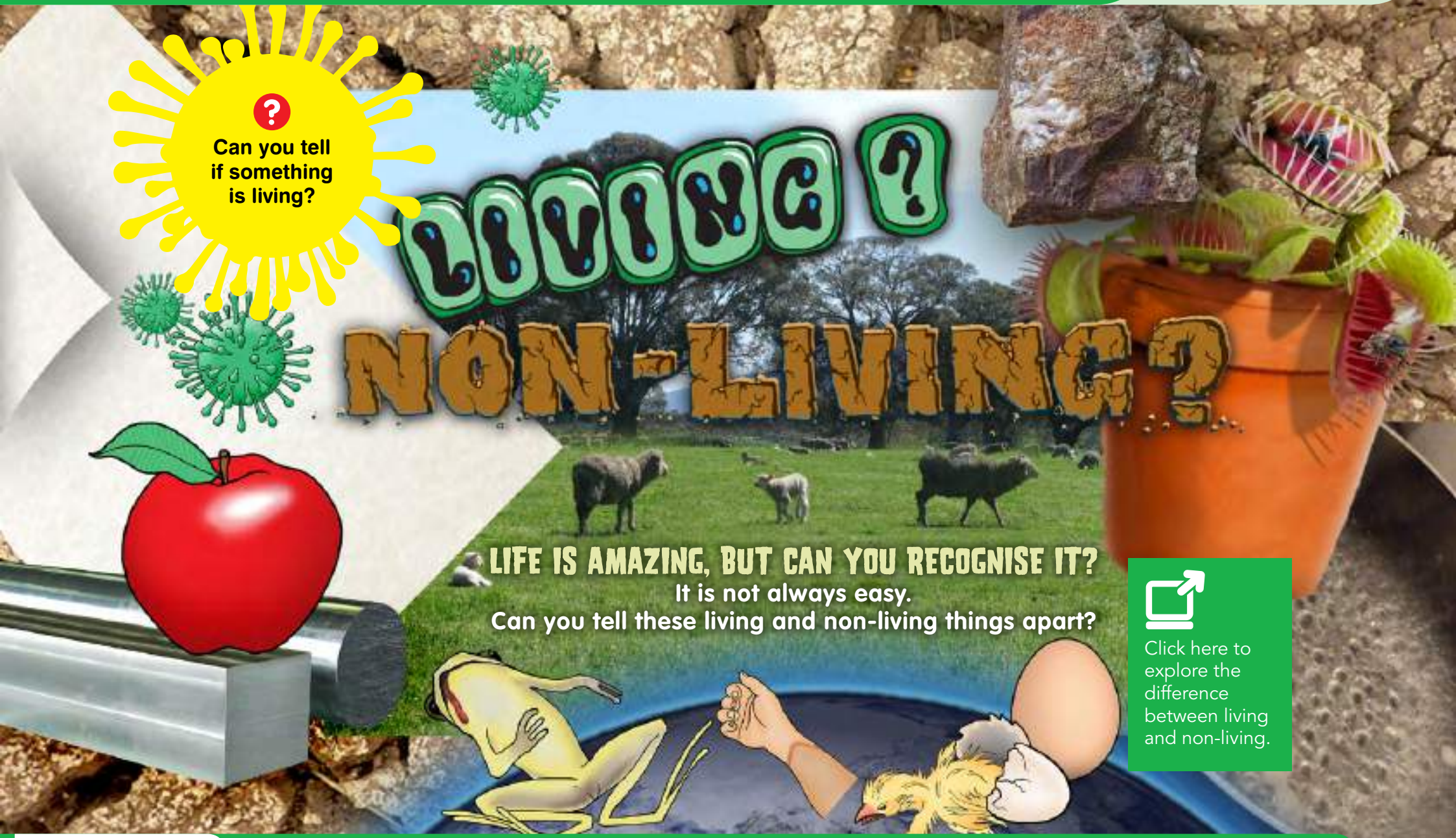
# PART 1

## Part 1: What is life?

# Activity 1.1 Living or non-living?

Activity type




Click here to explore the difference between living and non-living.

# Activity 1.2 Characteristics of life

Activity type

## IMAGINE THIS!

Scientists have investigated claims of a new life form found in the depths of one of Australia's largest sewage treatment plants. People are calling them 'sewer lice'.


What seem to be larvae (early life forms after insect eggs hatch) have been found in untreated sewage and later life forms have been found in treated sewage.

## Are 'sewer lice' alive?

### What to use:

**Each GROUP will require:**

- 3 samples of a potential new life form.

**Each STUDENT will require:**

- ***Notebook***.

### What to do:

In your group examine the three samples thought to be sewer lice at different stages of their life cycle. Record your observations in your ***Notebook***. See the text box on *Observation or Inference*.

### Discussion:

1. What did you observe that suggested the samples are living things?
2. What other information do you need to decide if they are really alive?

## OBSERVATION OR INFERENCE?

**When you collect results from experiments, you must only record what you measure or observe with your senses. Write these observations under the heading 'Results'. Do not infer (suggest) what these observations mean in the 'Results' section.**

**You may include inferences in the following section called 'Discussion', but remember that they are only suggestions and not confirmed facts.**

**See the differences between observations and inferences:-**

| Observation | Inference |
|---|---|
| The sewer lice were brown in colour | The sewerage made the sewer lice a brown colour |
| The sewer lice moved from the bottom of the beaker up to the surface of the liquid. | The sewer lice swam to the surface. |

KEEP GOING

If it moves, it's alive! Yes or no?

## Dancing dots

### What to use:

**Each GROUP will require:**

- wide basin or tray
- ethanol (methylated spirits)
- 50 mL measuring cylinder
- 50 mL beaker
- paper dots from a hole punch machine
- forceps.

**Each STUDENT will require:**

- ***Notebook***
- safety goggles.

### What to do:

**Step 1**
Wear your safety glasses throughout this activity; ethanol can cause eye irritation.

**Step 2**
Measure 10 mL water using the measuring cylinder. Add this water to the beaker.

**Step 3**
Measure 10 mL ethanol using the measuring cylinder. Add this ethanol to the beaker to make a 50% alcohol mixture.

**Step 4**
Drop 10 – 40 paper dots into the beaker to soak.

**Step 5**
Add about 1 cm depth of water to the tray or basin.

**Step 6**
Using forceps, carefully lower about five alcohol-soaked dots at a time onto the surface of the water.

### Discussion:

1. Are the dots living or non-living? Explain your answer.
2. Do you think movement is useful for helping us to recognise life? Explain your answer.
3. Design a scientific way to test if alcohol is important, using only the materials you have been given. If you have time, try out your idea.

What is a meniscus?

Do you remember how to use a measuring cylinder correctly? If not, check with your teacher.

Click here learn more about the characteristics of life.

# Activity 1.3 Plant life

Activity type

DOWNLOAD e-NOTEBOOK

## Growing a bean seedling

**What characteristics of life will you see?**

### What to use:

**Each PAIR will require:**

- gas jar or straight sided jam jar
- two broad bean seeds
- paper towel
- cheap filler material like potting mix, rice hulls or sand
- marking pen or small label.

**Each STUDENT will require:**

- ***Notebook.***

### What to do:

**Step 1**
Make a roll of paper towel to fit inside the jar as shown in the photo. Pour dry filler material into the centre of the rolled paper towel to give it shape and form.

**Step 2**
Carefully slide the two beans halfway down between the glass and paper, on opposite sides of the jar.

**Step 3**
Slowly add water to the jar so that the water level remains at 2 cm depth. The water will soak up into the filler and paper.

**Step 4**
Label your jar with your names and put the jar on a side bench where it will get some indirect light.

**Step 5**
Learn about the *Scientific Method* on the next page before tackling Step 6.

**Step 6**
Think-Pair-Share.

Think - Think about your answers to the Discussion questions.

Pair - Discuss and compare your answers with your partner.

Share – Share your ideas with the rest of the class.

**Step 7**
You must regularly observe for changes and check your beans have enough water. Do not overwater! Make a plan for what to do if someone else misses a lesson.

### Discussion:

1. What data could you collect to demonstrate the growth and development of your beans?
2. What is your hypothesis?
3. What is the independent variable and what is the dependent variable?
4. What variables have you controlled?
5. What is the control situation?
6. How can you make your experiment reliable and a fair test?
7. How could you best present the data?

KEEP GOING

# SCIENTIFIC METHOD

**Scientists have a consistent approach to problem solving to ensure their results are valid. This process is called the SCIENTIFIC METHOD.**

## HYPOTHESIS

The first step is to ask questions about the problem you are interested in and to develop an hypothesis that can be tested. An hypothesis is a statement that predicts a possible explanation for observations and which can be tested by experiment. An hypothesis should always be clear and simple.

E.g. A student noticed more flies around in hot, rather than in cold weather.

She devised the hypothesis:-
"Flies become more active as the temperature increases."

## CONTROLLED EXPERIMENT

To test the hypothesis, a controlled experiment must be designed. A controlled experiment must be made up of at least two situations, where only one factor or *variable* is changed between the situations.

The initial or normal situation is called the control and the other situation is the test situation, which you compare with the control.

A variable is a factor that may change the result of an experiment such as the:

- temperature
- type of fly
- the activity of the flies
- food or water available
- size and type of container the flies are kept in

## AIM

The aim of the student's experiment would be:-
"To investigate the effect of temperature on the activity of flies."

The aim is taken from the hypothesis and is written clearly and simply.

The aim should refer to the dependent and independent variables.

- The independent variable is the variable that is deliberately changed. In this example, it would be the temperature. In your table of results it goes in the left column of the table. When plotting a graph of the results it is plotted on the horizontal (x) axis.
- The dependent variable is the variable in the experiment that is measured. In this example it would be a measure of the activity of the flies. It goes in the right column of the results table and is plotted on the vertical (y) axis of the graph.

## RELIABLE AND FAIR TEST

In the experiment you vary the independent variable, measure the dependent variable and keep all the other variables for the experiment constant (the same) for the experiment to be valid.

In this example the controlled variables include:-

- type of fly,
- the size and type of container,
- food or water available

An experiment done only once might give a misleading result because it might give an extreme result and you will not know if the result is reliable. Experiments must be replicated (repeated several times) with consistent results to be reliable. The results are averaged for each test situation.

## CONCLUSION

The conclusion is a short statement at the end of your experimental report where you refer to your hypothesis and indicate if it was supported by the experimental results.

# Activity 1.4 Is Sammy alive?

Activity type

**Advanced science and technology gives us an extensive understanding of how the human body works. People with diseases or problems that would once have badly affected or killed them, now survive and thrive.**

**Australia's average life expectancy was less than 50 years in 1900, but increased to 70 in 1980 and is now 82.**



**These pictures show some ways people's lives have been saved or improved.**

**Can you think of more?**


Click here to look at the life of Sammy.

# Summary

PART 1

An **observation** is information about the world that you detect using your senses. An **inference** is your explanation or interpretation of an observation.

Living things share the following characteristics:-

- Living things are made up of one or more **cells**
- Living things can **reproduce** and produce offspring
- Living things require **energy** for their daily activities.
- Living things contain an information storing molecule called **DNA**, and this gives them the ability to adapt and evolve (change) over generations.
- Living things **respond** to stimuli in their environment.
- Living things **grow** and develop
- Living things maintain **homeostasis** (e.g. stable body temperature, blood volume, water balance).

The **scientific method** is the process scientists use to design experiments that produce valid results and answers to questions.

An **hypothesis** is a clear and simple statement that predicts a possible explanation for observations and which can be tested by experiment.

A **controlled experiment** is one in which everything is held constant (controlled) except for one **variable**. The normal situation or initial situation is referred to as the **control**. By varying one variable you create **test situations** which you compare to the control.

The **aim** of the experiment is a short statement explaining why the experiment is being done. It is taken from the hypothesis and refers to the independent and dependent variables. The **independent variable** is the variable that is deliberately changed. The **dependent variable** is the variable in the experiment that is measured.

An experiment is a **reliable** and **fair test** if it keeps all variables constant (controlled) except the one being tested and if it is **replicated** (repeated) a sufficient number of times to provide consistent results.

The **conclusion** is a short statement at the end of an experimental report that refers to the hypothesis and indicates if it was supported by the experimental results.

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