Integrated Science
Curriculum Units
with examples of teaching activities
2014

Form 1
Integrated Science Curriculum
Form 1
INTEGRATED SCIENCE CURRICULUM UNITS – FORM 1

SCI 7.1  YOUNG SCIENTIST AT WORK
SCI 7.2  SAFETY FIRST
SCI 7.3  LIVING THINGS
SCI 7.4  OUR ENVIRONMENT
SCI 7.5  UNDERSTANDING MATTER
SCI 7.6  ENERGY AROUND US
SCI 7.7  ELECTRICITY
SCI 7.8  ON THE MOVE
SCI 7.9  ACIDS AND ALKALIS
SCI 7.10 FOCUS ON GASES
SCI 7.11 CELLS AND BODY SYSTEMS
SCI 7.12 INCREASING IN NUMBERS
Subject: Integrated Science  
Unit code and title: **SCI 7.1 YOUNG SCIENTIST AT WORK**  
Strand: Physical Properties

<table>
<thead>
<tr>
<th><strong>OBJECTIVES</strong></th>
<th><strong>Points to note</strong></th>
<th><strong>Resources</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher will:</td>
<td>This curriculum promotes an inquiry based and student centred methodology, based on the 5E model in which students engage, explore, explain, elaborate and evaluate. Do not separate theory and practice as experiments should be part and parcel of the scientific process. <strong>ENGAGE</strong> students’ interest and curiosity. Students observe, <strong>EXPLOR</strong>e, predict, plan and conduct investigations, collect and interpret data and give <strong>EXPLANATIONS</strong>. Students are then challenged to <strong>ELABORATE</strong> on their understanding by linking known with new and by applying concepts and skills in new contexts. Students are encouraged to <strong>EVALUATE</strong> their understandings and competences. Assess the areas of strengths/weaknesses exposed by the student performance in the activity. Be aware of health and safety issues when carrying out experiments.</td>
<td>test-tubes, test-tube rack, holder, beakers, flask, pipette, chemical bottle, spatula, stirrer, evaporating dish, funnel, metre ruler, stopwatch, measuring cylinder, digital balance, thermometer, Bunsen burner, tripod, wire gauze.</td>
</tr>
</tbody>
</table>

This unit is an introduction. Explain the correct use of some of the apparatus at a later stage when the apparatus is being used. For the sake of unitised curriculum this topic was divided into two units (i.e. SCI 7.1 & 7.2). Consider both units as one continuous topic.

<table>
<thead>
<tr>
<th><strong>Key words</strong></th>
<th><strong>Points to note</strong></th>
<th><strong>Resources</strong></th>
</tr>
</thead>
</table>
| scientist, glassware, measurement, instruments, apparatus, test tube, test tube rack, beaker, flask, funnel, measuring cylinder, microscope, Bunsen burner, heat-proof mat, thermometer, stand, spatula, balance and stopwatch | | importancce of science & technology  
http://nobelprize.org/nobel_prizes/chemistry/articles/karle/index.html  
Science is fun  
Famous scientists and Science in Malta  
http://www.zephyrus.co.uk/famousscientist.html  
http://www.xlab.tv  
Women scientists  
http://womenshistory.about.com/od/airspacesciencemath/tp/Famous-Women-Scientists.htm  
Scientists and latest inventions  
### Teaching objective

**THE TEACHER WILL:**

1. introduce the relevance of science to everyday life.

### Examples of teaching activities / experiences

**Starter suggestion:** Ask students to give examples of science in everyday life and things which have to do with science.

**Main activity:** Guide students to think about developments in areas such as communication, transport, energy, buildings, health care, etc. and explain how the area developed over the time. Encourage students to predict the futuristic development in that area.

**Other activities:**
- Use the IWB to display images of two or three scientists. Think about past/present, foreign/local, male/ female scientists. Ask students to explore how the work of these scientists has changed our lives.
- May refer to research conducted by some local scientists such as that of Dr Joseph Borg, Mr Marco Cremona, Prof Alex Felice, Dr Pauline Galea, Dr Joseph Grima, Dr Nicholas Sammut, Dr Adriana Vella and Sir Temi Zammit. May also refer to some famous foreign scientists. Refer to the everyday use of science in the work of engineers, environmentalists, medical specialists, meteorologists and so on. (Class can be divided into groups and each group may be named after a scientist. Students will be part of this group when doing experiments).

**Other possible activities:**
- Some students may work on a prepared sheet to identify the implications of these discoveries / inventions.

**Other notes:**

### Indicators of Learning outcomes

**STUDENTS CAN:**

- identify the science concepts behind some of the discoveries / inventions. (Level 8)
- identify specific forms of science and technology and where they are used. (Level 7)
- link scientists to inventions and technology. (Level 6)
- recall that science and technology has implications on everyday activities. (Level 5)
2. Introduce the students to simple apparatus (glassware) and thus be able to use this apparatus in simple experiments.

**Starter suggestion:** Doing science requires science tools. Ask students to mention the names of any science apparatus they know about.

**Main activity:** Present a tray with different glassware and simple apparatus such as test-tubes, test-tube rack, holder, beakers, flask, pipette, chemical bottle, spatula, stirrer, evaporating dish, funnel, etc. Write the name of some of this apparatus on the IWB. Ask students to suggest what the apparatus is used for. Give examples of their use. Students fill a prepared handout with the names of this apparatus.

**Other activities:**
- On the IWB, students match names with apparatus.
- Ask students to work in mixed ability groups to use some of the above apparatus. Give clear instructions to simple activities. **Ask for possible safety measures.** Groups use different stations on a rotational basis to have the opportunity to do more than one activity. Activities may include:
  - Dissolving crystals of salt or sugar
  - Pouring water into a flask
  - Putting 5 drops of water in an evaporating dish
  - Pouring water from a beaker into a test tube.

**Other notes:**
- Choose and use the correct apparatus for a given task. (Level 8)
- State what each piece of apparatus is used for and handle the apparatus safely. (Level 7)
- State the use of some common science apparatus and handle this apparatus safely. (Level 6)
- Identify simple glassware and other commonly used apparatus. (Level 5)
3. introduce the students to measuring instruments and thus be able to use them correctly.

<table>
<thead>
<tr>
<th>Starter suggestion:</th>
<th>Main activity:</th>
<th>Other possible activities:</th>
<th>Other notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask a student from each group to draw a line of 50cm on the IWB. DO NOT USE A RULER FOR THIS EXERCISE. Ask some students to predict the length of each line. Measure each line using a metre ruler.</td>
<td>Guide the students to understand the need and importance of measurements in everyday life. Introduce the ruler, stopwatch, measuring cylinder, digital balance and thermometer as examples of measuring instruments. Demonstrate the correct use of these instruments (for example, the correct reading of the scale, correct eye position when using the measuring cylinder, taking note of measuring instrument specifications – e.g. mass range of a balance, temperature range of a thermometer). These measuring skills need to be improved in future activities. Some eLearning resources may help students to practice scale reading. Ask students to identify and match the measurement with the measuring instrument and appropriate measuring unit. Use the IWB to explain clearly how a measuring scale is used. Engage students in simple measuring tasks. Students may use a fill-in work sheet to note their findings. Remind students re possible safety measures. Guide students to evaluate their results and thus any readings which might not be correct.</td>
<td>- some students may explore the history of the development of some measuring instruments. - some students may explore other measuring instruments.</td>
<td>use measuring instruments correctly without supervision as part of an experiment. (Level 8) use measuring instruments correctly with supervision and use the appropriate measuring units. (Level 7) use a measuring cylinder and a digital balance correctly. (Level 6) use a ruler correctly. (Level 5)</td>
</tr>
</tbody>
</table>

**Starter suggestion:** Ask students to work in groups to answer questions re the names of apparatus, correct unit of measuring instruments, etc.

**Main activity:** Ask students to work in groups and go round prepared stations to solve particular tasks. Do not indicate the apparatus needed to do this task. Provide a work sheet on which students take note of the activity, apparatus used, measurement and unit. (Note that 15% of the final annual mark is allotted to experimental work.) If possible, include the data loggers in one of the following tasks. Tasks can include:
- measuring the mass of their pocket
- measuring the temperature of tap water
- measuring the mass of 50cm$^3$ of water
- measuring the volume of water in a beaker
- identifying the apparatus needed to heat 100cm$^3$ of water for 5 minutes

**Other possible activities:**
- students may explore other tasks
- some students may identify safety issues in some tasks

**Other notes:**
- choose and use the correct apparatus without supervision. (Level 8)
- identify the correct apparatus for an experiment made up of multiple tasks and use the appropriate measuring units. (Level 7)
- identify the correct apparatus for an experiment made up of a single task and use the appropriate measuring units. (Level 6)
- use basic apparatus for simple tasks under supervision. (Level 5)
**Digital Technology Enhanced Learning - Science eLearning Entitlement**

A scientist’s work has changed drastically through the use of digital technology. It has affected the whole process of scientific work, from the way that investigations are carried out and how the data is collected to how data is analysed and results are presented. Students can (and should) be exposed to such skills during science lessons. Topics which would have been impossible to explore are now more easily available through digital technology. They can use digital tools to analyse, evaluate and present their work in different ways. The following are suggestions which could be utilised to expand the range of teaching approaches used in teaching various topics. Remember that students learn from other students, so a lot of these suggestions can be prepared by the students themselves, rather than the teacher having to set up all the material. All suggestions are based on the assumption that the necessary eLearning resources are available.

**Unit 7.1 – Young Scientist at Work**

1. During group-work on science use in everyday life, students can be asked to research their selected topic online (assuming Internet and PCs are available). They can prepare presentations using software like PowerPoint or Prezi. Alternatively, they can present a movie, using either actual filmed footage and moviemaker or free online animation software like [http://goanimate.com/](http://goanimate.com/) or [http://www.xtranormal.com/](http://www.xtranormal.com/) to present a particular use or invention.

2. Students can set up wikis about selected scientists and contribute titbits of information about their work in order to create an information base about these scientists. This can be expanded upon in subsequent years by other classes.

3. Students can find and present information about a recent invention to the rest of the class. This could either be done as an in-class presentation or as an online blog, with each group of students writing about a particular invention.

4. Students can attempt this online quiz ([http://www.funtrivia.com/flashquiz/index.cfm?qid=273737](http://www.funtrivia.com/flashquiz/index.cfm?qid=273737)) to check their knowledge of lab safety rules. This can be used at the start and end of lessons to compare what they knew before and after.

5. Students can watch the following video as a starter activity ([http://www.youtube.com/watch?v=WZ-1lfammjk&feature=player_embedded](http://www.youtube.com/watch?v=WZ-1lfammjk&feature=player_embedded#at=85)) and then extract a list of safety rules from it.


7. In identifying lab apparatus and their uses, images of each type and their function could form part of a matching game on the IWB, using software features/resources included in Promethean and Smart Notebook Software. Focus Science Diagrams has an ample selection of lab apparatus clipart for free use in class. These are easily used and manipulated on an IWB in anyway the teacher deems suitable.

8. Focus Science Investigations 1 and 2 have a number of simulated experiments which can be used to highlight proper use of apparatus and reading of scales.
Subject: Integrated Science

Unit code and title: SCI 7.1 Young Scientist at work

Strand: Physical Properties

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

Objectives at attainment levels 5, 6, 7, 8

Teacher will:
1. introduce the relevance of science in everyday life.
2. introduce the students to simple apparatus (glassware) and thus be able to use this apparatus in simple experiments.
3. introduce the students to measuring instruments and thus be able to use them correctly.
4. guide students to perform simple experimental tasks.

Objectives attainment levels 1, 2, 3, 4

1.1 introduce the relevance of science in everyday life.
1.2 introduce the students to simple apparatus (glassware) and thus be able to use this apparatus in simple experiments.
1.3 introduce the students to measuring instruments and thus be able to use them correctly.
1.4 guide students to perform simple experimental tasks.

Key words

Scientist, glassware, measurement, apparatus, test tube, funnel, microscope, Bunsen burner, thermometer, stand, balance and stopwatch.
For students working within level 1 – 4, symbols should be used together with the spoken words.

Points to note

The approach to teaching and learning science is enquiry based and student centred. This unit follows the 5E model, which supports a constructivist teaching/learning approach in which students engage, explore, explain, elaborate and evaluate.
During each session the teacher determines the topic of enquiry/focus question to engage students’ interest and curiosity. Students observe, explore, and conduct investigations, try to collect and interpret data and give explanations where possible.
The teacher assesses the areas of strengths and weaknesses exposed by the student performance in the activity.
Be aware of health and safety issues when carrying out experiments.
The teacher has to ensure that the lab is fully accessible for students who are not mobile.
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.

Resources

Science is fun

Science in Malta
http://www.xlab.tv

Scientists and latest inventions
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td><strong>1.1 introduce the relevance of science to everyday life.</strong> The teacher gives one picture depicting an area of study to each student. Choose areas from communication, energy, transport, entertainment, farming, fishing, buildings, and health care. Discuss with students how that assigned area of study has developed over the time, using pictures which show the development. Some students may choose to just speak about the area and others may produce a drawing. Use the IWB/WB to display images of scientists. Include past and present, foreign and local, male and female scientists. Explain that these are some of the people who have conducted research which have changed the world. Give examples. Refer to the everyday use of science in the work of engineers, environmentalists, medical specialists, meteorologists and so on.</td>
<td><strong>STUDENTS CAN:</strong> start to be aware that science and technology has implications on everyday activities. (Level 4) start to be aware of how areas in science have developed over time. (Level 3) start to recognise changes in various areas in science. (Level 2) encounter activities and experiences. development of visual pursuit and permanence of objects (Level 1)</td>
</tr>
<tr>
<td><strong>1.2 introduce the students to simple apparatus and experiments.</strong></td>
<td><strong>Present a tray with different glassware and simple apparatus such as test-tubes, test tube rack, holder, beakers. flask, pipette, chemical bottle, spatula, stirrer, evaporating dish, funnel, etc. Write the name of each apparatus on the IWB/WB. Ask students to suggest what the apparatus is used for. Give examples of their use.</strong> - on the IWB/WB, students match names with apparatus. - guide students to work in groups to use some of the above apparatus. Give clear instructions to simple activities. Ask for possible safety measures. Groups rotate at different stations. Activities can include: - dissolving crystals of salt or sugar - pouring water into a flask - pouring water from a beaker into a test tube.</td>
<td>be aware that apparatus is used in science experiments. (Level 4) observe, use and recognise different simple apparatus. (Level 3) be aware of different apparatus and use them with assistance. (Level 2) cooperate with shared exploration and supported participation development of operational causality (Level 1)</td>
</tr>
</tbody>
</table>
| 1.3 introduce the students to measuring instruments. | Ask a student from each group to draw a line of 50cm on the IWB. Ask another student from each group to predict the length of each line. Measure each line using a metre ruler. Make the students aware of the need and importance of measurements in everyday life.
Guide students to mention things that can be measured using a ruler. Then explain that some things cannot be measured using a ruler but other instruments are used. Show the ruler, stopwatch, measuring cylinder, digital balance and thermometer as examples of measuring instruments. Give examples of what can be measured with each instrument. Use the IWB to explain clearly how a measuring scale is used.
After this, the students will use each instrument mentioned to measure an item, e.g. the length of their desk, some water from their bottle, their apple. | start to use a ruler and a balance (Level 4)
recognise some measuring instruments.
(Level 3)
become aware of different measuring instruments.
(Level 2)
cooperate with shared exploration and supported participation development of operational causality (Level 1) |
| 1.4 guide the students to perform simple experimental tasks. | The teacher helps students to work in groups and go round prepared stations to solve particular tasks. Students are guided to participate in activities related to simple experiments, which may include:
- Sink or Float Exercise: observing a range of objects and seeing whether each would sink or float in water
- Magnetic Pull Experiment: testing the force of magnetism and seeing whether it can travel through things. e.g. Drawing a maze on cardboard and guiding a paperclip through the maze, pulling a paperclip from a glass of water without getting wet
- Experiments targeted at encouraging students to use their senses and become more aware of these senses and their environment. e.g. Making sound boxes, using feely bags, optical illusions, and scent and taste activities. | actively participate in the various experimental tasks and activities.
(Level 4)
observe similar and different features between materials and experiment with the changing of materials and colours.
(Level 3)
start to explore and recognise changes in various areas in science.
(Level 2)
encounter activities and experiences. development of visual pursuit and permanence of objects (Level 1) |
**Subject:** Integrated Science  
**Unit code and title:** SCI 7.2 SAFETY FIRST  
**Strand:** Materials and their Properties  

**OBJECTIVES**  
Teacher will:  
1. guide the students to identify safety issues in the laboratory.  
2. teach students to light and use a Bunsen Burner safely.  
3. engage students to explore burning and use the fire triangle to describe fire.  
4. guide students to use the fire triangle to describe a safe way of putting out a fire.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
</table>
| safety rules, Bunsen burner, yellow flame, blue flame, safety flame, heat-proof mat, poisonous (toxic), irritant, flammable, corrosive, fire triangle, fuel, oxygen, heat, fire extinguisher, fire blanket | Refer to 5E approach to teaching and learning of science.  
Be aware of health and safety issues when carrying out experiments.  
Link this unit with SCI 7.1 as an introduction to the science course. For the sake of unitised curriculum this topic was spread over two units.  
Parts of this unit (e.g. fire triangle) link with SCI 7.10 Focus on gases and with Forensic Science in form 2. | Bunsen burner, tripod, wire gauze, fire extinguisher, fire blanket, candle or wooden splint, chemical bottles showing different hazard labels, iron wool, magnesium, copper,  
**Lighting the Bunsen burner**  
**Interactive Fire Triangle:**  
http://www.absorblearning.com/media/item.action?quick=vb  
**Fire safety**  
http://www.firefacts.org/  
**Safety in the lab**  
http://www.baruch.cuny.edu/tutorials/weissman/chemlab/ |
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Examples of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
</table>
| **THE TEACHER WILL:** 1. guide students to identify safety issues in the laboratory. | **Starter suggestion:** Ask students to identify differences between a normal classroom and the science laboratory. Use a clip to show scientists at work. **Main activity:** Show a picture of students working in a science laboratory. Discuss the issue of health & safety and ask for possible dangers which may be present. Ask students to identify number of dangerous / inappropriate situations shown on the picture. Elaborate on these situations by writing a set of safety rules and give explanations. Ask students to give examples of safety issues which they had to take into consideration while doing their previous unit 1 tasks. Some students may refer to the use of experiments in science and the consequences of not taking safety precautions. **Other activities:** - provide other laboratory situations. Students identify hazards, evaluate behaviour and suggest corrections. - identify common hazard labels such as poisonous, irritant, flammable and corrosive. - produce a chart which shows the basic safety rules. Put on the notice board. **Other possible activities:** - students design signs to promote safety. **Other notes:** | **STUDENTS CAN:** make correct predictions and act carefully to prevent danger by following safety rules. (Level 8) follow written and verbal instructions safely and recall some basic safety rules. (Level 7) identify common hazard labels. (Level 6) Follow verbal instructions to use the laboratory safely. (Level 5)
2. teach students to light and use a Bunsen burner safely.

**Starter Suggestion:** Use a beaker, tripod, wire gauze, water and a Bunsen burner. Introduce the Bunsen burner as a safe way of using heat.

**Main activity:** Project a large image of a Bunsen burner. Give the name and show the function of the main parts of the burner. Demonstrate the correct way of lighting a Bunsen burner. Ask the students to suggest safety issues when using the Bunsen burner. Include the use of a heat-proof mat. Demonstrate the blue and yellow flames and identify their use.

Students use a prepared work sheet which includes a diagram of the Bunsen burner. Students label the diagram and take note of the five steps which must be followed to light the Bunsen burner safely. Some students may use the worksheet to label and draw the different types of flames produced by the Bunsen burner.

**Other activities:**
- use an interactive simulation which helps the students to learn the correct steps which must be followed when lighting the Bunsen burner.
- under supervision, guide the students, in mixed ability groups, to light the Bunsen burner one by one.
- ask the students to note differences between both types of Bunsen flames.

**Other possible activities**
- ask each group of students to heat 50cm³ of water. Let them choose the appropriate apparatus. Before lighting on the Bunsen burner, ask them to explain their method and evaluate their set-up. Ask for safety measures to be adopted. (Note that 15% of the final annual mark is allotted to experimental work.)

**Other notes:**
- use a Bunsen burner safely without supervision. (Level 8)
- use a Bunsen burner safely under supervision. (Level 7)
- identify and label the main parts of the Bunsen burner. (Level 6)
- be aware that there are safety issues when using the Bunsen burner. (Level 5)
3. **engage students to explore burning and use the fire triangle to describe fire.**

**Starter suggestion:** Show a clip of a fire. Ask students to identify the conditions which lead to a fire. Do not add, correct or comment on these results but note any misconceptions which might be addressed at a later stage.

**Main activity:** Do the burning candle experiment. Light a candle and cover it with a large beaker or jar. Ask students to describe their observations and give reasons. Explain that the scientific name for burning is combustion.

**Other activities:**
- identify the three things (fuel, oxygen and heat) that need to be present for a fire to keep burning. Draw the fire triangle.
- present a number of burning situations and ask the students to identify the source of heat, oxygen and fuel. Can include examples such as fire coming from a cigarette lighter, matches, gas burner, magnifying glass, etc.
- use the fire triangle to show the significance of using the air-hole when lighting the Bunsen burner.

**Other notes:**
- describe that combustion is another term which describes burning.
  (Level 8)
- use the fire triangle to describe fire.
  (Level 7)
- identify heat, oxygen and fuel as the three things needed to produce a fire.
  (Level 6)
- Identify basic safety precautions and identify 112 as the emergency number.
  (Level 5)
<table>
<thead>
<tr>
<th>4. guide students to use the fire triangle to describe a safe way of putting out a fire.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starter suggestion:</strong> Show the students the fire extinguisher and the fire blanket which are found in the lab. Ask students to describe how/why these put out a fire.</td>
</tr>
<tr>
<td><strong>Main activity:</strong> Present a number of scenarios of fires and ask students to discuss in groups the best way of putting out that fire. Ask the students to look for any patterns and link their responses to the fire triangle. Students identify the thing which being removed. Scenarios can include a forest fire, electric fire, kitchen fire and so on.</td>
</tr>
<tr>
<td>Show different ways of putting out a fire. Think about involving school health &amp; safety teachers in this activity.</td>
</tr>
<tr>
<td><strong>Other activities:</strong></td>
</tr>
<tr>
<td>- make students aware of basic safety precautions and refer to the responsible use of the emergency call (112).</td>
</tr>
<tr>
<td><strong>Other possible activities:</strong></td>
</tr>
<tr>
<td>- ask students to identify any safety devices that they are aware of. Note the use of flammable hazard label on certain products.</td>
</tr>
<tr>
<td><strong>Other notes:</strong></td>
</tr>
<tr>
<td>use the fire triangle to describe fire and a safe way of putting out a fire. (Level 7)</td>
</tr>
<tr>
<td>recall the three elements that make up a fire. (Level 6)</td>
</tr>
<tr>
<td>identify basic safety precautions and identify 112 as the emergency number. (Level 5)</td>
</tr>
</tbody>
</table>
**Subject:** Integrated Science  
**Unit code and title:** SCI 7.2 SAFETY FIRST  
**Strand:** Materials and their Properties

### Objectives at attainment levels 5, 6, 7, 8

**OBJECTIVES**  
Teacher will:

1. guide the students to identify safety issues in the laboratory.  
2. teach students to light and use a Bunsen Burner safely.  
3. engage students to explore burning and use the fire triangle to describe fire.  
4. guide students to use the fire triangle to describe a safe way of putting out a fire

Mainstream objective 3 and 4 may not be suitable for students performing at Levels 1-4

### Objectives attainment levels 1, 2, 3, 4

2.1. guide the students to identify safety issues in the laboratory.  
2.2. teach students to light and use a Bunsen Burner safely

---

### Key words

- safety rules, Bunsen burner, yellow flame, blue flame, safety flame, heat-proof mat, poisonous (toxic), irritant, flammable, corrosive, fire triangle, fuel, oxygen, heat, fire extinguisher, fire blanket

For students working within level 1 – 4, symbols should be used together with the spoken words.

### Points to note

- Refer to 5E approach to teaching and learning of science.
- Be aware of health and safety issues when carrying out experiments.
- Link this unit with SCI 7.1 as an introduction to the science course. For the sake of unitised curriculum this topic was spread over two units.
- Parts of this unit (e.g. fire triangle) link with SCI 7.10 Focus on gases and with Forensic Science in form 2.

### Resources

- **Lighting the Bunsen burner**  

- **Interactive Fire Triangle:**  
  [http://www.absorblearning.com/media/item.action?quick=vb](http://www.absorblearning.com/media/item.action?quick=vb)

- **Fire safety**  
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Teacher will:</strong></td>
<td></td>
<td>STUDENTS CAN:</td>
</tr>
<tr>
<td>2.1 identify safety issues in the laboratory.</td>
<td>The teacher takes the students to the school laboratory and asks them to observe their surroundings. Then ask the students to identify differences between a normal classroom and the science laboratory. This can be done by showing different pictures of items found in class and others found in the lab, and students who are non-verbal can point to the pictures when asked what we find in the lab.</td>
<td>start to recognise and identify dangerous situations in a lab. (Level 4)</td>
</tr>
<tr>
<td></td>
<td>The teacher shows examples of activities carried out in a science laboratory by means of pictures and videos. Students refer to the use of experiments in science. Ask for any dangers which may be present and introduce the idea of health &amp; safety.</td>
<td>become aware of dangerous equipment in a lab and recognise safety signs. (Level 3)</td>
</tr>
<tr>
<td></td>
<td>The teacher shows a picture/video of students working in a science laboratory. Ask students to identify the maximum number of dangerous / inappropriate situations shown on the picture/video. Provide other laboratory situations. Students identify hazards and try to suggest corrections.</td>
<td>recognise dangerous situations in pictures and start to recognise safety signs. (Level 2)</td>
</tr>
<tr>
<td></td>
<td><strong>These activities are not appropriate for (Level 1):</strong></td>
<td></td>
</tr>
<tr>
<td>2.2 show students a Bunsen burner and how to use it safely.</td>
<td>Use a beaker, tripod, wire gauze, water and a candle. Set up the apparatus to heat some water over a candle! Explain this set-up and how it can be improved. Introduce the Bunsen burner as a safe way of using heat. Project a large image of a Bunsen burner. Give the name and show the function of the main parts of the burner. Demonstrate the correct way of lighting a Bunsen burner. Ask the students to suggest safety issues when using the Bunsen burner. Include the use of a heat-proof mat. Demonstrate the blue and yellow flames and identify their use. Use an interactive simulation which helps the students to practice the correct steps which must be followed when lighting the Bunsen burner. Under total supervision, guide the students, to light the Bunsen burner.</td>
<td>become aware that a Bunsen burner can be used for heating purposes (Level 4) start to recognise the Bunsen burner parts (Level 3) light the Bunsen burner with assistance. (Level 2) cooperate with shared exploration and supported participation development of operational causality (Level 1)</td>
</tr>
</tbody>
</table>
Subject: Integrated Science
Unit code and title: SCI 7.3 LIVING THINGS
Strand: Life Processes and Living Things

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

OBJECTIVES Teacher will:
1. guide students to understand the significance of fossils and be aware of the theory of evolution.
2. explain that the seven vital functions distinguish living and non-living things.
3. show that living things are grouped into plants, animals and small microbes.
4. teach students to sort animals into vertebrates and invertebrates.
5. teach students to sort vertebrates into fish, amphibians, reptiles, birds and mammals.

Key words
living things, non-living things, plants, animals, microbes, micro-organisms, fossils, vertebrate, invertebrate, breathe, extinct, evolution, excrete, reproduce, sense, grow, characteristics, skeleton, fish, reptiles, birds, amphibians, mammals

Points to note
Refer to 5E approach to teaching and learning of science. Be aware of health and safety issues if students are to handle some animals or plants.
For the sake of unitised curriculum the topic of living things and the environment was divided into two units (i.e. SCI 7.3 & 7.4). Consider both units as one continuous topic. Link this unit about living things with the unit about ecology through a fieldwork activity, a visit to a nature reserve or to the Natural History Museum.

Note that some students may find it difficult to:
- recognise the presence of a skeleton in some animals such as snakes and mice.
- identify invertebrates, birds, fish, amphibians and reptiles as animals. For some, ‘animals’ is another word for ‘mammals’!
- distinguish breathing and respiration.

Resources
fossils; pictures showing Ghar Dalam, animals from Galapagos Islands, variety of animals, plants and other organisms; model (or chart) of the human skeleton

Common characteristics of living things

Images of animals:
http://www.sciencephoto.co.uk/
http://animalphotos.info/a/

Images of plants:

Charles Darwin and Theory of Evolution
http://science.discovery.com/interactives/literacy/darwin/darwin.html
http://www.sciencekids.co.nz/sciencefacts/scientists/charlesdarwin.html
<table>
<thead>
<tr>
<th><strong>Teaching objective</strong></th>
<th><strong>Example of teaching activities / experiences</strong></th>
<th><strong>Indicators of Learning outcomes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. guide students to understand the significance of fossils and be aware of the theory of evolution. | **Starter suggestion:** Show some fossils. Give a fossil or two to each group of students. Give time for students to observe the fossils. Ask students to describe what fossils are and why fossils are important.  
**Main activity:** Describe that the Earth is about 4.6 billion years old and that fossils give an indication of our past history. Refer to Ghar Dalam and ask if any of the students have visited this place. Make the students aware that the extensive discovery of fossils at Ghar Dalam gives an indication of our past history. Refer to some animals which are now extinct.  
**Other activities:**  
- refer to Charles Darwin as a scientist who studied living organisms and developed the theory of evolution.  
**Other possible activities:**  
- some students may look for further information about Darwin and evolution.  
- some students may carry out some research re extinct species such as dinosaurs and relate changes and extinction with environmental changes.  
**Other notes:** | **STUDENTS CAN:**  
describe that living things change over time and that this is an ongoing process.  
(Level 8)  
understand that new living organisms appeared at different periods of time  
(Level 7)  
recall that fossils show evidence of organisms that lived thousands/millions of years ago.  
(Level 6)  
recall that some organisms shown in fossils may now no longer exist.  
(Level 5) |
| **Students CAN:** |                                               |                                   |

**STUDENTS CAN:**
- describe that living things change over time and that this is an ongoing process. 
  (Level 8)
- understand that new living organisms appeared at different periods of time. 
  (Level 7)
- recall that fossils show evidence of organisms that lived thousands/millions of years ago. 
  (Level 6)
- recall that some organisms shown in fossils may now no longer exist. 
  (Level 5)
2. Explain that the seven vital functions distinguish living and non-living things.

**Starter suggestion:** Ask students to discuss in groups whether the sun and soil are living things.

**Main activity:** Give time for students to share their answers. Ask questions to clarify their responses. Finally, ask each group to describe what a living thing is.

Use a clip which shows a number of living things. Ask students to work in groups to identify features in the clip which shows that the organism is a living thing. Give time to students to share their results. Guide students to identify the things that living things have in common. Identify movement, growth, sensation, respiration, excretion, feeding, and reproduction. Use the IWB to give examples of how these vital functions are illustrated in different living things. At this point, there is no need to refer to the fact that living things are made up of cells. Some students may find difficulty in identifying respiration (rather than breathing) and movements in plants.

**Other activities:**
- Ask students to sort a list of things into living or non-living. Some students may write the names of the things but others may use pictures.
- Ask students to discuss again whether some examples such as the sun, the soil, water, fire, and cars are living or non-living things. Ask students to give scientific reasons for their conclusions.

**Other possible activities:**
- Some students may explore variations in some of the vital functions such as sexual/asexual reproduction, aerobic/anaerobic respiration, etc.

**Other notes:**
- Be aware of variations in some vital functions.
  *(Level 8)*
  Use the seven vital functions to distinguish between living and non-living things.
  *(Level 7)*
  Identify living and non-living things by referring to some of the vital functions.
  *(Level 6)*
  Identify living and non-living things.
  *(Level 5)*
3. **Show that living things are grouped into plants, animals and small microbes.**

**Starter suggestion:** Show images of 12 living things such as a large tree, bacteria, a frog, a bird, a human being, a fish, a cow, grass, a snail, a jellyfish, any flowering plant and a mushroom. Ask students to identify any common characteristics between these 12 living things and sort into groups. If necessary revise the vital functions. At this point accept all answers and do not point out incorrect answers. Note any misconceptions which might be addressed at a later stage.

**Main activity:** Ask students to describe how the items in a supermarket are placed/sorted out and imagine the scenario if no type of sorting exists. Guide students to appreciate that grouping things makes life easier. Show that, similarly, grouping living things makes it easier to study them. Ask students to identify the best grouping results of the above exercise. Guide students to elaborate on their groups and evaluate other possibilities. Make students aware that there are various ways of sorting organisms – introduce the system of classification which is used all over the world.

**Other activities:**
- Show that living things are divided into a number of groups. At this level divide living things as
  - animals
  - plants
  - other small living things.
  Make the students aware that this last group is further divided into other groups.
- ask students to explore and share common characteristics and differences between animals and plants re mode of feeding, movement and so on.
- ask students to sort again the 12 organisms into the above 3-group system.

**Other possible activities:**
- explore other examples of living organisms.

**Other notes:**

- Use evidence to identify organisms as animals, plants or small living things (Level 8)
- Group living things as animals, plants or small living things. (Level 7)
- Recognise that living things can be sorted into groups according to similar characteristics and be able to sort some. (Level 6)
- Identify variety of living things. (Level 5)
| **4. teach students to sort animals into vertebrates and invertebrates** | **Starter suggestion:** Show images of a number of animals and ask students to group these animals into groups. At this point accept all answers and do not point out incorrect answers.

**Main activity:** Make students aware that there are various ways of sorting animals (domestic, wild, farm, etc), but science uses a system based upon the presence or absence of backbone/skeleton. Draw attention to the fact that the skeleton is not always evident and some students may find it difficult to recognise the presence of a skeleton in some animals such as snakes and mice. Use a large diagram / model of a human skeleton / backbone and ask students to describe the importance of skeleton.

**Other activities:**
- show further images of a number of animals and ask students to sort the animals into vertebrates or invertebrates. Guide students to explore the variation in size, colour, body features and so on.
- make students aware that although less conspicuous, there are more invertebrate animals than vertebrates.
- show images of various types of invertebrates and make the students aware that these are divided into further groups.
- students identify living things during a fieldwork activity. Point out any endemic or endangered species that students come across. Incorporate this fieldwork activity as part of Unit 3 and 4.

**Other possible activities:**
- ask students to use the internet, interactive simulations and other resources to explore other types of animals and sort them into groups.

**Other notes:**
- be aware of further grouping of invertebrates.
  (Level 8)
- be able to carry out observations and thus identify animals as vertebrates or invertebrates.
  (Level 7)
- identify vertebrates as animals with bones and invertebrates as animals without bones.
  (Level 6)
- recall characteristics in different animals.
  (Level 5) |
5. teach students to sort vertebrates into fish, amphibians, reptiles, birds and mammals.

**Starter suggestion:** Show images of vertebrates and ask students to give the names of these animals. Guide students to identify common things as living things and as vertebrates.

**Main activity:** Ask for possible ways of grouping these animals. Some students may already know how vertebrates are usually grouped. Ask further questions to clarify their understanding.

Use an example from each group and identify characteristics which are common to that group. Engage students to explore common features and identify the function or advantages of some of these features. Sort vertebrates by using common features such as body covering, warm/cold blooded, type of birth, types of limbs, milk production and so on.

**Other activities:**
- use a prepared handout to fill in examples of vertebrates and characteristics of each group.
- use an interactive presentation to sort vertebrates into their correct group.

**Other possible activities:**
- some students may explore the theory of evolution to explain links between different species.
- some students may explore other vertebrates which show exceptions to the norm.

**Other notes:**
- identify and explain how some vertebrates show features which are exception to the norm.
  (Level 8)
- describe the five groups of vertebrates, some common features and identify examples from each group.
  (Level 7)
- identify some vertebrates groups and identify some examples of each.
  (Level 6)
- recognise that vertebrates are animals with a backbone.
  (Level 5)
Unit 7.3 – Living things

1. This interactive flash site (http://www.childrensmuseum.org/geomysteries/necklace/c1_alt.html) can be used to expose students to the idea of fossils being found in different areas (even though these are not local). http://www.teachersdomain.org/asset/ess05_int_fossiltype/ also includes information about fossil types and their formation. http://www.abc.net.au/beasts/fossilfun/ offers a number of interactive activities which can be used with students to explore fossil formation as well as have fun at being palaeontologists.

2. Students can visit the Ghar Dalam Website (http://www.heritagemalta.org/sites/ghardalamcave/ghardalamcaveinfo.html) for details and images, especially if they have not been to visit or as a refresher.

3. Students can be assigned a project in which they use free morphing software (e.g. http://www.diphso.no/) to create animations showing animals changing from one to the other. They can find pictures of different organisms to create the final result and thus graphically explore how organisms change over time. Alternatively this could be turned into a stop-motion project using free software like Monkey Jam (http://www.giantscreamingrobotmonkeys.com/monkeyjam/download.html).

4. Students can be asked to identify the different characteristics which all living organisms have after viewing videos showing examples of different vital functions in different organisms. YouTube and other video sharing sites have abundant examples.

5. Students sort images of living and non-living things into specific containers/areas on IWB or PC screens using a sorting game (both Promethean and Smartboard software offer possibility of setting this up).

6. Students (working in groups) use presentation software like Prezi or Powerpoint to focus on one vital function per group. Presentations can then be shared in class or online via http://www.slideshare.net/ or similar sites.


8. Students can be asked to photograph and upload pictures of living things found in their environment. A list may be given, but also give credit for original/different organisms. Images can then be used in a sorting game related to Animals, Plants and other groups required.

9. Some more sorting games:
   - http://www.sciencekids.co.nz/gamesactivities/plantanimaldif.html
   - http://www.bbc.co.uk/schools/scienceclips/ages/6_7/variation_fs.shtml
   - http://www.teachersdomain.org/asset/lsp07_int_animalclass/
Subject: Integrated Science  
Unit code and title: **SCI 7.3 LIVING THINGS**  
Strand: Life Processes and Living Things

**OBJECTIVES at attainment levels 5,6,7,8**

Teacher will:
1. guide students to understand the significance of fossils and be aware of the theory of evolution.
2. explain that the seven vital functions distinguish living and non-living things.
3. show that living things are grouped into plants, animals and small microbes.
4. teach students to sort animals into vertebrates and invertebrates.
5. teach students to sort vertebrates into fish, amphibians, reptiles, birds and mammals.

The mainstream objective 1 is not relevant at this level of attainment

**OBJECTIVES at attainment levels 1,2,3,4**

3.1 distinguish living and non-living things.
3.2 show that living things can be grouped into plants and animals.
3.3 teach students to sort animals into vertebrates and invertebrates.
3.4 teach students to sort vertebrates into fish, amphibians, reptiles, birds and mammals.

**Key words**

living things, non-living things, plants, animals, breathe, extinct, excrete, reproduce, sense, grow, skeleton, fish, reptiles, birds,  
For students working within level 1 – 4, symbols should be used together with the spoken words.

**Points to note**

The teaching and learning of science is based on student enquiry.

The teacher should be aware of health and safety issues if students were to handle some animals or plants. Link this unit about living things with the unit about ecology through a fieldwork activity. For students working within level 1 to 4, it is important to note that at all times during activities students should be encouraged, prompted and given time to react and participate. It is also 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.

**Resources**

Pictures of various animals and plants.
Pictures of living and non living things such as: a flower, a car, a cup, a beetle.
BigMac switches when available.

**Common characteristics of living things**


**Images of animals:**

[http://www.sciencephoto.co.uk/](http://www.sciencephoto.co.uk/)
[http://animalphotos.info/a/](http://animalphotos.info/a/)

**Images of plants:**

<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 distinguish living and non-living things.</td>
<td>The teacher will show pictures to the students and ask the students to discuss whether they think they are living or non living things. The teacher will assist the students with their reasoning and together they will give reasons for their answers. Some students who are non-verbal will be asked to point to the pictures if they think they are living things. They can also use a BigMac switch when available to identify properties of objects. Following this the teacher will describe what a living thing is. Use a clip which shows a number of living things. Ask students to work in groups to identify features in the clip which shows that the organism is a living thing. Give time to students to share their results. Guide students to identify the things that living things have in common. Identify movement, growth, sensation, respiration, excretion, nutrition and reproduction. Other activities could be: The teacher asks students to sort pictures of things into living or non-living. The teacher asks students to discuss why some objects, such as a car or machines are not living things. The teacher gives students a group of pictures, in each group of pictures there will only be one pictures showing non living thing amongst pictures of living things and vice versa. The teacher asks the students work to identify the odd one out and give reasons.</td>
<td><strong>STUDENTS CAN:</strong> recognize differences between living and non-living things. (Level 4) explore and observe similarities between living things and between non living things (Level 3) begin to anticipate and join in activities focused on living and non-living things. (Level 2) begin to show interest in objects presented to them development of visual pursuit and the permanence of objects (Level 1)</td>
</tr>
</tbody>
</table>

3.2 show that living things can be grouped into plants and animals. | The teacher asks the students to work to sort in groups. Make use of picture cards. The organisms can include large tree, frog, bird, human being, fish, cow, grass, snail, jelly fish, any flowering plant and mushrooms. Ask students to decide about the number of groups based on particular characteristics. At this point accept all answers and do not point out incorrect answers. Students who need support are to be given time to be able to think and participate too. Main activity: Make students aware that grouping things makes life easier and there are different grouping systems used in our lives. When possible, students are encouraged to give examples of sorting things such as in a supermarket, workshop, a kitchen and so on. Explain that grouping living things makes it easier to study them and explore them. | identify a variety of living things. (Level 4) explore different living things. (Level 3) co-operate in shared exploration and supported participation. (Level 2) begin to show interest in objects presented to them development of visual pursuit and the |
### Other activities:
The teacher shows that living things are divided into a number of groups. At this level divide living things as: animals and plants.
The teacher takes the students out in the school yard or garden and let them explore living things there, pointing out and guiding them when necessary.
The teacher encourages the students to explore common characteristics and differences between animals and plants such as mode of feeding, movement and so on.
Use the IWB and pictures at all times to give examples of living organisms.

### 3.3 teach students to sort animals into vertebrates and invertebrates.

The teacher uses the IWB to show a number of animals. The teacher asks students to group these animals into two groups. At this point accept all answers and do not point out incorrect answers. For more individualised attention use pictures on the students desks which will be easier for the students to follow.

Main activity: Make students aware that there are various ways of sorting animals (domestic, wild, farm, etc), but we use a system based upon the presence or absence of a backbone.
Use a large diagram / model of a human skeleton / backbone and ask students to think about and where possible describe the importance of a skeleton.
The teacher will then explain why some animals have a skeleton and its importance.
show images of a number of animals. Ask students to sort the animals into vertebrates or invertebrates.
students identify living things during a fieldwork activity.

Other possible activities:
The teacher asks some students to use the internet or other resources to explore other types of animals.
The teacher develops interactive simulations in which students can explore other animals and sort them into groups.

- **Start to understand that animals have different characteristics.** *(Level 4)*
- **Sort living things into groups using simple features.** *(Level 3)*
- **Show interest in a wide range of living things, handling them and observing them.** *(Level 2)*
- **Begin to show interest and react to objects presented to them development of visual pursuit and the permanence of objects.** *(Level 1)*
| 3.4 teach students to sort vertebrates into fish, amphibians, reptiles, birds and mammals. | The teacher shows pictures of vertebrate animals to students and when possible asks them to name these animals. Guide students to point out some characteristics of these animals, e.g. they have fur, they have four legs. Use pictures of both vertebrate and invertebrate animals and identify characteristics which are common to both and then characteristics which are different. Engage students to explore common and different features throughout the activity. The teacher will go on to explain that some animals have a backbone and other bones and they are called vertebrates. Other activities: Use a prepared handout to fill in examples of vertebrates and characteristics of each group. Students who cannot fill in a handout will be presented with pictures of different animals and they have to point out which are the vertebrates. Use an interactive presentation to sort vertebrates into their correct group. Use the IWB to show various different vertebrates. | become aware that some animals have a backbone and they are called vertebrates. (Level 4) sort according to criteria when the contrast is obvious. (Level 3) show interest in a wide range of living things, handling and observing them. (Level 2) these activities may not be appropriate for (Level 1). |
Subject: Integrated Science  
Unit code and title: SCI 7.4 OUR ENVIRONMENT  
Strand: Life Processes and Living Things

**Unit Specific Objectives:** Teacher will:

1. guide students to identify types of feeding relationships  
2. guide students to interpret food webs.  
3. engage students to explore plant and animal adaptations.  
4. guide students to explore different types of habitats and living organisms through a fieldwork activity.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
</table>
| mountain, beach, desert, woodland, garigue, grassland, lakes, sea, forest, rainforest, sandy seashore, rocky seashore, cliffs, valleys, endemic, endangered, hibernation, producer, consumer, food chain, herbivore, carnivore, omnivore, photosynthesis | Refer to 5E approach to teaching and learning of science.  
Be aware of health and safety issues if students are to handle some animals or plants.  
Link this unit with the previous unit through a fieldwork activity or a visit to Simar, Ghadira Nature Reserve, Majjistral Park, Xrobb l-Ghagin field study centre or the Mdina Natural History Museum.  
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?id=1  
http://www.ramblersassociation.blogspot.com/  
http://www.foemalta.org/home/ | Wonders of the World  
http://sevennaturalwonders.org/about/declaration-committee  
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  
Adapting to climate change  
Food chain – chain reaction  
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The teacher will:</strong></td>
<td><strong>Starter suggestion:</strong> Show a clip of animals feeding on their prey. <strong>Main activity:</strong> Ask students to identify some animals and sort in groups according to the type of food they eat. List these animals on the IWB and sort as herbivores, carnivores and omnivores. Explain these terms. Ask students to describe how plants feed. Show how plants get their energy from the Sun. Briefly describe photosynthesis and explain why plants are called producers. Link the plants and animals in a food chain. Explain why animals are called consumers. Guide students to go through other food chains found in different habitats. <strong>Other activities:</strong> - give other examples of animals and plants and link them in a food chain. - students may demonstrate a food chain pictorially. Other students use pictures and labels provided to build up their food chain. Move around the groups to discuss and elicit different examples of food chains and feeding relationships which may be familiar or not very familiar to the students. <strong>Other notes:</strong></td>
<td><strong>Students Can:</strong> construct a food chain from given information. (Level 8) describe the terms producers, consumers, herbivores, carnivores and omnivores and interpret a food chain. (Level 7) interpret simple food chains. (Level 6) identify animals as carnivores and herbivores. (Level 5)</td>
</tr>
</tbody>
</table>
2. guide students to interpret food webs.

**Starter suggestion:** Present a simple food chain. Ask students to discuss whether this food chain shows a real situation...i.e. whether each organism eats only one type of food.

**Main activity:** Use their answers and present a simple food web which shows the relationship between various animals. Guide students to identify the different food chains present in this food web. Ask students to discuss the effect of change in the population of one species in a food web and to identify the effect on other species.

**Other activities:**
- discuss the effect of human impact and change in the environment on food webs.
- ask students to interpret food webs found in different habitats.

**Other possible activities:**
- construct a food web from given information (level 8)
- interpret food webs and identify the effect of change in populations and the environment on it (level 7)
- find different food chains from a given food web. (level 6)
- recall the meaning of a food chain (level 5)
3. engage students to explore plant and animal adaptations.

**Starter suggestion:** Show images of plant and animals and ask students to match them to their habitats.

**Main activity:** Guide students to explore and identify the main parts of a plant. Students use an interactive presentation to label the roots, the stem, the leaves and the flower and explore their function.

Similarly students use an interactive presentation to identify special characteristics of animals which allow them to survive in their natural habitats. Ask students to show the various adaptations and describe their function. Some students describe these characteristics. Students may work on a work sheet which links these characteristics/adaptations with functions.

**Other activities:**
- link some plants and animals with their habitats.
- Give examples of unusual plants and animals and show their characteristics.

**Other possible activities:**
- design an experiment to find the conditions preferred by an animal (such as a woodlouse). Allow time for students to take note of the experiment, results, etc. Relate results to real life situation of the animal. (Note that 15% of the final annual mark is allotted to experimental work.)

**Describe some adaptations and relate them to their habitat.**

**Level 8**
- identify some plant and animal adaptations and describe their function.

**Level 7**
- link some plants and animals with their habitats.

**Level 6**
- identify the leaves, stem, flowers and roots as the main parts making up a plant.

**Level 5**
- describe some adaptations and relate them to their habitat.
4. Guide students to explore different types of habitats and living organisms through a fieldwork activity.

**Starter suggestion:** (prior to fieldwork activity) Ask students to identify different kinds of habitats and give some information about them. Guide students to discover the relevance of a fieldwork activity by connecting scientific ideas with ‘hands on’ experiences. These experiences allow students to observe animals and plants in their natural habitat.

**Main activity:** Give background information about the place in which this activity is to take place. Guide the students to suggest different kinds of investigations which can be carried out. Activities mainly depend on the type of habitat and the duration of this activity. Students use prepared worksheets to guide them through this activity.

Activities may include:

- observations of the different kinds of habitats
- 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
- observing leaf patterns and seeds
- silent exercise
- identifying a food chain through observation
- characteristics of a microhabitat
- studying an area by using a quadrat, line/belt transect
- observing man-made or natural features in the environment
- identifying examples of pollution and conservation

Link this unit with the unit about grouping living things. Coordinate this activity with geography (and possibly with history).

Places in which some of above activities may be carried out include a nature reserve (e.g. Simar, Ghadira, Majjistral, etc), Buskett, garigue, Xrobb l-Ghagin, a valley, rocky or a sandy sea shore, or school grounds.

<table>
<thead>
<tr>
<th>Plan and carry out an investigation within a given habitat. (Level 8)</th>
<th>Carry out observations and measurements within a habitat. (Level 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link some characteristics of animals/plants to their habitat. (Level 6)</td>
<td>Recognise different habitats in a given area. (Level 5)</td>
</tr>
</tbody>
</table>
| Try to identify the Maltese name and (if possible) the English name of the organism. Show that living organisms are identified by a scientific name which is used by the international scientific community. Use books or internet resources to show some examples.  

**Note also:**  
- safety considerations (risk assessment of the place to be visited, students with particular health issues)  
- consent forms including parents/guardian contact number

**Post-Activity:**  
Ask students to share their observations through charts, power-point presentations or other forms. Guide the students to share and analyse their findings, observations and reflections. (Note that 15% of the final annual mark is allotted to experimental work.) |
Digital Technology Enhanced Learning - Science eLearning Entitlement

Unit 7.4 – Our Environment

1. Students can prepare posters to highlight characteristics of a particular habitat using sites like Glogster (http://www.glogster.com/).

2. Matching games can be used to allow students to identify different characteristics present in different habitats. Free software such as http://www.education.vic.gov.au/languagesonline/games/matching/index.htm can be used for this. Alternatively, by using Promethean Active Inspire software or SMART Notebook software resources, students can drag labels or images into appropriate sections/containers. Interaction can be achieved via the IWB or a wireless mouse which allows students to interact with a PC and projector.

3. Students can be asked to collect photos of different fauna present on school grounds and/or their locality. Each photo can then be identified and some information about each can be added. Such photos may be used to set up online albums using sites like http://www.mixbook.com/ or https://picasaweb.google.com/home.

4. If funds can be obtained, students can set up a calendar (or other stationery items) with photos of fauna taken by students. There are many online printing sites available, like http://www.kodakgallery.com or http://www.photobox.co.uk/ and many others.

5. Students can work in groups or individually to find information about selected plants and animals, focusing on the adaptations that these organisms show to their habitats. Presentations can be prepared and viewed in class in order to exchange information. These presentations can also be uploaded to the school website or to subject websites.

6. An alternative to suggestion (5) above is to get the students to set up wikis on their assigned plant or animal (e.g. Engrade: http://wikis.engrade.com/, Google Docs: http://docs.google.com, zoho: http://www.zoho.com, Intodit: http://class-wiki.intodit.com/, Wikis in Education: http://wikisineducation.wetpaint.com/ and many others).

7. For setting up food chains, a number of possible approaches can be used if a Computer Lab or Science Lab PCs are available:
   a. The online game (internet access required) at http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/ play_chainreaction.cfm can be used to allow students to form a food chain for given ecosystems.
   b. Students can set up their own food chains from supplied images of organisms using Power Point’s drag and drop capability.
   c. Students can use http://www.glogster.com/ to set up an online poster showing a food chain.

8. Students identify different animals (herbivores/omnivores/carnivores) which can be displayed on an IWB or a PC connected to a projector. An interactive sorting game using Promethean Active Inspire or SMART Notebook can be used as follow up. Alternatively a flashcard game can be used, like for example http://quizlet.com/.
Subject: Integrated Science

Unit code and title: **SCI 7.4 OUR ENVIRONMENT**

Strand: Life Processes and Living Things

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

**OBJECTIVES at attainment levels 5,6,7,8**

Teacher will:
1. guide students to identify types of feeding relationships.
2. guide students to interpret food webs.
3. engage students to explore plant and animal adaptations.
4. guide students to explore different types of habitats and living organisms through a fieldwork activity.

**OBJECTIVES at attainment levels 1,2,3,4**

4.1 guide student to identify and explore food chains.
4.2 engage students to appreciate the variety of plants in different environments
4.3 engage students to explore animal adaptations as predators and prey.
4.4 engage students to identify the types of habitats, and the distribution of living things through an outdoor activity.

**Key words**
- mountain, beach, desert, lakes, sea, forest, rainforest, sandy seashore, rocky seashore, cliffs, valleys, endangered, hibernation, producer, consumer, food chain,

For students working within level 1 – 4, symbols should be used instead of or together with the spoken words

**Points to note**
- Refer to 5E approach to teaching and learning of science. Be aware of health and safety issues if students were to handle some animals or plants.
- Refer to websites of local NGOs for information re local environment.
- For students working within level 1 to 4, it is important to note that at all times during activities students are encouraged, prompted and given time to react and participate.
- It is also 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.

**Resources**
- A secondary resource such as natural history videos, photographs of animals, books depicting animal habitats
- **Plant & Animal adaptations**
  - [http://www.mbgnet.net/bioplants/adapt.html](http://www.mbgnet.net/bioplants/adapt.html)
- **Adapting to climate change**
- **Food chain – chain reaction**
- **Local Environmental NGOs**
  - [http://www.naturetrustmalta.org/](http://www.naturetrustmalta.org/)
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1 guide students to identify and explore food chains.</td>
<td>The teacher shows a clip of animals feeding on their prey. The teacher asks students to identify some animals and their type of food. List these animals on the IWB and sort as herbivores, carnivores and omnivores. Explain these terms. Ask students to describe how plants feed. Refer to photosynthesis and explain why plants are called producers. Link the plants and animals in a food chain. Explain why animals are called consumers. The teacher encourages the class to attend to and participate in demonstrating the food chain. The teacher encourages the class to watch secondary resources and construct their own food chain using pictures provided. As above but the teacher gives out pictures and encourages the students to sequence food chains using the arrow convention and construct a food chain using relatively unknown animals.</td>
<td><strong>STUDENTS CAN:</strong> sort living plants and animals into their appropriate food chains. (Level 4) sort materials using simple criteria and communicate their observations of materials in terms of these properties. (Level 3) show interest in a range of food chains. (Level 2) accept and engage in co-active exploration development of operational causality. (Level 1)</td>
</tr>
<tr>
<td>4.2 engage students to appreciate the variety of plants in different environments</td>
<td>The teacher uses the IWB and the internet to show pictures and clips of different types of plants in a variety of environments ex. cactus in the desert, seaweed on the seabed, reeds in valleys, ornamental plants in gardens, crops in fields etc. The teacher helps the students identify the different environments shown in the clips and visuals. The teacher may also present some actual plants to students in order to reinforce the idea of different plants. The teacher may take the students on a field trip, where different plants may be seen and explored in the different local environments</td>
<td>explore plants collected from the environment, changing some materials by physical means, observing the outcomes (Level 4) explore and observe similarities and differences in different features of plants in different environments (Level 3) show interest in a wide range of plants, handling and observing them (Level 2) accept and engage in co-active exploration development of operational causality (Level 1)</td>
</tr>
</tbody>
</table>
| 4.3 engage students to explore animal adaptations as predators and prey. | The teacher asks the students to name some of their pets. Have some pictures ready and show pictures of these animals. The teacher shows a set of pictures and asks the students to match the animals with their habitats. Collect examples of animal adaptations e.g. camouflaged shells/fur/feathers, spines on cacti/holly, skulls of animals showing canines, stings of bees/wasps, sharp claws, armour of crabs/lobsters.

The teacher takes the class on a field trip and try to identify animal and plant adaptations within their surroundings. They match the animal/plant to its adaptation pictorially. They make a model animal and try to camouflage it using a selection of poster paint. Using secondary resources, students identify animal adaptation and suggest reasons for the adaptation in relation to the role of the animal/plant in the food chain. | identify ways in which an animal is suited to its environment and record the changes. (Level 4) explore and observe similarities, differences, patterns and changes in features of living things. (Level 3) show interest in a wide range of living things handling and observing them (Level 2) accept and engage in co-active exploration development of operational causality. (Level 1) |
| --- | --- | --- |
| 4.4 engage students to identify the types of habitats, and the distribution of living things through an outdoor activity. | Prior to an outdoor fieldwork activity with the students, for example, in a woodland area, the teacher may engage in these activities in order to familiarise students with different living things and habitats

The teacher uses the IWB to show pictures of trees, flowers, animals, birds, insects, etc. Guide the students to find the place where each of these living things can be found. Refer to these places as the habitats of those living things. Ask students to identify different places in the world such as forests, desert, ice-covered lands, mountains, rivers, lakes, sea, etc.

The teacher helps to create different habitats for the students to experience e.g. 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. | identify a variety of habitats (Level 4) explore different habitats (Level 3) co-operate in shared exploration and supported participation. (Level 2) begin to show interest in objects presented to them development of visual pursuit and the permanence of objects. (Level 1) |
| The teacher uses the IWB to show pictures of places found in Malta. Include pictures of buildings, countryside, rocky and sandy seashore, cliffs, valleys, etc. |
| The teacher takes the students out in the school yard, garden or woodland area and let them explore living things there, pointing out and guiding them when necessary. |
Subject: Integrated Science  
Unit code and title: **SCI 7.5 UNDERSTANDING MATTER**  
Strand: Materials and their Properties

---

### OBJECTIVES

Teacher will:
1. guide students to identify three states of matter and describe that matter is made up of tiny particles.
2. guide students to explore the properties of solids, liquids and gases.
3. guide students to explore the change of state of matter.
4. guide students to describe the arrangement of particles in solids, liquids and gases.

---

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
</tr>
</thead>
</table>
| matter, tiny particles, atoms, solid, liquid, gas, change in temperature, reversible change, three states of matter, theory, compress, flow, expansion, melting, evaporation, condensation, freezing. | Refer to notes re 5E approach to science teaching and learning.  
(Note: the following information is for the teacher only – In dealing with the theory of particles, this unit gives an opportunity to show the scientific method in which ideas about things are tested i.e. the process when forming a theory. A scientist will propose a **hypothesis** to explain a phenomenon. The hypothesis must be able to be tested. Investigations are designed to test the prediction made in a hypothesis. Repeated tests produce more accurate predictions until an accurate hypothesis forms an overall **theory**. A theory is a more certain way of explaining things. A hypothesis is a tentative explanation for something and often involves questioning and making a prediction.)  
Link this unit with other units dealing with Materials and their properties (i.e. Acids & Alkalis and Focus on gases). |

---

### Resources

- **Properties of gases**  

- **Interactive simulations – properties of materials**  

- **Structure of matter**  
  [http://www.strangematterexhibit.com/structure.html](http://www.strangematterexhibit.com/structure.html)

- **Particles and matter**  
  [http://www.middleschoolchemistry.com/lessonplans/chapter1/lesson1](http://www.middleschoolchemistry.com/lessonplans/chapter1/lesson1)

- **Tiny particles and matter – interactive:**  
### Teaching objective

**THE TEACHER WILL:**

1. guide students to identify three states of matter and describe that matter is made up of tiny particles.

### Example of teaching activities / experiences

**Starter suggestion:** Half fill a beaker with water. Slowly put in a crystal of potassium permanganate. DO NOT stir. Tell students that they will refer to this experiment later on.

**Main activity:** Write examples of solids, liquids and gases and ask students to sort them into groups. Students work in groups. There is usually more than one possible answer but the important outcome is the students’ justification of their decisions. Students may come out with different types of groups but finally lead students to understand that things can be sorted out into solids, liquids and gases. These are called the *States of Matter*.

Ask students to predict what matter is made up from. Engage students in a discussion which predicts answers to the above question. Show that at times scientists develop theories to explain observations.

Now look at the experiment of the starter activity. Ask students to observe what has happened to the permanganate crystal. All students should be able to observe the purple colour of permanganate. Ask for possible theories to explain observations. Some students may refer to particles moving in water. Guide the students to the theory that all matter is made up of tiny particles. These are called atoms. This theory is based on the evidence of various experiments.

**Other activities:**
- use an interactive simulation to zoom in a material. Make the students aware that atoms are not visible under the microscope.

**Other notes:**

### Indicators of Learning outcomes

**STUDENTS CAN:**

- explain that all matter is made up of tiny particles called atoms. (Level 8)
- identify three states of matter and state that materials are made out of tiny particles. (Level 7)
- identify one property in solids, liquids and gases. (Level 6)
- sort objects in solids, liquids and gases. (Level 5)
2. **Guide students to explore the properties of solids, liquids and gas.**

**Starter suggestion:** Present a selection of solids, liquids and gases and ask students to sort them in groups. All students are expected to sort these materials into solids, liquids and gases.

**Main activity:** Set up stations with solids, liquids and gases. Prepare a handout with questions which guide the students to investigate the properties of solids, liquids and gases. Ask the students to go round prepared stations and work in groups.

Go round the students and stimulate discussion by asking further questions. Ask students to put down their observations re fixed shape, spreading out or flowing easily, compressibility and ability for expansion on a prepared worksheet. Some of the following experiments may be used:

- pushing the plunger of a sealed syringe to investigate compressibility
- the bar and gauge or ball and ring experiment to investigate the effect of heating
- observing the column of water in a capillary tube connected to a conical flask full of water put in a hot water bath.
- smelling perfume across the room
- putting a hot empty drink can into a trough with cold water (note safety measures)

**Other possible activities:**
- some students may list other examples of solids, liquids and gases.
- some students may explore the behaviour of liquids of different densities.
- students may use other resources to explore further properties of solids and everyday examples where some of the above properties are put in use. (Note that 15% of the final annual mark is allotted to experimental work.)

**Other notes:**
- link everyday examples where some properties are put in use.
- describe the properties of solids, liquids and gases.
- recall one property of solids, liquids and gases.
- give examples of solids, liquids and gases.
3. guide students to explore the changes of states of matter

**Starter suggestion:** Give students a list of substances and ask them how many different ones there are. Include: ice, water, steam (all water); lava, rock (both rocks); cooking oil and margarine (both oil). Note that there are only three substances listed here.

**Main activity:** Show students some ice cubes. Ask students what will happen to ice if they were left on the side or heated. Heat the ice in a beaker until it melts. Ask students what will happen if you continue to heat it. Heat the water until it boils. Watch the water boil and show that it can be condensed by holding a piece of cold glass over the steam.

**Other activities:**
- use a flow chart, linking the words, solid, liquid and gas. Add the words melting, freezing, boiling and condensing.

**Other possible activities:**
- use interactive simulations to show change of state.

**Link heating and cooling correctly with the change of state of matter** (Level 8)

**Use and explain the terms melting, freezing, boiling and condensing correctly.** (Level 7)

**Use the terms melting and freezing correctly.** (Level 6)

**Recognise that water can be found in different forms.** (Level 5)
| 4. guide students to describe the arrangement of particles in solids, liquids and gases. | **Starter suggestion:** Ask students to name some properties of solids, liquids and gases.  

**Main activity:** Ask students why the three states of matter have these properties i.e. why a solid is different from a liquid and a gas, etc. Ask students to think about the theory that matter is made up of particles. Students use their observations to predict the particle arrangement in solids, liquids and gases. If necessary correct their responses to present the particle arrangement in solids, liquids and gases. Explain some of the properties (such as compressibility, expansion) in terms of the arrangement of particles. (Note: some students may think that particles expand during heating!)  

**Other activities:**  
- ask students to take note of the arrangement of particles in solids, liquids and gases. All students draw a diagram to show this arrangement. Some students may describe this arrangement.  
- use an interactive simulation to demonstrate some properties of the three states of matter.  
- use an interactive simulation to demonstrate the arrangement of particles in the three states of matter and during a change of state.  
- use the particle model to explain why solids - are strong, can’t be squashed  
  liquids - change shape, can’t be squashed  
  gases – can be squashed, can walk easily through the air  

**Other possible activities:**  
- some students may explore materials which may present difficulties to classify such as jelly, foam, sauce, sponge and glue.  

**Other notes:**  
| use the particle model to describe what happens when there is a change of state. (Level 8)  
use the particle model to explain observations about solids, liquids and gases (Level 7)  
recall the arrangement of particles in solids, liquids and gases. (Level 6)  
recognise that the properties of solids, liquids and gases are different. (Level 5) |
Unit 7.5 – Understanding Matter


2. Interactive simulations like http://www.berghuis.co.nz/abiator/patana/5t/science/Particles.swf can help in explaining changes of state.

3. Sorting exercises can be carried out in the IWB using Smart or Promethean software features (Use of resource interactive activities for Smart and images sorted into containers for Promethean).


5. Advanced students may use data loggers with temperature sensors to monitor temperature changes occurring during change of state. Graphs can be displayed using Excel charting facilities.

6. Most students have iPod players or mobile phones which can display images. This can be used as a medium for revision. Students are asked to create either an audio file or a PowerPoint presentation on this topic (PowerPoint slides can be saved in JPG format for this purpose). These files (audio or images) can then be posted online or shared between students. Such an exercise can also help the students in learning how to be concise as images on a small screen need to contain small amounts of data.

7. An alternative is to create word clouds (e.g. http://www.wordle.net/) using key words related to this topic (e.g. solid, liquid, gas, melting, boiling, condensing, evaporating, etc). This is a fun way of getting students to learn key words.
### Subject: Integrated Science

#### Unit code and title: SCI 7.5 UNDERSTANDING MATTER

**Strand:** Materials and their Properties

<table>
<thead>
<tr>
<th>OBJECTIVES at attainment level 5,6,7,8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher will:</td>
</tr>
<tr>
<td>1. guide students to identify three states of matter and describe that matter is made up of tiny particles.</td>
</tr>
<tr>
<td>2. guide students to explore the properties of solids, liquids and gases.</td>
</tr>
<tr>
<td>3. guide students to explore the change of state.</td>
</tr>
<tr>
<td>4. guide students to describe the arrangement of particles in solids, liquids and gases.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OBJECTIVES at attainment level 1,2,3,4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 guide students to experience and investigate the three states of matter and explore the concept that matter is made up of tiny particles.</td>
</tr>
<tr>
<td>5.2 guide students to explore solids and liquids.</td>
</tr>
<tr>
<td>5.3 guide the students to explore gases.</td>
</tr>
<tr>
<td>5.4 help students to investigate the change of state.</td>
</tr>
</tbody>
</table>

#### Key words
- matter, solid, liquid, gas,
- change in temperature,
- reversible change,
- compress, flow,
- expansion, melting,
- evaporation,
- condensation, freezing.

For students working within level 1 – 4, symbols should be used instead of or together with the spoken words.

#### Points to note
This unit gives an opportunity to show the scientific method in which ideas about things are tested i.e. the process when forming a theory. A scientist will propose a hypothesis to explain a phenomenon. The hypothesis must be able to be tested. Investigations are designed to test the prediction made in a hypothesis. Repeated tests produce more accurate predictions until an accurate hypothesis forms an overall theory. For students working within level 1 to 4, this can be done at a very basic level of attainment 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.

#### Resources
- **Properties of gases**
- **Interactive simulations – properties of materials**
  [http://www.bbc.co.uk/schools/ks2bitesize/science/materials](http://www.bbc.co.uk/schools/ks2bitesize/science/materials)
- **Structure of matter**
  [http://www.strangematterexhibit.com/structure.html](http://www.strangematterexhibit.com/structure.html)
- **Particles and matter**
  [http://www.middleschoolchemistry.com/lessonplans/chapter1/lesson1](http://www.middleschoolchemistry.com/lessonplans/chapter1/lesson1)
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1 guide students to experience, explore, and investigate, record and communicate what they discover and learn about material classifications as solid, liquid or gas.</td>
<td>The teacher begins with a demonstration using a half fill a beaker with water. Slowly put in a crystal of potassium permanganate. DO NOT stir. Tell students to observe carefully. Following processes of exploration and experimentation students are provided with a selection of solids, liquids and gases and group them with adult assistance according to set criteria. Encourage the class to group a selection of objects into solids, liquids and gases, using the previous investigations, and assign given pictorial properties to their grouping. Encourage the class to investigate and classify a selection of objects, using some of the previous investigative techniques, as solids, liquids and gases and justify their grouping using appropriate properties of solids, liquids and gases e.g. maintains shape, takes the shape of the container etc.</td>
<td><strong>STUDENTS CAN:</strong> sort materials into groups and describe the basis for their groupings. (Level 4) identify a range of common materials and know about some of their properties. (Level 3) group objects and materials in terms of simple features and properties recognise the features of objects. (Level 2) these activities may not be appropriate for (Level 1).</td>
</tr>
<tr>
<td>5.2 guide students to explore solids and liquids.</td>
<td>Starter suggestion: Present a selection of solids, liquids and gases and ask students to sort them in groups. All students are expected to sort these materials into solids, liquids and gases. Encourage the class to experience materials that exist as both solid and liquid, e.g. ice melting in their hand, chocolate melting on their tongue, butter melting on toast, ice cream melting in their mouth, liquid chocolate being cooled in the fridge or making chocolate crispy cakes, freezing ice pops. Investigate which materials can exist as both solid and liquid using the following methods, warmth of their body, heating in warm water, freezing in the freezer or cooling in the fridge. Investigate how some solid materials become liquid and vice versa e.g. by heating and cooling. They describe the changes that occur and the processes involved using symbols.</td>
<td>sort materials into groups and describe the basis for their groupings. (Level 4) identify a range of common materials and know about some of their properties. (Level 3) group objects and materials in terms of simple features and properties recognise the features of objects. (Level 2) accept and engage in coactive exploration (Level 1 – development of operational causality)</td>
</tr>
</tbody>
</table>
| 5.3 guide the students to explore gases. | Allow the class to experience gases using the following activities:  
- bubble tube  
- watching raisins float in fizzy drink  
- squeezing sponges underwater  
- balloons and parachutes  
The class is introduced to gases and participate in making bubbles by squeezing sponges or activating a bubble tube using switches.  
Encourage the class to investigate where the gases in the above objects come from by examining them. They shake fizzy drinks and squeeze the sponges really hard to see if they can release all the gas.  
Encourage the class to conduct the vinegar and bicarbonate reaction to produce gas and time how long it takes to dissipate. They alter variables e.g. amounts of bicarbonate, to see if this effects gas released. | Use simple equipment provided and make observations related to their task.  
(Level 4)  
Begin to make their own contributions to planning and evaluation and to record their findings in different ways.  
(Level 3)  
Engage in experimentation with a range of equipment in familiar and relevant situations.  
(Level 2)  
These activities may not be appropriate for Level 1. |
| 5.4 help students to investigate the change of state. | Present the class with a multi-sensory selection of different solids and liquids e.g. dough, wood, metal, glass, water, oil, fizzy drink, shampoo.  
Present the class with a selection of solids and liquids and allow them to participate in observing the appearance and properties of the objects using the following activities: immersing in water, pouring, mixing, heating, cooling.  
Encourage the class to sort a variety of different materials according to their properties using the above activities and classify the objects as solids and liquids.  
Encourage the class to sort materials into solids and liquids based on their properties and use vocabulary to correctly describe the properties of solids and liquids. Describe similarities and differences between solids and liquids.  
Give students a list of substances and ask them how many different ones there are. Include: ice, water, steam (all water); lava, rock (both rocks); cooking oil and | Identify a range of common materials and know about.  
(Level 4)  
Begin to make generalisations, predictions from regular experience.  
(Level 3)  
Explore objects and materials changing some materials by physical means and observing the outcome.  
(Level 2)  
These activities may not be appropriate for level 1 |
margarine (both oil). There are only three substances listed here.

Show students some ice cubes. Ask students what will happen to ice if they were left on the side or heated. Heat the ice in a beaker until it melts. Ask students what will happen if you continue to heat it. Heat the water until it boils. Watch the water boil and show that it can be condensed by holding a piece of cold glass over the steam
Subject: Integrated Science  
Unit code and title: SCI 7.6 ENERGY AROUND US  
Strand: Physical Processes

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

Objectives: Teacher will:

1. guide the students to explore the main forms of energy and that energy is measured in joules.
2. engage students to discover that energy can be changed from one form to another and that not all energy changes are useful.
3. help students to recognize that food is a source of energy and investigate food for its energy content.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to Note</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>energy resources, stored energy, movement, heat, electrical energy, light, sound, calories, joules, kilojoules, energy transfer,</td>
<td>Refer to the note re the 5E approach to teaching and learning of science. Link this unit with SCI 7.7 Electricity and one may proceed smoothly from this unit to the next. Energy as a concept is difficult to teach because of the underlying concepts of what energy is. In this unit energy is treated as something that is found in various forms and is transferred to make things happen. Another important point is the fact that energy cannot be created nor destroyed. Health &amp; Safety: Burning food experiment – make sure that no-one is allergic to any of the foods being burnt. For example, some students may be allergic to nuts. Remind students not to eat any of the foods.</td>
<td>Different types of food (actual or pictures), different food labels (actual or pictures), clockwork toy, bicycle dynamo, torch, photovoltaic cell, filament bulb, energy saving bulb, LED, Bunsen burner, stand, beaker half full of water, thermometer, digital balance. Forms of energy: <a href="http://www.misterteacher.com/whiteboard/energy.html#free">http://www.misterteacher.com/whiteboard/energy.html#free</a> <a href="http://www.energyquest.ca.gov/story/index.html">http://www.energyquest.ca.gov/story/index.html</a> Energy transfer: <a href="http://kmetemidni.mx.am/sfzps4.html">http://kmetemidni.mx.am/sfzps4.html</a> Food chain <a href="http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm">http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm</a> Energy in food: <a href="http://www.practicalchemistry.org/experiments/energy-values-of-food,225,EX.html">http://www.practicalchemistry.org/experiments/energy-values-of-food,225,EX.html</a></td>
</tr>
<tr>
<td>Teaching objective</td>
<td>Example of teaching activities / experiences</td>
<td>Indicators of Learning outcomes</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td></td>
<td><strong>STUDENTS CAN:</strong></td>
</tr>
</tbody>
</table>
| 1. guide the students to explore the main forms of energy and that energy is measured in joules. | **Starter suggestion:** Ask students to imagine a day without electrical energy at home or at school and list the effects this might have on their daily normal activities. Give time for students to share their responses. Note any misconceptions which might be addressed at a later stage. Guide students to understand that electricity is one form of energy. **Main activity:** Show a battery, a yo-yo and a food item and ask the students what do these things have in common. Some students may recognise different forms of energy. Set up a number of stations (e.g. batteries, yo-yo, radio, bulbs & LEDs, warm water, different food items, IWB showing short clips such as erupting volcanoes, bicycles on the move, aeroplanes taking off). Ask students to work in groups and identify forms of energy present in each station. Students draw a table with two columns; in the first column they write/draw the devices and in the second column they write its type of energy. Pool the results on the IWB. At times ask students to evaluate the response of the other students. Guide the students to identify the main forms of energy and show that in all cases energy makes things happen. **Other activities:** - use food labels and identify the energy content of different types of food. Explain that energy is measured in units called joules. Larger amounts of energy are expressed as kilojoules (just like grams and kilograms). (Some students may refer to calories. The unit of calories is a more popular way of expressing energy content in food but show that the scientific unit used for energy is the joules (J) or kilojoules (kJ).) - at this level there is no need to go into the meaning / definition of Joule. **Other possible activities:** - some students may explore other examples and identify nuclear, potential and chemical energy as other forms of stored energy. | identify and explain that nuclear, potential and chemical energy are forms of stored energy. (Level 8) associate different forms of energy with their source. (Level 7) identify different forms of energy such as stored, movement, heat, electrical, light and sound and realize that energy can be measured. (Level 6) know that there are different forms of energy. (Level 5)
<table>
<thead>
<tr>
<th>2. engage students to discover that energy can be transferred from one form to another and that not all energy changes are useful.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starter suggestion:</strong> Present students with a filament bulb, an energy saving bulb and an LED. Students discuss the characteristics of each type of bulb such as its power, brightness, energy consumption, heat, etc. and the advantages/disadvantages of each. Write new key terms on the whiteboard.</td>
</tr>
<tr>
<td><strong>Main activity:</strong> Ask students to work in groups to discuss the energy input and output present in each of the following: torch, clockwork toy, bicycle dynamo, photovoltaic cell, video clips demonstrating energy changers. Some students discuss the intermediate energy changes that take place in the device such as the stored energy in a battery changes to electrical energy to light energy in the bulb. All students draw a diagram to show the energy changes taking place in the device they have at hand. Students state the energy changes that occur and whether they are useful changes or not.</td>
</tr>
</tbody>
</table>
| **Other possible activities:**
- use an interactive animation in which students fill in the input and output energy/s in the space provided. Examples may include an athlete running; workers carrying heavy objects; a compressed spring; a device emitting a sound; an electrical device overheating, etc. Students identify the main form of energy and the non-useful part |
| **Other notes:** |
| be aware that energy is neither created nor destroyed but merely changes its form and understand that almost all energy transfers produce heat as an unwanted by-product. (Level 8) |
| describe some examples of energy transfers and distinguish between useful and non-useful energy transfers. (Level 7) |
| identify one energy change for a familiar device such as a bulb. (Level 6) |
| be aware that energy changes from one form to another. (Level 5) |
3. help students to recognise that food is a source of energy and investigate food for its energy content.

**Starter suggestion:** Show pictures of different types of foods and ask students to work in groups to discuss and predict two food items with most energy content and two items with least energy content.

**Main activity:** Ask students to come up with a test to show that energy is present in a food sample. Students investigate energy from food by burning a food sample and heating water. Ask students to work in groups to record the temperature rise of water in a boiling tube. Ask students to predict the amount of heat produced if a bigger sample of food is used thus linking the stored energy in the food with the amount of heat produced. At the end, the different groups present their results in the form of a table on the whiteboard. Elicit possible conclusions from the students with the help of questions.

**NOTE:** the aim of the above experiment is to recognise that food contains stored energy and the heat produced (i.e. increase in temperature) is indicative of the amount of stored energy present in food. At this level it is NOT expected to calculate the amount of energy present in a food sample. (Note that 15% of the final annual mark is allotted to experimental work.)

**Other activities:**
- May explore the energy content present in other foods. Introduce the issue of fair testing when comparing the heat energy produced by two different food samples by using an equal volume of water and mass of the food being burned.
- Ask all students to look at different food labels and identify the energy content of different types of food.

**Other possible activities:**
- Some students may refer to calories. The unit of calories is a more popular way of expressing energy content in food but show that the scientific unit used for energy is the joules (J) or kilojoules (kJ).
- Students may research and tabulate the amount of daily energy requirements for persons of different age, sex and activity.

describe the issue of fair testing. (Level 8)
describe an experiment to show that food contains energy and recognize that energy which can be expressed units called the joule. (Level 7)
identify foods with the most/least energy content. (Level 6)
recall that different foods contain different amounts of energy. (Level 5)
Digital Technology Enhanced Learning - Science eLearning Entitlement

Unit 7.6 – Energy Around us

1. Students research images or videos of what they think “energy” can be. This could be done either as a follow up activity or as preparation for the topic. The images/videos can be sent to the teacher via email, either as documents or URLs.

2. Students use interactive voting system like ‘activotes’ (assuming availability) to vote for different energy sources observed based on what type of energy they think it involves. Results can be interpreted in form of voting graph.

3. Students use matching games on IWB to identify the type of energy present in different situations and to link ‘things with energy’ to the corresponding ‘forms of energy’. A wireless mouse and projector can be used as an alternative to the IWB.

4. Students look up a food label to observe that energy is measured in joules or kilojoules. They can then “invent” a food label for “good” and “bad” foods, using a word processor to set up such a label and present it in class or as HW.

5. Students discuss the characteristics of different types of bulbs and their power, brightness, energy consumption, heat, etc. and advantages/disadvantages of each. Students can use Prezi meeting or google docs to create a collaborative presentation.

6. Students use a spreadsheet on Lab PCs or in Computer Labs to fill up a table showing a number of ‘energy changers’ together with the corresponding ‘input form of energy’ and ‘output form of energy’, maybe also identifying the output as ‘useful’ and ‘non-useful’. Spreadsheets can also be used to pool experimental data (e.g. Temperature change due to burning different foods) on the IWB.

7. Students identify different foods with high/low energy content on IWB. An interactive sorting game using Active Inspire or SMART Notebook can be used as follow up. Alternatively a flashcard game can be used, like for example http://quizlet.com/.


9. Students are assigned Internet research about different types of food prior to the lesson (as HW) or during lesson as preparation for this activity. Google Custom Search (http://www.google.com/cse/) offers teachers the possibility of setting up a customised search for their students, leading them to specific sites of the teacher’s choosing. Alternatively, a webquest can be set up using sites like http://www.zunal.com/index.php.

10. Students are asked to investigate how the daily energy requirement of humans varies with different ages, sex and activities. This can be done online at school (Computer or Science Lab PCs if available) or at Home as HW. A class wiki can be used to gather this data rather than having each student presenting different work.
Subject: Integrated Science  
Unit code and title: **SCI 7.6 ENERGY AROUND US**  
Strand: Physical Processes  

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

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to Note</th>
<th>Resources</th>
</tr>
</thead>
</table>
| Energy resources, stored energy, movement, heat, electricity, light, sound, source of energy, Sun, energy transfer, | Refer to the note re the 5E approach to teaching and learning of science. Energy as a concept is difficult to teach because of the underlying concepts of what energy is. In this unit energy is treated as something that is found in various forms and is transferred to make things happen. Health & Safety: Burning food experiment – make sure that no-one is allergic to any of the foods being burnt. Peanuts should not be used and remind students not to eat any of the foods. | Different types of food (actual or pictures), different food labels (actual or pictures), torch, clockwork toy, bicycle dynamo, photovoltaic cell, filament bulb, energy saving bulb, LED, Bunsen burner, stand, thermometer, weighing balance. **Forms of energy:** http://www.misterteacher.com/whiteboard/energy.html#free  
http://www.energyquest.ca.gov/story/index.html  
**Energy transfer:**  
http://kmetemidni.mx.am/sfzp54.html  
**Food chain**  
http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm  
**Energy in food:**  
http://www.practicalchemistry.org/experiments/energy-values-of-food,225,EX.html |

For students working within level 1 – 4, symbols should be used together with the spoken words.

Objectives at attainment levels 5,6,7,8  
The teacher will:
1. guide the students to explore the main forms of energy and that energy is measure in joules.
2. engage students to discover that energy can be changed from one form to another and that not all energy changes are useful.
3. help students to recognize that food is a source of energy and investigate food for its energy content.

Objectives at attainment levels 1,2,3,4  
6.1 make the students aware of the main forms of energy  
6.2 to explore the concept of measurement in energy  
6.3 engage students to discover that energy can be changed from one form to another  
6.4 help students to recognize that food is a source of energy

Objective 6.2 may not be suitable for students performing at Levels 1 and 2
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1 make the</td>
<td>Ask students to imagine a day without electrical energy at home or at school. Students mention the effects this might have on their daily normal activities. Where possible go to a dark room and tell the students to reflect about the difficulties we may encounter in the dark. Switches can be used to start lighting up the room slowly, whilst making the students aware about the difference light makes. Students in mixed ability groups move around prepared stations to identify forms of energy with which the items presented on their station are associated. Stations may include batteries, yo-yo, radio, bulbs &amp; LEDs, warm water, food items, etc. One station may consist of short clips such as erupting volcanoes, bicycles on the move, aeroplanes taking off, etc. Students observe the devices and their type of energy. At the end of this activity teachers will help students realize that electrical energy is only one of many different forms of energy.</td>
<td><strong>STUDENTS CAN:</strong> begin to know that different forms of energy exist. (Level 4) show interest in a wide range of objects and start to record their own findings. (Level 3) begin to show interest and participate in activities presented to them. (Level 2) respond consistently to objects - means of obtaining desired environmental events. (Level 1)</td>
</tr>
<tr>
<td>6.2 To explore the</td>
<td>The teacher helps the students to engage in simple experiments where different types of potential energy leads to proportionate amounts of kinetic energy ex. winding up a toy and placing an object on higher ground at different heights. In this way students are exposed to simple activities aimed at forming the concept of measuring energy.</td>
<td>students participate and engage in the experiments presented by the teacher (Level 4) students show interest in the various activities aimed at measuring energy (Level 3) these activities may not be appropriate for Level 2 these activities may not be appropriate for Level 1</td>
</tr>
<tr>
<td>6.3 engage students to discover that energy can be changed from one form to another</td>
<td>Present students with a filament bulb, an energy saving bulb and an LED. Teacher discusses the characteristics of each type of bulb such as its power, brightness, energy consumption, heat, etc. and the advantages/disadvantages of each. Flash cards of new Key terms are used. Provide students with different devices such as torch, clockwork toy, bicycle dynamo, photovoltaic cell, video clips demonstrating energy changers. The teacher explains the energy input and output of each device. Provide interactive animations in which students are shown a picture/video clip and the input and output energy/s. Such examples may include an athlete running; workmen carrying heavy objects; a compressed spring; a device emitting a sound; an electrical device overheating, a laser light travelling through space. show interest in a range of physical phenomena and distinguish between them. (Level 4) show interest in handling and observing a wide range of objects (level 3) begin to show interest and participate in activities presented to them. (Level 2) these activities may not be appropriate for (Level 1).</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6.4 help students to recognize that food is a source of energy.</td>
<td>The teacher shows pictures of different types of food such as pasta, water, chocolate, nuts, crisps, orange, bananas, etc. With assistance and after making sure there are no allergies, students can also taste some food to make it more interactive. Students, in mixed ability groups, discuss and predict the two food items with most energy content and the two food items with least energy content. Teacher will help the students investigate energy from food by burning samples and heating water. Together they set up an experiment to show the energy content of some foods. Show the increase in temperature /heat as a result of the burning of food. Assist the students at all times to ensure safety and to ensure that the students read the temperature rise correctly, and the mass of the food being burned is measured correctly. At the end a short video clip may be shown to reinforce the experiment. start to associate different types of food with energy content. (Level 4) show interest in handling and observing a wide range of objects. (level 3) begin to show interest and participate in activities presented to them. (Level 2) respond consistently to objects means of obtaining desired environmental events. (Level 1)</td>
<td></td>
</tr>
</tbody>
</table>
Unit code and title: **SCI 7.7 ELECTRICITY**
Strand: Physical Processes

**OBJECTIVES:** Teacher will:
1. guide students to use electrical components to construct basic circuits.
2. teach students to use symbols to represent electrical circuits.
3. help students to explore series and parallel circuits.
4. engage students to identify conductors and insulators and relate them to issues of safety.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
</table>
### Teaching objective

**TEACHER WILL:**

1. guide students to use electrical components to construct basic circuits.

### Example of teaching activities / experiences

**Starter suggestion:** Show a number of devices which use electricity as their starting form of energy. May show pictures of electric bulb, motor, driller, kettle, iron, etc. Ask students to state what do these things have in common. Guide students to identify electrical energy as their starting form of energy. Link with the previous unit by stating that during this unit you will be talking about one of the forms of energy, namely electricity.

Note: Briefly make the students aware of safety issues when using electricity. Identify batteries and sockets as two electrical sources and show that for safety reasons batteries are used in science experiments.

**Main activity:** Ask students to work in groups and pick items from the available electrical components. Students are to build a circuit and light a bulb in the shortest time possible. All students are expected to construct a simple circuit using a battery, wires and a bulb. Most students are expected to construct a circuit using a battery, wires and a bulb. This activity may take the form of a competition and thus no instructions are to be made available. Students are expected to realise that a complete circuit is required to light a bulb. All students are to label the electrical components by using readily available labels provided by the teacher. Ask students to describe their work and take a note on their workbook.

**Other activities:**
- ask students to identify the main electrical components. Most students are expected to show the complete circuit and some students are expected to draw this circuit on a worksheet provided by the teacher.

**Other notes:**

### Indicators of Learning outcomes

**STUDENTS CAN:**

- explain how switches can be used to control circuits. (Level 8)
- use circuit components to construct a complete circuit using bulbs, wires, battery and a switch (Level 7)
- identify the function of basic electrical components and realise that a complete circuit is needed to light a bulb. (Level 6)
- name basic electrical components. (Level 5)
|   | 2. teach students to use symbols to represent electrical circuits. | **Starter suggestion:** Set students in mixed ability grouping. Ask one student from each group to set up a complete circuit. The students are to choose any necessary components from the teacher’s bench. The task ends when the first student lights a bulb. Give some time so that each group makes a complete circuit.  
Main activity: Ask the students to work in groups and draw a diagram which shows the complete circuit. Introduce the idea that at times it is much easier to use symbols. Give examples from everyday life (e.g. traffic signs). Introduce some electrical symbols and ask students to predict a match between the symbol and the electrical component.  
Guide students to use the symbols to draw a complete electrical circuit showing a battery, wires and a bulb. Give time to students to draw circuit diagrams on their workbook and then on the IWB. Some students may add more components to this circuit, such as other batteries, bulbs and a switch.  
**Other activities:**  
- show other circuit diagrams and ask students to set up the circuits using electrical components provided.  
**Other possible activities:**  
- individual students play an interactive quiz to select correct circuit diagrams.  
- students make changes to circuits which were set up incorrectly.  
**Other notes:** | add other components to their circuit diagrams.  
(Level 8)  
use symbols to draw circuit diagrams correctly and interpret circuit diagrams.  
(Level 7)  
draw the circuit symbols for a battery, bulb, switch and wire.  
(Level 6)  
identify symbols for a battery, bulb, switch and wire.  
(Level 5) |
3. Guide students to explore series and parallel circuits.

**Starter suggestion:** Give each group of students one battery, some wires and 2 or 3 bulbs. Ask students to connect all the components in one circuit.

**Main Activity:** Give time to each group of students to make the bulbs light. Ask students to present their circuits. Different groups of students may have produced a different set up. Identify the two different ways of connecting circuits – series and parallel circuits.

Investigate the properties of a series circuit. Ask students working in groups to set up a series circuit and predict the effect of removing one bulb. Give time to each group of students to check their predictions and answer a set of questions on a worksheet. Ask students to observe the brightness of the bulbs.

Investigate the properties of a parallel circuit. Ask students working in groups to set up a parallel circuit and predict the effect of removing one bulb. Give time to each group of students to check their predictions and answer a set of questions on a worksheet. Ask students to observe the brightness of the bulbs.

Assist students to draw correct circuit diagrams. (Note that 15% of the final annual mark is allotted to experimental work.)

**Other activities:**
- Students investigate the effect of including a switch in each of the above circuits.

**Other possible activities:**
- Students observe different Christmas lights sets.
- May ask students to measure the current flowing through a circuit using a digital ammeter / data logger.
- Students use interactive games to explore the different properties of series and parallel circuits, including bulb brightness, current and the effect of removing or adding a bulb.

**Other notes:**

- Students investigate the effect of including a switch in each of the above circuits.

- May ask students to measure the current flowing through a circuit using a digital ammeter / data logger.

- Students use interactive games to explore the different properties of series and parallel circuits, including bulb brightness, current and the effect of removing or adding a bulb.
4. **engage students to identify conductors and insulators and relate them to issues of safety.**

**Starter suggestion:** Give the students a mains plug. Ask students to discuss the reasons why the pins are made of metal but the case is made of plastic.

**Main activity:** Most students will be aware that electricity will pass through some materials but not through others. Ask students to sort out and name familiar materials such as a spoon, a key, a plastic ruler and a rubber into two groups by predicting whether they conduct electricity or not. Ask students to plan an investigation to test their prediction. Give some time until each group of students tries the conductivity of a number of materials. Ask students to report back their results and take note of their findings in table form. Point out that in a circuit, electricity passes through a metal (conductor) all the way. (Note that 15% of the final annual mark is allotted to experimental work.)

Guide the students to think about the issue of SAFETY. Link to the starter activity and ask students to think about safety features which are used when using electricity. May refer to fuses, circuit breaker, voltage detectors. Link to the lesson objective by referring to the proper use of insulators (plastic handles, rubber gloves, etc). Make students aware of basic safety precautions in case of electric shock and refer to the responsible use of the emergency call (112)

**Other activities:**
- students use interactive sources to classify materials as conductors or insulators.

**Other possible activities:**
- ask students to research and present common examples and uses of conductors and insulators. Some students may refer to examples of poor / good conductors, resistance, dimmer switches, etc.

**Other notes:**

- distinguish between poor/good conductors and insulators and identify applications in everyday use. (Level 8)
- identify practical uses of conductors / insulators and relate to issues of safety. (Level 7)
- use a simple circuit to classify materials as conductors and insulators. (Level 6)
- recall some materials that conduct / do not conduct electricity. (Level 5)
Digital Technology Enhanced Learning - Science eLearning Entitlement

Digital Technology Enhanced Learning - Science eLearning Entitlement

Unit 7.7 - Electricity

1. Students are asked to search online, in class or at home, for details about life without electricity, as well as improvements brought about through the use of electrical devices. Each group can be assigned a particular range of years and would be encouraged to identify a number of electrical devices invented during that time and describe how things were done without the presence of those devices. Google Custom Search (http://www.google.com/cse/) or a webquest (e.g. http://www.zunal.com/index.php) can help in directing the searches.

2. Students use interactive sites such as Circuit World (http://www.cleo.net.uk/consultants_resources/science/circuitWorld/circuitworld.html) to plan and build their own circuits using basic components. Completed circuits can be “switched on” to see if they function, and can then be tried out in real life. http://phet.colorado.edu/en/simulation/circuit-construction-kit-dc is a free, more complex circuit builder. This activity can be extended by getting students to design more complicated circuits (according to ability) and then saving screen shots for presentation to peers. For this purpose, students can be allocated the number of devices that they can use. Circuit World Software can also be used in ‘circuit symbol mode’ to allow students to see what their circuits look like with symbols instead of images of devices. It can also be used to prepare various circuits which can be used to quiz students about which are correct and which are not.

3. Students work in groups on a memory pair-matching game (http://www.education.vic.gov.au/languagesonline/games/memory/index.htm) to match electrical devices with circuit symbols using. The game can be played in teams on the IWB if PCs for group work are not available.

4. The interactive activity at http://www.hyperstaffs.info/science/work/physics/child/main.html covers most of the above material and allows students to progress at their own pace. This can be used either as a learning game or as a revision game. Students can be encouraged to take screen shots of their completed exercises and create a short presentation using Prezi, PowerPoint or PhotoStory.

5. Students use the interactive section on conductors and insulators at http://www.learningcircuits.co.uk/ to ‘test’ various materials safely.

6. Students use a digital/mobile phone camera to take photos of different insulators and conductors (no downloaded images allowed). They use these to build a SHORT PowerPoint presentation and upload this to the school science website via sites like www.slideshare.net or http://www.slideboom.com/. They can also be shared as a Google docs Presentation (http://www.google.com/google-d-s/presentations/).


8. Students work in mixed ability groups to create an animation showing various electrical hazards. They can use video animation software like http://goanimate.com/ or cartoon/comic creation tools like http://www.pikistrips.com/ or http://www.toondoo.com/.


10. Students use data loggers with voltage and current sensors to understand differences in current flow in different parts of the circuit.
Subject: Integrated Science
Unit code and title: SCI 7.7 ELECTRICITY
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 use electrical components to construct basic circuits.
2. teach students to use symbols to represent electrical circuits.
3. help students to explore series and parallel circuits.
4. engage students to identify conductors and insulators and relate them to issues of safety.

OBJECTIVES at attainment levels 1,2,3,4
7.1 encourage students to explore basic components of a circuit.
7.2 assist students in matching symbols and pictures as representations to real components
7.3 give students various opportunities to explore and then sort different materials according to their properties
7.4 encourage students to apply knowledge of circuits to everyday life experiences
7.5 help students highlight the importance of safety when using electricity

Key words
Symbol, electric circuit, bulb, switch, cell, battery, Light, dark, sound, sun, candle.

Points to note
The approach to teaching and learning science is experience and enquiry based and student centred. Students encounter, engage, explore, explain, elaborate and evaluate.
Students are made aware of health and safety issues using electricity.
Do not let students mouth batteries or touch sockets. When using light emitting equipment, ensure students are in a darkened environment to maximise visual stimulation.
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.

Resources
- circuit boards; batteries; bulbs; switches; wires;
- materials including copper, iron, aluminium, wood, plastic, paper. conductors and insulators.
- Using electricity safely: http://www.switchedonkids.org.uk/
- http://cloverland.apogee.net/kids/
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1 encourage students to explore basic components of a circuit.</td>
<td>The teacher encourages the students to discuss and identify different sources that provide us with light e.g. sun, candle, torches and light bulbs. Teacher will give out the components that make up a simple circuit and try to construct one with minimal help. (Level 3)</td>
<td>Students can: name some uses of electricity. (Level 4) engage themselves in a discussion about light sources. They will manage to construct a simple circuit with minimal help. (Level 3) engage in experimentation with provided equipment and answer simple scientific questions. (Level 2) accept and engage in coactive exploration, explore components development of operational causality. (Level 1)</td>
</tr>
<tr>
<td></td>
<td>The teacher will provide all the components of a circuit to the students. The students will be encouraged to experiment with the components and with support try to see how these can all be connected to have a complete correct circuit. Students will answer simple scientific questions requiring yes and no answers related to the circuit built. (Level 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teacher presents different components of a circuit such as a bulb, battery, pieces of wire and different switches and encourages the students to cooperate with shared exploration. The teacher will then demonstrate how to construct a simple circuit and let students observe the results when all components have been connected. At level 1 Big Mac switches may be used for students to press and light a bulb.</td>
<td></td>
</tr>
<tr>
<td>7.2 assist students in matching symbols and pictures as representations to real components.</td>
<td>Students will play an Interactive quiz about the components of a circuit. The aim will be to select correct components to set up a circuit. They will be presented with 2 objects; one which is used to construct a circuit e.g. bulb and one which is not e.g. pebble. They have to select the correct one. (Level 3)</td>
<td>identify symbols for a battery and bulb. (Level 4) answer simple scientific questions and know what makes up an electric circuit. (Level 3) recognise and name components which make up a circuit. (Level 2) may give intermittent reactions, and interact with several objects at the same time development of objects in relation to schemes. (Level 1)</td>
</tr>
<tr>
<td></td>
<td>Teacher shows cards which represent circuit components to the students and explains the game to be played. Teacher places flashcards with symbols and pictures of circuit components facing down. With support, students need to turn over the cards and make up pairs of the same component. When the pairs are completed, students will name each component. (Level 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Students are presented with photos of each component in a circuit. There will be two of the same photos to represent each component. With help they will match the photos together. (Level 1)</td>
<td></td>
</tr>
</tbody>
</table>
7.3 give students various opportunities to explore and then sort different materials according to their properties.

| For the main activity the teacher will present students with a ready constructed circuit and ask the students to get different objects made up of different materials e.g. copper, plastic, stone. Students will try to predict if an object is a conductor or an insulator before actually trying it out. With minimal help from the teacher, students will try out placing different objects as part of the circuit and observe if the bulb lights up or not. They can record the results. With full teacher support, students will try out placing these objects as part of the circuit and observe if the bulb lights up or not (learning by observing). |

7.4 encourage students to apply knowledge of circuits to everyday life experiences.

| The teacher will set the lesson in a dark room e.g. a TV room where different lights will be enhanced when lit. Items will be brought to the room e.g. torch, and students explore and observe changes in light sources using the resources provided. Students complete the activity where they have to recognise pictures which depict light and dark on demand. Teacher will set the lesson in a room where changes in light can be explored and experienced. E.g. in a multi-sensory /dark room where different lights can be switched on and easy to observe. Switches that student can access with support will be used so that students can engage themselves in cause and effect activities. |

name some materials that are electrical conductors. (Level 4) Predict and explore objects which can be insulators or conductors and record their results. (Level 3) experiment with a simple circuit and observe their actions. (Level 2) observe the results of their own actions with interest. (Level 1)
| 7.5 help students highlight the importance of safety when using electricity | The teacher tells the students that they will be having different role plays to depict safety measures one has to take to avoid electrical hazards at school and at home. The teacher goes on to present resources which the students will use during the role plays. Some students can access the internet and see how they can use electricity responsibly and safely. Teacher presents students with large picture cards showing different scenarios of electrical hazards in a home or school. Students observe them whilst teacher and LSAs speak about electrical hazards and pass round resources which we need to be aware of when electricity is involved. E.g. water, metal objects. | know that electricity is dangerous. (Level 4) learn more about how to use electricity responsibly through role play and using the internet. (Level 3) explore different situations involving electricity use. (Level 2) these activities may not be appropriate for (Level 1). |
Subject: Integrated Science
Unit code and title: SCI 7.8 ON THE MOVE
Strand: Physical Properties

**OBJECTIVES** Teacher will:
1. guide students to describe what forces do and identify types of forces.
2. guide students to identify other types of forces and measure forces correctly.
3. help students identify forces present in objects that float and sink.
4. guide students to investigate friction between two surfaces.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>force, direction, size, pull, push, lubrication, surface, Newton meter, spring balance, weight (force of gravity), friction, upthrust, Newton, balanced and unbalanced forces</td>
<td>Refer to notes re 5E approach to teaching and learning of science. Be aware that the terms ‘mass’ and ‘weight’ are frequently mixed up. Sometimes this mistake is also found in school textbooks and other literature. Even masses used in labs are often called weights! Mass &amp; weight will be dealt with in form 2 (Earth &amp; Space II). At this point there is no need to explain the difference between the two but if used, take special note to make correct use of these terms.</td>
<td>Newton meter, force sensor, stand &amp; clamp, spring, ruler, different surfaces such as wood, sandpaper, fabric, plastic, different lubricants such as water, soap solution, oil, slotted masses, trough, toy vehicles, parachute</td>
</tr>
</tbody>
</table>

**Friction / different surfaces:**
www.bbc.co.uk/schools/scienceclips/ages/8_9/friction.shtml

**Forces and magnet games:**
www.woodlands-junior.kent.sch.uk/revision/Science/physical.htm

**Weight on different planets:**

**Experiment library:**

**Roller coaster simulation – (mass, friction, gravity)**
http://www.funderstanding.com/coaster

**Forces and skydiving:**
http://www.youtube.com/watch?v=ur40O6nQHsw&feature=related
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities/experiences</th>
<th>Indicators of learning outcomes</th>
</tr>
</thead>
</table>
| **THE TEACHER WILL:** 1. guide students to describe what forces do and identify types of forces. | **Starter suggestion:** Ask students to work in groups to discuss a plan how to produce a car which breaks the land speed record. Students can produce drawings, diagrams, verbal or written explanations. Give some time for group discussion and presentations. Elaborate on their responses and highlight examples of forces.  

**Main activity:** Give a prepared worksheet to the students. They work in mixed ability groups to identify examples of forces in action. A fill in work sheet might help as it gives some examples. Ask students to describe what is happening in each picture. Some examples include: stopping a car, kicking a ball, bending a ruler, slowing a car, tearing paper, hitting a nail, paddling a boat and so on. Ask students to discuss each picture before giving one common answer. Elaborate on their answers and ask for further examples which show everyday forces in action. Engage the students in discovering that most forces are pulling, pushing or turning and that forces change the shape, speed and direction of an object.  

**Other activities:**  
- let students experience different forces such as pushing/pulling an object, tug-of-war, holding of different masses supported on a string, pushing one hand against a Newton scale, forces between magnets, etc.  
- use the IWB to make a list of different examples of forces.  
- ask students to sort forces into different groups (push, pull or turn)  
- introduce the idea that forces can be represented as arrows on a diagram.  

**Other possible activities:**  
- use short clips to show examples of forces in action such as a rocket launch, racing car, running athlete, skiing and so on. Ask the students to list the different types of forces present.  

**Other notes:** | **STUDENTS:** know that forces always act in pairs.  
(Level 8)  
understand that forces change the shape, speed and direction of an object.  
(Level 7)  
give examples of different types of forces.  
(Level 6)  
distinguish between pulling and pushing forces.  
(Level 5) |
2. Guide students to identify other types of forces and measure forces correctly.

<table>
<thead>
<tr>
<th>Starter suggestion:</th>
<th>Ask the students to give examples of forces and sort them into pushing and pulling forces.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main activity:</td>
<td>Go through the story of how Newton discovered gravity. Ask students to make their observations and describe gravity in their own words. Use students’ daily life experiences to explain that objects fall downwards due to gravity. (NOTE: At this point DO NOT quantify gravity as $9.8 \text{ m/s}^2$ or convert mass into weight)</td>
</tr>
<tr>
<td></td>
<td>Show that forces can be measured. Explain the use of the Newton meter as the meter to measure forces. Link the unit of forces (Newton) with Newton’s name.</td>
</tr>
</tbody>
</table>

| Other activities:   | - Give some time for students to go round prepared stations where they can measure forces using the Newton meter. Examples may include the weight of different masses, the force needed to pull an object and so on. Go round the students to ensure that students read the scale correctly. Students use a prepared worksheet to keep record of their results. (Note that 15% of the final annual mark is allotted to experimental work.) |

| Use the Newton meter to measure other forces. (Level 8) |
| Use the Newton meter to measure weight. (Level 7) |
| Recognise that forces can be measured using a Newton meter. (Level 6) |
| Recognise that all objects fall downwards. (Level 5) |
3. help students identify forces present in objects that float and sink.

**Starter suggestion:** Ask students to work in groups and float the maximum number of marbles possible. Give each group of students a piece of aluminium foil, glass marbles and a trough of water.

**Main activity:** Ask students to predict the best design. Give time for students to solve the above situation and go round the students and elaborate on their responses. Ask them to predict the forces that act on the foil. Present forces in force diagrams. Introduce the term upthrust. Measure the weight of an object in/out of water to demonstrate upthrust.

Guide students to draw a diagram of forces. Use arrows for forces and label the diagram.

**Other possible activities:**
- some students may observe that forces act in pairs.
- Some students may explore floating objects in other liquids e.g. oil, salty water
- May refer to floating in the Dead Sea.

**Other notes:**
- identify floating and sinking as the result of balanced and unbalanced forces.
  (Level 8)
- identify the forces acting on a floating object as upthrust and weight and draw diagrams showing these forces.
  (Level 7)
- recognise that water produces an upward force on objects.
  (Level 6)
- identify objects that float and sink.
  (Level 5)
<table>
<thead>
<tr>
<th>4. guide students to investigate friction between two surfaces.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starter suggestion:</strong> Show a clip of a sports activity which involves friction such as new tyres on a sports car, putting powder on one's hand for weight lifting, polishing floor during curling, the soles of different types of shoes and so on.</td>
</tr>
<tr>
<td><strong>Main activity:</strong> Ask students to explain the clip. Ask students to list further examples of sports where a 'good grip' is essential and explain how this is achieved. Explain that friction is a force which opposes motion. Similarly, ask students to make a list of sport activities where friction needs to be reduced.</td>
</tr>
<tr>
<td>Guide students to predict the kind of surfaces which produce the greatest friction. Students work in groups to test their prediction by dragging a wooden block on different surfaces such as glass, sandpaper of different grades and the wooden bench. Measure the force needed to move the block using a Newton meter and fill-in a prepared handout. Investigate the factors that affect friction such as roughness of surface and decide which kind of surface causes the largest/smallest friction.</td>
</tr>
<tr>
<td><strong>Other activities:</strong></td>
</tr>
<tr>
<td>- use an interactive simulation to investigate the effect of friction.</td>
</tr>
<tr>
<td>- investigate the effect of using a lubricant on friction. Pour the lubricant on the surface, drag the block again and measure the force required.</td>
</tr>
<tr>
<td><strong>Other notes:</strong></td>
</tr>
<tr>
<td>describe some factors which increase or decrease friction. (Level 8)</td>
</tr>
<tr>
<td>describe situations where friction can be useful or not. (Level 7)</td>
</tr>
<tr>
<td>recognise that friction is a force that opposes movement. (Level 6)</td>
</tr>
<tr>
<td>recognise that movement is more difficult on rough surfaces. (Level 5)</td>
</tr>
</tbody>
</table>
Subject: Integrated Science
Unit code and title: SCI 7.8 ON THE MOVE
Strand: Physical Processes

OBJECTIVES at attainment levels 5,6,7,8
OBJECTIVES Teacher will:
1. guide students to describe what forces do and types of forces.
2. teach students identify other types of forces and measure forces correctly.
3. help students identify forces present in objects that float and sink.
4. guide students to investigate friction between two surfaces.

OBJECTIVES at attainment levels 1,2,3,4
8.1 guide students to describe what forces do and identify different types of forces.
8.2 teach students identify other types of forces
8.3 help students to explore floating and sinking.
8.4 guide students to investigate friction between two surfaces.

Key words
- force, direction, size, pull, push, surface, mass, weight (force of gravity), friction, air resistance, upthrust, reaction, balanced and unbalanced forces

Points to Note
- Students may need visual resources as well as practical activities to be able to take part in this unit.
- For students working within level 1 to 4, it is important to note that at all times during activities students are encouraged, prompted and given time to react and participate.
- It is also 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

Resources
- Digital, mass and spring balance, force sensor, spring, ruler, different surfaces such as wood, sandpaper, fabric, plastic, different lubricants such as water, soap solution, oil, slotted masses, trough, toy vehicles, parachute,
- Friction / different surfaces: www.bbc.co.uk/schools/scienceclips/ages/8_9/friction.shtml
- Forces and magnet games: www.woodlands-junior.kent.sch.uk/revision/Science/physical.htm
- Weight on different planets: http://www.seasky.org/solarsystem/planet-weight-calculator.html
- Roller coaster simulation – (mass, friction, gravity) http://www.funderstanding.com/coaster
- Forces and skydiving: http://www.youtube.com/watch?v=ur40O6nQHsw&feature=related
### Teacher Will:

1. **1.1 guide students to describe what forces do identify different types of forces.**

   - Teacher uses a toy with which students are familiar with. Teacher gives time for students to handle this toy. If (for example) a toy car is used the teacher asks the students to suggest ways how this car can move faster.

   - The teacher elaborates on the students’ responses and identify forces in action. Identify push and pull forces.

   - The students work through other examples which show forces in action. Examples may include kicking a ball, bending a ruler, slowing a car, tearing paper, hitting a nail, paddling a boat, etc. With guidance, students identify forces in action. If possible some students may use a prepared worksheet to mark/colour/draw forces in action.

### Students Can:

- distinguish one type of force (e.g. pull or push)
  (Level 4)

- use the correct force to produce the correct movement. (Level 3)

- respond consistently to objects know certain actions produce predictable results. (Level 2)

- Co-operate with shared exploration and supported participation development of operational causality. (Level 1)

### Teacher Will:

2. **2.1 teach students to identify other types of forces**

   - The teacher should give the students a range of objects which allow them to experience of different rates of fall as gravity and air resistance interact. Encourage eye tracking e.g. bubbles, feathers, tennis ball, rock. Try to encourage some students to investigate the different rates of fall and experiment with objects of their own choosing.

   - The teacher should discuss the force of gravity and demonstrate by asking students to jump up and try to stay in the air. Students make parachutes or yoghurt pot cable cars to show the effect of gravity. Extend this to show that there may be more than one force acting on an object e.g. student pulling the parachute up, gravity pulling it down.

   - Complete the above activity but extend this by representing the forces as arrows. Show students the following examples of two forces acting on one object and ask them what the forces are and to represent these using arrows:
     - a mobile suspended from the ceiling,
     - a ball hanging from a string,
     - a ball magnet hanging from another magnet.

   - communicate observations of change in movement. (Level 4)

   - actively join in scientific investigations identify forces and show an understanding of direction of forces and change in force. (Level 3)

   - respond consistently to objects know certain actions produce predictable results. (Level 2)

   - Co-operate with shared exploration and supported participation development of operational causality. (Level 1)
<table>
<thead>
<tr>
<th>3. 1 help students to identify floating and sinking.</th>
<th>The teacher shows how ships float by placing a small wooden block in a trough of water. With guidance guide students to draw the trough (and water) and the wooden block on a sheet of paper and explain floating. Elaborate on their responses. Ask them to predict the forces that act on the wooden block. Show that forces can be presented in diagrams as arrows.</th>
<th>compare the movement in terms of direction and record consequences. (Level 4) understand some simple scientific vocabulary and can communicate related ideas using simple phrases. (Level 3) engage in experimentation with a range of equipment. (Level 2) co-operate with shared exploration and supported participation development of operational causality. (Level 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 guide students to explore some forces that oppose/assist movement</td>
<td>The teacher demonstrates dragging a number of objects over various surfaces and shows that the movement of objects across the different surfaces is different because of the effect of friction on the objects. Students are helped to drag a wooden block on different surfaces such as glass, sandpaper of different grades and the wooden bench. Students also investigate how friction is affected by using a lubricant on a surface and dragging the block again.</td>
<td>compare the movement of different objects on various surfaces. (Level 4) actively join in scientific investigations identify forces and show an understanding of a change in force. (Level 3) respond consistently to objects and know that certain actions produce predictable results. Level 2) co-operate with shared exploration and supported participation development of operational causality. (Level 1)</td>
</tr>
</tbody>
</table>
**Subject:** Integrated Science  
**Unit code and title:** SCI 7.9 ACIDS AND ALKALIS  
**Strand:** Materials and their Properties

<table>
<thead>
<tr>
<th><strong>OBJECTIVES</strong></th>
<th><strong>Teacher will:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>make students familiar with common acids, their properties and their safe use.</td>
</tr>
<tr>
<td>2.</td>
<td>make students familiar with common alkalis, their properties and the use of indicators to distinguish acids, alkalis and neutral solutions.</td>
</tr>
<tr>
<td>3.</td>
<td>engage students to investigate the strength (and use) of common household acids and alkalis using universal indicator coupled with the pH scale</td>
</tr>
<tr>
<td>4.</td>
<td>engage students to investigate the neutralisation of an acid with an alkali</td>
</tr>
</tbody>
</table>

Key words
- acid, alkali, metal, chemical reaction, corrosive, strong and weak acid, dilute and concentrated acid, carbon dioxide, hydrogen, neutralisation, indicator, litmus, universal indicator

<table>
<thead>
<tr>
<th><strong>Points to note</strong></th>
<th><strong>Resources</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to notes re 5E approach to teaching and learning of science. Ensure the necessary safety precautions are used when handling acid and alkali solutions. Use small amounts and wear protective equipment (lab coats and safety specs). In addition, apply standard laboratory safety rules. Inspect laboratory first aid and eye wash kits before the start of the unit. Concentrated acid should only be handled by the teacher and used in a fume cupboard. Lab technicians must provide Material Safety Data Sheets (MSDS) for each commercial chemical and make them readily available in case of emergency. Laboratory technicians must be aware of an emergency procedure in case of acid or alkali spillage. To attain objectives 1-4, lessons must be held in the laboratory.</td>
<td>Common laboratory glassware, labcoats and safety goggles. magnesium, zinc, dilute hydrochloric, sulphuric, nitric and ethanoic acid, dilute sodium hydroxide solution, dilute ammonia, distilled water, small marble slab, calcium carbonate, wooden splints, limewater, litmus paper, universal indicator, beetroot or red cabbage, common household acids and alkalis, diluted limescale remover, antacid e.g. milk of magnesia, liquid soad</td>
</tr>
</tbody>
</table>

**Acids, alkalis and the pH scale**
- [http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/acids_bases_metals/revise1.shtml](http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/acids_bases_metals/revise1.shtml)

**Indicators and pH**

**Corrosive nature of acids**
- [http://www.youtube.com/watch?v=tI7QOMh7vvs](http://www.youtube.com/watch?v=tI7QOMh7vvs)

**Neutralisation**
- [http://www.footprints-science.co.uk/flash/neutralisation.swf](http://www.footprints-science.co.uk/flash/neutralisation.swf)
- [http://ep.teacherrambo.com/M1%20files/Animation%20%20neutralisation.swf](http://ep.teacherrambo.com/M1%20files/Animation%20%20neutralisation.swf)

**Link this unit with SCI 7.10 Focus on gases (and consider as one continuous topic) and SCI 7.5 Understanding Matter.**
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities/ experiences</th>
<th>Indicators of learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td><strong>Example of teaching activities/ experiences</strong></td>
<td><strong>Indicators of learning outcomes</strong></td>
</tr>
<tr>
<td>1. make students familiar with common acids, their properties and their safe use.</td>
<td><strong>Starter suggestion:</strong> Drop a piece of magnesium or zinc in a beaker /test tube half full of dilute hydrochloric acid. Ask students to observe what happens and give possible reasons for these observations. Note any misconceptions which might be addressed at a later stage. Make the students aware that the effervescence they observe in this experiment is due to the production of a colourless gas.</td>
<td><strong>STUDENTS CAN:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Main activity:</strong> Ask students to discuss in groups what they know about acids and present their ideas in few sentences or as diagrams. Ask questions and guide students to elaborate even further. Encourage students to give the name of common acids they know. Give each group of students dilute solutions of acids such as hydrochloric and ethanoic acids (label acids with the <em>corrosive</em> symbol). Ask students to investigate the reaction between zinc and these acids, record their results and share their observations. Relate effervescence with acid strength.  (Note that 15% of the final annual mark is allotted to experimental work.)</td>
<td>state that any acid contains hydrogen but not all compounds containing hydrogen are necessarily acids. (Level 8) work safely with dilute acids, identify some of their properties (corrosiveness, sour taste and their reaction with certain metals). (Level 7) name some common acids, recognise that some acids can be more dangerous than others and relate the degree of corrosiveness with its hazards. (Level 6) recognise the hazard symbols and know basic safety procedures when handling chemicals. (Level 5)</td>
</tr>
</tbody>
</table>
|  | **Other activities:**  
  - students list the names of common acids used in the laboratory, in the home and in everyday life and identify some common properties.  
  - students relate acid corrosiveness with its hazards.  
  - students identify the ‘corrosive’ label.  
  | **Other possible activities:**  
  - students identify names of other acids.  
  |
|  | **Other notes:** |  

2. make students familiar with common alkalis, their properties and the use of indicators to distinguish acids, alkalis and neutral solutions.

**Starter suggestion:** Present a number of acids together with one alkali (such as bleach). Use a variety of acids which include some food items. Ask students to identify the odd one out and explain their choice. Introduce alkalis as chemical opposites to acids. In mixed ability grouping, students list pairs of words which are opposite to each other.

**Main activity:** Present examples of commonly used alkalis such as liquid soap, detergents, and bleach. Students explore the soapy texture of some alkalis such as liquid soap. Students find the properties of these chemicals and work in groups to present their ideas verbally, written or as a drawing. Illustrate that strong alkalis are corrosive, sometimes dangerous but useful. Remind students that the corrosive label is also used with alkalis.

Ask students to predict ways how acids and alkalis can be distinguished. Students discuss in groups possible ways of recognising acids and alkalis and explain their views to the class. Introduce indicators as chemicals which change colour in acids or alkalis. Students work in mixed ability groups to produce their own indicator from a red cabbage or beetroot. Use this indicator with dilute solutions of an acid and an alkali. (Note that 15% of the final annual mark is allotted to experimental work.)

Introduce Litmus as a useful indicator which distinguishes between an acid and an alkali.

**Other activities:**
- Students list the names of common alkalis used in the laboratory, in the home and in everyday life and identify some common properties.
- Students relate alkali corrosiveness with its hazards.

**Other possible activities:**
- Students identify names of other alkalis.

**Other notes:**

Understand that alkalis contain hydroxides (OH) but not all compounds containing hydroxides are necessarily alkalis.

(Level 8)

work safely with dilute alkalis and identify some of their properties (corrosiveness, soapy texture) and know that the rate of reaction depends on alkalis’ strength.

(Level 7)

name some common alkalis and use litmus to identify acids and alkalis.

(Level 6)

recognise the hazard symbols and know the safety procedures when handling alkalis.

(Level 5)
3. **engage students to investigate the strength (and use) of acids and alkalis using universal indicator coupled with the pH scale.**

**Starter suggestion:** Ask students to work in groups and sort a list of chemicals into acids and alkalis. Then ask students to sort the acids and alkalis according to their strength. Ask students to suggest reasons why vinegar is put on chips but not sulfuric acid? Introduce the idea of acid strength.

**Main activity:** Introduce the pH scale as a measurement of the strength of acids and alkalis. Use indicators such as universal indicator or pH paper to find the pH of hydrochloric acid and sodium hydroxide solutions. Using universal indicator, students work in groups to predict and find the pH of some chemicals such as dilute hydrochloric acid, vinegar, rain, dilute sodium hydroxide, dilute ammonia, baking soda, distilled water, tap water, orange juice, coke etc. Ask different groups to test different chemicals. Ask students to device their own table of results and pool results. (Note that 15% of the final annual mark is allotted to experimental work.)

Students group the chemicals under the headings of acids (strong / weak), neutral and alkalis (strong / weak).

**Other activities:**
- Some students may work in groups to find the pH value of a chemical using digital pH meter and data logger.

**Other possible activities:**
- some students may use the IWB to match: pH value with names of chemicals; strong / weak with pH values; colours of universal indicator with the corresponding pH and so on.
- some students may refer to their home experience of using indicators to measure pH of water in an aquarium.

**Other notes:**
- describe the difference between strong and concentrated acids and between weak and dilute acids. (Level 8)
- use an indicator correctly coupled with the correct interpretation of the pH scale to find the pH of some common acids and alkalis. (Level 7)
- recall one example of strong and weak acids and alkalis. (Level 6)
- be aware that weak acids/ alkalis are generally less dangerous than strong acids / alkalis. (Level 5)
4. engage students to investigate the neutralisation of an acid with an alkali

**Starter suggestion:** Show some images of a jelly fish bite/wasp/bee sting. Ask students to describe ways of treating these bites.

**Main activity:** Ask students to identify the best remedy. Help students to explain, elaborate and evaluate their responses. Ask students to link the above situation with acids and alkalis. Ask one student to draw the pH scale on the IWB. Repeat the above question and present the scenario of treating a bite. Ask students how they could make the bite less dangerous.

Present another scenario of a person suffering from acid stomach. Ask for possible remedies. After discussing some of the answers introduce some examples of antacids *(e.g. Gaviscon, Milk of Magnesia)*. Ask students to predict and test its pH. Show that the above two scenarios involve the reaction between an acid and an alkali. Introduce the term ‘Neutralisation’ for reactions between acids and alkalis and ask for possible explanations how antacids reduce acid burns.

At this point DO NOT go into the word equation of neutralisation reactions.

**Other activities:**
- give examples of neutralisation. Ask students to work in groups and explore the situation and present it to the whole class. These examples can include neutralisation of acid soil by lime, bee stings with weak alkali, acid produced by bacteria with toothpaste and limescale removers.

**Other possible activities:**
- some students may carry out a neutralisation experiment between dilute HCl and NaOH until they get the solution to be completely neutral. It is an opportunity to data-log the pH or use universal indicator. Give special attention to students with poor motor skills as only tiny drops of acid or alkali will be needed at the end point.
- some students may be able to write a word equation for the neutralisation reaction.

**Other notes:**
- recall and describe the word equation between an acid and an alkali.
  (Level 8)
- describe that during neutralisation, pH gradually changes from acid or alkali towards neutral and be able to describe that at neutral point an acid and an alkali neutralise each other.
  (Level 7)
- use an indicator to follow the reaction between and acid and alkali.
  (Level 6)
- recall everyday examples of neutralisation such as the use of antacids and toothpaste.
  (Level 5)
Unit 7.9 - Acids and Alkalis

1. Students access the web in order to find names, images and details about acids and alkalis used in the home and in everyday life. They use a word processor to create a table with images and descriptions, similar to what is available on [http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/acids_bases_metals/revise2.shtml](http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/acids_bases_metals/revise2.shtml).

2. Students use drawing software (e.g. bundled software like MSPaint or online software like [http://www.sumopaint.com/app/](http://www.sumopaint.com/app/)) to design hazard symbols associated with acids and alkalis.

3. Use Flashcards (e.g. [http://www.flashcardmachine.com/](http://www.flashcardmachine.com/)) on the IWB to help students identify hazard symbols. This can also be used as an exercise in which students create their own flashcards with information about acids covered during the lesson. Useful as a revision tool.

4. [http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks3/science/acids/flash/litmus.swf](http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks3/science/acids/flash/litmus.swf) can be used to explore use of litmus as indicator. This can be used as a follow-up activity to reinforce a lab session or as a problem-solving activity given to students in order to analyse and figure out how litmus works.


6. A sorting game (on the IWB) can be used to identify acids (strong / weak), neutral and alkalis (strong / weak). Use of ‘containers’ in Promethean software or ‘Category Sort’ Lesson activity in SMART Software can help achieve this.

7. [http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks3/science/acids/flash/neuralisation.swf](http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks3/science/acids/flash/neuralisation.swf) can be used to investigate the concept of neutralisation, either as a class activity on the IWB or on PCs/data loggers running flash animations.

8. Students can use camcorders/cameras/mobile phones to record experiments showing colour changes during an experiment about neutralisation. They can use the footage to produce a short video, using free software like Moviemaker.

9. The simulation of a neutralisation experiment found in Focus Educational Software – Science Investigations 2 can be used on the IWB with student interaction to try out various combinations, especially if students with impaired motor skills may not be able to handle actual chemicals. It also provides the possibility of varying parameters and re-running the simulated experiment.

10. [http://www.epa.gov/acidrain/education/site_students/index.html](http://www.epa.gov/acidrain/education/site_students/index.html) has plenty of possibilities for starter activities.

11. Students can be asked to take photos of evidence of acid rain (e.g. on buildings) near their house or in their town. These photos can be viewed in class and a short article can be written by different groups based on a photo they chose. Articles can be uploaded to the school or subject website.

12. Students prepare a stop-animation movie of marble dissolving in acid. Photos can be taken daily and used to create a movie using either movie maker or online software like Monkey Jam ([http://www.giantscreamingrobotmonkeys.com/monkeyjam/](http://www.giantscreamingrobotmonkeys.com/monkeyjam/)).
Subject: Integrated Science
Unit code and title: SCI 7.9 ACIDS AND ALKALIS
Strand: Materials and their Properties

Objectives at attainment levels, 5, 6, 7, 8
Teacher will:
1. make students familiar with common acids, their properties and their safe use.
2. make students familiar with common alkalis, their properties and the use of indicators to distinguish acids, alkalis and neutral solutions.
3. engage students to investigate the strength (and use) of common household acids and alkalis using universal indicator coupled with the pH scale.
4. engage students to investigate the neutralisation of an acid with an alkali.

Mainstream objective 3 may not be relevant to this level.

Objectives at attainment levels, 1, 2, 3, 4
9.1 make students familiar with common acids, their properties and their safe use.
9.2 make students familiar with common alkalis, their properties and the use of indicators to distinguish acids, alkalis and neutral solutions.
9.4 help students explore some practical examples of neutralisation reactions.
Objective 9.4 may not be relevant to students performing at Levels 1 and 2.

Key words
acid, alkali, metal, chemical reaction, strong and weak acid, carbon dioxide, acid rain

Points to note
This unit should not be done with students at level 1. For students working within level 2 to 4, Science is an enquiry based subject, so it is important to note that at all times during activities students are encouraged, prompted and given time to react and participate. It is also very important for the teacher to allow time for the students to respond. Ensure that the necessary safety precautions are used when handling acids and alkalis solutions. Small samples should be used and protective equipment (lab coats and safety specs) should be worn at all times during the practical work. In addition, standard laboratory safety rules should always be applied. Concentrated acid should only be handled by the teacher and used in a fume cupboard. Laboratory First aid and eye wash kits should be inspected before the start of

Resources
Common laboratory glassware, labcoats and safety goggles. magnesium, zinc, dilute hydrochloric, sulphuric, nitric and ethanoic acid, dilute sodium hydroxide solution, dilute ammonia, distilled water, small marble slab, calcium carbonate, wooden splints, limewater, litmus paper, universal indicator, common household acids and alkalis, diluted limescale remover, limewater, milk of magnesia suspension, liquid soap, antacid tablets (eg Gaviscon)
http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material behaviour/acids_bases_metals/revise1.shtml
http://www.youtube.com/watch?v=tI7QOMh7vvs
http://www.footprints-science.co.uk/flash/neutralisation.swf
http://www.epa.gov/acidrain/education/site_students/whatcauses.html
http://www.swlauriersb.qc.ca/english/edservices/pedresources/webquest/
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities/ experiences</th>
<th>Indicators of learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Teacher will:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1 make students familiar with common acids, their properties and their safe use.</td>
<td>The teacher should allow the students to experience the taste of every day acids e.g. lemon, vinegar. Encourage to show preferences. The teacher should drop a piece of magnesium or zinc in a beaker half full of dilute hydrochloric acid. Ask students to observe what happens and give possible reasons for these observations. Students discuss in mixed ability groups what they know about acids. Ask students to present their ideas e.g. some write a few sentences and others draw diagrams. Encourage students to give the name of common acids they know. The teacher should make the students aware that the effervescence they observe in the experiment above is due to the production of a colourless gas. Let one of the students put a lighted splint into the gas. This burns with a pop showing the presence of hydrogen. Make the students aware that whenever a metal reacts with an acid, hydrogen is produced.</td>
<td>Students Can: describe similarities and differences between materials when questioned directly. (Level 4) explore and observe similarities, differences, patterns and changes. (Level 3) group objects and materials in terms of simple features or properties. (Level 2) these activities may not be appropriate for (Level 1).</td>
</tr>
<tr>
<td>9.2 make students familiar with common alkalis, their properties and the use of indicators to distinguish acids, alkalis and neutral solutions.</td>
<td>Present a number of acids together with one alkali (such as bleach). With assistance and guidance students identify the odd one out. Introduce alkalis as chemical opposites to acids. In mixed ability grouping, students list pairs of words which are opposite to each other. Explore selection of every day acids/alkalis and label: Blue - alkali Red - acid</td>
<td>describe similarities and differences between materials when questioned directly. (Level 4) explore and observe similarities, differences, and pattern changes. (Level 3) group objects and materials in</td>
</tr>
</tbody>
</table>
Put into two piles.
Test every day substances with home made cabbage indicator. Group accordingly.
Extend above to identify neutral substances. Investigate main substances and with support predict outcomes. Try to ‘mix’ and interpret results.

Using pictures and objects, present examples of commonly used alkalis such as liquid soap, detergents, bleach. Students explore the soapy texture of some alkalis such as liquid soap. Illustrate that alkalis are corrosive, sometimes dangerous but useful.

Other activities can include;
The teacher enable the students list the names of common alkalis used in the laboratory, in the home and in everyday life and identify some common properties.
The teacher makes the students aware of alkali corrosiveness with its hazards.

9.4 help students explore some practical examples of neutralisation reactions

Using pictures and possible some video clips, the teacher can show some images of a jellyfish bite/wasp/bee sting and show how using vinegar on the sting may help alleviate the problem

The teacher may also help the students explore the importance of brushing their teeth in order to decrease bacteria in the mouth as much as possible. Bacteria in the mouth react with food producing acid. This acid attacks the enamel of teeth and cause tooth decay. Toothpaste contains an abrasive that helps remove food particles and it also contains an alkali which neutralises the acid that forms.

Teachers should note that even at Level 2, this unit is unlikely to be appropriate in resource centres because of the inherent dangers of working with a group of students who may have behavioural motor challenges. In mainstream settings the assistant needs to be very aware and well rehearsed about the possible dangers.

Terms of simple features or properties.
(Level 2)

These activities may not be appropriate for (Level 1).

Actively participate in the demonstration of practical examples of neutralisation such as the use of vinegar on jellyfish stings and toothpaste.
(Level 4)

Join in the scientific exploration of some practical examples of neutralisation reactions.
(Level 3)
Subject: Integrated Science  
Unit code and title: **SCI 7.10 Focus on Gases**  
Strand: Materials and their properties

**Objectives**  
Teacher will:
1. engage students to explore production, use and test for hydrogen.  
2. help students to identify air as a mixture of gases.  
3. engage students to explore production, use and test for oxygen.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxygen, hydrogen, carbon dioxide, flammable, effervescence, combustion, air, mixture, pollutants</td>
<td>Refer to notes re 5E approach to science teaching and learning.</td>
<td>Common lab apparatus, small pieces of magnesium ribbon, zinc granules, dilute HCl, CaCO₃ (marble chips), concentrated and dilute H₂O₂, copper turnings, wooden splints, manganese (IV) oxide, fresh finely chopped potatoes and cabbages</td>
</tr>
</tbody>
</table>
|                                              | Link this unit with activities/experiments carried out in **SCI 7.1 Young Scientist at Work** and **SCI 7.2 Safety First**. Link this unit (especially the first objective) with **SCI 7.9 Acids and Alkalis**. | **Carbon dioxide:**  
  http://www.youtube.com/watch?v=j5vF4_ggLv8&feature=player_embedded  
  **Hydrogen:**  
  http://www.youtube.com/watch?v=adBz9clk7Tg&feature=player_embedded  
  http://www.youtube.com/watch?v=j4QjcdFtBE  
  **Oxygen:**  
  http://www.youtube.com/watch?v=Jxp_wpDufdg&feature=related  
  http://www.sciencekids.co.nz/sciencefacts/chemistry/oxygen.html |
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Teacher Will:</strong> 1. Engage students in the production, use and test for hydrogen.</td>
<td><strong>Starter suggestion:</strong> Revisit SCI 7.9.1 and react a piece of magnesium and zinc in a test tube half full of dilute hydrochloric acid. Ask students to use previous knowledge and describe their observation. <strong>Main activity:</strong> Students should be aware that the effervescence they observe in the experiment is due to the production of a colourless gas. Some students may identify this gas as hydrogen. Guide students to show that the presence of this gas can be tested by using a lighted splint. Hydrogen burns with a pop. Helps students to repeat the experiment and the test. Note safety precautions. Discuss appearance, properties and uses. These should include; Appearance: colourless, odourless Properties: flammable, lightest gas, found in many chemicals (such as water) Uses: fuel (in rockets and welding), making of margarine, fertilisers and disinfectants. Use an interactive presentation to describe the above.</td>
<td><strong>Students Can:</strong> identify uses of hydrogen. (Level 8) identify properties of hydrogen and carry out the test for hydrogen. (Level 7) identify hydrogen as a gas. (Level 6) link effervescence with the production of a gas. (Level 5)</td>
</tr>
</tbody>
</table>
2. help students to identify air as a mixture of gases.

**Starter suggestion:** Ask students what air is made of. Build a mind map using students’ answers.

**Main activity:** use interactive resources and present a pie chart which shows percentage of gases making up air. Ask students to guess what each part of the pie chart represents. Note any misconceptions.

Reveal the correct percentage of each gas present in air. Show that air is a mixture of gases. Explain that some gases may be pollutants.

Ask students to describe common uses of different gases in the air. All students will be able to link oxygen with breathing. Some students may be able to link carbon dioxide with photosynthesis in plants/ greenhouse effect, etc and nitrogen to bacteria in soil.

**Other activities:**

- May refer to pollutants such as those produced by the burning of fossil fuels.

- identify other gases present in air. (Level 8)
- identify oxygen and nitrogen as the main components of air and give their approximate percentages. (Level 7)
- identify air as a mixture of gases (Level 6)
- describe air as a vital thing for living things. (Level 5)
3. **engage students to investigate the preparation, properties and uses of oxygen.**

**Starter suggestion:** Show a clip illustrating the importance of oxygen. Can use a clip of a fire fighter, diver or a mountain climber with an oxygen mask. Ask students to describe the clip.

**Main activity:** Use the IWB to build a concept map about oxygen. Ask each student to add a one word idea to the concept map. Elaborate on their answers and highlight the importance of oxygen, identify plants as the natural source of oxygen, identify some physical properties such as appearance, ask students to predict the amount of oxygen present in air and so on.

**Other activities:**

- Demonstrate the lab production of oxygen using hydrogen peroxide and manganese (IV) oxide powder. (Note: \( \text{H}_2\text{O}_2 \) is corrosive when concentrated). Explain that catalysts, such as manganese (IV) oxide powder, are used to break up \( \text{H}_2\text{O}_2 \). Ask students to use the concept map to predict a way of testing for the presence of oxygen. Give each group of students a conical flask containing \( \text{H}_2\text{O}_2 \). Add some manganese (IV) oxide. A strong effervescence (oxygen) and frothy fumes are produced. Use a lighted/glowing splint to test for oxygen. Ask the students to use the concept map to show the relation between oxygen and burning and rusting.

**Other notes:**

- describe how oxygen is produced in the lab. (Level 8)
- describe some properties of oxygen and carry out the test for oxygen. (Level 7)
- use the chemical test to identify oxygen (Level 6)
- recall the importance of oxygen for life. (Level 5)
Digital Technology Enhanced Learning - Science eLearning Entitlement

Unit 7.10 – Focus on gases

1. Matching/Sorting games can be carried out to identify different examples of changes, using Smart or Promethean IWB software features/lesson activity resources.

2. Free concept mapping software like [http://freemind.sourceforge.net](http://freemind.sourceforge.net) or [https://bubbl.us/](https://bubbl.us/) can be used to carry out the suggested oxygen concept map exercise on the IWB.

3. Focus Science Investigations 2 has a simulated experiment showing the Decomposition of H₂O₂ by catalase, which can be used to supplement the actual experiment.


5. Students can prepare presentations (Prezi, powerpoint, etc) about fire-safety related issues. Prezi offers the chance of working collaboratively through prezi-meeting, particularly in class if web-access is available.

6. Students can be asked to follow up activities held during this lesson by preparing short movies or animated clips describing how processes such as rusting, photosynthesis, respiration, etc occur, using anything from movie maker and a digital camera to online solutions like [http://www.xtranormal.com/](http://www.xtranormal.com/).
Subject: Integrated Science
Unit code and title: SCI 7.10 FOCUS ON GASES
Strand: Materials and their properties

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

**UNIT SPECIFIC OBJECTIVES:** Teacher will:

1. engage students to explore production, use and test for hydrogen.
2. help students to identify air as a mixture of gases.
3. engage students to explore production, use and test for oxygen.

This unit is not appropriate for students who are working within levels 1, 2, 3, 4
Subject: Integrated Science
Unit code and title: SCI 7.11 CELLS AND BODY SYSTEMS
Strand: Life Processes and Living Things

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

UNIT SPECIFIC OBJECTIVES: Teacher will:
1. teach students to use a light microscope effectively and understand that cells are the basic unit of life.
2. help student to recognise plant and animal cells and be able to observe simple cells under a light microscope.
3. guide students to identify the main organs and systems and their function.

Key words | Points to note | Resources
--- | --- | ---
cell, organ, body, animal, plant, microscope, slide, multicellular; nucleus; cell membrane; cytoplasm; cell wall; vacuole; chloroplast; tissue; organ; system; organism; magnification; eyepiece lens; objective lens; stage; specialized cells such as muscle, nerve, sex, blood, leaf and root; main body organs; main body systems. | Refer to notes re 5E approach to science teaching and learning. Note that students often think that living things contain cells rather than being made of cells. Be aware that some students might confuse cells with atoms. Some students may find it difficult to understand the small size of cells. The exercise of viewing known objects (such as a plastic ruler) under the microscope might help. For the sake of unitised curriculum the topic of cells and reproduction was divided into two units (i.e. SCI 7.11 & 7.12). Consider both units as one continuous topic. | student light microscope, prepared slides, human torso, organ tunic
Under the microscope: http://micro.magnet.fsu.edu/optics/intelplay/simulator/index.html
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td><strong>Starter suggestion:</strong> Show a picture of a close-up of a familiar object or living organism. Ask students to guess what the object is. <strong>Main activity:</strong> Elaborate on the concept of being able to see more detail when we look closely enough. Ask students to use hand-lenses to observe details of small objects. Introduce the light microscope as a combination of lenses to observe small detail. Set students in groups and ask each group to look at a transparent plastic ruler through the microscope. Lead the students to discover how a microscope works. Through a hands-on activity, students explore through a hands-on activity how to use a microscope, first at low power and then at high power. Elaborate on the specific parts of the light microscope. Give out prepared slides of small things such as hair, cotton thread and parts of small animals and plants. Give time for each student to use the microscope effectively. Show a photo of a brick wall and ask students to identify what is in the picture. Engage students to use the brick wall analogy to describe how living things are made up of cells just like the wall is made of bricks. Elaborate and explain that cells cannot be seen by the naked eye since they are too small. <strong>Other activities:</strong> - use the IWB to show images of microscopic organisms. At this point do not show details of individual cells. - Use the IWB or digital microscope to show animal and plant cells. <strong>Other possible activities:</strong> - some students may calculate the magnification of the microscope - go through the story of plant cell discovery by Robert Hooke in 1665.</td>
<td><strong>STUDENTS CAN:</strong> perform simple calculations regarding magnification and appreciate the small size of cells. (Level 8) recall the basic parts and function of a light microscope and use it effectively to observe a cell under the microscope. (Level 7) use the microscope to magnify small things/items invisible to the naked eye such as cells. (Level 6) use lenses to observe small things. (Level 5) Students can: perform simple calculations regarding magnification and appreciate the small size of cells. (Level 8) recall the basic parts and function of a light microscope and use it effectively to observe a cell under the microscope. (Level 7) use the microscope to magnify small things/items invisible to the naked eye such as cells. (Level 6) use lenses to observe small things. (Level 5)</td>
</tr>
<tr>
<td>1. teach students to use a light microscope effectively and understand that cells are the basic unit of life</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other notes:**
2. help students to recognise plant and animal cells and be able to observe simple cells under a light microscope.

**Starter suggestion**: Ask the students what an onion is made of. Link the responses with the previous lesson.

**Main activity**:  
**Animal cells**  
Use the digital microscope or IWB to show simple animal cells. Explain that animals are made up of a large number of cells. Explain the structure of a typical animal cell. Lead the students to predict the function of the cell membrane, the cytoplasm and the nucleus. Ask the students to draw a labelled diagram of an animal cell. Give guidance re simple biological drawings.

**Plant cells**:  
Repeat the above activity using images / slides of plant cells. Ask students to identify differences between animal and plant cells. Explain the function of the different parts (cell wall, vacuole and chloroplast). Ask students to predict the location of cells with chloroplasts. Ask the students to draw a labelled diagram of a plant cell.

**Other activities**:  
- students use the microscope to examine some prepared slides of simple animal and plant cells. Ask students to identify cell features in each type of cell.  
- use an interactive presentation on the IWB; students match parts of cell to their function.  
- may refer to examples of specialized cells.

**Other possible activities**:  
- use an interactive simulation to label plant and animal cells.  
- present a quiz or crossword to evaluate the level of understanding of key terms.

**Other notes**:  
- identify some examples and function of specialized cells.  
  (Level 8)
- draw and label typical plant and animal cells as seen under the light microscope and state the function of the nucleus, cytoplasm and cell membrane.  
  (Level 7)
- identify a typical plant and animal cell as seen under the light microscope.  
  (Level 6)
- know that plants and animals are made up of millions of cells.  
  (Level 5)
3. guide students to identify the main organs and systems and their function.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starter suggestion:</strong></td>
<td>Ask students to name parts of the body.</td>
</tr>
<tr>
<td><strong>Main activity:</strong></td>
<td>Describe an organ has a specialized function. Ask some students to give examples of human organs.</td>
</tr>
<tr>
<td></td>
<td>Show the position of organs on the organ tunic / human torso. Ask students in groups to list further body organs and possibly their function. Relate groups of organs to a body system.</td>
</tr>
<tr>
<td><strong>Other activities:</strong></td>
<td>- some students may use the internet or other books to find further information about tissues, organs and systems.</td>
</tr>
<tr>
<td></td>
<td>- some students may explore the use of advanced medicine in case of organ failure such as in kidney dialysis, organ transplant and so on.</td>
</tr>
<tr>
<td><strong>Other notes:</strong></td>
<td>be aware of the use of technology in case of organ failure.</td>
</tr>
<tr>
<td></td>
<td>(Level 8) relate organs to body systems.</td>
</tr>
<tr>
<td></td>
<td>(Level 7) identify the position and the function of the main organs on the human torso.</td>
</tr>
<tr>
<td></td>
<td>(Level 6) name some human organs.</td>
</tr>
<tr>
<td></td>
<td>(Level 5)</td>
</tr>
</tbody>
</table>
Unit 7.11 – Cells and Body Systems

1. The use of the microscope in itself is a hands-on use of technology. However, a light microscope connected to a PC and the IWB might be a good way of demonstrating how to use the microscope, as the students can observe the results on screen directly. It is also an excellent way of showing how a drawing can be made by using the IWB pen to draw over the actual image, thus creating a line diagram of the actual structures being observed. It can also be used to observe items which may not be available for the whole class. The PC-Light Microscope combination can also be used to observe different cells on the IWB, as part of the lesson on cells.

2. Students can be asked to look up a small number of images of different types of cells, and present them using free software like PhotoStory, which is installed on teachers’ laptops. Alternatively the images can be combined into a single presentation which could then be uploaded to the school website for sharing.

3. Matching games can be set up using free software like this memory game (http://www.education.vic.gov.au/languagesonline/games). This can be used as a competitive exercise in class. Students could also be asked to create their own games for sharing as this software is quite easy to use and comes with instruction worksheets for students.

4. The suggested interactive site http://www.bbc.co.uk/schools/ks3bitesize/science/ offers an excellent way to introduce levels of organisation in organisms. Alternatively it can be used as a means of revising.

5. http://www.sciencenetlinks.com/interactives/systems.html is a good suggestion for organ identification and can be utilised during lessons or as home work by students.

6. Students can be asked to create simple animations to show what different organs do using free software like http://www.doink.com/.
Subject: Integrated Science  
Unit code and title: SCI 7.11 CELLS AND BODY SYSTEMS  
Strand: Life Processes and Living Things

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

<table>
<thead>
<tr>
<th>Key terms:</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
</table>
| cell, organ, body, animal, plant, microscope, | Note that this topic will be very new to the students. It can be abstract for them and they will need visual resources as well as practical activities to be able to take part in this unit. The student’s experience in these activities is the main focus for students working within level 1 and 4. For students working within level 1 to 4, it is important to note that at all times during activities students are encouraged, prompted and given time to react and participate. It is also 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 | student light microscope, hand lenses, isi-scope, prepared slides, large poster of the human torso, plants, pictures of: plants, cells and the body organs  
www.biology4kids.com  
Cells:  
http://www.bbc.co.uk/schools/ks3bitesize/science/organisms_behaviour_health/cells_systems/activity.shtml  
Microscope  
http://www.udel.edu/biology/ketcham/microscope/scope.html  
http://www.kbears.com/sciences/microscope.html  
Body organs:  
www.netrover.com/~kingskid/science/science.htm  
www.sciencenetlinks.com/interactives/systems.html  
www.hhmi.org/coolscience/forkids/veggie5.html  
http://urbanext.illinois.edu/gpe/ |
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEACHER WILL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.1 demonstrate a light microscope to the students and show them how it is used.</td>
<td>Show a picture of a close-up of a familiar object or living organism. Ask students to guess what the object is. Elaborate on the concept of being able to see more detail when we look closely enough. Ask students to identify tools which can help us see more detail. Students work in groups to use hand-lenses to observe details of small objects. Introduce the light microscope as a combination of lenses to observe small detail. Ask each group to look at a given picture through the microscope. Lead the students to discover how a microscope works. Through a hands-on activity, students explore through a hands-on activity how to use a microscope to observe detail. Elaborate on the specific parts of the light microscope. Give out prepared slides of small things such as hair, newsprint, cotton thread and parts of small animals and plants. Give time for each student to use the microscope effectively.</td>
<td>STUDENTS CAN: recall the basic parts of a light microscope or isi-scope and use it effectively to see fine detail. (Level 4) join in scientific enquiry and learn that microscopes are used to magnify small things. (Level 3) use lenses to observe small things with assistance. (Level 2) These activities may not be appropriate for (Level 1)</td>
</tr>
<tr>
<td>11.2 Guide the students to differentiate and distinguish between living and non-living things.</td>
<td>Engage students in groups, by giving a list of objects and ask them to sort as living or non-living. Guide the students to understand that living things are made up of cells. Show a photo of a brick wall and ask students to identify what is in the picture. Use the brick wall analogy to describe how living things are made up of cells just like the wall is made of bricks. Elaborate and explain that cells cannot be seen by the naked eye since they are too small. Give the students prepared slides of animal and plant tissues or textures and ask them to examine them with the microscope or isi-scope.</td>
<td>identify a cell under the microscope. (Level 4) use a microscope and/or isi-scope to observe different textures. (Level 3) distinguish between living and non-living things. (Level 2) show awareness and interest in activities presented to them (Level 1)</td>
</tr>
<tr>
<td>11.3 Explain and demonstrate what animal cells are and introduce new terminology referring to cells.</td>
<td>Use the digital microscope to show simple animal cells. Project images on the IWB. Explain that animals are made up of a large number of cells. Show images of other animal cells. Explain the structure of a typical animal cell. Label the cell: cell membrane, cytoplasm and the nucleus. Ask the students to draw a labelled diagram of an animal cell with guidance. Students use the microscope to examine some prepared slides of simple animal cells. New terminology will be written on flash cards and are used to label diagrams.</td>
<td>Identify and draw typical animal cells as seen under the light microscope. (Level 4) Identify a typical animal cell as seen under the light microscope. (Level 3) Become familiar with the fact that animals are made up of millions of cells. (Level 2) These activities may not be appropriate for (Level 1).</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11.4 Demonstrate plant cells and encourage the students to observe them under a light microscope.</td>
<td>Show images of different types of plants and plant cells. Draw and label a plant cell: cell wall, vacuole and chloroplast. With assistance the students draw a diagram of a plant cell. Use the internet or other resources to find examples and further information about plant and animal cells. Ask students to identify differences between animal and plant cells. Students, in groups, use previous knowledge to sort the cells according to whether they are plant or animal cells. Pictures are ideally used at all times during these activities.</td>
<td>Identify and draw typical plant cells as seen under the light microscope. (Level 4) Identify a typical plant cell as seen under the light microscope. (Level 3) Become familiar with the fact that plants are made up of many cells. Students recognise the fact that not all cells are the same. (Level 2) These activities may not be appropriate for (Level 1).</td>
</tr>
</tbody>
</table>
| 11.5 demonstrate a poster or model of the internal body organs and assist the students to identify the different organs | Explain to the students that each organ in our body has a highly specialized function. Give examples of some human organs. Explain to students the functions of various organs and where they are found in our body. With assistance some students will say the names of the body organs and possibly their function. Ask a student to show the position of these organs using a model or poster of the human torso or an interactive simulation.

The teacher may present some students with a word search about body organs. Some students may use the internet or other books to find further information about human organs.

The teacher can identify major external organs such as the nose, mouth, eyes and ears and sing action songs with the students as they touch their appropriate body parts. |
| name some body organs and state the main function of these organs. (Level 4) identify the position of the main organs on the human torso (Level 3) point to or name some human organs. (Level 2) show awareness and interest in activities presented to them (Level 1) |
Subject: Integrated Science
Unit code and title: SCI 7.12 INCREASING IN NUMBERS
Strand: Life Processes and Living Things

**OBJECTIVES** Teacher will:
1. guide students to identify specialised human reproductive cells and describe the structure and function of the human reproductive organs.
2. guide students to identify and understand the body changes during puberty and adolescence.
3. help students to understand that fertilisation is the fusion of the male and female reproductive cells.
4. engage students to understand and describe what happens during pregnancy and birth.

<table>
<thead>
<tr>
<th>Key words</th>
<th>Points to note</th>
<th>Resources</th>
</tr>
</thead>
</table>
| sperm, egg, ova, sex cell, sexual intercourse, sex organs, testis, penis, tube, uterus, cervix, vagina, fertilisation, conception, ejaculate, erection, semen, puberty, adolescence, menstruation, menstrual cycle, period, embryo, pollen, ovule, sexual reproduction, asexual reproduction, | Refer to 5E approach to teaching and learning of science. This is a good opportunity for students to ask questions that may be worrying them. Laison with PSD department and be familiar with the school policies on sex education. Refer to the fact that values and respect are also part and parcel of human relationships in addition to the biological aspect of reproduction. Link this unit with the previous unit. | The human torso
Male & female reproductive systems: [http://www.kscience.co.uk/revision/reproduction/reproduction_index.htm](http://www.kscience.co.uk/revision/reproduction/reproduction_index.htm)
Foetal development: [www.justthefacts.org](http://www.justthefacts.org)
The Flower life cycle
[http://www.youtube.com/watch?v=eGUt6PYxDiE&feature=related](http://www.youtube.com/watch?v=eGUt6PYxDiE&feature=related)
[http://www.crickweb.co.uk/ks2science.html](http://www.crickweb.co.uk/ks2science.html)
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THE TEACHER WILL:</strong></td>
<td></td>
<td><strong>STUDENTS CAN:</strong></td>
</tr>
<tr>
<td>1. guide students to identify specialised human reproductive cells and describe the structure and function of the human reproductive organs.</td>
<td><strong>Starter suggestion:</strong> Ask students to identify characteristics of living things (i.e. the 7 vital functions). Introduce the topic by showing images of baby animals and reproduction in plants.</td>
<td>explain the process of fertilisation. (Level 8)</td>
</tr>
<tr>
<td></td>
<td><strong>Main activity:</strong> Elaborate on the concept of living things being able to reproduce other ones like themselves and ask students to come up with reasons why this is important. Introduce the sperm and the ovum as specialised sex cells in animals.</td>
<td>label and identify the function of the different parts of the male/female reproductive systems and identify the male/female human cells. (Level 7)</td>
</tr>
<tr>
<td></td>
<td>Explain that a baby is made when these two meet inside the woman’s body.</td>
<td>identify differences between the male and female reproductive systems. (Level 6)</td>
</tr>
<tr>
<td></td>
<td>Use the IWB to go through the structure of the male reproductive system. Elicit the importance and function of each part.</td>
<td>state that a new offspring is the result of a male and female coming together. (Level 5)</td>
</tr>
<tr>
<td></td>
<td>Go through the same process with the female reproductive system. Use the IWB to describe and label the female reproductive system.</td>
<td></td>
</tr>
<tr>
<td><strong>Other activities:</strong></td>
<td>- use a drag and drop labelling exercise to reinforce the learning of the key words.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- students can work in groups to match labels with the parts of the reproductive systems and with their function.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- students use a prepared work sheet to fill in the labels of the male and female reproductive organs.</td>
<td></td>
</tr>
<tr>
<td><strong>Other notes:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. guide students to identify and understand the body changes during puberty and adolescence.

| **Starter suggestion:** Use short advert clips, one about shaving foam and/or the other about sanitary towels. Ask the students questions such as: Who is the advert targeting? Why is it not directed to children? Why do teenagers and adults need these products while kids do not? Introduce the idea of body changes during teenage.

**Main activity:** Ask the students to identify and list changes that take place in boys and girls during adolescence. Elaborate on their results and add any changes that were not elicited. Present puberty as the process of reaching sexual maturity which involves the production of sperms and ova.

Refer to common changes in boys and girls such as growth in height, pubic hair; changes in boys such as change in voice, growth of facial hair, growth of reproductive organs, production of sperms; changes in girls such as development of breasts, menstrual periods, widening of hips.

**Other activities:**
- use a chart to explain the menstrual cycle and explain the terms ‘menstruation’, ‘ovulation’ and ‘periods’.

**Other possible activities:**
- explain that there are other changes that perhaps are less evident such as the production of chemicals (hormones) which cause these changes (physical) and refer to psychological changes.
- give the students an exercise to draw lines between words and their simple meanings.
- use a blank chart to mark the period, fertile and ovulation days in a female.

**link the physical and behavioural changes taking place during puberty and adolescence to hormones** (Level 8)

**describe common processes taking place during puberty and adolescence in the process of reaching sexual maturity.** (Level 7)

**identify common body changes taking place in boys and girls during puberty and adolescence.** (Level 6)

**identify puberty and adolescence as a period of rapid growth and other changes.** (Level 5)
### 3. help students to understand that fertilisation is the fusion of the male and female reproductive cells.

**Starter suggestion:** Present images of parents with their child. Ask students to identify any similarities between the parents and the child. Some students may refer to eye, hair and skin colour, their physical make up, health conditions, character and so on.

**Main activity:** Ask students to give reasons for these similarities. Some students may link this to the role of sex cells and others may refer to environmental (nurture) conditions. Show clips of how sperm meet and fertilise an egg and explain that at this point the nuclei of both cells join together – hence the resemblance of the offspring to the parents. Use a diagram of the female reproductive system and ask students to mark the passage of the sperm until it reaches the egg. Show the place where fertilisation occurs.

Students work in same ability groups to put in order the series of events leading to mating and fertilisation. Some students may use pictures and others statements. Use the IWB to show the correct order of events.

**Other activities:**
- use diagrams of the male and female reproductive systems, discuss where ova and sperm are formed, where fertilisation takes place.
- repeat the same activity using animals as examples. Show that sexual reproduction and fertilisation happens also in animals.
- refer to how twins are formed.

**Other possible activities:**
- discuss the difference in number of sex cells produced. Link the differences in structure to the need for motility of sperms.
- explore examples of internal and external fertilisation in animals

**Other notes:**
- describe the adaptations of sperm and eggs, the process of mating and fertilisation in humans. (Level 8)
- put in order the series of events leading to mating and fertilisation in humans. (Level 7)
- describe that fertilisation is the fusion of the male and female reproductive cells. (Level 6)
- identify the male and female sex cells. (Level 5)
4. engage students to understand and describe what happens during pregnancy and birth.

**Starter suggestion:** use a diagram of the female reproductive system. Ask students to identify where fertilisation occurs and ask them to describe what happens from then on.

**Main activity:** Use a clip to show the development of the fertilised egg into an embryo and a foetus.

Use diagrams or models to show how the baby fits inside the uterus and how the uterus expands with the growth of the foetus. Refer to the function of the placenta as the link between foetus and the mother and the role of the amniotic fluid as protection to the foetus and its development.

Ask students to guess the gestation period of some animals. Compare this to that of humans. Ask students to describe their understanding of the process of birth. Refer to a diagram showing the last stages of pregnancy and explain the process of birth.

**Other activities:**
- identify health hazards during pregnancy. Ask students to work in groups and divide a list of statements into do’s and don’ts for a pregnant woman. They will suggest a reason for their choices. The list will include bad practices such as smoking, alcohol drinking and excessive medications and good practices, such as healthy eating, extra-care when going up stairs, moderate exercise.

**Other possible activities:**
- some students may relate experiences of complications occurring during birth such as a breech baby, premature baby and Caesarian births. (Be aware that some issues may be sensitive for some students.)

**Other notes:**
- describe in more detail what happens during a normal pregnancy and birth and be able to describe some complications that may arise.
  (Level 8)
  - describe in simple terms what happens during a normal pregnancy and birth and be able to identify habits that may harm the foetus.
  (Level 7)
  - recall in simple terms that the fertilised egg grows into a baby during nine months of pregnancy and at the end of which the baby is born.
  (Level 6)
  - understand that a baby grows inside its mother.
  (Level 5)
Unit 7.12 – INCREASING IN NUMBERS

1. Students participate in a memory pair-matching game on the IWB in order to match reproductive structures and their names. This can be set up using http://www.education.vic.gov.au/languagesonline/games/memory/index.htm.

2. Promethean Active Inspire software allows the teacher to set up a label-the-diagram exercise by using layers and magic ink. The students can be asked to write out the labels on the IWB, and then the correct answers are displayed by using the magic ink eraser to remove the written labels and display the hidden ones. Drag and drop games can also be set up using Active Inspire by using hidden containers placed in the required parts of a diagram. Thus, for example, organs can be dragged onto a body map and will only stay in place if they are correctly placed.

3. Students use a ‘sort the sentence’ activity on IWB to identify the steps leading to fertilisation. SMART Notebook Software (if available) has such flash templates included in its resources section. Alternatively use software like http://www.education.vic.gov.au/languagesonline/games/matching/index.htm for matching of steps in the method.

4. Students prepare short presentations using PowerPoint to identify health hazards during pregnancy. Students can work in groups on specific hazards. The different presentations can then be combined to create one single presentation for class viewing and uploading to School web-site.

5. Students prepare a stop-animation movie about plant reproduction and/or about the life cycle of a plant. Hand-drawn diagrams can be scanned (or captured with a webcam or digital camera) and used with movie maker or online software like Monkey Jam (http://www.giantscreamingrobotmonkeys.com/monkeyjam/) to create the final product.

6. Students prepare a poster about a selected flower using http://www.glogster.com/ or similar sites. Students should include images of the different parts of the selected flower, which they can either capture themselves using a digital camera or search for images on the web.
Subject: Integrated Science  
Unit code and title: SCI 7.12 INCREASING IN NUMBERS  
Strand: Life Processes and Living Things  

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

OBJECTIVES at attainment level 5,6,7,8
1. guide students to identify specialised human reproductive cells and describe the structure and function of the human reproductive organs.
2. guide students to identify and understand the body changes during puberty and adolescence.
3. help students to understand that fertilisation is the fusion of the male and female reproductive cells.
4. engage students to understand and describe what happens during pregnancy and birth.

OBJECTIVES at attainment level 1,2,3,4
12.1 guide students to identify specialised reproductive cells and to recognise the structure and function of the human reproductive organs.
12.2 guide students to experience, investigate and communicate what they discover and learn about the parts of the male and female body.
12.3 help students to understand that fertilisation is the fusion of the male and female reproductive cells.
12.4 engage students to try to understand what happens during pregnancy and birth.

Key words
Body, hygiene, sperm, egg, ova, sexual intercourse, sex organs, testis, penis, tube, uterus, cervix, vagina, fertilisation, conception, erection, semen, puberty, adolescence, menstruation, sexual reproduction.

Points to note
Refer to 5E approach to teaching and learning of science.

This is a good opportunity for students to ask questions that may be worrying them. Liaison with PSD department and be familiar with the school policies on sex education. Refer to the fact that values and respect are also part and parcel of human relationships in addition to the biological aspect of reproduction. The importance of privacy and personal hygiene should be highlighted throughout.

For students working within level 1 to 4, 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.

Resources
The human torso, glue, charts, newspapers, paint, paint brushes.

Baby animal pictures:
http://www.environmentalgraffiti.com/featured/weirdest-animal-babies/12030?image=7 (for baby animal pictures)

Male & female reproductive systems:
http://www.kscience.co.uk/revision/reproduction/reproduction_index.htm

Foetal development:
www.justthefacts.org
<table>
<thead>
<tr>
<th>Teaching objective</th>
<th>Example of teaching activities / experiences</th>
<th>Indicators of Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Teacher will:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.1 guide students to identify specialised reproductive cells and describe the structure and function of the human reproductive organs.</td>
<td>The teacher can introduce the topic by showing clips and pictures of baby mammals. Students work in mixed ability groups or individually to identify these animals. The teacher asks students to identify the characteristics of a living thing. Elaborate on the concept of living things being able to produce other ones like themselves. The term reproduction is introduced at this stage. Introduce the sperm and the ovum as specialised sex cells using large pictures. Explain that a baby is made when these two meet inside the woman’s body. Use the IWB to go through the structure of the male reproductive system. Go through the same process with the female reproductive system. Use the IWB to describe and label the female and male reproductive system. Other activities the teacher may use are; Use a drag and drop labelling exercise to reinforce the learning of the key words/symbols. Students can work in groups to match labels with the parts of the reproductive systems and with their function.</td>
<td>Students can: actively participate in activities and will recognise the human reproductive organs. (Level 4) participate in shared activities with less support. (Level 3) show emerging awareness of activities and experiences. They begin to respond consistently to familiar objects and events. (Level 2) these activities may not be appropriate for (Level 1).</td>
</tr>
<tr>
<td>12.2 guide students to experience, investigate, and communicate what they discover and learn about the parts of the male and female body.</td>
<td>The teacher gets the students to look at themselves in a mirror. Put sticky paper on different body parts – link the body part with name (or diagram). The teacher uses a large picture of the body in order to identify key parts. Repeat with the male &amp; female body identifying similarities and differences. Discuss the key differences between men and women and label them on a diagram. The teacher refers to common changes in boys and girls such as growth in height, pubic hair; changes in boys such as change in voice, growth of facial hair, growth of reproductive organs, production of sperms; changes in girls such as development of breasts, menstrual periods, widening of hips. Look at two pictures – one of a young child and one of adolescent and the teacher points out key differences. Recap on the key differences between men and women during puberty changes and label on a diagram. The teacher encourages the students to look at photographs to encourage discussion. The teacher helps the students to identify their own major body parts.</td>
<td>co-operate in shared exploration and supported participation. (Level 4) imitate actions involving body parts, closely observe the changes that occur. (Level 3) recognise some external body parts. (Level 2) encounter activities &amp; experiences development of visual pursuit. (Level 1)</td>
</tr>
</tbody>
</table>
12.3 help students to understand that fertilisation is the fusion of the male and female reproductive cells and this occurs during mating between a male and a female.

The teacher encourages the students to discuss reasons for having babies. Show model/diagram of basic facts involved in intercourse. Keep information very simple throughout using every day terms rather than scientific terms.

Ask students to identify any characteristics they may have which are also found in their mother and father separately. Some students may refer to eye, hair and skin colour, their physical make up, health conditions, character and so on.

Ask students to give reasons for these similarities. Some students may link this to the role of sex cells and others may refer to environmental (nurture) conditions. Show clips of how sperm meet and fertilise an egg and explain that at this point the nuclei of both cells join together – hence the resemblance of the offspring to the parents. Use a diagram of the female reproductive system and ask students to mark the passage of the sperm until it reaches the egg. Show the place where fertilisation occurs.

Ask students to describe how some animals get together to produce offspring. Elicit information from students who have pets at home to describe this process.

Identify the male & female sex cells.

(Level 4) participate in shared activities with less support.

(Level 3) show emerging awareness of activities and experiences. They begin to respond consistently to familiar objects and events.

(Level 2) these activities may not be appropriate for (Level 1).

12.4 engage students to understand what happens during pregnancy and birth.

The teacher shows pictures/slides taken at different times during pregnancy and get the students to spot the differences.

The teacher shows a clip to show the development of the fertilised egg into an embryo and a foetus. Use diagrams or models to show how the baby fits inside the uterus and how the uterus expands with the growth of the foetus. Ask students to guess the gestation period of some animals. Compare this to that of humans. Ask students to describe their understanding of the process of birth. Refer to a diagram showing the last stages of pregnancy and explain the process of birth.

Other activities may include:

The teacher asks the students to work in groups to divide a list of statements or pictures into do’s and don’ts for a pregnant woman. Pictures of different situations should be used. The list will include bad practices such as smoking, alcohol drinking and excessive medications and good practices, such as healthy eating, extra-care when going up stairs, moderate exercise.

Become aware that a baby grows inside its mother.

(Level 4) answer simple scientific questions and consistently sort materials according to given criteria when the contrast is obvious.

(Level 3) communicate observations of a range of features.

(Level 2) these activities may not be appropriate for (Level 1).