

Summary of students' performance by the end of Grade 5

Scientific enquiry

Students plan and conduct systematic controlled investigations. They identify patterns in observations and draw generalised conclusions from them, and make simple calculations from experimental data. They use simple diagrams and charts to show relationships, chains and processes and draw conclusions. They use equipment correctly and adapt everyday objects to carry out scientific investigations. They make accurate measurements of time, distance and force.

Life science

Students know the main characteristics of the five groups of vertebrates and how vertebrates differ from invertebrates. They recognise that characteristics can vary between members of the same type of organism. They know that organisms within a habitat have feeding relationships and that green plants are the basis of many food chains. They name the life processes common to all living things and relate the life processes of some organisms to the environment in which they live. They know that sexual reproduction requires mating. They know that food provides energy for the body. They know the importance of a balanced diet. They can describe the main stages in the human life cycle.

Materials

Students know that water is essential for life, that water should be conserved and that water pollution should be avoided. They describe the water cycle and, in outline, the processes used in Qatar for getting drinking water from seawater. They know that although water is a good solvent, not all substances dissolve in it, and that seawater contains dissolved substances, mainly salt. They classify the ways we change materials as temporary or permanent changes and give examples.

Earth and space

Students compare different rocks and group them according to readily observable characteristics. They devise tests for making simple comparisons between different rock types. They realise that how we use rocks depends on their properties. They know that there is rock under all the Earth's surfaces and that soil is formed from rocks by the processes of weathering. They compare different soils.

Physical processes

Students know that friction is a force that opposes movement and that air and water resistance slow objects down. They calculate how fast something is moving and perform tests to show what shapes move best through water and air. Students know that electrostatic charges are caused by friction when an insulator is rubbed and that there are two types of charge. They know that unlike charges attract each other and like charges repel. They know that only certain metals can be made into magnets, that magnets have two poles and that unlike poles attract each other and like poles repel.

They know that magnets attract iron but not other metals. They construct simple circuits using bulbs, switches and cells. They know that a circuit must be complete and have a power source for it to work, and that the electricity flows round a circuit from the positive pole of the cell to the negative one. They test materials to discover whether they are good or bad conductors of electricity. They know that increasing the number of cells in a circuit will make bulbs shine brighter and that increasing the number of bulbs in the circuit makes them shine less brightly.

The balance between scientific enquiry and the subject content strands

The science standards for Grade 5 are grouped into five strands: four content strands – life science, materials, Earth and space, and physical processes – and the scientific enquiry skills strand, which addresses the development of scientific practical and intellectual skills across all the content strands. The teaching of the enquiry skills strand should be an integral part of the teaching of the content strands.

Assessment weightings for Grade 5

There are three general assessment objectives for the science curriculum:

- knowledge and understanding;
- application of knowledge and understanding, analysis and evaluation of information;
- scientific enquiry skills and procedures.

The balance between these three general objectives will vary from grade to grade. As students’ scientific proficiency and experience develops, there should be a greater emphasis on the application of knowledge to solve problems in new situations.

For Grade 5, the weightings of the subject content strands are as follows:

	Life science	Materials	Earth and space	Physical processes
Assessment weighting	30 to 40%	25 to 35%	5 to 15%	30 to 40%

For Grade 5, the weightings of the assessment objectives to be applied to each content strand are as follows:

	Knowledge and understanding	Application, analysis and evaluation	Scientific enquiry skills and procedures
Assessment weighting	35 to 45%	20 to 30%	30 to 40%

Scientific enquiry

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Students should:

1 Use methods of scientific investigation

- 1.1 Plan investigations with an understanding of the importance of controlling variables and of collecting an appropriate range of evidence, observations and relevant data in a systematic manner.
- 1.2 Identify patterns in observations and data, draw appropriate, generalised conclusions and use the data to test predictions.

2 Process and communicate information

- 2.1 Use simple diagrams and charts to show relationships, chains and processes and to record observations and conclusions.
- 2.2 Use ICT methods where appropriate to communicate observations, data and results.
- 2.3 Classify observations according to shared characteristics and make generalised conclusions from them.
- 2.4 Perform simple calculations using experimental data.

3 Handle equipment and make measurements

- 3.1 Select and use simple specialised equipment correctly, safely and without damage to carry out simple experiments
- 3.2 Adapt everyday items to help carry out scientific investigations
- 3.3 Make accurate measurements of time, distance and force.

Key standards

Key performance standards are shown in shaded rectangles, e.g. 1.3.

Examples of learning exercises

The examples of active learning exercises shown in italics are intended to be illustrative and do not represent the full range of possible exercises.

Cross-references to scientific enquiry skills

Some of the suggested learning exercises are cross-referenced where appropriate to scientific enquiry skills.

Life science

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Students should:

4 Recognise characteristics of some major groups of organisms

- 4.1 Recognise the main distinguishing features of the vertebrate groups (fish, amphibian, reptile, bird, mammal) and know how vertebrates differ from invertebrates.

Using specimens, models, photographs and drawings, compare the features of various types of vertebrate and draw tables to indicate common features.

- 4.2 Know that individual members of the same type of organism show variation.

Measure the arm length of students in the class and draw charts to show the degree of variation.

Make a collection of leaves from a tree. Measure their length and breadth. Make a display to show variation.

Enquiry skill 2.3

ICT opportunity

Make a database of the features of specimens of the major groups of plants.

Enquiry skill 2.3

5 Know that the organisms in a habitat have a feeding relationship

- 5.1 Know that some organisms in a habitat feed off green plants, others prey on other animals and some eat dead animals.

Make a field trip or watch an appropriate video and observe the feeding habits of animals. Note those that eat green plants (or parts of plants), those that eat other animals (or parts of them) and those that eat both.

- 5.2 Know that green plants make their own food.

Enquiry skills 2.1, 2.2, 2.3,

6 Know the life processes common to all living organisms

- 6.1 Know that living organisms require air, food and water, and that they release waste; know that they are sensitive and that they grow and reproduce to create more organisms like themselves.

- 6.2 Relate the life processes of some organisms to the environment in which they live.

Examine the behaviour of some fish, birds and mammals (in the field or on video). Observe how they feed, drink and get air. Relate the observations to the environment in which they live.

Enquiry skill 1.2

- 6.3** Know that sexual reproduction in fish, amphibians, reptiles, birds, mammals and insects requires adult males and females to mate.

Breed fish or small mammals.

Watch and discuss video material.

Enquiry skill 1.2

7 Know that the human body requires food

- 7.1** Know that humans require food as an energy source.

Ignite a Brazil or other nut and use the flame to heat a small quantity of water in a test tube. Measure the temperature increase and the time taken to reach maximum temperature. Compare this with a spirit burner.

Enquiry skills 1.1, 3.1

Safety

Check for nut allergies beforehand.

- 7.2** Estimate energy intake.

Using tables of energy values of different foods, students estimate their daily energy intake and compare this with recommended levels.

Enquiry skill 2.2

- 7.3** Know that a balanced diet is essential to good health.

Make a collection of food labels (or use equivalent data). Draw up tables to show the amounts of carbohydrate, protein and fat contained in different foods. Indicate which foods contain vitamins. Decide which combinations of foods could form a balanced diet.

Enquiry skill 2.3

- 7.4** Know that a balanced diet must contain carbohydrate, protein and fat.

Make up diets for different people (e.g. office workers, builders, athletes) to illustrate how different lifestyles require a different balance of carbohydrate, protein and fat.

Enquiry skill 2.2

- 7.5** Know that the body needs vitamins and fibre.

Visit a health food shop or obtain information to determine the range of vitamins required for good health and the usual source of these.

Enquiry skill 1.1

Examine food packets to see which foods contain fibre.

- 7.6** Determine if they have a healthy diet.

Keep a food diary for a week. Work out the proportions of carbohydrate, protein and fat and discuss whether the diet is healthy.

Enquiry skill 2.4

8 Describe the human life cycle

- 8.1** Know that the human life cycle involves stages of birth, babyhood, childhood, adolescence (i.e. reproductive maturity), reproductive capability, old age and death.

Make a poster to show the main stages in the human life cycle.

Enquiry skill 2.2

- 8.2** Compare and contrast the life cycle of humans with those of other mammals.

Make charts to show the life spans of various mammals, their age of maturity and the number of young in a typical birth.

Enquiry skill 2.1

Materials

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Students should:

9 Know some of the properties of water and how it is used

9.1 Know that water is essential for life; recognise the importance of water conservation and of not polluting seas, rivers and other water supplies.

See Standard 7.1

9.2 Describe the water cycle.

Identify the physical changes involved in the water cycle.

Make a poster, a PowerPoint presentation or a web display showing the water cycle.

Explain, using the water cycle, why Qatar gets less rainfall than nearby more hilly areas such as Oman.

IT opportunity

Use drawing or web-page applications.

9.3 Investigate how waste water is treated in Doha.

Make a model sewage works.

Enquiry skill 3.2

9.4 Describe the process of getting drinking water from seawater in Qatar and know that the distillation process uses waste heat from producing electricity and that the steam is condensed using seawater as a coolant.

9.5 Know that the boiling point of water at atmospheric pressure is 100 °C but this reduced when the pressure is below atmospheric pressure and hence the distillation process to produce water from seawater in Qatar is carried out under reduced pressure.

Make a display about the Ras Abu Aboud power station and distillation plant.

Organise a class visit to the power station and distillation plant.

Enquiry skill 2.2

9.6 Know that water is a good solvent but that not all substances dissolve in water.

Explore the solubility in water of a number of common solids (e.g. sand, sugar, salt, flour, powder paint, plaster of Paris). Group them according to similar behaviour.

Enquiry skills 1.2, 2.3

9.7 Know that water is not the only liquid and solvent; other common ones are methylated spirit and petrol.

Show that some liquids (e.g. oil), do not mix with water, but others (e.g. ethanol), do.

Show that some solids dissolve in water but not in methylated spirits.

9.8 Know that seawater contains dissolved substances, mainly salt.

Evaporate a sample of seawater by leaving it in a dish to evaporate slowly. Look carefully at the product using a magnifying glass to see if there is more than one kind of crystal in it.

9.9 Know that the waste salt from water distillation in Doha is returned to the sea.

Discuss the environmental issues related to returning water that is either too warm or too salty to the sea.

10 Change substances temporarily and permanently

10.1 Give examples of ways in which we change materials: for example, cooking, firing clay, setting cement. Know that these changes are permanent.

10.2 Describe the differences between the substances before and after a permanent change.

Make and test bricks from fired clay and cement. Use a magnifying glass to describe them before and after the process.

Cook some biscuits or cake in class and make a table comparing the physical properties of the ingredients with the properties of the product.

10.3 Give examples of the ways we can change material temporarily: for example, making objects out of clay without firing, dissolving table salt, melting a candle.

Carry out some temporary changes on substances and later recover the original substance.

10.4 Describe the differences in substances before and after a temporary change and know how the change can be reversed.

10.5 Classify common changes as temporary or permanent.

Classify a wide variety of changes (e.g. the evaporation and boiling of water, melting ice, burning, cooking food, eating and digesting food, setting concrete, softening of chocolate).

Enquiry skill 1.1

Safety

Do not eat anything unless it is prepared under hygienic conditions

Earth and space

By the end of Grade 5, students compare different rocks and group them according to readily observable characteristics. They devise tests for making simple comparisons between different rock types. They realise that how we use rocks depends on their properties. They know that there is rock under all the Earth's surfaces and that soil is formed from rocks by the processes of weathering. They compare different soils.

Students should:

11 Compare rocks from different places

11.1 Compare different rocks and group them according to readily observable characteristics; devise tests for making simple comparisons between different rock types, such as the effect of rubbing and porosity.

Make a collection of different rocks and classify them according to characteristics (e.g. texture, colour, whether they easily mark other rocks or a concrete floor). Some of the rocks should be collected from the seashore.

Devise and conduct simple physical tests on a variety of rock samples.

11.2 Realise that the use we make of rocks depends on their properties.

Enquiry skills 1.2, 2.3

Enquiry skill 1.1

Use secondary sources to find out the uses for common rocks (e.g. limestone, marble, granite, rocks that are rich in mineral crystals).

- 11.3** Know that there is rock under all the Earth's surfaces and that soil is formed from rocks by the processes of weathering.

Use the rock collection to show some of the effects of weathering (e.g. wearing smooth by movement in water).

Soak some rocks (including porous rocks such as limestone or sandstone) in water and leave overnight in the freezing compartment of a refrigerator to test the weathering effect of ice formation.

- 11.4** Know that soils from different rocks have different physical characteristics and properties.

Examine different soils under a magnifying glass.

Compare the particle size in different soils by sieving.

Devise a way of finding out how well water is absorbed by soils or how well water flows through soils.

ICT opportunity

use the Internet as a resource on the uses of rocks.

Physical processes

By the end of Grade 5, students know that friction is a force that opposes movement and that air and water resistance slow objects down. They calculate how fast something is moving and perform tests to show what shapes move best through water and air. Students know that electrostatic charges are caused by friction when an insulator is rubbed and that there are two types of charge. They know that unlike charges attract each other and like charges repel. They know that only certain metals can be made into magnets, that magnets have two poles and that unlike poles attract each other and like poles repel. They know that magnets attract iron but not other metals. They construct simple circuits using bulbs, switches and cells. They know that a circuit must be complete and have a power source for it to work, and that the electricity flows round a circuit from the positive pole of the cell to the negative one. They test materials to discover whether they are good or bad conductors of electricity. They know that increasing the number of cells in a circuit will make bulbs shine brighter and that increasing the number of bulbs in the circuit makes them shine less brightly.

Students should:

12 Understand friction

- 12.1** Know that forces are pushes and pulls, and that the unit of force is the newton.

Use a forcemeter to measure a number of forces (e.g. the force needed to lift a bag or close a door).

Recognise, through experience, the approximate size of a newton (the weight of a small apple) and estimate, before measuring, the magnitude of forces such as those in the previous activity.

Enquiry skill 3.1

12.2 Measure short time intervals and distance, and use these to calculate the speed of an object.

Develop techniques for measuring short time intervals (e.g. the time taken to run one step – measure the time taken to run many steps and divide by the number of steps).

Use appropriate measuring instruments (ruler, tape and trundle wheel to measure distance).

Calculate the average speed of a student running and walking.

Use a trolley to switch light-operated switches to stop and start a clock and so calculate the speed of the trolley.

12.3 Know that friction is a force that opposes movement and that the nature of the surfaces in contact influences the size of the frictional force. Distinguish between dynamic and static friction.

Pull a variety of objects along surfaces to become familiar with forces of different sizes and with friction caused by different surfaces. Note the difference between dynamic and static friction.

Place various objects on an inclined plane and increase the angle of the plane until the object slides. Note the effect of changing the surfaces between the plane and the object. Investigate the difference between dynamic and static friction by comparing the angle at which the object will begin to slide by itself with the angle at which the object will continue to slide if pushed.

12.4 Know that water and air resistance slow an object down when it moves through water or air and that the shape of an object affects the size of this resistance.

Investigate the relationship between the force needed to pull a boat through water and how deep the boat floats in the water. Change the depth with weights on the boat.

Perform tests to show what shaped objects move best through water and relate the results to the shapes of fish and boats.

Use Plasticine to make different shapes that are then dropped into a tall cylinder of water.

Explore how spinners weighted with clips fall. Devise a problem relating the number of clips to the time taken to fall. Investigate it fairly and display the results.

13 Understand electrostatic and magnetic forces

13.1 Know that electrostatic charge is generated by friction when an insulator is rubbed and that two kinds of charge can be created in this way.

Give an electrostatic charge to a rod made from an insulator by rubbing it with a cloth.

13.2 Know that unlike charges attract each other and like charges repel.

Use hanging rods of opposite charge (polythene negative, acrylic positive) to show attraction and repulsion of electrostatic charges. Show that electrostatic force acts at a distance.

13.3 Know that certain metals, such as iron and nickel, can be made into magnets.

Use a permanent magnet to make a magnet from a screwdriver.

13.4 Know that magnets have two poles and that unlike poles attract and like poles repel each other.

Use suspended magnets to show attraction and repulsion. Show that magnetic force acts at a distance.

Enquiry skills 3.3, 2.4

Enquiry skill 2.3

Enquiry skills 3.3, 2.4

ICT opportunity

Use electronic gates to start and stop an electronic timer.

Enquiry skill 2.1

Enquiry skills 1.1, 1.2

Enquiry skills 1.1, 2.2

13.5 Know that magnets attract objects that contain iron, but not those that contain other metals such as aluminium or copper.

Test a variety of metals for magnetic attraction.

13.6 Distinguish between a metal that is magnetic and a metal that is magnetised.

Test metals with a magnet. A metal that is magnetic will always be attracted to both poles of a magnet but one that is magnetised will have magnetic poles, one of which will be repelled by the same pole of the magnet.

14 Make simple electrical circuits

14.1 Construct simple circuits using bulbs, switches and cells, and know that a circuit must be complete and have a source of electrical power in order to work.

Investigate the basic properties of electricity by constructing simple series and parallel circuits with bulbs, cells and switches.

Enquiry skill 3.1

14.2 Know that the electricity flows round a circuit from the positive pole of the cell to the negative one.

14.3 Test whether a material is a good or bad conductor of electricity and recognise that metals conduct electricity whereas non-metals do not.

Test a variety of substances for conductivity, including carbon (pencil lead). Classify the substances and draw conclusions about which classes of substances are good or bad conductors

14.4 Know that increasing the number of cells in series in a circuit will make bulbs shine brighter but that increasing the number of bulbs in series in the circuit makes them shine less brightly.

Construct circuits with different numbers of cells in series.

Enquiry skill 3.1

14.5 Represent circuits using circuit diagrams.

Set tasks that allow students to design and test circuits, for example:

Enquiry skill 1.1

- *design and make a circuit with two cells that has one bright bulb and two dimmer ones;*
 - *design and make a circuit with two bulbs, one of which can be switched off with a switch.*
-