ,year, seasons: http://www.engineeringinteract.org/resources/astroadventure/flash/concepts/earth.htm</p> <p>http://www.bbc.co.uk/schools/scienceclips/ages/9_10/earth_sun_moon_fs.shtml</p> <p>Seasons : http://www.youtube.com/watch?v=DuiQvPLWziQ</p> <p>Moon game : http://www.schoolsobservatory.org/activ/moonsaic</p>
---	--	---

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>11.1 illustrate the movement of the Earth around the Sun and help students describe day and night</p>	<p>Encourage the class to go to different situations where they can experience natural light, shadow and darkness.</p> <p>Make shadow puppets so they can see how light and shadows create shape. Use a globe and lamp to demonstrate the effect of light and shadow and if possible go on to talk about night and day.</p> <p>Plot the course of the Sun during the day over a period of days by sticking a large piece of card on the floor outside and placing little coloured suns in the correct position. Complete the above activity but relate it to the length and position of the shadows they investigate earlier. They look for a pattern in the results i.e. higher sun, shorter shadows and discuss when the sun is highest.</p> <p>As above but students extend this to discuss how it is day on one side of the earth and night on the other. You may wish to show a video of the Earth spinning creating night and day. The teacher may further reinforce the concept of day and night by encouraging students to choose between activities (ex. Sleeping, going to school etc) and sorting them into those that happen during the day and those that take place during the night</p>	<p>STUDENTS CAN:</p> <p>describe changes when questioned directly. (Level 4)</p> <p>observe some of the simple properties of light and begin to record their findings. (Level 3)</p> <p>communicate their awareness of light. (Level 2)</p> <p>co-operate in shared exploration and supportive participation. (Level 1)</p>
<p>11.2 guide students to develop an awareness of the four seasons</p>	<p>Encourage the class to experience the warmth of the Sun and coolness of the shadow. Create different seasons in the classroom e.g.</p> <p>Winter – woolly hats, scarves, ice and cold water, Christmas dinner, Christmas music, dark days. Spring – lambs wool, flower buds, sounds of baby animals, April showers. Summer – ice creams, swimsuits and shorts, hot water and air, sunshine, sand. Autumn – fallen leaves, sounds of leaves being crunched on the floor, selection of fallen nuts, warmer clothes.</p> <p>Experience the heat from a radiator at various distances, taking the necessary safety precautions. Encourage the class to role play the Earth moving around the Sun and discuss why the warmer seasons happen when the Earth is closer to the Sun. They make a poster about the seasons and include the position of the Earth to the Sun.</p>	<p>describe their observations using scientific vocabulary and engage in simple recording of such observations where appropriate. (Level 4)</p> <p>start to explore and observe similarities, differences, patterns and changes in the features of seasons. (Level 3)</p> <p>group objects and materials in terms of seasonal features. (Level 2)</p> <p>react to new activities and experiences. (Level 1)</p>

<p>11.3 guide students to develop a basic awareness of what happens during an eclipse</p>	<p>Explore the concept of the permanence of objects by asking students to visually track an interesting object as it moves in towards, behind and out from a screen. Discuss whether the object still exists.</p> <p>Repeat as above, class sit behind a bright light source such as a big torch in a darkened room. Place a globe in front of light source and move a ping-pong ball behind globe using globe as a screen. Observe the effect of light and shadow.</p> <p>Watch a video of a solar and lunar eclipse. Then role-play what was happening to the Earth, Sun and Moon during these events using models of the Earth, Moon and a light source for the Sun.</p> <p>Complete the above activity but explain using diagrams the difference between a solar and lunar eclipse.</p>	<p>make their own observations of changes that result from movement of the Earth and Moon. (Level 4)</p> <p>engage in experimentation with a range of equipment and answer simple scientific questions. (Level 3)</p> <p>remember learned responses over short periods of time. (Level 2)</p> <p>accept and engage in co-active Exploration. (Level 1)</p>
<p>11.4 guide students to explore the main features of the Solar System</p>	<p>The teacher may present the following material to the students to familiarise themselves with the features of the Solar System</p> <ul style="list-style-type: none"> - a slide show of the solar system - a model of the solar system and the planets, including some basic information on how the planets orbit the sun - a picture of a space shuttle - a picture of an astronaut - a portable planetarium - video clip of the solar system <p>The above activities may be consolidated by guiding students to draw up a poster of the solar system and the order of the planets orbiting the Sun.</p>	<p>recognise some of the main features of the solar system. (Level 4)</p> <p>actively participate in activities related to the solar system. (Level 3)</p> <p>show an interest in the Solar System. (Level 2)</p> <p>accept and engage in co-active exploration. (Level 1)</p>

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.12 EARTH AND SPACE (II)**

Strand 1: Physical Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives

The teacher will:

1. help students describe what gravity is and recognise that it keeps things in orbit.
2. illustrate the difference between mass and weight.
3. present the Sun and stars as light sources and help students understand light.
4. engage students to explore space exploration and describe why satellites are useful.

Key Words	Points to Note	Resources
Earth, moon, gravity, gravitational pull, mass, weight, orbit, path, sun, stars, light, shadows, luminous & non-luminous sources, reflection,	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit to <i>SCI 7.8 On the Move (Forces)</i> and <i>SCI 8.6 Light and Sound</i>. Link this unit to <i>SCI 8.11 Earth & Space I</i>. Consider as one topic but for unitised curriculum this topic was divided into two units.</p> <p>Note that the terms weight, mass and gravity may cause problems. Some sources may even confuse mass and weight. Be aware that primary school maths textbooks refer to weight in terms of kg (e.g. what is the weight of this block? 10kg).</p> <p>Note that some students think that there is no gravity on the Moon rather than there is less gravity than Earth.</p>	<p>Large Rubber ball, tennis ball, soft toy, mass balance, bathroom scale, power supply, light bulb,</p> <p>Lesson re Mass, weight and Gravity http://www.schoolsworld.tv/node/304?terms=720</p> <p>Mass & weight explained http://www.design-simulation.com/ip/curriculum/misccontent/demoinstructions/weightmassandgravity.php</p> <p>NASA website: http://www.nasa.gov/ Life on other planets : Information http://www.newscientist.com/article/dn11710</p> <p>Solar system and beyond – questions : http://woody1.edublogs.org/files/2008/09/unit-1.pdf The Sun: http://www.youtube.com/watch?v=TOErr4xntHE</p>

Teaching Objective	Examples of teaching experiences and activities	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>1. help students describe what gravity is and recognise that it keeps things in orbit.</p>	<p><u>Starter suggestion:</u> Use a large and a small ball and ask students to imagine the Earth and the Moon and the jumping motion of AstroBear (a soft toy) on Earth and Moon as in http://www.schoolsworld.tv/node/304?terms=720. Some students may talk about gravity. Note any misconceptions.</p> <p><u>Main activity:</u> - Use the following clip about Newton on the origin of the (mathematical) concept of gravity: http://www.youtube.com/watch?v=jwPc0kK9VHU&feature=related. Ask students to describe gravity. Elaborate on their responses and ask further questions. Refer to the starter activity and guide students to identify gravity as an attraction (pulling) force between two masses. Establish that things would fall downwards towards the Earth and that this is the definition of 'downwards'.</p> <p>Organise the students in groups and ask each group to find the time different objects take to fall to the ground. Students may use the simulation on http://www.algodoo.com to explore the time it takes for different objects to fall to the ground. Ask each group to share their findings on the IWB and guide students to explain patterns and elaborate on their findings. Address any misconceptions throughout the discussion. Most students may be able to explain what determines the size of gravity and link the strength of the pull with mass.</p> <p>Ask students to think about how planets keep to their orbit. Guide students to link this to gravity and guide students to use the previous activities to describe what happens to the gravitational attraction as the distance between them increases and what happens as the size of the planet increases.</p> <p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Ask students to compare the gravity of the Moon with that of the Earth. - Ask students to compare the gravity on different planets. - Explain that the Sun is the largest object in the Solar System – link this to gravity. 	<p>STUDENTS CAN:</p> <p>describe what happens to the gravitational pull as the distance between objects and mass of object increase. (Level 8)</p> <p>describe the force of gravity and identify gravity as the force that keeps things in orbit. (Level 7)</p> <p>link the downward movement of objects to gravity. (Level 6)</p> <p>show that falling objects move downwards. (Level 5)</p>

	<p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - Use the software 'Gravity Launch' to explore how the force of gravity can pull an object toward the Earth and moon. (http://sciencenetlinks.com/tools/gravity-launch/) - Give the following link to students to try the gravity simulator at home and report their successes. (http://sciencenetlinks.com/afterschool-resources/gravity-launch/#stu) - Ask students to think about how rockets get away from the Earth. May use a clip to show a rocket launch. <p><u>Other notes:</u></p>	
<p>2. illustrate the difference between mass and weight.</p>	<p><u>Starter suggestion:</u> Start this activity with Astrobear on a mass balance. Ask students to measure their mass before a hypothetical space journey to the moon. (Note that some students may be conscious of their mass.) Ask some students to share their result. Note any misuse of the correct terms and address this at a later stage.</p> <p><u>Main activity:</u> Refer to the responses given by the students during the starter activity and ask students to elaborate on the meaning of 'mass' and 'weight'. Use a clip which shows an astronaut walking on the Moon. Ask students to describe what they see and to relate it to what they know about gravity on the Moon. Ask students to form sentences and use 'mass', 'weight' and 'gravity' correctly. Show that the mass is the amount of material that an object contains</p> <p>Organise students in groups. Ask students to use Newton metres/Spring Balances with different scales and ranges to read both the mass and the weight of different objects (e.g. school bag, pencil case, chair, book, etc). Students record their observations on a fill-in activity sheet. Ask students to evaluate their results and check whether the proper units were used.</p>	<p>describe mass and weight of an object and relate this to gravity. (Level 8)</p> <p>measure weight correctly with appropriate units. (Level 7)</p> <p>measure mass correctly with appropriate units. (Level 6)</p> <p>put a number of objects in order according to their mass. (Level 5)</p>

	<p><u>Other activities:</u></p> <ul style="list-style-type: none"> - Use an interactive simulation to find the weight of an object on different planets. - Ask students to put a number of objects in order according to their mass. Similarly put a number of forces in order according to their size. <p><u>Other notes:</u></p>	
<p>3. present the Sun and stars as light sources and help students understand light.</p>	<p><u>Starter suggestion:</u> Revisit SCI 8.6 (Light and Sound) and ask students to identify some sources of light. Organise students to work in groups and put these sources in order of brightness. Ask each group of students to share their results.</p> <p><u>Main activity:</u> Go through a short clip about the Sun (e.g. http://www.youtube.com/watch?v=TOErr4xntHE or any other clip). Lead a brainstorming exercise about the Sun. Note any misconceptions which might be addressed at a later stage.</p> <p>Identify the Sun as the main light source of the Solar System. Ask students to describe how we see planets and other objects. Refer to ray diagrams and to the fact that light travels in a straight line. Explain that light from the Sun takes around 8 minutes to reach the Earth.</p> <p>Ask students to share their knowledge about the stars that are visible during night time. Some students may be able to describe correctly what these stars are. Explain that our Sun is an average sun...some suns are smaller, others are bigger but they all look small...why?</p> <p>Guide students about the following:</p> <ul style="list-style-type: none"> - some shiny objects are planets (e.g. Venus, Mars, Jupiter) which are visible to the naked eye. Ask students to describe how we can see these planets if they are not sources of light. - Ask students to explain what happens to the stars during the day. 	<p>elaborate on stars as being distant light sources and explain their distance in terms of light years. (Level 8)</p> <p>identify the Sun and stars as light sources and describe that light travels in straight lines at very high speed. (Level 7)</p> <p>correctly describe the stars as distant light sources. (Level 6)</p> <p>identify the Sun as our main source of light. (Level 5)</p>

	<p><u>Other possible activities:</u></p> <ul style="list-style-type: none"> - some students may describe the meaning of a light year. - may use a prism to explore the white light from the Sun. (Note safety precautions as it is dangerous to look directly at the Sun.) <p><u>Other notes:</u></p>	
<p>4. engage students to explore space exploration and describe why satellites are useful.</p>	<p><u>Starter suggestion:</u> Ask students to think about reasons why space exploration is useful. Some students may not connect space exploration to daily practical things.</p> <p><u>Main activity:</u> Give a set of cards / statements to each group of students and ask each group to put in chronological order. Cards may include reference to the main events in space exploration such as first rocket launch (1942), first animals (fruit flies) in space (1947); first monkey in space (1949); first satellite in space (1957); first dog in space (1957); first human in space (1961); first Venus flyby (1962); first Mars flyby (1965); first landing on the Moon (1966); first landing on Venus (1966); first human being on the Moon (1969); use of Space Shuttle (1981); construction of first space station -MIR (1986) and ISS (1986); first space tourist (2001).....May refer to weblinks (space exploration – main events) such as in http://en.wikipedia.org/wiki/Timeline_of_space_exploration and choose any events. May use an interactive or ppt presentation to highlight the main events. Guide students to appreciate that space explorations took place gradually.</p> <p>Link with the responses shared by the students during the starter activity and use the following link (http://science.nasa.gov/realtime/jtrack/3d/JTrack3D.html/ or any other real time link) to show the number of satellites around the Earth. Ask students how space exploration is useful and guide students to appreciate a number of benefits acquired through the use of satellites such as the use of GPS, weather forecast, communication, location of minerals/fossil fuels using satellites, research re electronics and new energy sources, etc.</p>	<p>explain in more detail some benefits of space explorations such as the use of GPS and communication. (Level 8)</p> <p>identify some examples of the benefits of space exploration. (Level 7)</p> <p>understand that space exploration took place gradually. (Level 6)</p> <p>recognise that objects and humans have been sent in space. (Level 5)</p>

	<p><u>Other activities:</u></p> <ul style="list-style-type: none">- revisit the previous lessons and link satellites in orbit with gravity. <p><u>Other possible activities:</u></p> <ul style="list-style-type: none">- May ask some students to elaborate further on any one of the benefits of space exploration.- May ask some students to describe in more detail any one of the space missions. <p><u>Other notes:</u></p>	
--	---	--

SCI 8.12 Earth and Space (II)

Digital Technology Enhanced Learning - Science eLearning Entitlement

1. Instead of just watching Newton's story at <http://www.youtube.com/watch?v=jwPc0kK9VHU&feature=related>, students can be asked to animate Newton's story about forces of gravity using online software like <http://www.xtranormal.com/>. Alternatively they can use this software to describe a space mission of their choice in the form of a story-telling exercise.
2. In the lessons on the difference between mass and weight, <http://www.accudesigns.com/collection/weightP.swf> can be used by students to work out the weight of their mass (or Astrobear's) on different planets.
3. Students can use free software like Photostory to create a movie showing the timeline of space exploration. This material can also be uploaded to the school website for sharing.
4. Students can sort different objects according to their mass and/or forces according to their size using IWB software (Promethean, Smart or Starboard) or through interactive games like those found at <http://www.education.vic.gov.au/languagesonline/> for more interactivity.
5. The starter activity with light sources can easily be carried out by students on the IWB if images of different light sources are prepared beforehand.

Subject: Integrated Science

Form 2

Unit code and title: **SCI 8.12 EARTH AND SPACE (II)**

Strand 1: Physical Properties

Unit Duration: Approx. 9 sessions of 40 minutes (6 hours)

Objectives at attainment levels 5,6,7,8

The teacher will:

1. help students describe what gravity is and recognise that it keeps things in orbit.
2. illustrate the difference between mass and weight.
3. present the Sun and stars as light sources and help students understand light.
4. engage students to explore space exploration and describe why satellites are useful

Mainstream objective 2 may not be relevant at this level of attainment

Objectives at attainment levels 1,2,3,4

12.1 guide students towards an understanding and an experience of gravity

12.2 help students identify light sources, with a focus on the Sun and stars

12.3 engage students in an exploration of Space

Keywords	Points to Note	Resources
<p>Earth, moon, gravity, gravitational pull, mass, weight, orbit, path, sun, stars, light, shadows, luminous & non-luminous sources, reflection,</p>	<p>Refer to notes re 5E approach to teaching and learning of science. Link this unit to <i>SCI 7.8 On the Move (Forces)</i> and <i>SCI 8.6 Light and Sound</i>. Link this unit to <i>SCI 8.11 Earth & Space I</i>. Consider as one topic but for unitised curriculum this topic was divided into two units.</p> <p>Note that the terms weight, mass and gravity may cause problems. Some sources may even confuse mass and weight. Be aware that primary school maths textbooks refer to weight in terms of kg (e.g. what is the weight of this block? 10kg).</p> <p>Note that some students think that there is no gravity on the Moon rather than there is less gravity than Earth.</p>	<p>Large Rubber ball, tennis ball, soft toy, mass balance, bathroom scale, power supply, light bulb, Lesson re Mass, weight and Gravity http://www.schoolsworld.tv/node/304?terms=720 Mass & weight explained http://www.design-simulation.com/ip/curriculum/miscontent/demoinstructions/weightmassandgravity.php NASA website: http://www.nasa.gov/ Life on other planets : Information http://www.newscientist.com/article/dn11710</p> <p>Solar system and beyond – questions : http://woody1.edublogs.org/files/2008/09/unit-1.pdf The Sun: http://www.youtube.com/watch?v=TOErr4xntHE</p>

Teaching objective	Example of teaching activities / experiences	Indicators of Learning outcomes
<p>THE TEACHER WILL:</p> <p>12.1 guide students towards an understanding and an experience of gravity</p>	<p>Have students experiment with the object pairs, dropping them, one at a time, while standing on a chair or desk.</p> <p>Other students in the group should observe closely to see whether one object reached the floor before another or both objects reached the floor at the same time.</p> <p>Students can record their results on their charts. (Students should be guided to understand that balls of different sizes and weights fall at the same rate of speed, as do a book and a sheet of cardboard the same length and width as the book.)</p> <p>When students try dropping a feather or a sheet of paper from the same height from which they dropped the other objects, they will discover that the feather and the paper fall more slowly</p> <p>When students try dropping a feather or a sheet of paper from the same height from which they dropped the other objects, they will discover that the feather and the paper fall more slowly. Suggest that they bunch the sheet of paper up into a ball and drop it from the same height. They will find that the ball of paper reaches the floor in less time than the sheet of paper</p>	<p>STUDENTS CAN:</p> <p>communicate observations of changes in movement.(Level 4)</p> <p>sort materials using simple criteria and communicate their observations of materials in terms of their properties. (Level 3)</p> <p>know that certain actions produce predictable results. (Level 2)</p> <p>co-operate with shared exploration and supported participation. (Level 1)</p>
<p>12.2 help students identify light sources with a focus on the sun and the stars</p>	<p>Encourage the class to experience objects that create light e.g. luminous toys and clothes, torches, lamps, optic fibres, U.V. lights.</p> <p>Observe and switch on objects that are luminous and non-luminous and group.</p> <p>Predict which objects will be luminous from a selection and group accordingly.</p> <p>The teacher helps student prepare a list, using visuals, of a number of light sources.</p> <p>Choose an object, possibly from a list on a worksheet or using the IWB, and guide students to identify whether it's a source of light..</p> <p>Students may draw a picture of a night time scene showing different light sources, e.g.</p>	<p>understand that the Sun is a luminous object that shines its light on other planets such as the Earth and Moon. (Level 4)</p> <p>start to understand that there are many stars in the universe and these are luminous at night. (Level 3)</p> <p>show interest in luminous objects. (Level 2)</p> <p>accept and engage in co-active</p>

	street lights, torches, lights in houses, stars.	exploration.(Level 1)
12.3 engage students in an exploration of space	<p>The teacher may introduce the topic of space exploration by familiarising the students with basic key terms related to the topic. This may include pictures or video clips depicting the sun, the moon, the stars and some of the planets.</p> <p>The teacher may also show students clips related to space travel, including rockets, satellites as well as pictures/video of astronauts.</p> <p>A video of the first landing on the Moon may also be shown, to reinforce the above ideas.</p>	<p>recognise and identify the key terms related to space and its exploration. (Level 4)</p> <p>begin to understand some of the key terms related to space and its exploration. (Level 3)</p> <p>these activities may not be relevant at (Level 2)</p> <p>these activities may not be relevant at (Level 1)</p>