

Solomon Islands

# Primary Science

**TEACHER'S GUIDE** **Year 5**



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## Pearson Australia

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# Contents

Introduction to the Teacher's Guide	4
Outcomes-based education and the learner-centred approach	5
The Learner's Book and the syllabus	8
Teaching methods	10
Assessment: recording, monitoring and reporting	16
Resources for Primary Science	23
Links between Primary Science and other subjects	25
Chapter 1 Plant world	26
Chapter 2 Body systems	34
Chapter 3 Energy sources and energy changes	40
Chapter 4 Magnets in our lives	54
Chapter 5 Solubility	62
Chapter 6 Sound and light	70
Chapter 7 Crops and animals for food	83
Chapter 8 The solar system	94
<b>Appendices</b>	
1 Glossary of terms	102
2 Lesson plan format	113
3 Sample individual record form	114
4 Sample class record form	115
5 Sample individual monitoring form	116
6 Sample class monitoring form	117
7 Sample individual remedial work form	118
8 Sample individual report form	119

# Introduction to the Teacher's Guide

This Teacher's Guide supports the *Solomon Islands Primary Science Learner's Book Year 5*. It is meant to give you ideas, not to tell you exactly how to teach. The exact methods and timing you use will vary according to your own circumstances.

The chapters of this Teacher's Guide correspond to the chapters in the Learner's Book. Each chapter is presented in three sections. The first section contains the sub-strand statement and the learning outcomes and indicators for the Learner's Book chapter. The bracketed letters after the outcomes indicate the type of domain covered by the general learning outcomes. There are four domains: understanding (U), knowledge (K), attitudes (A) and skills (S). The information in this section is taken from the Primary Science syllabus.

The second section of each chapter provides support information for the teacher about each of the activities in the Learner's Book. It is presented in table format.

- Column 1 lists important Science processes and skills being developed by each activity.
- Column 2 lists any resources that are needed for the activity and also refers to the *Primary Science Encyclopedia*, by Matthew Cole, 2005.
- Column 3 provides information for teachers about conducting the activity.
- Column 4 gives the reference to the relevant pages in the Learner's Book.

The third section of each chapter lists the answers to the activities and assessment activities in the Learner's Book.

At the beginning of this Teacher's Guide you will find information on:

- outcomes-based education and the learner-centred approach
- the approach of the Learner's Book
- the Learner's Book and the syllabus
- teaching methods
- assessment—recording, monitoring and reporting
- resources required for Science
- the links between Primary Science and other subjects.

At the end of the Teacher's Guide are copies of forms to be used for recording, monitoring and reporting individual and class achievement.

# Outcomes-based education and the learner-centred approach

This Teacher's Guide is written for a Learner's Book and syllabus that follow the outcomes-based approach to learning. This approach has been adopted by the Ministry of Education and Human Resources Development and the Curriculum Development Division as part of the new curriculum for Basic Education from Years 1 to 9.

The basis of this approach is that learners should acquire knowledge, understanding, skills, values and attitudes that will be useful to them later in life. The approach is based on the needs of the learners rather than the needs of the subject. The emphasis is not on the traditional content of the subject, but on choosing those elements of the subject that will be useful and valuable to learners. The curriculum is learner-centred rather than subject-centred.

This learner-centred approach contrasts with the teacher-centred approach that has been common in the past. The emphasis is on learners learning for themselves with the guidance of the teacher rather than being taught by the teacher. This means active learning in which learners do things that help them to find out for themselves, think about and draw on their own knowledge and experience, make observations, do experiments and carry out practical tasks. This can be called "learning by doing".

Syllabuses, textbooks and teacher's guides refer to "learners", which suggests active participation in the process, rather than "students", which suggests passive reception of knowledge. One way to understand the learner-centred approach is to think of the more traditional approach of our schools as "banking education". In banking education, the teacher regards the learners as empty vessels that need be filled with knowledge. The learners are then tested by being asked to reproduce the knowledge the teacher has given them. This method relies a lot on the learner listening to the teacher, copying notes from the board, learning the notes and reproducing them later. Learners can often do this successfully without understanding fully what they are writing and reading.

The present outcome-based and learner-centred approach can be called “problem-posing education”. This assumes that the learners already have their own ideas, knowledge and skills based on previous experience in school or elsewhere. The job of the teacher is to build on this by posing problems to the learners that make them think about their own ideas and experiences, as well as adding new knowledge and skills to it. Learners are also exposed to experiences by being asked to observe reality outside the classroom, look at pictures or diagrams, examine statistics and read passages, and so gain knowledge and develop ideas for themselves. They are then expected to express these in their own words, not those of the teacher, to prove that they have really understood what they have learnt. Learners are encouraged to be responsible for their own learning, to think for themselves and to form their own ideas and opinions. They are encouraged to become critical thinkers and to be able to face new challenges and situations for themselves. Learning becomes a cooperative effort between the learner and the teacher. This approach also emphasizes the use of multiple intelligences. In addition, education is seen not just as a way of passing on knowledge and skills but a way of forming the kinds of values and attitudes that will make people good and responsible citizens in the future.

## The approach of the Learner's Book

The Learner's Book, therefore, is based on these principles. It is not just a summary of the factual knowledge and concepts of the subject. In addition to the content, there are activities for the learners to do and these activities form an essential part of the learning process. It is no longer good enough to simply read the book. Learners must also do the activities in the book.

In the past, activities were often included only at the end of chapters, and learners and teachers often ignored these and moved on to the next “content” section. In these books, the activities are part of the text and must be completed in order to fully learn from the book. Some sections or chapters start with an activity to encourage learners to find out information, think about their own experiences and knowledge, or practise skills for themselves.

There are also many activities based on discussions that encourage learners to form their own ideas. This is to help in the development of desirable values and attitudes.

Many of the activities are to be done in groups. This is to encourage interaction among the learners, as they can often learn as much from each other as they can from the Learner's Book or the teacher.

# The Learner's Book and the syllabus

The Learner's Book is structured according to the strands and sub-strands of the syllabus. Each chapter is based on one or more sub-strands, and the order of the chapters follows the order of the sub-strands of the syllabus.

Within the individual chapters, however, the order of the outcomes in the sub-strand of the syllabus is not necessarily followed. Each sub-strand of the syllabus outlines the knowledge, understanding, skills and attitudes—that is—the outcomes, we want learners to achieve. The Learner's Book gives guidance about how the learners might best achieve these outcomes. The best way to do this is not always to follow the exact order of the outcomes in the syllabus. In teaching, therefore, you should usually follow the order of presentation in the Learner's Book rather than following the order of outcomes in the syllabus. As long as the outcomes are achieved, you have reached your goal.

The Learner's Book contains many illustrations: photos, pictures, maps, diagrams and statistics. These are not just included for decoration—they are often just as important as the words.

## Timing of the syllabus

The time available for Year 5 Science is five periods of 40 minutes per week. While some teachers may find they do not have time to complete all the activities in the Learner's Book, others may complete them all with time to spare. If you do not have time, leave out some sections and move on to the next topic. Do not spend so long on one topic that you miss other topics altogether. Try to teach at least some of every strand of the syllabus. If you have very quick learners, make up extra exercises that challenge them to think about the topic in greater depth.

Some chapters of the Learner's Book cover one sub-strand of the syllabus. Other chapters cover two or more sub-strands that are related to each other and best taught together. The sub-strands of the syllabus covered by a chapter are indicated at the beginning of each chapter.

As explained above, the order of topics in the chapters do not always follow the order of the outcomes in the syllabus. As a teacher, therefore, you should follow the Learner’s Book rather than the syllabus, and use the syllabus as a guide to what the learners should finally achieve.

## Yearly program planner

The yearly program planner shows the Year 5 learning program for the Primary Science course and the suggested teaching times based on 8 teaching weeks per term and 32 teaching weeks per year.

### Year 5

Term 1										Term 2										
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year 5	<b>Plant world</b> LL, 25 periods, 5 weeks					<b>Body systems</b> LL, 15 periods, 3 weeks					<b>Energy sources and energy changes</b> EC, 20 periods, 4 weeks					<b>Magnets in our lives</b> EC, 20 periods, 4 weeks				
	<ul style="list-style-type: none"> <li>Plant parts and their functions</li> <li>Green plants are food producers</li> <li>Plants and reproduction</li> </ul>					<ul style="list-style-type: none"> <li>Organization and control</li> <li>Organisms as systems</li> <li>Senses and control</li> </ul>					<ul style="list-style-type: none"> <li>The Sun as a source of energy</li> <li>What is energy?</li> <li>Different types of energy</li> <li>Kinetic energy to electrical energy</li> </ul>					<ul style="list-style-type: none"> <li>Uses of magnets</li> <li>Magnetic fields</li> <li>Magnetic forces</li> <li>Making magnets</li> <li>Compasses</li> <li>Electromagnets</li> </ul>				
Term 3										Term 4										
Week	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Year 5	<b>Solubility</b> NPM, 20 periods, 4 weeks					<b>Sound and light</b> EC, 20 periods, 4 weeks					<b>Crops and animals for food</b> F, 20 periods, 4 weeks					<b>The solar system</b> EB, 20 periods, 4 weeks				
	<ul style="list-style-type: none"> <li>Solubility</li> <li>Water mixtures</li> <li>Using coloured mixtures</li> <li>Separating mixtures</li> </ul>					<ul style="list-style-type: none"> <li>Sound</li> <li>Hearing sounds</li> <li>Waves of energy</li> <li>The ear</li> <li>Problems with hearing</li> <li>Echoes</li> <li>Light</li> <li>Reflection of light</li> <li>Refraction of light</li> <li>Seeing colours</li> </ul>					<ul style="list-style-type: none"> <li>Types of soil</li> <li>We need soil to grow plants for food</li> <li>Caring for food crops</li> <li>Animals for food</li> <li>Canned food</li> </ul>					<ul style="list-style-type: none"> <li>Orbit</li> <li>The planets</li> <li>Days, months and years</li> <li>The Moon</li> </ul>				

#### Strands

- LL Life and Living  
 EC Energy and Change  
 NPM Natural and Processed Materials  
 F Farming  
 EB Earth and Beyond

# Teaching methods

The following are some teaching methods or approaches you can use to facilitate effective learning in your classrooms. Planning and good preparation are important for effective application of these methods.

## Fieldwork and excursions

Fieldwork is any work outside the classroom. Fieldwork helps learners to link classroom learning to real-world experience outside the classroom. Here learners are instructed to apply the skills of observation, investigation, interviewing etc. as a means of collecting information about the topic of study for themselves, thus achieving the outcomes of the syllabus in more practical and realistic ways. This is very important in science for teaching learners about the real world around them.

Fieldwork is particularly important in the outcomes approach, which aims to link learning to the real needs of the learners. Fieldwork, therefore, is an essential part of teaching, not an optional extra.

To ensure an effective and successful outcome, you must consider important aspects of fieldwork, such as good classroom preparation and planning, an effective process of carrying out actual work in the field and follow-up work in the classroom.

This means you must go and look at the area you plan to do fieldwork in before you do it, and decide exactly what you want learners to observe and do when they go there. The best way is often to provide a questionnaire to the learners before they go. A lot of the work can then be done by learners working in groups to answer the questions, without too much help from you. The activities in the Learner's Book will often provide the basis for a questionnaire.

Fieldwork takes time and may have to be fitted in after the normal teaching time—in an afternoon or even a weekend. Learners can often fill in questionnaires during their own time by looking at their own area—either after school or, in boarding schools, during the holidays.

Fieldwork is difficult in town schools but should not be ignored. You

may have to rely on questionnaires to help learners to do the fieldwork in their own time, as described above. For instance, learners can be encouraged to go out at weekends and look at a river or stream, the sea and coastline, or a farming area. Assignments can also be given for learners to do in their home areas during holidays—this helps them to realize that what they are learning applies to their home area.

## Report writing

The report-writing process involves researching an issue thoroughly, often through fieldwork, collecting the information through one or more of the techniques explained in this section, and organizing the information in a logical and clear manner. In Year 5 you should not place too much emphasis on the formal writing of reports. It is usually enough for learners to answer a series of questions in a questionnaire.

Many of the units in the Year 4 and 5 English course teach learners about research and report writing, so you should know what learners are doing—you could even share an exercise to write up fieldwork or other information as part of their English course.

## Group work

Learners take a more active role and talk naturally when they are allowed to work in small groups. In this way they can express their ideas rather than listening passively to the teacher, as is often the case in the whole class. Group work encourages learners to talk or do things for themselves as part of the learning process. Learners discuss, share views and interact in their learning in small groups and present their collective work to the class. To ensure effective learning during group work, preparation and class management are important for teachers.

Group work must be properly organized and supervised. You must not use it as an excuse to sit back and let learners get on with it. However, learners will often not talk freely if they know the teacher is listening, so you must leave groups to talk on their own. Sometimes it is even effective to walk out of the classroom for a while to give groups a chance to get going without you listening.

The role of the teacher in group work is as follows.

- **Choose the topic.** Groups can only discuss topics that they know something about, and that allow a range of points of view or opinions. You cannot discuss a topic such as “How are volcanoes formed?” because there is only one answer to the question and answers are right or wrong. You can discuss “How can people who live near volcanoes prepare for what to do if the volcano erupts?” There are many different answers and each learner can have different ideas.
- **Set the objective.** Make sure groups know exactly what to discuss and have a set of clear questions to answer. It is not enough just to say “discuss this topic”.
- **Organize the groups.** Groups should be small enough for everyone to be able to talk. They should usually be mixed—different island groups, not all wantoks. It is good to mix girls and boys but do not do this if it leads to girls being too shy to talk. All-girl groups may sometimes be better.
- **Organize the seating.** Good discussion will take place only if learners face each other in a circle. You cannot have a discussion with someone's back! If possible, classrooms may be arranged by grouping desks in circles facing each other so group work is easy and no movement is necessary. In crowded classrooms you may allow some groups to have their discussion outside.
- **Circulate and listen to progress.** It is best to do this only after giving time for discussion to start. Try to make sure that everyone is given a chance to speak. If you see certain people dominating groups, intervene and ask others their ideas. If groups are having difficulty, give guidance by explaining the topic, give some extra questions or ask individuals their ideas. If groups are doing well on their own, do not interfere.
- **Decide on the language to be used.** In Year 5, most learners will want to use Pijin. It is best to let them do so or they may say nothing. There is nothing wrong with a local language if all in the group speak it, but try to get each group to report back their ideas at the end in English, either verbally or in writing.
- **Report back.** It is often a good idea to appoint a ‘chair’, who will report back to the whole class at the end, but this is not always

necessary. Each member may write their own ideas, or groups may just learn from the process of discussion.

## **Debate and discussion**

Group work involves learners in debates and discussions, which are active ways of engaging learners in the learning. Learners are able to conduct and collect information through research to use in debates about a particular topic or share ideas with others in the classroom. They will learn a lot in this process. Discussion can take place in small groups or as a whole class.

Debates are good for encouraging learners to form their own opinions about a topic. Even in Year 5 we should encourage this, using simple topics such as “Do you think girls and boys should be treated equally?”. At this level, debates should be informal, without trying to follow the strict parliamentary rules of debating.

## **Presentations**

Role-play is a type of group work in which learners are given a part to play, in either a discussion or a story. Acting out a role-play encourages learners to participate, interact and learn through talking. Learners imagine themselves in the place of other people and try to think, act and talk as those people would act. Role-play is often best used at the end of a teaching topic, when learners have learnt quite a lot about a topic or about people in a different area. This helps them to think about the ideas, emotions and feelings of those people.

Simulation is similar to role-play, but the emphasis is on a situation rather than the people. Learners are given a situation that is similar to a real-life situation and learners can either be themselves acting in that situation or can act a role-play. For instance, learners are given a story about a dispute leading up to a fight in a school hall. They are asked to play the parts of the people in the story and act it out. This helps them to understand other people and how they feel and also to think about what they themselves would do in a similar situation. For a role-play or simulation to be successful, learners need enough time and information about the person and the situation to enable them to act and talk realistically.

Other types of presentations are:

- drama performances
- dance performances
- talks and reports
- poster presentations
- collage presentations
- cartoon presentations.

The outcomes approach is intended to teach attitudes and values as well as knowledge, understanding and skills. Role-play and simulation are particularly important in teaching attitudes and values.

## Graphs and statistics

Representing information through graphs and statistics is an important and effective way of teaching and learning about a particular topic.

Learners may find some information easier to understand when it is represented in graphical or statistical form. In the Learner's Book, learners are introduced to some simple statistics. You should not use complicated statistics in your teaching, or expect learners to remember statistics. They are there to illustrate a point, not to be learnt.

## Research interviews and questions

There are a number of ways of conducting research interviews with people to collect information about a topic, such as:

- organizing informal chats
- preparing questions to ask particular people
- preparing standardized questionnaires that learners can use with small groups, asking the same questions to a large number of people and later converting the answers into statistical form. There is a simple example of a questionnaire on page 41 of the Learner's Book, which is aimed at finding out what learners know about their senses.

Prepared questions are also useful for fieldwork and they can be used alone or with any of the above techniques to collect information.

## Guest speakers

Asking people from outside the school with specialized knowledge and skills in particular topics to speak to the learners is one way of varying the normal classroom teaching and learning. Through this process, learners will appreciate the importance of specialized knowledge that other people in the community have.

## Visits

If possible, try to visit areas that are relevant to the topic in the Learner's Book. When you visit, make sure learners go with a questionnaire as they would for fieldwork, so they know what to look for and what to find out.

## Case studies

A case study is a detailed study of a particular area or topic. A case study helps learners to translate the abstract topic in the syllabus into concrete reality, and so understand it better.

# Assessment: recording, monitoring and reporting

Assessment is a continuous planned process of gathering, analyzing and interpreting information about learners' knowledge, understanding, skills and attitudes in the various subjects. Assessment enables teachers to judge whether the learning outcomes have been achieved and the learner progress to be reported.

A good system for learner assessment involves:

- planning for assessment
- using a variety of assessment techniques
- providing opportunities for learners to demonstrate performance using the specific learning outcomes given in the syllabus
- diagnosing, analyzing and feedback
- gathering and recording evidence of learners' performance
- observing learners demonstrating a certain skill and assessing their competence
- providing feedback to learners
- making judgments on learners' achievement.
- using a meaningful system of grading achievement
- reporting on learners' achievements by referring to the learning outcomes.

Teachers are encouraged to use an effective recording, monitoring and reporting system. This is a requirement and it is important that teachers keep accurate records of all outcomes assessed for both individual students and the entire class. It is important for teachers to keep updated and accurate records of all assessments conducted for formative purposes. This type of assessment is also known as continuous assessment. This is the teacher's record of the learner's performance, progress and achievements.

## Purpose of assessment

Assessment is about improving learning for both teachers and learners. It is an important ongoing process in teaching and learning and it should

be used continuously; this means that it should not be done only at the end of a particular topic.

Assessment may be formative or summative. Formative assessment is continuous assessment, which takes place throughout every teaching topic and every chapter of the Learner's Book. The assessment information helps you to continually observe and evaluate learners' achievement, and collect data on areas of improvement and the new skills they acquire.

You should focus on the general and specific learning outcomes stated in the syllabus so that learners are aware of what is being assessed, the assessment techniques being used, and the criteria being used. Learners can then judge for themselves whether they are achieving the general and specific learning outcomes.

To make assessment easier, teachers must develop achievement levels. This is often known as "achievement-based assessment". This type of assessment involves the assessing of knowledge, understanding, attitudes and values. It will also assist teachers to identify the level of achievement or attainment for individual students as well as suggesting remedial work for underachieving learners. You can use the specific learning outcomes to identify what to assess. Teachers must also develop descriptors or specific statements to use as evidence to justify whether a learner has achieved an outcome.

Summative assessment tells you what learners have learnt or can do after a whole section of teaching, for example a unit or chapter test. Tests must include skills as well as knowledge. You should test whether learners can read a thermometer, use a compass or interpret directions using a compass, as well as test the factual knowledge they have learnt.

The other type of assessment is "competency-based assessment". This type of assessment involves the assessing of skills. This type of approach is useful for finding out whether learners have acquired the skill competently or not. Such assessment does not need achievement levels.

The purpose of classroom assessments is to support the learning process and to communicate that learning process with others. Learners need to identify what they already know and what needs to be learnt, and be able to apply what they have learnt. Likewise, parents and guardians need to know how their children perform in the classroom.

This assessment approach is known as “assessment as learning”. This process will help learners to do self-assessment and to build a shared language that teachers can use to describe effective learning in the classroom. Learners need to identify their own strengths and weaknesses. They also need to identify their own learning progress and ways that they can improve their learning in the classroom.

## Principles of assessment

To ensure that assessment is effective, assessment practices should:

- be based on an understanding of how students learn
- be a component of course design
- be based on clear standards and criteria
- embrace a variety of measures
- be valid, reliable and consistent
- be an integral part of the teaching and learning process
- give feedback which can be used by teachers to assess the achievement of the learning outcomes and to provide reports to parents and guardians.

## Assessment techniques

Assessment techniques include the following:

- verbal assessment
  - answering questions
  - making a verbal report
  - interviews
- written assessment
  - doing an activity (from textbooks or self-prepared)
  - doing an assignment
  - writing a report
  - sitting for a test or an examination
- practical assessment
  - carrying out a simple scientific activity, as in many of the activities in the Learner's Book
  - participating in a field trip/excursion and collecting information

- demonstrating a particular task
- undertaking basic library research and collecting information
- group work assessment
  - participating in a group task and discussion
  - participating in a role-play and drama
- observation of what individual learners do
- consultation with individual learners by asking them questions
- focused analysis of learners' work such as a portfolio, or a collection of work they have done, to determine how each individual learner is performing in their learning process.

## Recording learners' achievements

It is important to keep accurate records of both individual learners and the whole class. At the end of each assessment event, individual records of achievements must be recorded using the approved recording template. Teachers must indicate whether learners have achieved an outcome, with an A; have partially achieved an outcome, with a PA; or have not achieved an outcome, with an NA. The recommended recording template is shown in Appendix 3.

Up-to-date and accurate records are essential for monitoring and reporting learners' performance, progress and achievements. They are also useful for teachers to show parents, the learner and other key stakeholders.

Sample recording forms are provided for individual learners and the entire class in Appendices 3 and 4. Assessment events should be described in the appropriate columns on the recording forms. Learners achievement should be described as achieved, partially achieved and not achieved.

Teachers must understand the way outcomes are arranged in the syllabus. Section 11 of the syllabus outlines the structure of the syllabus, which differentiates general learning outcomes (shown in column 1) and specific learning outcomes (shown in column 2). Both columns contain learning outcomes that reflect the OBE curriculum approach but are separated to show that the general learning outcomes are open-ended statements while specific learning outcomes are specific statements and are measurable, observable and do-able (can

be demonstrated). The coding of the syllabus indicates the specific learning outcomes for each general learning outcome. The achievement of specific learning outcomes will mean that appropriate general outcomes are also achieved.

The focus of the syllabus is the specific learning outcomes because these are the statements that describe the highest level of performances expected of learners to acquire and demonstrate at the end of each learning activity in a term, semester or a year. These are the curriculum requirements or benchmarks of the approved national school curriculum and are often referred to as the Curriculum Standards. A continuous record of achievement using approved forms will act as a report card for an individual learner. It also evaluates the effectiveness of the teaching program. These forms are also integrated in the recording, monitoring and reporting systems in the National Examination and Standards Unit (NESU), Inspectorate Division, Primary and Secondary Divisions and other divisions of the Ministry of Education and Human Resources Development.

## Monitoring learners' achievements

With accurate records, you can monitor the learning performance, progress and achievements of individual learners and the whole class. You can monitor individual learners' performance, progress and achievements at the end of each assessment event. As you continue to assess more outcomes, the learning pathway of each learner can be mapped and tracked over a period of time, such as a term or semester, in any one year. This information provides useful data when you need to advise learners, parents and other key stakeholders.

In order to identify strengths and weaknesses of individual learners in the classrooms, you need to keep accurate records of the performances of all learners in the class against the performances of an assessed outcome at the end of an assessment event. In this way you can identify which learners have achieved, partially achieved or not achieved the outcome for a particular assessment event. Using this simple monitoring technique, you can identify those who need enrichment support and those who need remedial support to achieve the outcomes required by the national

curriculum. The recommended monitoring template is shown in Appendix 6.

Teachers are also encouraged to build learners' portfolios, or profiles. A portfolio should contain details of knowledge, understanding, skills, attitudes/values and achievements that learners acquire in class. Such information can be obtained from observation of assessment tasks, products resulting from performances, documentary evidence of completed tasks and written accounts of activities. A learner portfolio must be constructed to keep accurate record of learners' achievements for the purposes of effective monitoring and making accurate reporting.

## Reporting learners' achievements

With accurate records and effective monitoring systems, you can make a balanced, accurate and fair report on the learners' performance, progress and achievements in a given assessment period. This type of report, which is recommended by the Ministry of Education, must give a descriptive account of the learners' achievements during a particular term or semester.

This descriptive report does not use marks or grades but instead specifies whether a learner has achieved, partially achieved or not achieved a required outcome. Such statements will be indicated with an A, PA or NA in the approved reporting form. At the end of each assessment period, the teacher has to give an overall achievement level for the learner. This is essential for the calculation of the overall award. The overall achievement level is calculated as a gross point average, whereby the values of each of the outcomes assessed are added and divided by the number of outcomes assessed. The value of each overall achievement level is equivalent to an award of attainment for the learner for a specified assessment period. The recommended reporting template is shown in Appendix 8.

### **Calculation of progressive achievement level for formative assessment**

To calculate the progressive achievement level for the learner, you need to add the values of the achievement levels for all outcomes assessed, and divide by the number of outcomes assessed.

### Calculation of progressive achievement level for summative assessment

To calculate the progressive achievement level for the learner, you need to add the values of the achievement levels for all outcomes assessed, and divide by the number of outcomes assessed.

### Calculation of overall achievement level—formative and summative assessment

To calculate the overall achievement level, you need to add progressive achievement levels for formative and summative assessment and divide by 2. An award is issued to the learner in the form of a coloured certificate in recognition of their achievement. The table below shows achievement levels and the corresponding achievement awards.

Achievement levels	Performance descriptors	Achievement awards	Certificate colour code
Level 5	Learner is competent in 95% or more of the outcomes	Achieve with excellence	Gold
Level 4	Learner is competent in 80–94% of the outcomes	Achieve with merit	Green
Level 3	Learner is competent in 50–79% of the outcomes	Achieve	Pink
Level 2	Learner is competent in 20–49% of the outcomes	Achieve below standards	Orange
Level 1	Learner is competent in less than 20% of the outcomes	Achieve far below standards	Purple
Level 0	Learner is not competent. Does not achieve outcomes	Not achieve	Blue

## Meetings with parents, learners and other stakeholders

Teachers and the school administration are encouraged to consult parents, learners and other stakeholders to discuss the performance, progress and achievements of learners and suggest ways in which each learner can improve. This is a very important process because it involves giving proper feedback to the learners, parents and other key stakeholders. Meetings can be organized by the school administration with the teacher and the parents, or with the teacher, parents and learner. Teachers should keep accurate records of each learner's performance, progress and

achievements and at the same time be able to identify the learning progress for a given period of time during a term, semester or year. These results and data should provide the substance and guidance for the teacher to identify remedial work for each learner and also provide effective feedback to parents, guardians and other stakeholders. The teacher will also need to provide results after each remedial work has been carried out with the learner. Learners who are unable to achieve the curriculum standard or requirement for a particular specific learning outcome are referred to as “under-achievers”.

These very important meetings make important links with parents and key stakeholders, and give parents and stakeholders the confidence to support their children’s education in our schools and to become part of the learning community.

## Resources for Primary Science

Following is a list of materials and equipment required for Primary Science.

### General resource items

Learners can collect many of these items. The school should use some of its grant money to buy the other items in the shops. They are all available.

Aluminium foil	Glass jars	Sand
Balloons	Nails	String
Cardboard	Plastic cups	Tin cans
Cloth	Rubber bands	Torches
Coins		

### Items for specific strands

#### Life and Living

Blu-Tack®	Kumara tuber	Pineapple
Brown paper bags	Large bag	Plates
Clear plastic bags	Large plastic bottle	Pots (for plants)

Coffee	Marbles	Rocks
Cotton balls	Onions	Scarf
Drinking straws	Pac choi	Shells
Eye glasses	Paper cups	Spoons
Fruit juice	Peanuts	Stone (1 kg)
Hibiscus flower	Perfume	Toothpaste

### **Energy and Change**

Ball	Magnet—horseshoe	Rubber ball
Black paper	Margarine	Ruler
Black tray	Metal paper clips	Scissors
Cardboard carton	Metal spoon	Sewing needle
Clear plastic sheet	Mirrors	Steel nail
Coconut oil	Paper	Sticky tape
Dish	Pencil	Teacup
Eraser/rubber	Plastic bowl	Tissue paper
Hammer	Plastic paper clips	Toilet rolls
Insulated wire	Plastic spoon	Waxed paper
Leaves	Polystyrene cup	Wooden peg
Magnet—bar	Rice	

### **Natural and Processed Materials**

Chalk powder	Instant coffee	Serviettes
Curry powder	Milk powder	Spoon
Dirt	Milo powder	Sugar
Eye dropper	Mosquito netting	Tall thin bottle
Filter papers	Muddy water	Tea strainer
Flour	Paper towelling	Thermometer
Fly wire	Salt	Toilet paper
Food colouring		

### **Farming**

Corn	Peanut	Wood
Newspaper	Stones	Yard-long beans

### **Earth and Beyond**

Globe (of the world)	Small soft ball	Soccer ball
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# Links between Primary Science and other subjects

Many other subjects cover topics or skills that are similar to or related to the topics and skills we teach in science. It is important that you are aware of these and, when you teach a topic or use a skill, you point out to learners that they have also learnt about this or will learn about this in another subject.

Below is a list of some of the topics or skills in other subjects that you should be aware of.

Other subjects: sub-strand and level	Science sub-strand and level	
Health Studies	<b>Year 4</b> Looking after our water	<b>Year 4</b> Solubility
	<b>Year 5</b> Clean safe water for living Making healthy food choices	<b>Year 5</b> Clean drinking water Crops and animals for food
Social Studies	<b>Year 3</b> Weather and seasons	<b>Year 5</b> The Earth's revolution, rotation and seasons
	<b>Year 4</b> Transport	<b>Year 5</b> Energy sources and energy changes
	<b>Year 6</b> Using and managing resources	<b>Year 5</b> Gardening skills

# Chapter 1 Plant world

## Strand: Life and Living

**Suggested periods: 25 (5 weeks)**

### Sub-strand statement

Green plants use light energy and carbon dioxide to make food by the process of photosynthesis. Plants absorb water and nutrients from the soil and carbon dioxide from the air. Water transports the nutrients from the soil and food from photosynthesis to all parts of the plant. The food and nutrients allow the plant to grow. Respiration in plants releases energy for growth of photosynthesis. Oxygen is produced as waste in the process and released to the atmosphere.

### General learning outcomes

Learners should:

- 5.1.1 understand that the different parts of a plant have specific functions (U)
- 5.1.2 understand that green plants need water, light energy and carbon dioxide for the process of photosynthesis. This process produces food (U)
- 5.1.3 appreciate that oxygen is a by-product of the process of photosynthesis; green plants give oxygen to the atmosphere (V)
- 5.1.4 understand how nutrients from the soil are absorbed and transported to parts of the plant (U)
- 5.1.5 understand that the green plant uses the food from photosynthesis by respiration (U).

### Specific learning outcomes

Learners should be able to:

- 5.1.1.1 draw a diagram of a plant, labelling the parts and noting their functions

- 5.1.2.1 draw a simple diagram of a green plant to illustrate the process of photosynthesis in terms of light energy, carbon dioxide and oxygen
- 5.1.2.2 do a simple experiment to show that plants need sunlight to grow
- 5.1.3.1 state that the oxygen from the photosynthesis process is used by animals
- 5.1.4.1 indicate the part of a plant stem that transports nutrients absorbed from the soil to other parts of the plant
- 5.1.5.1 tabulate the elements of the processes of photosynthesis and respiration in plants.

Processes and skills	Resources	Teacher's support notes	Learner's Book
Follow activity instructions carefully and make observations.	<i>Explore Science: An Interactive Journey through the World of Science</i> , by Matthew Cole, Pearson Education South Asia, 2005, pages 116–17	<p><b>Activity 1</b> Explore the surrounding school vegetation to locate the plants indicated in the activity prior to the actual lesson. Organize the class into sizeable groups to go outside and do the activity. Direct learners to the locations identified prior to the beginning of the lesson. The observation can be done inside or outside of the classroom. Discussion about the activity is best done in class, when learners come back together again to give feedback and you conclude the lesson.</p> <p><b>Tip</b> Substitute a plant with a tap root and fibrous root system for the plants indicated in the activity if they are not located in the area.</p>	Page 2
Follow activity instructions carefully and make observations.	<i>Explore Science</i> pages 116–17	<p><b>Activity 2</b> Onions are not locally grown and therefore for this activity the onion should be replaced with another plant that has a similar root system (adventitious root system). Plants that can be used as replacements include shallots, lilies, sugar cane and ginger.</p> <p>Learners must collect the relevant plants from Activity 1 and Activity 2 in order to compare the three types of root systems (adventitious, fibrous and tap root), and not rely on textbook pictures to complete the activity.</p>	Pages 3–4
Observe and identify the parts of the shoot system.	<i>Explore Science</i> pages 118–20	<p><b>Activity 3</b> Learners go outside the classroom to do this activity. Soft-stem growing plants that learners can observe without cutting the plant include banana, pawpaw, cucumber, pumpkin, snake beans, sunflower, kumara, and tomatoes. Learners complete the activity by following the activity instructions and answering the activity questions.</p>	Page 5
Observe and make scientific conclusions.	Colouring materials such as dye, ink and food colours; jar, plastic cup, glass cup, water	<p><b>Activity 4</b> Learners carry out the experiment in the Learner's Book.</p> <p><b>Tip</b> Use pac choi stalks because they are white and therefore easy to observe when the food colouring is transported up the stem. It is difficult to see the colour moving up through the stem if the stems are not white. If pac choi is not available, use another soft-stemmed, white-stalk plant in the local area.</p>	Page 6

Processes and skills		Resources		Teacher's support notes		Learner's Book	
Observe.		<i>Explore Science</i> page 119		<p><b>Activity 5</b> A good way to do this activity is to divide learners into smaller groups. Each group collects different types of leaves. Sort the leaves into groups according to size, colour, texture, edge and vein pattern, and talk about their differences. Encourage learners to study the text and diagram in the Learner's Book.</p> <p><b>Tip</b> If for some reason it is impractical for learners to get out to the surrounding environment, ask learners to bring in a variety of leaves from their homes, gardens or other places that they visit on their way to school on the day of the lesson.</p>		Pages 6–7	
Observe and make scientific conclusions.		<i>Explore Science</i> pages 119, 256 Clear plastic cup, leaf, boiled water		<p><b>Activity 6</b> Using volunteers, demonstrate the activity for the whole class.</p> <p><b>Tip</b> To ensure that every learner gets the opportunity to do the activity and observe what happens, ask learners to do the activity (or repeat it) as homework in their own time and to write down their observations.</p>		Page 8	
Observe and make scientific conclusions.		<i>Explore Science</i> pages 119, 256–57 Clear plastic cup, leaf, warm water		<p><b>Activity 7</b> Learners carry out the experiment as in the Learner's Book. Ask them to investigate and observe what is happening. This activity should help learners to appreciate the fact that plants produce oxygen, which is a product of photosynthesis.</p> <p><b>Tip</b> The process of photosynthesis is demonstrated in this activity: under the right conditions, gas exchange occurs as the stomata open and allow carbon dioxide to enter and oxygen gases to exit a plant leaf.</p>		Pages 9–11	

Teacher's support notes		Learner's Book	
Processes and skills	Resources	Teacher's support notes	Learner's Book
Identify energy from food pathways in organisms.	<i>Explore Science</i> pages 119, 256–58	<p><b>Activity 8</b> This activity should help learners to differentiate between photosynthesis and respiration.</p> <p><b>Tip</b> This activity requires learners to think about photosynthesis in a more personal way by looking at what they eat and tracing it back to photosynthesis. For example, a boy eats a flying fox. The flying fox eats fruits from a certain tree. The tree uses sunlight, carbon dioxide and water to make its food to help it grow and bear the fruits that the flying fox eats. Through this activity, learners will appreciate the importance of photosynthesis for all living things. Learners copy and complete the table on page 12 of the Learner's Book.</p>	Pages 12–14
Identify flower parts, draw diagrams and label parts.	<i>Explore Science</i> pages 22, 120	<p><b>Activity 9</b> This would be a good group activity for teamwork and group discussion.</p> <p><b>Tip</b> The Learner's Book does not indicate how to cut up the flower. Giving clear and specific instructions, demonstrate how to cut a trans-section of the flower (see the diagram on page 15 of the Learner's Book) to the class using a razor blade to show the major parts of the female sex organ (pistil) as well as the male sex organ (stamen). Then learners can be assigned to groups to do this activity. Learners should talk about the different parts of the flower, their roles and their functions, and report to the class their group's discussion and conclusions.</p>	Page 15
Observe vegetative reproduction.	<i>Explore Science</i> pages 64–65	<p><b>Activity 10</b> This activity should be done outside the classroom. In smaller groups, follow the instructions on page 17 of the Learner's Book exactly. This activity will take up to three weeks to observe.</p> <p><b>Tip</b> Be careful to only do three pots—not six—of soil. It is also advisable to start the activity one or two weeks before the actual lesson and keep observation charts for the activity so that when it comes to the lesson, the project is well on the way for discussion and feedback and will not drag on too long.</p>	Page 17

Processes and skills	Resources	Teacher's support notes	Learner's Book
Write a summary of what has been learnt in the chapter.	<i>Explore Science</i> referenced texts	<p><b>Chapter review</b> Go through the chapter review to revise the work covered in each of the sections. Refer back to the appropriate pages in the chapter if learners do not easily understand each chapter review statement.</p> <p><b>Tip</b> Learners can assess their knowledge and understanding by ticking the statements (1–16) they understand, crossing those they do not understand and putting a question mark against those that they are unsure of. They can then revise those they do not understand and are unsure of after the exercise by going over the appropriate chapter notes again and seeking help if need be.</p>	Page 18
		<p><b>Concept map</b> Review the concept map with learners to ensure they understand.</p>	Page 19
		<p><b>Revision (assessment)</b> Give learners time to complete questions 1–3 in the Learner's Book.</p>	Page 20

## Activities and assessment answers

### Activity 1 (page 2)

- 3 The sunflower plant has a tap root while the grass plant has a fibrous root.

### Activity 2 (page 3)

- 3 The onion has roots that grow directly from the stem.
- 4 The onion has adventitious roots while the sunflower has a tap root and the grass plant has a fibrous root.

### Activity 3 (page 5)

- 1 Some examples are: tomato plant, banana plant, pumpkin, passionfruit and creepers such as a bean plant.
- 2 Stem, leaf, stalk, trunk, bud, flower and fruit.

### Activity 4 (page 6)

- 3 The white pac choi stalk (stem) absorbs the red water from the jar and transports the water up through the pac choi stem. The white stem appears red as it is stained by the red-coloured water being transported upwards.

### Activity 5 (page 6)

Compare learners' descriptions of leaf sizes, shapes and colours.

### Activity 6 (page 8)

- 5 Small bubbles (gases) come out through small openings in the leaf (stomata).

### Activity 7 (page 9)

Small bubbles come out from the underside of the leaf when it is placed in warm water in sunlight. When the leaf is heated, the gases inside the leaf expand and escape through the openings in the leaf called the stomata.

### Activity 8 (page 12)

- Scientists say all living things need photosynthesis because all living things need food and their food comes directly or indirectly from photosynthesis by plants.

Food name	From plant— yes/no?	From animal— yes/no?	What animal eats this?
Rice	Yes	No	human, chicken, dog, cat
Egg	No	Yes	
Pig meat	No	Yes	
Cucumber	Yes	No	human, pig

- Photosynthesis takes place mainly in leaves because chlorophyll (green substance) are found mainly in leaves, and more specifically green leaves. Other leaves can photosynthesize if chlorophyll is present in the leaves.

### Activity 9 (page 15)

- 2 Petals, stamens (anther, filament), pistil (stigma, style, ovary), sepals, flower stalk.

### Activity 10 (page 17)

- 3 After three weeks:
  - new kumara plants did not grow in all three pots
  - new plants grew in the second and third pots
  - one new plant grew in the second pot and two new plants in the third pot.

### Revision (page 20)

- 1 A
- 2 d
- 3 Error—none of the responses to this question is appropriate.

# Chapter 2 Body systems

## Strand: Life and Living

**Suggested periods: 15 (3 weeks)**

### Sub-strand statement:

The human body has special systems that complement each other in carrying out their functions. The major organ systems in mammals are the digestive system, the circulatory system and the respiratory system. These systems play important roles in sustaining life. The digestive system absorbs nutrients from food intake. The nutrients in food are transported in the blood by the circulatory system to the rest of the body by the pumping action of the heart. Air that is inhaled through the respiratory system is absorbed and transported throughout the body by the circulatory system. The skeletal system, on the other hand, gives the body its shape and protects the inner organs. The muscular system enables the body to move.

### General learning outcomes

Learners should:

- 5.2.1 understand the functions of the major organ systems, namely the skeletal, digestive, muscular, and circulatory and respiratory systems (U)
- 5.2.2 appreciate the interrelationship between the different systems in the process of maintaining life (V)
- 5.2.3 understand that, during digestion, food is made soluble so that it can enter the blood (U)
- 5.2.4 understand that our sense organs enable us to find out about changes in the environment (K).

### Specific learning outcomes

Learners should be able to:

- 5.2.1.1 outline the basic functions of the major organ systems

- 5.2.1.2 show on a diagram the basic structure of the major organs
- 5.2.2.1 explain how the digestive system absorbs nutrients into the blood, the respiratory system filters air into the blood, and the circulatory system distributes blood to the body
- 5.2.2.2 explain that the skeleton gives the body its shape and protects the body organs
- 5.2.3.1 state the reason why food must be made soluble before it enters the blood
- 5.2.4.1 name and locate the five sense organs.



Processes and skills	Resources	Teacher's support notes	Learner's Book
	<p><i>Primary Science Encyclopaedia</i> pages 121–37</p>	<p><b>Interdependence of body systems</b> Learners discuss some of the different systems within the body. Read through the text on page 29 to find out how the different body systems depend on each other in all the different sorts of activities we are engaged in.</p> <p><b>Activity 5</b> This is an individual activity. Each learner should try to answer each question in their exercise book.</p> <p><b>Tip</b> Emphasize the importance of individual reflections on these questions: what happens if one of the systems does not work properly; how would learners feel?</p>	Pages 29–30
	<p><i>Explore Science</i> page 136 Cotton balls, aluminium foil, cloth, stones, marbles, shells, a large bag</p>	<p><b>Activity 6</b> Learners carry out the activity to test their sense of touch.</p>	Page 32
	<p><i>Explore Science</i> page 134 Toothpaste, coffee, onions, perfume, scarf</p>	<p><b>Activity 7</b> Learners carry out the activity to test their sense of smell.</p>	Page 32
	<p><i>Explore Science</i> page 135 2 chairs, a sheet, some household items such as spoons and plates, coins, a peanut in a plastic jar and a bag</p>	<p><b>Activity 8</b> Learners carry out the activity to test their sense of hearing.</p>	Page 33

Processes and skills	Resources	Teacher's support notes	Learner's Book
Conduct an investigation to test the sense of taste.	<p><i>Explore Science</i> page 133 Pair of eye glasses</p> <p><i>Explore Science</i> page 137 Fruits (e.g. bush lime, orange, pineapple etc.), paper cups, scarf (piece of cloth)</p>	<p><b>Activity 9</b> Learners do the activity in the Learner's Book as an introduction to the topic "sight". Refer to page 133 in <i>Explore Science</i> for further information.</p> <p><b>Activity 10</b> This activity will be interesting if learners attempt to determine the type of juice without looking at the fruits. This is a good test of learners' sense of taste.</p>	<p>Page 33</p> <p>Page 34</p>
		<p><b>Where are our sense organs?</b> Lead learners through the text and the table.</p>	<p>Pages 35–36</p>
		<p><b>Chapter review</b> Go through the chapter review to revise the work in each section in the chapter.</p> <p><b>Tip</b> Learners can assess their knowledge and understanding by ticking the statements (1–11) they understand, crossing those they do not understand and putting a question mark against those they are unsure of. They can then revise the ones they do not understand and are unsure of after the exercise by going over the appropriate chapter notes again and seeking help from the teacher if need be.</p>	<p>Page 37</p>
		<p><b>Revision (assessment)</b> Give learners time to complete the tasks in the Learner's Book.</p> <p><b>Tip</b> This is a very important and interesting assessment activity. Go through the activity with learners to help them conduct the activity successfully. They use vital skills to conduct a survey, present data and solve problems by making informed decisions based on evidence from data collected and by applying knowledge learnt (types of senses).</p>	<p>Pages 40–41</p>

# Activities and assessment answers

## Activity 1 (page 23)

4 Refer to shoot systems and root systems in Chapter 1 to answer this question.

## Activity 2 (page 26)

5 The muscles become longer and shorter as you lift things up and down.

## Activity 3 (page 26)

Learners' answers will depend on individual descriptions.

## Activity 4 (page 27)

2 The balloons take in air.

3 The balloons push out air.

## Activity 5 (page 29)

1 Life would not be possible without our systems.

2 Our circulatory, respiratory and digestive systems would not work without the muscular and skeletal systems.

3 Our hearts will not pump blood to our bodies without muscles.

4 We cannot breathe without our diaphragms.

5 We cannot swallow food without muscles.

## Activities 6–10 (page 32–34)

Learners' answers will depend on individual findings.

## Revision (pages 40–41)

Examples of daily activities:

Activity	Digestive system	Circulatory system	Skeletal system	Muscular system	Respiratory system	Sense organs
Eating	X		X	X	X	X
Breathing			X	X	X	
Drinking	X		X	X		X

# Chapter 3 Energy sources and energy changes

## Strand: Energy and Change

**Suggested periods: 20 (4 weeks)**

### Sub-strand statement:

Energy that we use today comes from many different sources. Some sources are renewable while others are non-renewable. Renewable energy sources are able to regenerate themselves and so may always be available in the environment, for example wood, coconut oil. Non-renewable energy sources are finite—they are used up over time. Our planet has a limited supply of energy; therefore energy sources must be used in a sustainable way. Energy can be converted from one form to another. Energy can be transferred in the form of stored energy, kinetic energy or heat energy to other useful forms.

### General learning outcomes

Learners should:

- 5.3.1 know that energy sources may be renewable or non-renewable (K)
- 5.3.2 know that the Sun is the primary source of light and heat energy (K)
- 5.3.3 understand that there is a limited supply of energy on our planet (U)
- 5.3.4 identify types of energy resources used in the school, the community and the country (U)
- 5.3.5 know that the process of energy conversion involves many energy changes (K)
- 5.3.6 appreciate that people must use their energy resources carefully (A/U)
- 5.3.7 appreciate that energy allows our body to do different tasks (A/U).

## **Specific learning outcomes**

Learners should be able to:

- 5.3.1.1 identify different types of energy sources
- 5.3.2.1 recognize that the Sun is the primary source of heat energy
- 5.3.3.1 state some implications of limited global energy on the lives of Solomon Islanders
- 5.3.4.1 give examples of different types of energy used in the school, community and country
- 5.3.5.1 illustrate, by drawing a diagram with labels, the process of energy conversion from stored energy to kinetic energy and then to heat energy
- 5.3.6.1 communicate personal opinions about the importance of energy to life
- 5.3.7.1 define energy as the ability to do work.

Processes and skills		Resources	Teacher's support notes	Learner's Book
Use different communication means to gather information about the importance of light.	<i>Explore Science</i> pages 94–95	<b>No Sun, no life</b> Allow time for learners to imagine the scenes described and give feedback when necessary. Emphasize the fact that without sunlight (in total darkness) we would not see, we would be cold and life will not be pleasant for human beings. We would not want to live in darkness and in cold because that would not be life at all—so it seems that without the Sun, there is no life.	Page 43	
Make deductions concerning the heating effect of the Sun.	<i>Explore Science</i> pages 94–95, 224	<b>Activity 1</b> This activity is to be done in groups of five learners per group. It is important for learners to experience the warming effect of the Sun at first hand. Thus it is important to allow them to each take turns at standing in the Sun for 2 minutes. To save time, ask all the group members to stand in the Sun and move under the shade at the same time. <b>Tip</b> The activity introduces the Sun as a source of heat energy. By feeling the heat on their body, learners experience some of that heat on themselves.	Page 43	
Make suggestions about the importance of the Sun to life on Earth. Value the Sun as the source of energy for all.	<i>Explore Science</i> pages 95, 224	<b>The Sun is a source of energy</b> Emphasize the importance of the Sun to life on Earth by highlighting some of the characteristics of the Sun as mentioned in the text. Note that the Sun gives out heat and light energy. You can even expound on it.	Page 43	
Make deductions about the Sun as the source of all fossil fuels.	<i>Explore Science</i> pages 216, 227	<b>Energy from fossil fuels came from the Sun</b> The key idea here is that the Sun is the source of energy for all living things. Explain clearly the basic formation of fossil fuels to learners, using the diagrams to aid your explanation. Note that it took millions of years to produce fossil fuels. Ask learners to give some examples of fossil fuels after your explanation.	Page 44	

Processes and skills	Resources	Teacher's support notes	Learner's Book
<p>Define energy. Demonstrate what is shown in illustrations after identifying the forms of energy for each illustration.</p>	<p><i>Explore Science</i> pages 224–26</p>	<p><b>What is energy?</b> Note the definition of energy: the ability to do work. Learners should identify the different forms of energy in the illustrations. Allow learners to think for themselves and identify the form of energy that each of the illustrated activities represents or requires.</p>	<p>Page 45</p>
<p>Observe and conduct experiments to demonstrate the ability of energy to change objects.</p>	<p><i>Explore Science</i> pages 227–29</p>	<p><b>All from the Sun</b> Everything that human beings do is because of energy. Our daily activities are only possible because of energy. Without energy, all human activities would be impossible. We would not be able to lift things, run, swim, play or read. Emphasize to learners that plants use energy from the Sun to produce food that is consumed by both animals and humans.</p>	<p>Page 46</p>
<p>Use appropriate tasks to make interconnections with energy usage in humans and machines.</p>	<p><i>Explore Science</i> pages 94–95</p>	<p><b>Activity 2</b> This activity is important as it gives the opportunity for learners to express their ideas, beliefs and what they already understand about what is being discussed. Do not provide answers to the class. Allow learners to think for themselves and deduce answers to the questions being asked (see <i>Activity and Assessment answers</i> on page 50 for guidance). Give ample time for learners to think and write their answers. Emphasize the importance of food as a source of energy for humans.</p>	<p>Page 47</p>
<p>Classify organisms into their nutritional classes.</p>	<p><i>Explore Science</i> pages 192–93, 223</p>	<p><b>Activity 3</b> Learners copy and complete the table, and answer the questions that follow. This activity gives learners the opportunity to find out for themselves that the Sun is the source of energy. By using the food chains of different groups of animals (herbivores, omnivores, carnivores) to trace their sources of energy, it should become clear to them that the Sun is the primary source of energy for all living things.</p>	<p>Page 47</p>

Processes and skills	Resources	Teacher's support notes	Learner's Book
Observe energy transformation in our daily lives.	<i>Explore Science</i> pages 150–51, 227–33	<p><b>Also from the Sun</b> The law of energy is: energy is neither created nor destroyed but changes from one form into another. In this activity different forms of energy and their applications are illustrated. Use illustrations to aid your explanation.</p>	Page 48
Identify energy usage by the human body.	<i>Explore Science</i> page 258	<p><b>How do we use energy in our bodies?</b> Without energy the entire body would not perform its different functions as it ought to. In order for our bodies to digest food, grow new cells and tissues, repair old and damaged tissues, move, reproduce and be healthy, we need energy. Our source of energy is from the plants and animals that we eat.</p>	Page 49
Analyze a day's work (list of activities) and the energy needed to do daily tasks.	<i>Explore Science</i> pages 230–33	<p><b>Activity 4</b> Point out to learners that what they have learnt so far is not just about other people or other living things—it is also true for them. In this activity learners use their own experiences to answer the questions. Give learners time to think for themselves. Encourage them to reflect on what they do in a day.</p>	Page 49
Observe types of energy in nature. Identify energy forms and their usage in nature by humans.	<p><i>Explore Science</i> pages 246–51</p> <p><i>Explore Science</i> pages 245–61</p>	<p><b>Different types of energy</b> Energy exists in nature in different forms. Energy allows us to change and transform many substances.</p> <p><b>Light energy</b> This is one of the forms energy takes in nature and even in every home. Without light, life would be a misery. We could not see very far.</p>	Page 49
Observe the heating process through conduction as a means of light.	<i>Explore Science</i> page 239	<p><b>Heat energy</b> Make good use of the illustrations provided. In your class discussion, explain the importance of heat to life. If possible, use real objects such as light bulbs, fire, vehicles, candles etc.</p>	Page 50

Processes and skills		Resources	Teacher's support notes	Learner's Book
Devise a sound exercise to show how sound travels from one place to another.	<i>Explore Science</i> pages 252–55	<b>Sound energy</b> Ask learners to pair up and ask one individual to sing while the other listens. Emphasize that it is the vocal chords in the throat that vibrate and produce the sound. If your school is near a road, listen to the different sounds that vehicles travelling down the road make. If your school is situated near an airport, take a trip to the airstrip to do this activity.	Page 51	
Evaluate the concept of stored energy as chemical energy.	<i>Explore Science</i> page 232	<b>Stored energy</b> Explain the concept of stored energy. Use the objects identified in the Learner's Book and other suitable objects to demonstrate stored energy.	Page 52	
Work with others to explore heat transfer.	<i>Explore Science</i> pages 237–43	<b>Heat (thermal) energy</b> Explain heat energy in terms of energy used for cooking and keeping us warm. Heat energy causes an increase in temperature. Note that temperature is a measure of how hot an object is. To measure temperature we use an instrument called a thermometer. Note also how heat transfers from its source to the cooked object (potato) through conduction.	Page 53	
Carry out an investigation to observe conduction of heat.	<i>Explore Science</i> pages 240–41 2 coffee cups, 1 plastic spoon, 1 metal spoon, margarine, 1 metal plate, 1 plastic plate	<b>Activity 5</b> Organize groups of four learners per group. Ensure that learners make inferences before they carry out the activity. See that there is enough equipment for all learners to do the activity. <i>Tip:</i> The emphasis in this activity should be on energy transfer. Learners discover that the hot water in the cup transfers heat energy to the metal spoon, which is initially cold. The metal spoon, upon receiving heat energy from the cup of hot water, gradually becomes hot, meaning that it has received heat energy. We can prove this because we see that the margarine on the metal spoon melts. This indicates that metal is a good heat conductor. The margarine on the plastic spoon does not melt, showing that plastic is not a good heat conductor. Heat energy is transferred from the hotter part to the cooler part. Explain the difference between good and poor conductors of heat. Bring some examples, using both types of conductors and allowing learners to decide which are good conductors.	Page 53	

Processes and skills	Resources	Teacher's support notes	Learner's Book
Observe energy that moves and its effects.	<i>Explore Science</i> page 236	<p><b>Movement energy (kinetic energy)</b> Kinetic energy is due to movement. Moving energy can be converted into other forms of energy. Make good use of the illustrations provided and add some more suitable examples for your context.</p>	Page 54
Conduct an experiment to observe the change kinetic energy causes in objects.	<i>Explore Science</i> page 230	<p><b>Activity 6</b> Allow learners to deduce the answers to the questions themselves. You are there to guide learners. It is important to highlight the relationship between speed and energy involved. The faster the object the more the energy exerted.</p> <p><b>Tip</b> Four important facts from this lesson are:</p> <ul style="list-style-type: none"> <li>• heavy moving objects have more energy</li> <li>• light moving objects have less energy</li> <li>• fast-moving objects have more kinetic energy</li> <li>• slow-moving objects have less kinetic energy.</li> </ul>	Page 54
Observe the transformation from kinetic energy to electrical energy, etc.	<i>Explore Science</i> page 230	<p><b>Kinetic energy to electrical energy</b> Kinetic energy can be converted to electrical energy; for example, kinetic energy from water turns into electricity (hydro power). Use the illustration of the windmill to explain how wind energy can be converted into electricity. Moving energy has the potential to change things, including the physical features of both natural and human-made things. If there are examples of a hydro power plant nearby, or a windmill, make an effort to take a field trip there.</p>	Page 55

Processes and skills	Resources	Teacher's support notes	Learner's Book
<p>Make conclusions about sound travelling through a medium.</p> <p>Evaluate and make comparisons of how sound travels in air and in water.</p>	<p><i>Explore Science</i> pages 252–55</p>	<p><b>Sound travels</b> It is important to introduce the idea that sound travels through a medium. Explain what a medium refers to. Without a medium, sound cannot travel. We hear sounds due to sound travelling in air particles.</p> <p><b>Activity 7</b> If the school is near a pool (swimming pool, water pool, sea or river), organize a class swim for the second part of the activity, so learners gain first-hand experience of sound in water.</p> <p><b>Tip</b> Three important facts from this lesson are:</p> <ul style="list-style-type: none"> <li>• sound is transmitted through air</li> <li>• sound travels through water</li> <li>• sound is transmitted through solids as vibrations.</li> </ul>	<p>Page 56</p>
<p>Observe how sound travels through vibration.</p>	<p><i>Explore Science</i> pages 252–55</p>	<p><b>Activity 8</b> Use a guitar to demonstrate how taut strings are plucked and vibrate. Allow time for learners to do the activity. Note that the class will be noisy. If necessary, find a shady spot around the school to avoid disturbing other classes.</p> <p><b>Tip</b> The activity illustrates that sound travels through solids (guitar strings, voice boxes) as vibrations that we hear as sound.</p>	<p>Page 56</p>
<p>Deduce the importance of electrical energy to life.</p>	<p><i>Explore Science</i> pages 147–49</p>	<p><b>Electrical energy</b> Discuss in class how important electricity is to us today. Without electricity we would not be able to light our houses, we would not have freezers to preserve our food, and we could not enjoy our favourite TV shows. Bring into class a variety of electrical items and use them to explain this form of energy to your class. If you are in a remote area, use equipment that learners are familiar with, for example a radio.</p>	<p>Page 57</p>

Processes and skills		Resources		Teacher's support notes		Learner's Book	
Conduct a mini survey on electrical usage and appliances.	<i>Explore Science</i> pages 147–49	<p><b>Activity 9</b> This activity requires two periods of 40 minutes for learners to conduct the survey and do their write-up. If there is enough time available they can report back or do the presentation in their next lesson.</p> <p><b>Tip</b> This mini research task is important for developing skills and processes in science, such as following instructions in the book to conduct research, collecting data from the research questions in the Learner's Book and processing them into graphs and tables, and using those graphs and tables to communicate the results to the class in a meaningful way. The emphasis is on the skills involved, not just the completion of the task.</p>	Page 57				
Observe and make deductions about chemical-potential energy.	<i>Explore Science</i> pages 230–33	<p><b>Potential energy</b> Use the illustrations to help explain potential energy. It is important to highlight the fact that we have potential energy in us when we eat energy food such as bread, potato, cassava, banana and other types of fruits. Note the photosynthesis process of plants absorbing light energy and converting it into chemical-potential energy that humans and animals eat.</p>	Page 58				
Observe and make judgements about gravitational-potential energy.	<i>Explore Science</i> pages 230–33	<p><b>Activity 10</b> This activity is based on the concept of gravitational-potential energy. Objects at different heights have different potential energies. An object with greater mass has a more damaging impact if dropped than an object with a smaller mass. Allow learners to think about and write their answers.</p>	Page 59				
Observe elastic-potential energy in bouncing balls, rubber bands and springs.	<i>Explore Science</i> page 232 Rubber bands, a sling, springs, and a bouncing ball	<p><b>Elastic—potential energy</b> Use the objects listed in the previous column to aid your discussion on elastic-potential energy. Do the demonstration of a bouncing ball and take note of the energy changes that are taking place throughout the activity. Explain the process step by step so that learners can fully understand changes involved. It is highly recommended that you allow learners to do the demonstration.</p>	Page 60				

Processes and skills		Resources	Teacher's support notes	Learner's Book
Conduct an elastic-potential energy activity. Observing energy stored in rubber bands.	<i>Explore Science</i> page 232	<b>Activity 11</b> This is an elastic-potential activity. Make sure that learners take care not to harm anyone when handling the catapult. Direct the stone to an open space, not towards another person or where other people are present. <b>Tip</b> The main concept to be understood by learners is energy transfer. Remember that energy can only be transferred—it cannot be created or destroyed. In the activity with the bouncing ball there are four stages of energy transfer: <b>1</b> gravitational-potential energy to kinetic energy <b>2</b> kinetic energy to elastic-potential energy <b>3</b> elastic-potential energy to kinetic energy <b>4</b> kinetic energy to gravitational-potential energy.	Page 60	
Write a summary of what has been learnt in the chapter.	<i>Explore Science</i> pages 224–58	<b>Chapter review</b> To revise the concepts covered, go over these concepts or summary statements and provide additional explanations, statement by statement. Do not limit learners to the summary statements provided. You need to elaborate on the statements.	Page 61	
Make and establish links between concepts.		<b>Concept map</b> Work through the concept map with learners. Try to ensure that learners understand clearly how each concept relates to others in the map. Provide further information if necessary for learners to fully understand.	Page 62	
Answer questions to show an understanding of what has been learnt.		<b>Revision</b> Learners should answer of all the revision questions. Go through the questions and give answers to the questions so that learners have immediate feedback.	Page 63	

## Activities and assessment answers

### Activity 1 (page 43)

- 1 Learners should say that they feel hot or warmer. This is because the heating effects of the Sun increase their body temperature.
- 2 When they move back to shade they will feel cooler and much more comfortable since their body temperature lowers back to normal.
- 3

What I did	Observing (what I feel)
Standing in the Sun for 2 minutes	I feel warm and hotter as my temperature increases.
Sitting in the classroom/shade for 2 minutes	I feel cooler as my temperature reduces to normal body temperature.

- 4 I would feel much hotter than when I was out in the Sun for only 2 minutes.
- 5 The skin as a sense organ senses heat on your skin and your nervous system communicates this to your brain, which makes you feel what you feel.

### Activity 2 (page 47)

- People die without food because their body systems (internal organs) can no longer function due to lack of energy.
- Food gives us energy.
- Factories do need energy to carry out their work. Without energy, their machines cannot operate.
- Buses and other vehicles need energy so that they can work when we need to use them.
- My body is like a factory working to keep me alive.
- My body needs energy all the time, 24 hours a day, even when I am asleep.

### Activity 3 (page 47)

Organism	Producer (Make own food)	Herbivore (Eat plants)	Omnivore (Eat plants and animals)	Carnivores (Eat other animals)
Human	–	Eats plants, vegetables, fruit. Plants make their own food using energy from the Sun.	Eats both animals and plants.	Eats animals that eat plants as well, and animals that eat other animals, such as some fish.
Cow	–	Eats grass. Grasses make their own food using energy from the Sun.	–	–
Shark	–	–	–	Eats other fish in the sea. These fish eat other smaller fish, which in turn eat small plants in the sea. These plants make their own food using the energy from the Sun.
Dog	–	–	Eats plants and animals, e.g. cats, rats or pigs. Plants produce their own food using the energy from the Sun.	Eats animals.
Tiger	–	–	–	Eats animals that may be feeding on plants. Plants make their own food using the energy from the Sun.
Cat	–	–	Eats plants and animals. Plants make their own food using the energy from the Sun.	Eats animals (lizards). Lizards eat insects that feed on plants and scraps. Plants make their own food using the energy from the Sun.
Fish	–	–	Eats phytoplankton and zooplankton. Phytoplankton make their own food using the energy from the Sun.	Eats other fish. Fish eat other smaller fish that in turn eat small plants in the sea. These plants make their own food using the energy from the Sun.

- Yes. The Sun is our ultimate source of energy.
- All forms of life on Earth depend directly or indirectly on energy from the Sun.

### **Activity 4 (page 49)**

- No, I cannot get through the day without energy.
- Some things humans do daily:
  - thinking in class
  - walking from home to school in the morning and evenings
  - cooking the rice
  - cutting the firewood for cooking
  - going fishing
  - doing gardening
  - paddling the canoe
  - talking/teaching
  - building a house
  - all manual/trade work.

### **Activity 5 (page 53)**

- The blob of margarine on the metal spoon will melt first.
- Yes—metals are good conductors of heat.
- Yes—heat energy transfers from a hotter part to a cooler part.

### **Activity 6 (page 54)**

- More eggs will be broken.
- No eggs will be broken.
- The heavy metal ball gives the greater impact.
- The car will be damaged severely.
- The impact would be greater than with a slower moving vehicle.

### **Activity 7 (page 56)**

- Yes, I can hear sounds in water.
- Yes, I can hear the banging of stones when I dive under water.
- Yes, sounds can be transmitted by solids.
- Yes, I can hear the knocking.

### **Activity 8 (page 56)**

- Yes, I can feel the vibrations in my voice.
- I can feel a vibration.

### **Activity 9 (page 57)**

The following are the types of answers that learners may present.

Household/ Family	Light source (appliances )	Sources of energy	Other appliances that depend on electricity
Auna A	Hurricane lamp	Kerosene	–
Tema J	Solar light	Sun	Tape recorder, DVD player
Maratino P	Fluorescent tube	Electricity	Desktop computer, printer
Totom H	Table lamp	Battery	Laptop computer, audio system

### Activity 10 (page 59)

- The two stones have different amounts of potential energy because they are at different heights: the stone on the house has the greater potential energy as it is higher.
- In the tree, the bigger stone has the greater potential energy due to its size.

### Activity 11 (page 60)

- 2 There are marks on the ground that the stones produce as they land on the ground. There is a difference in the size of stone marks on the ground. They are also different distances from the launching position. This is due to the difference in the length of the pull of the catapult (sling). The longer the pull, the bigger the elastic-potential energy.

### Revision (page 63)

- 1 Answer is (3); i.e. A, C and D are true.
- 2 A
- 3 Energy from the Sun in the form of light enters the green leaves of plants. The plant then uses photosynthesis to produce food for both humans and animals.
- 4 Yes, the Sun is important, because:
  - it is the source of energy for all life forms on Earth
  - it gives us light and heat energy to light up the world and to warm us on Earth.

# Chapter 4 Magnets in our lives

## Strand: Energy and Change

**Suggested periods: 20 (4 weeks)**

### Sub-strand statement:

A magnet exerts a force called a magnetic force. It has a north and a south pole. The magnetic force is strongest at its poles, but there is a field of force around it. The unlike poles (north/south) attract, and the like poles (e.g. north/north) repel. Magnets can attract or repel certain materials. A temporary magnetic field is created when electricity flows in a wire. This is called the “electromagnetic effect”. Our Earth also has a magnetic field. We can use magnets to find directions on the Earth’s surface.

### General learning outcomes

Learners should:

- 5.4.1 understand that a magnet can be used for orientation on the Earth’s surface (U)
- 5.4.2 appreciate that magnets attract some materials but not others (U)
- 5.4.3 know that some materials are magnetic and others are non-magnetic (K)
- 5.4.4 know that unlike poles of magnets attract and like poles repel (K)
- 5.4.5 know that there is a link between magnetism and electricity (K)
- 5.4.6 appreciate that the electromagnetic effect is applied in everyday devices such as the electric bell (V).

### Specific learning outcomes

Learners should be able to:

- 5.4.1.1 identify and name the north and south poles of a magnet
- 5.4.1.2 use a small magnet to identify direction on the Earth’s surface
- 5.4.2.1 demonstrate the attraction and repulsion of magnets
- 5.4.3.1 list some magnetic materials and some non-magnetic materials

- 5.4.4.1 demonstrate that the north poles of two different magnets repel each other and the north and south attract each other
- 5.4.5.1 make a simple electro-magnet by coiling a covered wire round a nail and passing a current through it.

Processes and skills	Resources	Teacher's support notes	Learner's Book
Share ideas and explain what a magnet is.	<p><i>Explore Science</i> page 166 Magnet, cotton wool, peg, screw, nails, metallic paper clips, scissors, spoon, pencil, safety pin, key, book, leaf, coins, plastics, eraser, etc.</p>	<p><b>Magnets</b> Organize to collect some of the items listed to introduce the lesson. These items are familiar to learners and you can start introducing the term "magnet" as you discuss some of the functions of the items. For example, magnets are found in freezers and they help the door to close tightly. Chainsaws have magnets to keep the chains around the blade when it is being used. Explain to learners that magnets are useful in everyday life. We don't realize that we use them because most of them are hidden in machines. Show learners what a magnet looks like and explain some of its functions.</p>	Page 65
Identify objects that are attracted to magnets.		<p><b>Activity 1</b> Bring to the classroom a variety of objects, some of which are attracted to magnets and some of which are not. Divide learners into groups. Give each group some of the objects and a magnet, if possible. Ask learners to find out which objects are attracted to the magnets and which objects are not. Make a record of each group's findings. Learners copy and complete the table in the Learner's Book.</p>	Page 66
	<p><i>Explore Science</i> page 252 Magnet, metal paper clips, aluminium foil</p>	<p><b>Activity 2</b> In this activity learners observe the force of a magnet. Use objects other than a magnet to pick up paper clips. A magnet attracts magnetic objects to itself using its magnetic force.</p>	Page 68

Processes and skills		Resources	Teacher's support notes	Learner's Book
Make comparisons and classify objects that are attracted to magnets.	Piece of paper, rubber ball, piece of aluminium foil, small plastic spoon, small metal spoon, small wooden spoon, metallic paper clips, plastic paper clips, a variety of coins, pencils and other objects.	<b>Activity 3</b> Learners work in groups. Give each group a range of objects from the list. Ask each group to sort the objects into two groups. Before learners test the objects that they collect, they must predict whether the object will be attracted to the magnet or not. Then use a magnet to test if they are correct. Learners should copy and complete the table in the Learner's Book with their findings.	Page 69	
Investigate and make comparisons.	Bar magnet, horseshoe magnet, iron filings	<b>Activity 4</b> This activity helps learners to determine which part of the magnet is the strongest in terms of its force of attraction. Iron filings are used because they are attracted to magnets, they are light, and they show the patterns of the magnetic field clearly. In the example in the Learner's Book, the iron filings show different magnetic field patterns. It is clear that the magnet is strongest at the poles, which are the ends of the magnet.	Page 69	
Demonstrate and record results.	<i>Explore Science</i> page 166 Glass jar or glass	<b>Activity 5</b> After the activity, explain to learners that magnetic force can pass through non-magnetic materials. For example, glass and water are non-magnetic materials.	Page 70	
Demonstrate and record results. Carry out experiment and observe the movement of the magnet.	<i>Explore Science</i> page 166 Paper, string, bar magnet, chair	<b>Activity 6</b> You can use 3-inch nails for this activity if sewing needles are not available. <b>Activity 7</b> This activity will give learners a clear understanding of the Earth's magnetic force. When they hang a magnet freely on a chair, they will see that the North Pole points automatically to the north and the South Pole points to the south.	Page 72 Page 73	

Processes and skills	Resources	Teacher's support notes	Learner's Book
Investigate and observe the reaction of like and unlike poles of a magnet.		<p><b>Activity 8</b> In this activity learners observe what happens when they move the south pole of a bar magnet towards the south pole of the hanging magnet: they will repel (move away). When they try this with the unlike poles they see that the two magnets will attract (come together).</p> <p><b>Tip</b> The important facts from this lesson are:</p> <ul style="list-style-type: none"> <li>• opposite poles attract</li> <li>• like poles repel.</li> </ul>	Page 73
	Ruler, tape, sand, box, various objects	<p><b>Activity 9</b> This activity can be done in a group or just with a partner. If your school is located on the coast, it is best to do this activity on the beach. If your school is far from the beach, then you can construct a box and put some sand in it. This will be your treasure box.</p>	Page 74
	Compass, globe	<p><b>Compasses use magnets</b> A compass is useful for captains in ships to show them direction. Scouts and bushwalkers always use a compass so that they can return home safely. You don't have to carry a magnet with you because the Earth has its magnetic poles close to the geographical poles. Use a globe in your school to locate the Arctic (the North Pole) and the Antarctic (the South Pole) and show it to learners.</p>	Page 74
	Needle, piece of paper, basin, water	<p><b>Activity 10</b> In this activity learners learn how to make a compass. Compasses are important devices to show direction.</p> <p><b>Tip</b> Demonstrate this activity to the class, as needles are very dangerous for children to handle. Allow five or six learners at a time to observe the steel needle compass. You should go through the steps together with the whole class.</p>	Page 75

Processes and skills		Resources	Teacher's support notes	Learner's Book
Investigate the effects of an electromagnet.	<i>Explore Science</i> page 167 Insulated wire, metal nail, crocodile clip, dry cell battery, sticky tape, paper clips	<b>Activity 11</b> This activity can be done in groups of five. You should have all the required materials prepared before the lesson. Go through the steps together before each group begins work on its own experiment. Check that each group is following the correct steps. Explain what is meant by the term "electromagnet" and how an electromagnet makes work easier for learners.	Page 73	
		<b>Chapter review</b> Discuss with learners the importance of magnets in our lives. They are hidden in useful machines. Magnetic materials are iron, steel, cobalt and nickel. Non-magnetic materials include wood, glass, plastic, rubber, copper, aluminium, gold and silver. The strength of a magnet is at its poles. Like poles repel, while unlike poles attract.	Page 77	
Use the concept map to summarize the key ideas in this chapter.		<b>Concept map</b> Go through the concept map. Highlight the key areas.	Page 78	

## Activities and assessment answers

### Activity 1 (page 66)

Attracted	Not attracted
Screw	Pencil
Paper clips	Book
Spoon	Leaf
Safety pin	Plastic
Key	Eraser
Coin	
Peg (wire that holds the two pieces together)	
Scissors	

### Activity 2 (page 68)

A wooden peg, a rubber object, a plastic object and a piece of cotton cloth cannot pick up paper clips because they are non-magnetic materials.

### Activity 3 (page 69)

Object	Prediction		Test result
	Yes/No	Why?	Yes/ No
Plastic paper clip	No	Plastic	No
Piece of paper	No	Paper	No
Rubber ball	No	Rubber	No
Piece of aluminium foil	No	Aluminium	No
Small plastic spoon	No	Plastic	No
Small wooden spoon	No	Wood	No
Metallic paper clip	Yes	Iron	Yes
Variety of coins	Yes	Iron	Yes
Pencil	No	Wood	No

### Activity 4 (page 69)

- Yes, there would be more iron filings at the poles.
- Yes, the magnetic field patterns are similar. However, the bar magnet holds more iron filings.

### Activity 5 (page 70)

- You can pick up more paper clips at the ends of the magnet than along the body of the magnet.

- Yes, magnetic forces can pass through non-magnetic materials. Therefore, you are able to get the metal paper clip out of the water-filled glass with a magnet.

### **Activity 6 (page 72)**

A magnet will be created by following the steps of this activity.

### **Activity 7 (page 73)**

The magnet will always return to to the same position.

### **Activity 8 (page 73)**

This activity demonstrates how opposite poles attract and like poles repel.

### **Activity 9 (page 74)**

This activity demonstrates magnetic force working through material (sand).

### **Activity 10 (page 75)**

- The sharp end of the needle (temporary north) points to a particular direction, presumably the magnetic North Pole of the Earth.
- The sharp end of the needle swings round to point in the same direction as before.

### **Activity 11 (page 76)**

- When the switch is turned on, it magnetizes the paper clip. When the switch is turned off, the paper clip is no longer magnetized because there is no electrical current flowing through it.

### **Revision (page 79)**

1 Iron, iron, copper, magnet, magnet, magnetism, unlike, North, field.

<b>Magnetic materials</b>	<b>Non-magnetic materials</b>
Iron nail	Wooden chair
Steel razor blade	Aluminium saucepan
Steel knife blade	Plastic spoon
Safety pin	Brass screw
Steel needle	Glass jar
Iron bar	Copper wire
	Piece of cloth
	Eraser
	Plastic comb
	Newspaper

# Chapter 5 Solubility

## Strand: Natural and Processed Materials

**Suggested periods: 20 (4 weeks)**

### Sub-strand statement:

Some substances can dissolve to form solutions, while others do not dissolve but instead form a suspension in liquid. A solution forms when a substance in the solid state (the solute) dissolves in a liquid (the solvent). Mixtures form when two or more substances are combined without any chemical change. Mixtures can be separated using mechanical or physical methods, for example evaporation, filtration, sedimentation or decanting.

### General learning outcomes:

Learners should:

- 5.5.1 understand the terms “mixture”, “soluble”, “insoluble”, “solute”, “solvent”, “solution”, “suspension” (U)
- 5.5.2 know that a mixture contains two or more pure substances (K)
- 5.5.3 know some methods for the separation of mixtures, for example filtration, decanting, sieving, evaporation (K)
- 5.5.4 apply the appropriate method for separation of given mixtures (S).

### Specific learning outcomes:

Learners should be able to:

- 5.5.1.1 list some examples of substances that dissolve in water and some that do not
- 5.5.2.1 prepare mixtures from pure substances
- 5.5.3.1 apply the different mixture separating methods, for example:
  - 5.5.4.1 sieve a mixture of sand particles and small stones.
  - 5.5.4.2 evaporate a mixture of salt and water
  - 5.5.4.3 filter a mixture of chalk particles and water
  - 5.5.4.4 decant a suspension.

Processes and skills	Resources	Teacher's support notes	Learner's Book
Observe and describe different mixtures of more than one substance.		<p><b>Solubility</b> Learners look at the illustrations in the Learner's Book and discuss the items they see. Use the questions at the bottom of the page as a guide to the discussion.</p>	Page 81
		<p><b>Describing the substances around us</b> Discuss mixtures of more than one substance with learners, using the pictures of the sea and soft drinks as examples. Use the table to consolidate the concept.</p>	Page 82
	Salt, flour, sugar, instant coffee, curry powder, Milo milk powder, dirt, clean powder, glass jar, cup or plastic container, a spoon, water	<p><b>Activity 1</b> In this activity learners carry out the investigation. Samples of different solids must be made available for learners to do the experiment then record their findings in a table like the one in the Learner's Book.</p>	Page 83
		<p><b>Water mixtures</b> Discuss the terms "solution" and "suspension" with learners, referring to the Learner's Book to further explain the term "solution". The term "suspension" will be dealt with in a later lesson (see page 86, Learner's Book).</p>	Page 84
Use simple equipment and record data in simple tables of results.		<p><b>Activity 2</b> Make sure learners have completed Activity 1 properly before they do this activity.</p>	Page 85
		<p><b>Suspensions</b> Help learners to understand the term "suspension", referring to the Learner's Book to further explain the term. Refer them also to their observations in Activity 1 to help them.</p>	Page 86

Processes and skills	Resources	Teacher's support notes	Learner's Book
Follow instructions and make accurate observations and drawings.	Flour, clean glass jar, cup or plastic container, a spoon, water.	<p><b>Activity 3</b> Learners need to refer to their observations in Activity 1 to be able to complete Activity 3. This activity helps them to understand suspension.</p> <p><b>Activity 4</b> Encourage learners to accurately draw what they have observed in Activity 1. Activity 4 is another activity on suspension, focusing on flour as a substance.</p> <p><b>Using coloured mixtures</b> In this activity learners read through the story to find out how other people use the concept in ,real life.</p>	Page 86  Page 87
		<p><b>Activity 5</b> Talk about different decorations used in different parts of the country. Ask learners to explain how people in their area prepare colours used for patterns and decorations. If possible, have samples available.</p>	Page 88
		<p><b>Separating mixtures</b> Discuss ways of separating substances mixed with water. Encourage learners to talk about methods of separating these mixtures, then go through the separation methods in the Learner's Book with learners.</p>	Pages 88–92
Use appropriate tasks to demonstrate the filtering concept.	Muddy water, flour + water, chalk + water, sand + water	<p><b>Activity 6</b> Provide the suspension water mixtures as listed in the Learner's Book. Learners must prepare filters to carry out the experiment and record their results.</p>	Page 89

Processes and skills	Resources	Teacher's support notes	Learner's Book
		<p><b>Activity 7</b> Learners need to closely study the pictures of some of the filters people use each day. Get learners to identify and classify the filters in the pictures into categories (a, b, c) from the Learner's Book.</p> <p><b>Clean water for us to drink</b> Most Solomon Islanders store rainwater in tanks. Rainwater is naturally purified or filtered through evaporation. Learners need to study the diagram showing how water is filtered, stored and supplied to houses.</p>	<p>Page 90</p> <p>Pages 90–91</p>
		<p><b>Activity 8</b> Each learner should be given enough time to complete this activity. Help learners to think about people in other places who live with limited water supply (for example Kiribati) and compare this situation with the Solomon Islands, where water is not considered scarce. Help learners to think of water as a scarce resource so that they can consider ways of conserving water.</p> <p><b>Separation by evaporation</b> Define the difficult terms used in the text to assist learners understand the concept. Go through the two examples in the text of the separation of substances to form solids ("Separating a sugar solution" and "Getting salt from sea water").</p>	<p>Page 92</p>
	<p>Fresh water from tap, a jar, glass or cup, eye dropper, thermometer, sea water, bottle, food colouring</p>	<p><b>Activity 9</b> Help learners to talk about what is meant by doing an "investigation". An investigation is a scientific activity that involves skills and process. It is an experiment. In an experiment they will have an aim, a method and a list of the materials they use, and they will draw a conclusion from what they find. All these will be part of the report that they will write. Ask learners to collect the items listed the day before they conduct the experiment.</p>	<p>Page 93</p>

Processes and skills	Resources	Teacher's support notes	Learner's Book
	Tap water, a jar, glass or cup, eye dropper, sea water, bottle, food colouring	<p><b>Activity 10</b> This activity should take a few days to complete. Make sure that the containers used in the experiment are placed in a safe corner somewhere in the classroom.</p> <p><b>Tip</b> Ensure that learners are focused on the specific processes and skills in the activity, not just completing it. These include decisions about techniques (where to collect water, how many times to collect, and what to look for in the water), the communication style (tables, graphs, report) and the conclusion they make (what they find out).</p>	Page 93
	Sugar or salt, water, spoon, heat source, thermometer (if available)	<p><b>Activity 11</b> This activity involves dissolving different substances in water at different temperatures.</p> <p><b>Tip</b> This activity will emphasize the same type of science processes and skills as in Activity 10. Use the same approach to guide learners to using the skills consciously. Ensure that learners know what you are focusing on in the activity.</p>	Page 94
		<p><b>Chapter review</b> Work through the chapter review with learners. See that learners understand the concepts in this chapter. Explain further whenever necessary.</p>	Page 95
		<p><b>Revision (assessment)</b> Give learners time to complete questions 1 to 8 as assessment for this chapter. Keep a record of each learner's performance.</p>	Pages 96–97

# Activities and assessment answers

## Activity 1 (page 83)

Investigating substances and mixing with water	
Substance investigated	Clear or cloudy mixture?
Salt	Clear
Flour	Cloudy
Sugar	Clear
Instant coffee	Clear
Curry powder	Cloudy
Milk powder	Cloudy
Milo powder	Cloudy
Dirt	Cloudy

The substances that have been added in the clear mixtures have dissolved.

## Activity 2 (page 85)

Substance	+ Water	Solution—yes/no?
Salt	mixed with water	Yes
Curry powder	mixed with water	No
Flour	mixed with water	No
Milk powder	mixed with water	No
Sugar	mixed with water	Yes
Milo powder	mixed with water	No
Instant coffee	mixed with water	Yes

**Activity 3 (page 86)**

Substance	+ Water	Suspension—yes/no?
Salt	mixed with water	No
Curry powder	mixed with water	Yes
Flour	mixed with water	Yes
Milk powder	mixed with water	Yes
Sugar	mixed with water	No
Milo powder	mixed with water	Yes
Instant coffee	mixed with water	No

**Activity 4 (page 87)**

- Curry powder, flour, milk powder and Milo powder did not dissolve in water; they were suspended.
- The flour settles at the bottom of the glass when we stop stirring it.

**Activity 5 (page 88)**

Learners' answers will depend on their experience and knowledge.

**Activity 6 (page 89)**

- Learners' answers will depend on the materials used in the experiment.
- A salt solution will pour through the filter and not be separated. This is because a solution cannot be separated through filtration.

**Activity 7 (page 90)**

- Hairs in nose and air conditioner filter solids from gas.
- Vegetable sieve and swimming pool filter solids from liquid.
- Car engines filter gases from air.

**Activity 8 (page 92)**

These are some ways in which we can use water wisely:

- Water plants with a bucket rather than a hose pipe.
- Use water from washing clothes in the toilet.
- Wash dishes in running water from a basin rather than a tap.
- Repair any leaking taps.
- Turn off all taps when they are not in use.
- Turn off all taps when water from the main source is off because you do not know when it will come on again.

## Revision (page 96)

- 1 c
- 2 c
- 3 d
- 4 a
- 5

	Solute	Solvent
a	Oil-based paint	Turpentine
b	Nail polish	Acetone
c	Grass stains	Methylated spirits
d	Coffee stains	Vinegar

- 6 Put an uncooked egg in each liquid. The egg should float higher in the sugar solution than the fresh water.
- 7 b (mix with water–filter–evaporation)
- 8 a does not  
b does  
c suspension  
d cloudy

# Chapter 6 Sound and light

## Strand: Energy and Change

**Suggested periods: 20 (4 weeks)**

### Sub-strand statement:

Sound and light are forms of energy. Learners observe, investigate and experience various properties of sound and light. Sound waves always need a medium to travel through. The pitch of a sound is determined by the frequency of sound waves. Light travels in a straight line, reflects and refracts, forms images of objects on shiny surfaces and is composed of different colours.

### General learning outcomes:

Learners should:

- 5.6.1 recognize that vibrating objects produce sound (K)
- 5.6.2 know that sounds can travel through different materials (K)
- 5.6.3 understand that sound takes time to travel (U)
- 5.6.4 understand that sound must have a substance to travel through (U)
- 5.6.5 understand that noise (uncontrolled noise) can be an environmental nuisance (U)
- 5.6.6 know that light can be made to change direction (reflection or refraction) (K)
- 5.6.7 know that shiny surfaces can cause images of objects to be formed (K)
- 5.6.8 understand that light travels in straight lines (U)
- 5.6.9 understand that light beams can be bent (U)
- 5.6.10 know that white light is composed of different colours (K).

### **Specific learning outcomes:**

Learners should be able to:

- 5.6.1.1 identify three everyday objects that can vibrate, to create different sounds
- 5.6.2.1 demonstrate how sound travels in selected materials
- 5.6.4.1 state that sound waves travel through substances
- 5.6.5.1 list three disadvantages of noise pollution
- 5.6.5.2 identify a sample of noise pollution in the environment
- 5.6.6.1 demonstrate how light can be made to change direction using a mirror or other reflective surface
- 5.6.7.1 demonstrate light reflection using a mirror
- 5.6.8.1 show that light travels in straight lines and forms shadows
- 5.6.8.2 distinguish between an object and its image in a mirror
- 5.6.9.1 identify an instance of light reflection, for example a stick partly held over the surface of water
- 5.6.10.1 use a mirror and a dish of water to form a spectrum
- 5.6.10.2 link the rainbow formed by clouds to the bending of light.

Processes and skills	Resources	Teacher's support notes	Learner's Book
Observe and listen to different sounds by objects and animals.	30 cm ruler, balloon, glass jar, rubber band, rice grain	<p><b>Activity 1</b> This activity can be done in pairs. The materials needed for this activity must be prepared before the lesson.</p> <p><b>Tip</b> This activity should help learners understand that vibrating objects produce sound. The vibrating objects are the ruler and balloon. Sound can travel through the air, liquids and solids. Ask learners to list some sound produced by different objects or animals. They should observe, listen and answer the two questions in the Learner's Book.</p>	Pages 99–100
	<p><i>Explore Science</i> pages 252–55 Two coins, paper cone</p>	<p><b>Activity 2</b> Learners do this activity with partners, in a quiet place so they can hear the sound produced at different positions. They should follow the steps, record the results at each step and answer the questions in the Learner's Book.</p> <p><b>Hearing sounds</b> Hearing is one of the five human senses. The sense organ for hearing is the ear. Ask someone to strum the guitar while the whole class listens and observes the strings of the guitar when it is being strummed.</p> <p><b>Waves of energy</b> Sound can travel through solids and liquids. Ask learners if they have ever dropped a stone in a pool. What happens to the water? It will produce waves or ripples (ring-like). This section is similar to Activity 1. Ask learners to list local musical instruments and the sounds produced by different birds and animals. Ask them if they can imitate the sounds.</p>	<p>Page 101</p> <p>Page 102</p> <p>Pages 102–103</p>
	<p><i>Explore Science</i> page 135</p>	<p><b>Activity 3</b> This activity helps learners to find out how sound travels in solids (through the tins and the string). You should have the materials prepared before the lesson. Learners make two string telephones, one with a longer string and the other with a shorter string. They use the telephones and answer the questions in the Learner's Book.</p>	Page 103

Processes and skills	Resources	Teacher's support notes	Learner's Book
		<p><b>Where are our sound sense organs?</b> Like human beings, birds and other animals also have ears, or sound sense organs. Examine the diagram of the ear in cross-section with learners. The sounds we hear are vibrations in the air called "sound waves". The three main parts of the ear, which play a special role in sending sound waves to the brain, are the outer ear, the middle ear and the inner ear.</p>	Page 104
		<p><b>Problems with hearing</b> Using the table in the Learner's Book, ask learners questions such as:</p> <ul style="list-style-type: none"> <li>• What is the effect on your ears when you hear a jet plane taking off?</li> <li>• What is the sound intensity (in decibels) of a normal conversation? (50)</li> <li>• What sound is very annoying? (street traffic/noisy party)</li> </ul> <p><b>The loudest noise on Earth</b> Ask learners about the loudest noise they have ever heard. What, where and when was it? How did they feel about it?</p>	Page 105
	<p><i>Explore Science</i> pages 135, 252, 255</p>	<p><b>Activity 4</b> Ask learners to study the table of information on the sources of sound in the Learner's Book and answer the questions.</p>	Page 105
	<p><i>Explore Science</i> page 135</p>	<p><b>Looking after our ears</b> Children must be very careful with their ears. They must not poke any objects into their ears. These might cause damage that will lead to ear infection.</p>	Page 106
	<p><i>Explore Science</i> page 255</p>	<p><b>Echoes</b> Ask learners if they have ever heard their voice echo. Explain the meaning of the word "echo" (reflected sound from hard surfaces such as walls, mountains or cliffs).</p> <p><b>Hearing in other animals</b> Birds and reptiles can communicate very well with each other by sound. Encourage learners to observe the geckos in their houses at night and birds in the trees during the day.</p>	Page 106

Processes and skills	Resources	Teacher's support notes	Learner's Book
	<i>Explore Science</i> page 255	Discuss with learners their experiences at the sea. If they have been underwater they may have heard noises made by animals in the sea.	Page 107
	<i>Explore Science</i> page 246 Mirror	<p><b>Activity 5</b> Go to a sunny place outside: morning is best. Learners investigate what they see when the Sun shines onto the mirror and reflects onto the wall, trees or house.</p> <p><b>Tip</b> In this activity learners have an opportunity to encounter the rays of the Sun. They will learn more about it in the coming lessons.</p>	Page 107
	<i>Explore Science</i> pages 247–48	<p><b>Activity 6</b> You need four learners to do this activity (person A, person B, person C and person D). This activity is best done first in a darkened room. Find a clear place where the Sun shines. Ask learners to list all the things that give off light. Some of these are: the Sun, a lamp, a torch, a candle, burning wood, a firefly, fluorescent tubes. Some things do not give out light but they reflect light from light sources so that we are able to see them.</p> <p><b>Tip</b> The activity reinforces the fact that the Sun's rays can be reflected. Person A reflects the light from the torch to person B, person B to person C and person C to person D. Persons A, B and C are able to reflect their light because they have shiny surface objects to do it (mirrors). Person D does not have another shiny surface object to reflect the light, so the reflection stops there.</p>	Page 108
Investigate the nature of light beams.	<i>Explore Science</i> page 248 Cardboard, hole punch, torch	<p><b>Activity 7</b> Light beams called "rays" travel in a straight line. From this experiment, you will see that when all three squares of cardboard are lined up, light from the torch will pass through the holes. When one square of cardboard is moved slightly, light from the torch does not pass through because it is blocked by the moved cardboard.</p>	Page 109

Processes and skills	Resources	Teacher's support notes	Learner's Book
		<p><b>How reflection works</b> Light has special behaviours or properties. One of these is that light can bounce back or reflect if it falls on flat and shiny surfaces, for example a mirror or a pool of water.</p>	Page 110
	Torch, black pan, water, dark-coloured curtains	<p><b>Activity 8</b> This activity is designed to investigate the reflection of light. Prepare materials needed for this activity beforehand. Darken the room using dark-coloured curtains. Encourage learners to compare their results.</p> <p><b>Tip</b> By carrying out this activity learners will understand that:</p> <ul style="list-style-type: none"> <li>• light reflects: when you shine a torch into a dish of water in a dark room, the water lights up where the torch beam is directed</li> <li>• light reflects in the same way it hits the surface; for example, if it hits the surface at an angle of 45 degrees, it will reflect at 45 degrees.</li> </ul>	Page 110
	Mirror, sheet of paper, stones	<p><b>Activity 9</b> Prepare materials for this activity. This is a model of reflection. Go through the steps together with learners before actually doing the activity. Allow some learners to do step 3 and ask them what they saw in the mirror. Compare results from individual learners.</p> <p><b>Tip</b> Make sure learners follow the instructions and examine the illustration carefully. You could do a class demonstration for this activity. The activity reinforces the fact that light is reflected back in the same way it hits the surface. Here, the stone is actually placed at 45 degrees, so it is reflected back at 45 degrees as well.</p>	Page 111
	Explore Science pages 248–50, 251 Mirror, cardboard, marker	<p><b>Activity 10</b> Prepare materials for each group. Go through and describe the activity steps to learners. Allow learners to do the activity and ask each group to share what they saw in the mirror.</p>	Page 111

Processes and skills		Resources		Teacher's support notes		Learner's Book	
Explain refraction.	<i>Explore Science</i> page 251	<b>Refraction</b> Explain the term "refraction" to learners, using the glossary at the back of the Learner's Book. Encourage them to carefully observe the picture in the Learner's Book carefully. Light travels in a straight line through empty space unless it strikes an object that changes its direction. In this picture, the clear plastic bowl and water refract light and that is why the direction of the light beam is slightly changed.	Page 112				
Observe how light bends.	<i>Explore Science</i> page 251 Plastic bowl, water, ruler	<b>Activity 11</b> Prepare materials needed for this activity. Give clear instructions about the activity to learners. Allow them to do the activity while you check each group and see if they need help. Encourage learners to observe the ruler in the water. Ask group leaders to report the results of the activity to the class.  <b>Tip</b> You should conclude the activity by relating it to the concept of refraction (speed slows down, light bends and so objects appear bent at the air–water interface).	Page 112				
Observe how light bends.	<i>Explore Science</i> Shoe box, large piece of white paper, glass jar, torch	<b>Activity 12</b> Introduce the materials that will be used in this activity. Demonstrate the activity, on the front table, following the five steps in the Learner's Book and allowing time for learners to read each step. Learners will develop a clear understanding of refraction when they observe the light changing direction as it leaves one medium and enters another. Encourage learners to try Step 5 at the front table.	Page 113				
Carry out an experiment to filter white light into its different colours.	<i>Explore Science</i> page 249 Mirror, dish, large piece of white paper or cardboard	<b>Activity 13</b> Prepare materials needed for this activity beforehand. Ask learners questions such as: <ul style="list-style-type: none"> <li>• Have you seen a rainbow?</li> <li>• How many colours are there in a rainbow?</li> <li>• What is your favourite colour?</li> <li>• At what time of the day will you be able to see the rainbow?</li> </ul>	Page 114				

Processes and skills	Resources	Teacher's support notes	Learner's Book
Investigate why coloured discs appear white while spinning.	<i>Explore Science</i> page 249 Cardboard, coloured pencils	<p>In this activity learners make their own rainbow. When they make their own rainbow, they learn about reflection and refraction from light.</p> <p><b>Tip</b> At the end of the lesson, it is helpful to recap the important concepts of reflection and refraction using the making of the rainbow. When the light from the Sun hits the shiny surface of the mirror, light is reflected back and we can see it on the white paper. When the light travels through the air and into the water, it goes from one medium to another, so it slows down in speed and bends. As it leaves the water and enters air again, it bends again. This is refraction. When refraction occurs, the white light bends and separates, giving the seven colours of the rainbow that can be seen on the white paper, and in the sky after light showers.</p>	Page 115
		<p><b>Activity 14</b> Prepare materials needed for the activity and go through the five steps with learners. Allow learners to do the activity. Ask each group to tell the whole class what colour they see while spinning the coloured disc and why the coloured disc appears white. Write each group's answers on the blackboard.</p>	Page 116
Observe shadows at different times of the day (morning, midday, late afternoon).	<i>Explore Science</i> page 250	<p><b>Seeing colours</b> We see that things have colours because of reflection. The colour of a particular material tells us that this particular light colour is reflected. For example, a red shirt means that it reflects red light; a green plant reflects green light.</p>	Page 117
		<p><b>Activity 15</b> The position of the Sun changes during the day, which causes differences in your shadow and the shadows of other objects.</p>	

Processes and skills		Resources	Teacher's support notes	Learner's Book
Observe the shapes and sizes of the shadow of objects.	<i>Explore Science</i> page 250 Torch, different types of objects	<b>Activity 16</b> Prepare the materials before the lesson. Introduce the word "shadow" and explain its meaning: the dark space that is formed when an object blocks the light. Select five learners to do this activity with your help, while others watch and listen. Ask them to observe the shape of the shadow of the objects as they move the torchlight closer to and further away from the object. The shapes of the objects change.	Page 118	
Identify different materials that allow light to pass through them to varying degrees.	<i>Explore Science</i> page 250	<b>All light, some light, no light</b> Light passes through some materials but not in others. The three containers illustrated are made of plastic and cardboard. The first container (food safe) is made of clear plastic so light can pass through, which is why we can see the food inside. The second container is made of plastic but it is not a clear plastic. Only some light passes through it and that is why we can't see clearly, although we can see the outline of the thing inside. The third container is made of cardboard. Light cannot pass through this box and so it is impossible for us to see what is inside the container.	Page 119	
	Clear plastic sheet or bags, black paper or plastic, waxed paper, toilet rolls, torch	<b>Activity 17</b> Prepare materials for three experiments on the table in front of the class where everyone can see. Explain each step clearly to learners. Divide the class into three groups. Each group should do one experiment at a time, moving on to the second and the third as soon as they finish with the first. Explain the terms "transparent", "translucent" and "opaque". Use the glossary at the back of the Learner's Book to find their meanings.	Page 119	

Processes and skills	Resources	Teacher's support notes	Learner's Book
Identify, predict and compare materials that are translucent, transparent or opaque.	<p><i>Explore Science</i> page 250</p> <p>Variety of materials from those listed in the Learner's Book, such as a clear plastic cup, a glass of water, cardboard, tissue paper, a wooden ruler and a leaf</p>	<p><b>Activity 18</b> This activity is designed to test which materials are transparent, translucent and opaque. Ask learners to copy the table into their exercise books and fill in the prediction and observation columns. Make sure learners predict before they actually test the materials. Compare the predictions with the observations and see the similarities and differences.</p> <p><b>Thunder and lightning</b> Light travels much faster than sound. That is why when there is a storm; you will see lightning first before you hear thunder, even though they happen at the same time.</p>	Page 120
		<p><b>Concept map</b> Discuss the concept map with learners to ensure that they understand.</p>	Page 121
		<p><b>Chapter review</b> Go through the items in the chapter review. Refer back to the appropriate pages in the Learner's Book.</p>	Page 122

## Activities and assessment answers

### Activity 1 (page 99)

- 1 Learners' answers will depend on what they observe.
- 2 The pitch should be higher when the ruler is shorter.
- 3 Yes. The balloon should vibrate. The rice grains should move.

### Activity 2 (page 101)

- Answers will vary according to the individuals who actually do this activity.

### Activity 3 (page 103)

- 5 A tighter string should make for a clearer sound. Other answers will vary according to the individuals who actually do this activity.

### Activity 4 (page 105)

- Estimated decibel readings:
  - lunchtime: 60
  - bus or outboard motor: 70–90
  - beach in the morning: 40
  - soccer crowd: 70
- Yes. The speed of the car affects the loudness of the sound it produces.

### Activity 5 (page 107)

The sunbeam is reflected by the mirror.

### Activity 6 (page 108)

Learners should be able to reflect the light.

### Activity 7 (page 109)

- 3 When the cardboard moves the light is unable to pass through.

### Activity 8 (page 110)

- 3
  - When light strikes the water from directly above, the water seems very dark. Very little light is reflected back into the room.
  - When light strikes the water at a low angle, the water seems lighter. Some light is reflected back into the room.

### Activity 9 (page 111)

Learners will observe a model of reflection.

**Activity 10 (page 111)**

4 The letter B appears backwards or reversed.

**Activity 11 (page 112)**

Learners will observe an example of refraction.

**Activity 12 (page 113)**

- 5
- Two rays shine into the box.
  - The lines do not continue in a straight line inside the jar.
  - The light rays first change direction inside the jar.
  - Yes, the rays bend again as they leave the jar.

**Activity 13 (page 114)**

5 Colours appear on the paper. There are seven colours visible.

**Activity 14 (page 115)**

The disc appears white because the colours are mixed together by the speed of the spinning movement.

**Activity 15 (page 117)**

Shadows will change as the Sun moves across the sky, appearing shorter when the Sun is high in the sky and longer when the Sun is low in the sky.

**Activity 16 (page 118)**

- 1 The shadow will get smaller and sharper.
- 2 The shadow will get bigger and blurrier.
- 3 Smaller and sharper, bigger and blurrier.
- 4 As the object gets closer to the wall, the shadow becomes smaller and sharper. As the object is moved away from the wall, the shadow gets bigger and blurrier.
- 5 Sharp shadow.
- 6 Blurry shadow.

**Activity 17 (page 119)**

- 4
- Clear plastic bag allows light to pass through.
  - Waxed plastic allows some light to pass through.
  - Black paper does not allow light to pass through.

**Activity 18 (page 120)**

The observation column should look like this.

<b>Observation</b>		
<b>Transparent (clear image)</b>	<b>Translucent (hazy image)</b>	<b>Opaque (no image)</b>
Clear plastic cup	Different types of plastic bags	Cardboard
Glass of water	Waxed paper	Aluminium foil
Clear plastic sheet	Sheet of white paper	Mirror
Clear glass	Tissue paper	Piece of wood
	Plastic ruler	Metal ruler
	Cloth	Wooden ruler
		Leaf

**Revision (pages 123–24)**

- 1 vibrate, air waves, movement, sound, material
- 2
  - banging: drum
  - shaking: maracas
  - plucking: guitar
  - blowing: panpipe
- 3
  - a a candle
  - c a torch
  - d the Sun
- 4 Opaque: Doesn't allow light to pass through  
 Transparent: Allows all light to pass through  
 Translucent: Allows some light to pass through
- 5 reflect, dark, visible, straight, bent, light

# Chapter 7 Crops and animals for food

## Strand: Farming

**Suggested periods: 20 (4 weeks)**

### Sub-strand statement:

The knowledge and skills used in gardening, such as preparing good soil, caring for plants by watering and weeding, and the appropriate use of tools, are essential skills for learners. Applying this basic knowledge and these skills in farming can be very rewarding.

### General learning outcomes

Learners should:

- 5.7.1 know that there are three types of soil (K)
- 5.7.2 appreciate the importance of doing practical gardening activities to reinforce understanding and ensure application of skills (V)
- 5.7.3 know how to do the necessary soil preparation, caring for tools, caring for plants, nursery and transplanting in a practical setting (K)
- 5.7.4 know how to reproduce plants artificially (K)
- 5.7.5 know the methods of crop care: shading, mulching, thinning, staking, intercropping, watering and pest control (K)
- 5.7.6 understand the commercial importance of animals in the village: pigs, chicken and cattle (U).

### Specific learning outcomes

Learners should be able to:

- 5.7.1.1 name and appreciate the types of soil
- 5.7.2.1 prepare a garden plot and carry out all the necessary preparations for planting and caring for the garden
- 5.7.3.1 apply the skills of preparing good soil, preparing and planting seeds in a nursery, transplanting, watering and weeding the garden, and harvesting

- 5.7.4.1 grow crops from cuttings and tubers
- 5.7.5.1 demonstrate simple and basic garden management activities
- 5.7.6.1 appreciate the importance of raising commercial animals: pigs, cattle and chicken.

Processes and skills		Resources	Teacher's support notes	Learner's Book
Identify and recognize soil types.			<p><b>Activity 1</b> This activity needs to be completed in two periods of 40 minutes. It is important to identify three specific locations for groups to collect their soil samples—do not allow learners to decide for themselves where to do this. However, you can allow the class to identify three locations with your agreement well beforehand. Do not to allow learners to turn to page 127 in the Learner's Book while doing this activity.</p>	Page 126
Identify soil compositions and know their differences.			<p><b>Soil in different areas can be very different</b> It is important for the teacher to prepare well in advance. Identifying and recognizing the soil types is a necessity as far as agriculture is concerned. Clearly identify differences between clay soil, sandy soil, and loam soil.</p>	Page 127
Observe soil layers to appreciate distinguishable layers and patterns.			<p><b>Activity 2</b> The teacher should visit the surrounding area to identify specific locations for carrying out this activity. Ensure that all soil layers necessary for carrying out the task are to be found at the location. Make careful note of the different layers of soil. It is important to understand the illustration of layers in the Learner's Book.</p>	Page 128
Explore the five constituents of soil. Make conclusions based on data and information given.			<p><b>We need soil to grow plants for food</b> Soil contains five things. It is important that these five constituents of the soil are well understood. Take careful note of the underground food web. Ensure that you understand the linkage in the web. Familiarize yourself first with the entire illustration.</p>	Page 129
Carry out an investigation to identify the different objects of a plant for vegetative propagation.			<p><b>Vegetative propagation methods</b> Ensure that you understand the term "vegetative propagation". It is very important to be prepared for the lesson. You can do this by providing, where possible, real examples of runners, suckers, rhizomes, tubers, corms and bulbs. It will be even more effective and worthwhile if you can identify locations where each of the above are found. You can then take your class to the specific locations and allow them to discover where each of the vegetative parts can be found on plants.</p>	Pages 130–31

Processes and skills	Resources	Teacher's support notes	Learner's Book
Conduct a field excursion to collect data. Identify different types of crops and methods of vegetative propagation	<i>Explore Science</i> pages 64–66, 116–19	<p><b>Activity 3</b> This activity should be done within two periods of 40 minutes each. It would be more effective for the visit if garden owners were informed beforehand. If the garden is a long way away, you could organize a talk by the owner of the garden (guest speaker). Ensure that the talk addresses what the activity aims to achieve.</p>	Page 130
Interpret data through direct observation.		<p><b>Roots, leaves, stems</b> Make good use of the photos provided in the Learner's Book and provide real examples.</p>	Page 132
Formulate an experimental procedure for land and air layering.		<p><b>Activity 4</b> Emphasize to learners the importance of applying these skills and knowledge to real-life contexts or situations. Where you can, do the activity in advance, on your own, and show it to learners when this topic or activity is to be done.</p>	Page 133
Conduct techniques to look after food crops in the garden.		<p><b>Caring for food crops</b> Stress the importance of caring for food crops. When we care for the food crops, food crops will take good care of us.</p> <p><b>Companion plants</b> These are plants that live and grow side by side. They do not compete with each other but help each other to grow. Between them, they contribute a range of nutrients to the soil. The nutrient needs of each plant are different from each other.</p>	Page 134
Carry out preliminary trials of planting companion plants.		<p><b>Activity 5</b> Take note of the system of exchange in these companion plants. They share and aid each other to grow healthy. The corn leaves help protect the bean leaves from the hot Sun, while the bean roots supply nutrients to the corn.</p>	Page 134

Processes and skills	Resources	Teacher's support notes	Learner's Book
Analyze the problem of plant diseases by doing mixed cropping.		<p><b>Mixed cropping</b> This is a common method used in a typical Solomon Islands garden. Make good use of the photo, which depicts a mixed garden.</p>	Page 135
Observe and make deductions about mixed crop gardening.		<p><b>Activity 6</b> Make garden visit arrangements with the garden owner prior to doing this activity. Take notes on why gardeners grow crops as they do (mixed crops). Allow learners to answer questions in the activity and give feedback to the rest of the class.</p>	Page 135
Classify crop types. Identify crops for, and experiment with, crop rotation.		<p><b>Crop rotation</b> This section is about rotating or taking turns to grow crops in small or limited spaces. Take note of the four different types of crops: leafy crops, fruiting crops, legumes and root crops. It is important to emphasize the application of such knowledge and skill gained in gardening. Encourage learners to do likewise in their family gardens.</p>	Pages 135–36
Recognize the paramount importance of watering plants.		<p><b>Watering</b> Watering is very important in order to ensure that all plants have sufficient water for growth.</p>	Page 137
Make a watering can for watering plants.		<p><b>Activity 7</b> Carefully monitor learners as they prepare the watering can. Prepare well in advance by getting nails, tins and hammers or stones ready.</p>	Page 137
Produce a mulch to grow healthy plants		<p><b>Mulching</b> Emphasize to learners the importance of mulching in protecting plants and allowing water and nutrients to seep slowly into the soil. It is important to work through the flow chart on page 138. Ensure that you are familiar with the entire chart and can transmit its knowledge to learners effectively.</p>	Pages 137–38

Processes and skills	Resources	Teacher's support notes	Learner's Book
Conduct research.		<p><b>Activity 8</b> Organize garden visits prior to doing this activity. In this way you can look for specific examples instead of simply visiting many gardens without shades. This would enable you to use the time for more observation instead of wasting time looking around for a good example.</p>	Page 139
Observe how weeds and crops compete with one another.		<p><b>Weeding</b> Stress the importance of weeding crops to reduce competition for water, sunlight and nutrients. Sometimes weed killers are used to remove unwanted weeds from planted crops.</p>	Page 140
Conduct a weeding exercise on a regular basis.		<p><b>Activity 10</b> Ensure that there is enough time for learners to weed their demonstration plots. This will help the crops to grow well.</p>	Page 140
Construct a compost.		<p><b>Activity 11</b> Ensure that you have all the necessary materials available and that your measurements are exact and procedures are correct. Take learners through the information on the advantages of compost on page 142.</p>	Page 141
Identify nutrients, where they are found, and what they are used for.		<p><b>Animals for food</b> Familiarize yourself with the contents of the table of food types and nutrient contents.</p>	Page 142–43
Identify and analyze the two ways of raising chickens.		<p><b>Raising chickens</b> Take note of the two ways of keeping chickens in a village. If possible, allow learners to visit a chicken farm nearby. Such visits will aid concrete understanding of the ideas presented.</p>	Page 144

Processes and skills	Resources	Teacher's support notes	Learner's Book
Observe and make deductions about the features of a local chicken farm.		<p><b>Activity 11</b> Take careful note of hazards that are associated with chicken farming. Suggest to learners that they wear some sort of covering over their noses, if possible, to mask the smell. Use the illustrations to aid your explanation of the activity.</p>	Page 144
Conduct a field excursion. Evaluate the features of a piggery. Highlight the types of food pigs eat.		<p><b>Raising pigs</b> Organize a field visit to a piggery before going through this section with learners. If there is no facility to visit, a village piggery will do. If your school is isolated, make good use of the photos provided. Highlight the types of food a pig eats: energy food, body-building food and protective food, plus water.</p>	Pages 145–46
Observe a cattle farm.		<p><b>Cattle</b> Organize a visit to a neighbouring cattle farm to aid effective learning. Use the photos when explaining the information in the text. Note that shops and butcheries sell the meat of pigs and cows to customers.</p>	Page 146
Value the role of the river and ocean as sources of food.		<p><b>Food sources from the river and ocean</b> Stress the importance of the river and ocean as sources of food. It is important to use learners' experience to aid you in your explanation. Make good use of the photos in the Learner's Book.</p>	Page 147
Identify food types in the river and ocean, and recognize how they can be obtained and cooked.		<p><b>Activity 12</b> For this activity, organize learners into groups of four or five. Ask learners to identify some of the foods (shellfish, crabs, shrimp etc) that the river and the ocean provide for us daily. Identify one food from those identified. Assign one or two foods to each group and ask the groups to discuss how their animal or shellfish is caught and how it is cooked. Discuss the tuna catch in Solomon Islands oceans. Use the map and the photos to aid your explanation.</p>	Page 148

Processes and skills	Resources	Teacher's support notes	Learner's Book
Analyze the advantages and disadvantages of canning food.		<p><b>Canned food</b> Explain the importance of canning food and discuss its advantages and disadvantages. If possible, research further information. You may wish to ask learners to list the advantages and disadvantages of canning food.</p>	Page 149
Observe and record data about different types of canned food.		<p><b>Activity 13</b> Allow learners to visit a nearby canteen or shop to identify the different types of canned foods and their prices.</p>	Page 149
Use critical thinking to analyze questions and make conclusions.		<p><b>Chapter review</b> Try as much as possible to go through the chapter point by point, explaining briefly in a bit more detail when necessary.</p>	Page 150
Solve problems by doing and carrying out a written activity.		<p><b>Revision</b> Allow learners to do the activity before going through it with the whole class.</p>	Page 151

# Activities and assessment answers

## Activity 1 (page 126)

- Learners' answers will depend on where they collect their samples from.
- The answers provided are examples of what is likely to be observed. They are not the only answers.

Test	Sample a (Clay)	Sample b (Sandy soil)	Sample c (Loam soil)
Rub a small amount of the soil between your fingers. How does it feel?	It feels sticky, smooth and is very fine.	It feels stony due to its mixture. The particles are bigger than in clay soil.	It feels rough and has a lot of plant fibres in it.
Roll the soil between the palms of your hands. How does it smell?	It does not really have a specific odour.	It does not really have a specific odour.	It smells like dirt. It feels dry in the palm. It is full of humus.
Describe the colour of your soil.	It is dark brown in colour.	It is white/blackish-grey.	It is brownish-grey.

## Activity 2 (page 128)

The basic difference is that there is no distinctive layering in bad soil areas, unlike good soil areas. The top soil layer of any bad soil is much thinner than in the good soil.

## Activity 3 (page 130)

- Learners' answers will depend on the ground visited. Allow learners to list their findings.
  - Learners' answers will depend on the ground visited.
  - The method that causes plants to produce new shoots is called "vegetation propagation".

## Activity 4 (page 133)

For this activity, answer questions raised by learners while doing the activity. Assist learners by following the basic illustration provided.

## Activity 5 (page 134)

Answer any questions raised by learners concerning the planting of these plants.

**Activity 6 (page 135)**

- 1 Learners' answers will depend on the type of crops grown in the gardens they visit.
- 2 Due to competition for nutrients and sunlight energy, crops growing together are not as healthy as those grown by themselves.
- 3 This is done as a means of pest control. By doing this, the gardener restricts pests to a particular area and so prevents them from spreading all over the garden.

**Activity 7 (page 137)**

There are no specific questions for this activity. However, be prepared to answer any questions raised by learners.

**Activity 8 (page 139)**

Allow learners to take notes on their observations of how the gardens help to protect their crops from the direct heat of the Sun.

**Activity 10 (page 140)**

There are no specific questions for this activity. However, it is important to stress the importance of weeding the garden.

**Activity 11 (page 141)**

There are no specific questions for this activity. However, ensure that all instructions are followed correctly and answer any questions that learners might have.

**Activity 11 (page 144)**

The questions can be answered when the activity is carried out, as different places/contexts have different ways of looking after chickens.

**Activity 12 (page 148)**

There are no specific questions for this activity. However, you can devise some questions for discussion purposes. For example, How do people catch fish or pigs? How do they cook fish or other animals?

**Activity 13 (page 149)**

There are no specific questions for this activity. However, be prepared to answer questions raised.

## Revision (page 151)

1 Vegetative propagation matching answer samples.

Propagation Method	Description
Cutting	Piece of plant root, stem or leaf that can grow into a new plant.
Sucker	Upright shoot that develops from the stem of a plant.
Runner	Stem that runs along the surface of the soil.
Bulbs	Top of a swollen plant stem.

- 2 A The key to this question is the fact that the order of crop rotation is related to crop groups: Group 1 crops, Group 2 crops, Group 3 crops and Group 4 crops (see page 136 of the Learner's Book).
- 3 A True  
B True  
C False

# Chapter 8 The solar system

## Strand: Earth and Beyond

**Suggested periods: 20 (4 weeks)**

### Sub-strand statement:

Our Earth is part of the solar system, which consists of eight planets and their moons. The measurement of time is related to the movement of the Earth around the Sun, the rotation of the Earth on its axis and the Moon around the Earth. The path of the Earth around the Sun is called its orbit. The Earth takes 365 days to make one orbit around the Sun. This is called a year. The tilting of the Earth's axis and its revolution cause seasons on Earth, as different parts of the Earth receive different amounts of sunlight during the year. Imaginary lines called the Equator, tropics, lines of latitudes and lines of longitude are used to locate places on the Earth's surface. Like the Earth going around the Sun, the Moon orbits the Earth, completing one orbit in 28 days. The phases of the Moon are the result of the changing positions of the Moon in its orbit around Earth.

### General learning outcomes

Learners should:

- 5.8.1 know that the solar system consists of our Sun, eight planets and the moons of some planets (K)
- 5.8.2 understand that each planet moves around the Sun in a path called an orbit (U)
- 5.8.3 know that it takes one year, 365 days, for the Earth to orbit around the Sun (K)
- 5.8.4 understand that the tilting of the Earth on its axis causes the seasons in one year, as the Earth moves in its orbit (U)
- 5.8.5 understand that the observed differences in the seasons are linked to the Earth's movement and tilt (U)

- 5.8.6 know that the imaginary lines on the Earth's surface are a way of locating places and identifying regions with similar climatic conditions (K)
- 5.8.7 understand that the Moon's orbit around the Earth takes 28 days (U).

### **Specific learning outcomes**

Learners should be able to:

- 5.8.1.1 use a simple model to show the Earth's orbit around the Sun
- 5.8.2.1 use the model to show how the tilting and positional changes of the Earth cause season differences
- 5.8.3.1 state characteristics of the seasons in relation to the Earth's position in its orbit
- 5.8.4.1 identify the imaginary lines on the Earth's surface
- 5.8.5.1 make a model to illustrate how the movement of the Moon in its orbit around Earth causes us to see the changing shape of the Moon.

Processes and skills	Resources	Teacher's support notes	Learner's Book
Observe the movement of the ball representing the Earth's orbit and the gravitational force.	<i>Primary Science Learner's Book Year 4</i> pages 143–45	<p>Refer to <i>Primary Science Year 4 Learner's Book</i>. Recap the rotation of the Earth, which causes night and day, and the three bodies in space by asking question such as:</p> <ul style="list-style-type: none"> <li>• What does "rotation" mean?</li> <li>• What causes day and night?</li> <li>• What are the three bodies in space that you learnt about in Year 4?</li> <li>• What changes shape each month?</li> <li>• What gives us heat and light?</li> </ul>	Page 153
Demonstrate the movement of the Sun, Earth and Moon.	Balls or lemons, string	<p><b>Activity 1</b> This activity can be done in groups. Make sure you prepare the materials needed for this activity beforehand. Allow learners in each group to have a try: that is, swing the ball tied to a string without letting go. Explain to them that the moving ball, or lemon, around their head is like our Earth moving around the Sun. The gravitational pull or force keeps the Earth spinning around it.</p> <p><b>What is an orbit?</b> When the Earth moves around the Sun, we call this an "orbit". It is a path that an object follows around another object.</p> <p><b>Activity 2</b> Learners should do this activity in groups of three so that they represent the three moving bodies: the Sun, Moon and Earth.</p>	Page 154
Identify the eight planets.	<i>Explore Science</i> pages 96–101	<p><b>The planets</b> There are eight planets that orbit the Sun in our solar system. According to scientists, Pluto is not regarded as a planet. Planets closer to the Sun revolve more quickly around the Sun than planets that are further away. The Sun consists of very hot gases and liquids, which is why it is very hot.</p>	Page 155
Interpret data on planet diameter and distances from the Sun.	<i>Explore Science</i> page 96	<p><b>Activity 3</b> Learners should study the table and answer the questions in the Learner's Book. Use a lemon or a soccer ball to demonstrate diameter (the distance across a sphere at its widest point).</p>	Page 156

Processes and skills	Resources	Teacher's support notes	Learner's Book
<p>Improvise a model of the solar system</p>	<p><i>Explore Science</i> pages 96–97, 98–101 Cardboard, balloon, marker, stick, sticky tape</p>	<p><b>Activity 4</b> Take learners outside to do this activity. Refer to page 156 and use the last column of the table to give you the distance in metres between each person representing the planets. Select eight learners to act as planets and one for the Sun. The planet learners will stand in order from the Sun as shown on the diagram on page 157. Use placards to show the different planets.</p>	<p>Page 156–57</p>
		<p><b>Years, days and months</b> Explain to learners how many days and months in a year. Ask learners when their birthdays are and work out how many years, months and days old they are. This is simply to show what we mean by years, days and months. Compare the speed of the world's fastest animal (the peregrine falcon), the speed of a vehicle and the speed of the Earth's travel around the Sun. Explain that the Earth travels faster than the animal and a vehicle.</p>	<p>Page 158</p>
<p>Use a globe to show the imaginary line (Equator) that runs through the centre of the Earth.</p>	<p><i>Explore Science</i> page 112</p>	<p><b>Earth's orbit and the climate</b> Show learners a globe of the world and the imaginary line running through the centre of the Earth—the Equator. Show them the North Pole and the South Pole. The seasons on Earth are caused by the tilting of the Earth on its axis as it travels around the Sun. Explain what is meant by summer and winter. When the Earth tilts towards the Sun, the closer part of the Earth gets warmer. The part of the Earth that is further away from the Sun is cooler. Places on the Earth near the Equator are always hot.</p>	<p>Page 159</p>
<p>Improvise on the models of the Earth.</p>	<p>Dark-coloured curtains, globe or large ball, torch</p>	<p><b>Activity 5</b> You can do this activity inside your classroom provided that you cover your windows with dark-coloured curtains. The torchlight acts as the Sun's rays and the globe represents the Earth.</p>	<p>Page 160</p>

Processes and skills	Resources	Teacher's support notes	Learner's Book
List and explain the four seasons.	<i>Explore Science</i> page 112	Observe the Earth's orbit in four different positions. The four seasons are winter, summer, autumn and spring.	Pages 160–61
		<p><b>Moon</b></p> <p>The moon is Earth's closest neighbour, and it moves around Earth in 28 days. The different phases of the Moon are determined by whether it is lit by the Sun or in the Earth's shadow.</p> <p>The Moon does not sustain life because it has no water or air.</p> <p>Encourage learners to make up riddles about the Moon.</p>	Pages 161–63
Model and observe the different phases of the Moon.	<i>Explore Science</i> pages 110–11 Dark-coloured curtains, globe or large ball, torch	<p><b>Activity 6</b></p> <p>This activity can be done in the classroom, provided that you cover the windows with dark curtains. Select four learners to do this activity while others watch. You should arrange learners as shown in the Learner's Book.</p>	Page 164
Follow instructions for simple calculations.	<i>Explore Science</i> pages 110–11	<p><b>Activity 7</b></p> <p>Encourage learners to study the table. Following the instructions given in the book for simple calculations, they can then copy and complete the table correctly.</p>	Page 165
	<i>Explore Science</i> pages 110–11	<p><b>Activity 8</b></p> <p>This activity must be organized for learners to do over a period of one month. Remind them regularly to complete the task.</p> <p><b>Satellites</b></p> <p>Explain the word "satellite". Refer to the glossary at the back of the Learner's Book. Natural and human-made satellites orbit the Earth. An example of a natural satellite is the Moon. The Moon is the Earth's satellite. An example of a human-made satellite is the Hubble space telescope, a special satellite that takes pictures of stars and galaxies in outer space.</p>	Page 166

Processes and skills	Resources	Teacher's support notes	Learner's Book
		<p><b>Concept map</b> Study the concept map. Learners can use the concept map to self-evaluate their own understanding of the chapter with their peers.</p>	Page 167
		<p><b>Chapter review</b> Go through the chapter review. Refer back to the appropriate pages of the Learner's Book. Clarify all the statements so that learners have a clear understanding about the solar system.</p>	Page 168
		<p><b>Revision</b> Give learners the multiple-choice questions as a self-assessment exercise for this chapter.</p>	Page 169

## Activities and assessment answers

### Activity 1 (page 153)

- The ball pulls against the string because you are still holding on to it. The string acts as the gravitational force.
- When you let go of the string from your hand, the ball will fly off into space.

### Activity 2 (page 154)

It is possible for the three learners to move at the same time. This is exactly what happens when the Earth orbits the Sun and the Moon orbits the Earth.

### Activity 3 (page 156)

- 1 Mercury
- 2 Neptune
- 3 149,600,000 km
- 4 Jupiter
- 5 Mercury

### Activity 4 (page 157)

There are no specific questions for this activity.

### Years, days and months (page 158)

- The period of the Earth's orbit around the Sun is called a "year".
- The period of the Moon's orbit around the Earth is called a "month".
- The period of the Earth's spin on its axis once every day is called a "day".

### Activity 5 (page 160)

There are no specific questions for this activity.

### Activity 6 (page 164)

There are no specific questions for this activity.

### Activity 7 (page 165)

Months	Number of days	Days more than 28	
January	31	3	
February	28	0	
March	31	3	
April	30	2	
May	31	3	
June	30	2	
July	31	3	
August	31	3	
September	30	2	
October	31	3	
November	30	2	
December	31	3	
Earth year total days	365	Total days more than 28	29
		12 x 28	336

4 365

5 29

6 336

365

### Activity 8 (page 166)

Learners' answers will depend on their observations.

### Revision (page 169)

1 b

2 None of the options is correct.

3 A

4 a Year—revolution

b Day—rotation

## Appendix 1: Glossary of terms

The glossary in the Learner's Book lists important words and concepts for each chapter. Each of these words is printed in bold where it appears in the Learner's Book. You may need to explain other difficult words to learners, or encourage them to use a dictionary.

Learners should be encouraged to use the glossary whenever they come across a word in bold that they do not know or understand clearly, but they do not need to learn the definition. They should make sure they understand the word and then practise using it for themselves. The real test is being able to use the word correctly in a sentence, not being able to repeat the definition.

The glossary from the Learner's Book is repeated in the following pages.

## **A**

<b>adventitious roots</b>	roots that grow directly from the stem of a plant, not from a main root
<b>air</b>	an invisible mixture of gases surrounding the Earth
<b>alloy</b>	mixture of two or more metals
<b>aluminium</b>	grey metal, light in weight, often used for making pans for cooking
<b>anus</b>	opening at the end of the gut
<b>artery</b>	blood vessel that carries blood with oxygen from the heart to the rest of the body
<b>axis</b>	imaginary line that runs through the centre of a planet which it spins around

## **B**

<b>blood</b>	mixture of fluid and tissue that carries various substances around the body
<b>blood vessels</b>	thin tubes that carry blood around the body
<b>bones</b>	the pieces of hard tissue making up the skeleton of vertebrates
<b>brain</b>	organ in the skull of vertebrates that controls all the activity of the nerves and senses
<b>breathing</b>	the act of inhaling (taking in oxygen) and exhaling (sending out carbon dioxide) in the body
<b>buds</b>	plant parts that can grow into flowers or new shoots
<b>bulbis</b>	tip of a swollen plant stem

## **C**

<b>carbohydrate</b>	energy-giving compound made up of carbon, hydrogen and oxygen, found in foods such as vegetables and bread
<b>carbon dioxide</b>	gas produced during respiration by living organisms
<b>carnivore</b>	animal that eats other animals
<b>cell</b>	the basic unit of a living thing

<b>chemical</b>	any substance that can change when joined or mixed with another substance
<b>chlorophyll</b>	the green substance in leaves that traps sunlight energy during photosynthesis
<b>circulatory system</b>	the body system responsible for the transportation of blood from the heart to all organs of the body
<b>climate</b>	the normal weather conditions in an area over a long period
<b>collar bone</b>	the bone that joins the shoulder to the chest bone
<b>compass</b>	magnetic instrument that shows geographical directions
<b>compost</b>	mixture of decayed vegetation that gives nutrients to soil
<b>consumer</b>	animal that eats other organisms for food
<b>copper</b>	reddish-brown metal that allows electricity and heat to pass through it easily
<b>corm</b>	round underground part of certain plants, similar in appearance to a bulb, from which the new plant grows each year
<b>D</b>	
<b>decibel</b>	unit of measurement for the loudness or intensity of a sound
<b>diameter</b>	the distance from one side of a circle to the other, passing through the centre
<b>diaphragm</b>	thin, dome-shaped muscle that separates the stomach and intestines from the lungs and helps to bring air in and out of the lungs
<b>digested food</b>	food that is broken down into simpler forms that the body can use
<b>digestive system</b>	the body system responsible for breaking down food
<b>dilute</b>	to make a liquid weaker by adding water or another liquid

<b>dissolve</b>	to make a solid substance mix with a liquid and become part of it
<b>dye</b>	substance that changes the colour of a material
<b>E</b>	
<b>ear</b>	the sense organ responsible for hearing sounds and for maintaining balance
<b>echo</b>	sound waves that reflect off a surface and can be heard after the original sound
<b>elbow</b>	the joint where the arm bends
<b>electromagnet</b>	magnetised nail or iron rod, created when a nail or rod is placed inside a coil of insulated wire that has an electric current flowing through it
<b>energy</b>	the ability to do work or cause change
<b>environment</b>	the surroundings of an animal or plant
<b>Equator</b>	imaginary circle around the middle of the Earth, midway between the north and south poles
<b>evaporation</b>	the process by which a liquid changes into gas
<b>eye</b>	the sense organ responsible for sight
<b>F</b>	
<b>fertilizer</b>	natural substance or chemical added to soil to make it more fertile and help plants grow
<b>fibrous root</b>	cluster of thin roots of about the same size
<b>filter</b>	device that allows one substance to pass through, but not others
<b>fluorescence</b>	the property of a substance by which it gives off light
<b>force</b>	a push, pull, lift or squeeze that causes an object to move or change its shape
<b>freeze</b>	the process by which a liquid changes to a solid, for example, when water changes to ice
<b>frequency</b>	the number of waves from a vibrating object that pass a point every second

## **G**

**galvanised iron**

iron metal coated with zinc metal

**gas**

the state of matter that can change shape and volume, for example air

**germination**

the process by which a seed develops into a plant

**glucose**

natural form of sugar that exists in fruit

**gravity**

a force that pulls objects towards other objects

**gullet**

the tube through which food travels from the mouth to the stomach

## **H**

**hearing**

the sense that you use to hear sounds

**heart**

the organ that pumps blood around the body

**hemisphere**

a half of the Earth; one half is above the Equator and the other half is below

**herbaceous stem**

thin stem that bends easily and does not get thicker as the plant gets older

**herbivore**

animal that eats only plants

**humus**

material formed by decayed vegetation that makes soil more fertile

## **I**

**insect**

organism with six jointed legs, three body sections and an outer skeleton

**insoluble**

substance that cannot be dissolved

**insulate**

to use a material that stops electricity, sound and heat from passing through it

**interdependence**

the dependence of living things on each other and on non-living things for survival

**intestine**

long tube in the body that helps process food; it carries the solid waste from the stomach out of the body

**iron**

naturally occurring metal that is used to make steel; it is magnetic

## **L**

**layering**

way of growing new plants without seeds or cuttings

<b>liquid</b>	state of matter that has a definite volume and flows to take the shape of the container it is in
<b>lodestone</b>	rock that is a form of magnetic iron ore found in the ground
<b>lung</b>	body organ where gas exchange takes place
<b>M</b>	
<b>magnet</b>	piece of iron, steel or alloy with the ability to repel or attract materials
<b>magnetic</b>	property of a material which enables magnets to attract it
<b>magnetic field</b>	space in which the magnetic force of a magnet can be felt
<b>manure</b>	animal dung used for fertilizing soil
<b>mass</b>	the amount of matter in an object
<b>metal</b>	naturally occurring substances found as ores in the rocks of the Earth's crust
<b>microbe</b>	extremely small living thing you can see only if you use a microscope
<b>mineral</b>	naturally occurring substance that makes up the rocks of the Earth's crust
<b>mixture</b>	several different substances mixed together
<b>mulch</b>	natural material placed on the ground, around a growing plant
<b>muscle</b>	one of the pieces of tissue inside the body which cause bones to move
<b>muscular system</b>	the body system that includes all of the muscles in the body
<b>N</b>	
<b>nervous system</b>	the body system that consists of the nerves, the brain and the spinal cord
<b>north-seeking pole</b>	the pole of a magnet which, when hanging freely, points to the north magnetic pole of the Earth
<b>nose</b>	the organ used for breathing and for the sense of smell

<b>nutrients</b>	substances in food that are used by plants and animals for growth
<b>O</b>	
<b>omnivore</b>	animal that eats both plants and other animals
<b>opaque</b>	property of materials that do not allow light to pass through
<b>orbit</b>	the path that an object takes as it moves around another object
<b>organ</b>	group of tissues that work together to carry out a particular job in the body
<b>organism</b>	an individual living thing, made of one or more cells
<b>oxygen</b>	gas found in air; oxygen is needed for respiration in living things
<b>P</b>	
<b>particle</b>	very small piece of matter
<b>photosynthesis</b>	the process by which plants make their own food using energy from the Sun
<b>pitch</b>	measure of how high or low a sound is
<b>planet</b>	large body that orbits a star (such as the Sun)
<b>pressure</b>	the amount of force applied to a unit of area
<b>propagate</b>	to grow and increase the number of plants from seeds or other plant parts
<b>prune</b>	to cut off some of the branches of a tree or bush to make it grow better
<b>R</b>	
<b>red blood cell</b>	cell in blood that carries oxygen throughout the body
<b>reflection</b>	the bouncing back of light from a surface
<b>refraction</b>	the change of direction of a light beam as it passes from one material to another of different density, for example from air to glass
<b>repel</b>	to push away

<b>reproduction</b>	the process by which organisms produce more organisms like themselves
<b>respiration</b>	the process by which living organisms use oxygen to break down food to produce energy and carbon dioxide
<b>respiratory system</b>	the system responsible for supplying body cells with oxygen and removing carbon dioxide
<b>revolution</b>	a complete movement of one object around another
<b>rhizome</b>	the thick stem of certain plants which grows along or under the ground and has shoots and roots growing from it
<b>ribcage</b>	the set of curved bones from the breastbone to the spine which protect the heart and lungs
<b>root system</b>	the parts of a plant that are found in the ground, namely the root and root hairs
<b>rotation</b>	changing the food crops that are planted in a garden area
<b>runners</b>	long plant stem that runs along the surface of the soil
<b>S</b>	
<b>saturated solution</b>	solution that does not allow more solute to dissolve in it
<b>season</b>	period of the year which has weather conditions caused by the tilt of the Earth in relation to the Sun
<b>sense organs</b>	the organs that help humans to monitor what goes on inside the body and to be aware of the environment
<b>shading</b>	slight darkness caused by something blocking the direct light of the Sun
<b>shoot system</b>	the parts of a plant above ground: the stem, leaf, flower and fruit
<b>sight</b>	the ability to see

<b>skeletal system</b>	the body system made up of the bones, for protection, movement and support
<b>skin</b>	the outer covering of the body; the largest body organ
<b>skull</b>	the collection of 22 bones that form the head and face
<b>smell</b>	the ability to sense odours
<b>soil</b>	the top layer of the Earth in which plants get nutrients for growth
<b>solar system</b>	the Sun and everything that orbits around it, including the eight planets
<b>solid</b>	the state of matter with a definite shape and volume that is not easy to change
<b>solubility</b>	measure of the ability of any substance to dissolve in a liquid
<b>soluble</b>	property of a substance that can dissolve in a liquid
<b>solute</b>	substance that dissolves in a liquid
<b>solution</b>	mixture in which tiny particles of one substance are dissolved evenly in a liquid
<b>solvent</b>	the liquid substance that does the dissolving
<b>sound</b>	form of energy produced by a vibrating object, which can be heard
<b>south-seeking pole</b>	the pole of a magnet which, when hanging freely, points to the south magnetic pole of the Earth
<b>spectrum</b>	the band of colours in white light, visible as red, orange, yellow, green, blue, indigo and violet
<b>stalk</b>	long narrow part of a plant that supports leaves, fruits or flowers
<b>stamen</b>	the male sex organ of the plant, consisting of two parts, the “anther” and the “filament”
<b>stem</b>	plant part that supports the plant and transports water and minerals to other parts of the plant
<b>stomach</b>	the organ in which food is mixed with digestive juices before moving to the small intestine

<b>stomata</b>	small pores on the under side of leaves that can open to allow gas exchange and water loss
<b>substance</b>	anything that takes up space
<b>sucker</b>	upright shoot on stems of some plants that can develop into a new plant
<b>summer</b>	the season of the year when the Sun is hottest and the days are longest; caused by Earth's tilt on its axis, relative to the Sun
<b>suspension</b>	cloudy mixture of a liquid and solid substance

## **T**

<b>taste</b>	the ability to perceive sensations, such as sweetness and sourness, using the tongue
<b>temperature</b>	a measure of how hot or cold an object is
<b>thermometer</b>	an instrument for measuring temperature
<b>tissue</b>	a group of cells in living things that perform a specific function
<b>tongue</b>	the sense organ responsible for taste
<b>touch</b>	the sense of feeling
<b>translucent</b>	the property of a material that allows some light through, but it is not "see through"
<b>transparent</b>	the property of a material that allows nearly all light through, so that it is "see through"
<b>tuber</b>	short, thick part of an underground stem which stores food

## **V**

<b>vegetative reproduction</b>	reproduction in plants that does not involve the male and female parts of the flower
<b>veins</b>	blood vessels that carry blood from various parts of the body back to the heart
<b>vibrate</b>	move quickly back and forth
<b>vitamin</b>	a substance found in food which is essential for good health
<b>volcano</b>	openings in the Earth's crust through which molten rock can flow

**W**

**water**

colourless, odourless, tasteless, transparent liquid  
found in rain, seas, lakes and rivers

**windpipe**

the tube that takes air from the nose to the lungs

## Appendix 2: Lesson plan format

<b>Name of school:</b>		<b>Class teacher:</b>	
<b>Lesson title:</b>			<b>Date:</b>
<b>Learning outcomes:</b> <ul style="list-style-type: none"> <li>• What are the main things I want learners to learn and be able to do as a result of the lesson? How are lesson outcomes linked to syllabus outcomes?</li> <li>• What are other things I want learners to learn as well?</li> </ul>			
<b>Lesson content:</b> <ul style="list-style-type: none"> <li>• What are the key facts, concepts or procedures that I want learners to understand as a result of this lesson?</li> </ul>			
<b>Introduction:</b> <ul style="list-style-type: none"> <li>• How will I get learners motivated, curious and ready to learn?</li> <li>• This section should be allocated 3–5 minutes.</li> </ul>			
<b>Teacher activities:</b> <ul style="list-style-type: none"> <li>• What am I going to do during the lesson in order for learners to achieve the learning outcome?</li> <li>• This section should be allocated 8–10 minutes.</li> </ul>		<b>Learner activities:</b> <ul style="list-style-type: none"> <li>• What are the learners going to do during the lesson in order for them to achieve the learning outcome?</li> <li>• This section should be allocated 20–25 minutes.</li> </ul>	
<b>Conclusion:</b> <ul style="list-style-type: none"> <li>• How will I bring the lesson to a logical and meaningful conclusion?</li> <li>• This section should be allocated 5–7 minutes.</li> </ul>			
<b>Learner assessment:</b> <ul style="list-style-type: none"> <li>• How will I know that learners have achieved what I wanted them to achieve?</li> </ul>			
<b>Lesson evaluation:</b> <ul style="list-style-type: none"> <li>• How will I evaluate the success of the lesson?</li> </ul>			
<b>Lesson endorsement:</b> (to be signed by Head of Department/Head Teacher/Principal) Head of Department: Head Teacher/Principal:			

# Appendix 3: Sample individual record form

Learner name:		Year:		Class:		
Strand:		Sub-strand:				
Assessment event	Specific learning outcome (use appropriate code)	(ratings)				Specific learning
1	7.1.1.1 <i>Identify a living thing and a non-living thing</i>			*		A
2	7.1.1.2		*			PA
3	7.1.1.3	*				NA
4	7.1.1.4			*		PA
Descriptive comments:						
Class teacher:		Signature:			Date:	

# Appendix 4: Sample class record form

Class:		Strand:										Sub-strand:										Year:												
Assessment event	1																																	
Learning outcome assessed (code)	7.1.1.1																																	
Denis	A																																	
Ian	A																																	
Jack	A																																	
James	A																																	
John	PA																																	
Joyce	PA																																	
Lionel	PA																															Steady/satisfactory		
Liza	NA																																	
Luke	NA																																	
Mary	A																															Improved/excellent progress		
Michael	PA																																	
Nancy	NA																																	
Peter	A																																	
Tom	NA																																	
Yates	NA																															Not improved/slow progress		
Overall comments:																																		
Class teacher:															Signature:															Date:				

# Appendix 5: Sample individual monitoring form

<b>Learner name:</b>		<b>Class:</b>		<b>Year:</b>
<b>Strand:</b>		<b>Topic/unit:</b>		
<b>Sub-strand:</b>		<b>Remarks: comment on learning progress: improved, steady or not improved</b>		
<b>Assessment event</b>	<b>Specific learning outcomes: A = achieved, PA = partially achieved, NA = not achieved</b>	<b>A</b>	<b>PA</b>	<b>NA</b>
	<b>Code</b>	<b>Outcome assessed</b>		
1	7.1.1.1	Identify a living thing and a non-living thing	*	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
<b>Class teacher:</b>		<b>Signature:</b>		<b>Date:</b>



# Appendix 7: Sample individual remedial work form

Learner name:		Class:		Term/semester:	Year:		
Strand:		Sub-strand:					
Assessment event	Specific learning outcomes (use appropriate code)		A	PA	NA	Remedial work required	Results after remedial work
	Code	Outcome assessed					
1	7.1.1.1	Identify a living and a non-living thing	*			Give specific activity to identify the characteristics of a living thing and a non-living thing	Able to identify characteristics of living thing and a non-living thing. Achieved the requirement
Class teacher:						Signature:	Date:

# Appendix 8: Sample individual report form

Learner name:		Class:	Term:	Year:
<b>Strand:</b>		<b>Sub-strand:</b>	<b>Specific learning outcomes: Achieved (A), partially achieved (PA) or not achieved (NA)</b>	
<b>Code</b>	<b>Specific learning outcome assessed (use appropriate code)</b>		<b>A</b>	<b>PA</b>
7.1.1.1	<i>Identify a living and a non-living thing</i>		*	*
Descriptive remarks:				
<b>Strand:</b>		<b>Sub Strand:</b>	<b>Specific learning outcomes Achieved (A), partially achieved (PA) or not achieved (NA)</b>	
<b>Code</b>	<b>Specific learning outcomes (use appropriate code)</b>		<b>A</b>	<b>PA</b>
Descriptive remarks:				

# Appendix 8 continued

Results for summative assessment: The progressive achievement level for summative assessment is:		
Strand:	Combination of sub-stands	Specific learning outcomes: Achieved (A), Partially Achieved (PA) or Not Achieved (NA)
7.3.1.1		*
7.4.1.2		*
7.4.1.3		*
Descriptive remarks from summative assessment:		
Overall achievement level:	Overall achievement award:	
<b>School administration report on learner's behaviour and character</b>		
Class teacher:	Signature:	Date:
Class teacher comments:		
Head Teacher/Principal:	Signature:	Date:
Head Teacher/Principal comments:		

# Solomon Islands Primary Science

## TEACHER'S GUIDE Year 5

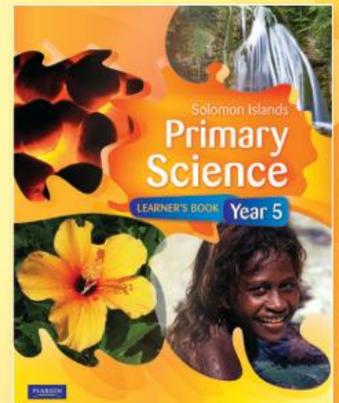
This *Solomon Islands Primary Science Teacher's Guide, Year 5* is the teacher support material for the *Solomon Islands Primary Science Learner's Book, Year 5*.

The teacher's guide supports the chapters of the learner's book— 'Plant world', 'Body systems', 'Energy sources and energy changes', 'Magnets in our lives', 'Solubility', 'Sound and light', 'Crops and animals for food' and 'The solar system'. The support notes for each chapter are presented in a standard format. Each section has:

- processes and skills
- resources
- teacher's support notes
- learner's guide references
- answers to the activities and assessment items.

*The Solomon Islands Primary Science Teacher's Guide, Year 5* is part of a new series of materials for Solomon Islands Primary Science for Years 1 to 6. This series was developed as part of the Solomon Islands school curriculum reform during 2005 to 2012. The teacher's guide will help teachers to give learners the opportunity to learn from their environment. It supports teachers in the organization of learners' hands-on investigations of the physical and living world.

Throughout this teacher's guide there are page references to a primary science encyclopedia, *Explore Science*, where teachers can find background information on each chapter of the learner's book. The encyclopedia accompanies this teacher's guide.



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