

# Science

## Skills

Observe carefully in order to gather data.

Learner will

- ? Examine objects and living things to find out more about them.
- ? Observe and manipulate objects by using all their senses as appropriate.
- ? Observe changes in living things, objects and events over a period of time.
- ? Distinguish between significant and less significant observations.
- ? Record observations in a systematic way.

## Phase 2

Year 2, Year 3

**Examine** objects for specific attributes (with specific objectives - e.g. is it watertight?)

Observe **and record** changes over time (sequence of a decaying plant).

**Examine** objects for **specific** properties **and investigate their changing states (e.g. How does water change when it is frozen?)**

Record data using a variety of strategies (e.g. flow charts, picture sequencing, key words and **labelled diagrams**)

**Take relevant observations and use standard measuring equipment for quantities e.g. temperature, volume.**

**Record data orally, in pictures and/or in written words or sentences**

## Use a variety of instruments and tools to measure data accurately.

Learner will

- ? Use a range of tools and techniques with increasing competency.
- ? Use standard and non-standard units for measurement.
- ? Measure, compare and record data including mass, weight, time and temperature.
- ? Select appropriate tools and measurement units.

## Phase 2

Year 2, Year 3

Use **appropriate** scientific tools during structured scientific investigations.

Use **standard** units for measurement and record in variety of ways.

Make comparisons of measurement between mass, weight, temperature and **time**.

**Select and safely use tools and equipment to extend the sense for observation.**

**Select and safely use tools and equipment to observe and measure -Range of materials or object chosen by students to suit investigations e.g. 3 to 4 parachutes**

**Intervals may use non-standard units e.g. coarse, medium, fine**

**Use various measuring devices appropriately with some teacher guidance.**

## Use scientific vocabulary to explain their observations and experiences.

Learner will

?Talk about what is observed.

?Describe simple features of objects and events.

?Describe what is happening using an increasing scientific vocabulary.

? Record and present findings and conclusions using a variety of strategies and appropriate scientific vocabulary

## Phase 2

Year 2, Year 3

**Discuss in small group situations** what is observed with specific scientific vocabulary (e.g. This material is translucent and allows light to pass through).

Name and describe several attributes of an object and events **in the context of a specific scientific investigation. (e.g. when I exercise my heart beats faster and I burn more energy).**

Students talk about what is happening in a scientific investigation using teacher modelled scientific vocabulary

**Record findings using relevant scientific vocabulary.**

**Students report back and try to explain their observations and findings.**

**Use scientific vocabulary when planning, recording and explaining findings e.g. dissolving, evaporating, prediction, evidence.**

**Discuss/describe findings or learning through pictures, simple tables and graphs.**

**Use evidence to support findings.**

## Identify or generate a question or problem to be explored.

Learner will

?Ask questions or show curiosity about the natural and physical environment.

?Ask questions or identify problems that may lead to investigations.

?Pose questions and define problems that will facilitate effective investigations or inquiries.

## Phase 2

Year 2, Year 3

**Ask their own questions about the scientific inquiry** (e.g. What do I need to carry out this investigations )

Use wonderings to build a scientific investigation upon ( by identifying a problem suggest next steps)

Discuss scientific ideas and **ask questions**.

**Ask questions related to the specific topic that lead to further scientific inquiry**

Recall teacher led scientific investigations

Use scientific ideas to pose problems

## Plan and carry out systematic investigations, manipulating variables as necessary.

Learner will

?Identify variables

?Collect information and data from a range of sources.

?Suggest approaches and methods for solving problems

?Identify one or two variables relevant to an investigation.

?Recognize the way in which an experiment is unfair if the relevant variables are not controlled.

?Reflect on methods used in investigations and their effectiveness

## Phase 2

Year 2, Year 3

Identify variables within a scientific investigation.

Identify and think of ways to solve problems during scientific investigations.

Recognize ways scientific experiments can be unfair.

**Use appropriate methods to collect information from a scientific investigation.**

Recognize ways scientific experiments can be unfair.

**Plan the main steps of an investigation, building fair testing elements into the plans (with support).**

**Suggest observations and measurements required.**

**Recognize the variables within a fair test with teacher support e.g. measured, keep the same, change.**

## Make and test predictions.

Learner will

?Observe similarities and differences.

?Guess and suggest what will happen next in structured situations.

?Based on prior learning and/or observations, suggest outcomes of an investigation.

?Make justified predictions.

? Propose ideas or simple theories that may be explored or tested

## Phase 2

### Year 2, Year 3

Identify similarities and differences in a range of contexts using **scientific vocabulary** (e.g. properties: rough/smooth; hot/cold).

Make an **informed** prediction **with explanations** based on observations during scientific investigations.

Propose simple **theories** to test out during scientific **investigations**.

Discuss and describe similarities and differences in a range of contexts using **scientific vocabulary** (e.g. properties: rough/smooth; hot/cold).

**Predict outcomes of investigations using their personal experiences.**

Propose simple **hypothesis** to test out during scientific **investigations**.

## Interpret and evaluate data gathered in order to draw conclusions.

Learner will

?Sort and classify according to observable features or selected criteria.

?Look for and recognize patterns in observations.

?Compare results of different investigations.

?Interpret information and offer explanations.

## Phase 2

Year 2, Year 3

**Recognise repeated patterns in teacher-directed experiments (e.g. all types of elastic are stretchy).**

Compare results by observing another's investigation **and offer explanations (e.g. my cup held water because it is made of glass, my cup didn't because it is made of cardboard).**

**Identify where to go next.**

**Identify patterns in the data and summarize the data**

**Draw a simple conclusion on the basis of observations**

**Locate information from simple charts and graphs -Describe observations in detail and provide explanations for them**

**Make a simple evaluation of the investigation**

**Develop ability to make simple judgements based on a given criteria.**

**Compare and classify using given criteria (begins to suggest criteria for comparisons).**

Consider scientific models and applications of these models (including their limitations).

Learner will

?Share findings with peers informally.

?Represent findings using pictures and models.

?Reflect on and build upon their own current scientific theories and applications.

?Apply scientific knowledge to reconstruct or refine their understandings of the physical, chemical and biological worlds.

?Assess their understanding in light of new data or reconsideration of existing data.

## Phase 2

Year 2, Year 3

**Discuss** and demonstrate their understanding using concrete examples and drawings **and flow charts**.

Draw conclusions and with teacher support and apply new scientific understandings to the current context (e.g. All living things need food, If I don't eat I will die because I'm a living thing).

**Recount steps in a scientific investigation using labelled diagrams.**

**Recognise the difficulties encountered. With support, suggests how the inquiry might be improved.**

**Present steps in and results of an experimental procedure orally and in charts, graphs or diagrams and/or sentences.**

**Use simple tables and graphs to record observations and results of experiments.**

**Can use pictures, labels, sentences, observational drawings and tallies.**



## Conceptual Understandings

### EARTH AND SPACE

The study of planet Earth and its position in the universe, particularly its relationship with the sun; the natural phenomenon and systems that shape the planet and the distinctive features that identify it; the infinite and finite resources of the planet.

Related concepts: atmosphere, climate, cycles, dynamic equilibrium, erosion, evidence, geography, geology, gravity, renewable and non-renewable energy sources, resources, seasons, space, sustainability, systems (solar, water cycle, weather), tectonic plate movement, theory of origin

The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate. (H)

At the Earth's surface, radiation from the Sun heats the surface and causes convection currents in the air and oceans, creating climates. Below the surface heat from the Earth's interior causes movements in the molten rock. The solid surface is constantly changing through the formation and weathering of rock.

The solar system is a very small part of one of millions of galaxies in the Universe. (H)

Our sun and eight planets and other smaller objects orbiting it comprise the solar system. Day and night and the seasons are explained by the orientation and rotation of the Earth as it moves round the Sun. The solar system is part of a galaxy of stars, one of many millions in the Universe, enormous distances apart, many of the stars having planets.

### Phase 2

Year 2, Year 3

### Weather, Seasons & Cycles

Short-term weather conditions (e.g., temperature, rain, snow) can change daily, and weather patterns change over the seasons. (M)

Water can be a liquid or a solid and can be made to change from one form to the other, but the amount of water stays the same. (M)

### Form of the Universe and Earth's place in it

The Sun and Moon have basic patterns (e.g., the Sun appears every day and the Moon appears sometimes at night and sometimes during the day; the Sun and Moon appear to move from east to west across the sky; the Moon appears to change shape over the course of a month; the Sun's position in the sky changes through the seasons). (M)

The stars are innumerable, unevenly dispersed, and of unequal brightness. (M)

The Earth moves round the Sun taking about a year for one orbit. (H)

The moon orbits the Earth taking about four weeks to complete an orbit. (H)

The Sun, at the centre of the solar system, is the only object in this solar system that is a source of visible light. (H)

### Form of Earth

Earth materials consist of solid rocks, soils, liquid water, and the gases of the atmosphere. (M)

The solid material beneath the soil is rock. (H)

Rocks come in many different shapes and sizes (e.g., boulders, pebbles, sand). (M)

Much of the solid surface of the Earth is covered by soil, which is a mixture of pieces of rock of various sizes and the remains of organisms. (H)

Earth's resources, including water, are used in a variety of ways. (A)

## FORCES AND ENERGY

The study of energy, its origins, storage and transfer, and the work it can do; the study of forces; the application of scientific understanding through inventions and machines.

Related concepts: energy, dynamic equilibrium, cycles, conservation of energy, efficiency, equilibrium, forms of energy (electricity, heat, kinetic, light, potential, sound), magnetism, mechanics, physics, pollution, power, technical advances, transformation of energy

Objects can affect other objects at a distance (H)

Some objects have an effect on other objects at a distance. In some cases, such as sound and light, the effect is through radiation which travels out from the source to the receiver. In other cases action at a distance is explained in terms of the existence of a field of force between objects, such as a magnetic field or the universal gravitational field.

Changing the movement of an object requires a net force to be acting on it. (H)

Objects change their velocity only if there is net force acting on them. Gravity is a universal force of attraction between all objects however large or small, keeping the planets in orbit round the Sun and causing terrestrial objects to fall towards the centre of the Earth. (H3)

The total amount of energy in the Universe is always the same but energy can be transformed (or transferred) when things change or are made to happen. (H)

Many processes or events involve changes and require energy to make them happen. Energy can be transferred from one body to another in various ways. In these processes some energy is changed to a form that is less easy to use.

Energy cannot be created or destroyed. Energy obtained from fossil fuels is no longer available in a convenient form for use. (H4) Energy flows; matter cycles.

Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms (H) \*\* also under Living Things strand

## Phase 2

### Year 2, Year 3

## Magnetism

Objects can have an effect on other objects even when they are not in contact with them. (H)

Magnets can be used to make some things move without being touched. (V)

## Gravity

When things that are unsupported fall downwards they are being pulled by the attraction of the Earth, which holds all things on the Earth. (H)

Objects near the Earth fall to the ground unless something holds them up. (M)

## Forces and motion

When forces acting on an object are not equal and opposite in direction, their resulting effect is to change the object's motion, to speed it up or slow it down. Conversely, things only change their motion if there is a net force acting on them.

How quickly an object's motion is changed depends on the force acting and the object's mass. The greater the mass of an object, the longer it takes to speed it up or slow it down, a property of mass described as inertia. (H)

Forces can be exerted by one object on another through direct contact or from a distance. (A)

Forces cause changes in speed or direction of motion. (V)

Forces cause changes in position and the shape of an object. (M)

## Energy

Energy is needed to make things change and in the process of change, energy is transformed from one form to another

(H)

An object which transfers energy to something else is called a source of energy. (H)

The Sun supplies heat and light to Earth (M)

Heat can be produced in many ways (e.g., burning, rubbing, mixing substances together) (M)

Energy cannot be created or destroyed. (H)

Energy can be transported by radiation, as sound in air or light in air or a vacuum (H)

Light and sound are produced by a range of sources (light: sun, stars, fire, artificial sources, etc.; sound: musical instruments, vocal cords, a door closing, etc.) and can be sensed (A)

Sound is produced by vibrating objects (M)

Light travels in a straight line until it strikes an object (M)

There are different forms of energy: chemical, kinetic, potential, mechanical, heat, light, sound and magnetic energy (H)

There are different ways of classifying energy: • Kinetic, potential • Heat, light, sound • Mechanical, elastic. magnetic

## LIVING THINGS

The study of the characteristics, systems and behaviours of humans and other animals, and of plants; the interactions and relationships between and among them, and with their environment.

Related concepts: adaptation, animals, biodiversity, biology, classification, conservation, cycles, dynamic equilibrium, ecosystems, evolution, genetics, growth, habitat, homeostasis, organism, plants, systems (digestive, nervous, reproductive, respiratory).

Organisms are organised on a cellular basis.

All organisms are constituted of one or more cells [link to 'Materials & Matter']. Multi-cellular organisms have cells that are differentiated according to their function. All the basic functions of life are the result of what happens inside the cells which make up an organism. Growth is the result of multiple cell divisions.

Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.

Food provides materials and energy for organisms to carry out the basic functions of life and to grow. Some plants and bacteria are able to use energy from the Sun to generate complex food molecules. Animals obtain energy by breaking down complex food molecules and are ultimately dependent on green plants for energy. In any ecosystem there is competition among species for the energy and materials they need to live and reproduce.

Genetic information is passed down from one generation of organisms to another.

Genetic information in a cell is held in the chemical DNA in the form of a four-letter code. Genes determine the development and structure of organisms. In asexual reproduction all the genes in the offspring come from one parent. In sexual reproduction half of the genes come from each parent.

The diversity of organisms, living and extinct, is the result of evolution.

All life today is directly descended from a universal common ancestor that was a simple one-celled organism. Over countless generations changes resulted from natural diversity within a species which makes possible the selection of those individuals best suited to survive under certain conditions. Organisms not able to respond sufficiently to changes in their environment become extinct.

## Phase 2

### Year 2, Year 3

#### Heredity

Living things produce offspring of the same kind, but in many cases offspring are not identical with each other or their parents. (H)

Plants can reproduce in different ways (e.g. cuttings).

Life cycles are different for different organisms. (M)

#### Form and function of cells and organisms

Living things need water, air, food and a way of getting rid of waste and an environment which stays within a particular range of temperature in order to survive. (H)

Plants and animals have features that help them live in different environments. (M)

Characteristics of living things include movement, respiration, sensitivity, growth, reproduction, excretion, nutrition and death.

Life cycles are different for different organisms. (M)

#### Cycles and systems

Plants containing chlorophyll can use sunlight to make the food they need and store food that they do not immediately use. (H)

Animals need food they can break down and which comes either directly by eating plants (herbivores) or by eating

animals (carnivores), which have eaten plants, or other animals, or both plants and animals (omnivore). (H)

Some source of "energy" is needed for all organisms to stay alive and grow. (V) [Energy]

From food, people obtain energy and materials for body repair and growth. (V) [Energy]

Living things are found almost everywhere in the world and that distinct environments support the life of different types of plants and animals. (M)

Plants and animals have features that help them live in different environments. (M)

## Evolution and adaptation

Animals and plants are classified into groups and subgroups according to their similarities. Within groups of animals there are families and different species within these families. (H)

Human activity can impose far-reaching effects on the environment. (H)

Some kinds of organisms that once lived on Earth have completely disappeared (e.g., dinosaurs, trilobites, mammoths, horsetail trees). (M)

## MATERIALS AND MATTER

The study of the properties, behaviours and uses of materials, both natural and human-made; the origins of human-made materials and how they are manipulated to suit a purpose.

Related concepts: changes of state, chemical and physical changes, conduction and convection, density, gases, liquids, properties and uses of materials, solids, structures, sustainability

All material in the Universe is made up of very small particles.

Atoms are the building blocks of all materials, living and non-living [[link to 'Living Things'](#)]. The behaviour of the atoms explains the properties of different materials. Chemical reactions involve rearrangement of atoms in substances to form new substances.

### Phase 2

Year 2, Year 3

#### Materials and matter

Different objects are made up of many different types of materials (e.g., cloth, paper, wood, metal) and have many different observable properties (e.g., color, size, shape, weight). (M)

All the 'stuff' encountered in everyday life, including air, water and different kinds of solid substances, is called material (matter) because it has mass and takes up space. (H)

Things can be done to materials to change some of their properties (e.g., heating, freezing, mixing, cutting, dissolving, bending), but not all materials respond the same way to what is done to them. (M, V)

Different materials can be combined, including by mixing, for a particular purpose. (A)