

1 Classification

Overview

In this chapter, students will review the main characteristics of different organisms and identify different groups of organisms using their features. They should also be able to identify the key features of a living organism in a living thing.

Practical investigation 1.1 Drawing and labelling organisms

Planning the investigation

In this investigation, students should use their observation skills to identify possible samples for collection. These samples should then be drawn and labelled. Details of observable features should be made with reference to the guidelines for making accurate scientific drawings. The investigation can last for up to an hour, depending on the amount of time it takes to collect specimens from outside.

This investigation will focus on the following assessment objectives:

- AO3.1 Demonstrate knowledge of how to safely use techniques, apparatus and materials (including following a sequence of instructions where appropriate)
- AO3.3 Make and record observations, measurements and estimates.

Setting up for the investigation

Equipment per group of 2–4 students: small tray or box, forceps (or tweezers/small shovel for picking up items), latex gloves, sharp pencil, insect pooter.

You will need to review your own local environment prior to this investigation. Which areas on your school grounds might have suitable organisms for collection? These can be plants, grasses and flowers or small invertebrates if you have access to them. If you do not have access to suitable organisms, purchase plastic

models for students to draw.

Organisms can be collected using an insect pooter – you can make your own if you do not have access to such equipment. To do so, you will need a glass jar with a lid, scissors, plasticine®, muslin, a small elastic band and some plastic tubing (approximately 7–10 mm in diameter; a large straw would suffice). You need to cut the plastic tubing into two lengths of between 15 and 25 cm, make two holes in the jar lid with scissors and insert the tubing into each hole so that at least 2–3 cm is inside the jar. Use the Plasticine® to fill any gaps in the lid and place a piece of muslin (or similar) over the end of one of the straws, using the elastic band to tie it in place. Put the lid on the jar and you now have a working pooter (see Figure 1.1). To use the pooter, you must place the end of a tube near a small insect and suck through the other tube. The air will be drawn into the jar and the insect with it. You can complete this investigation without a pooter and focus on collecting plant life if your environment dictates this. Students can use gloves and any collection equipment such as forceps, tweezers, or small shovels to collect different items from the field, playground, or other outdoor areas that are available.

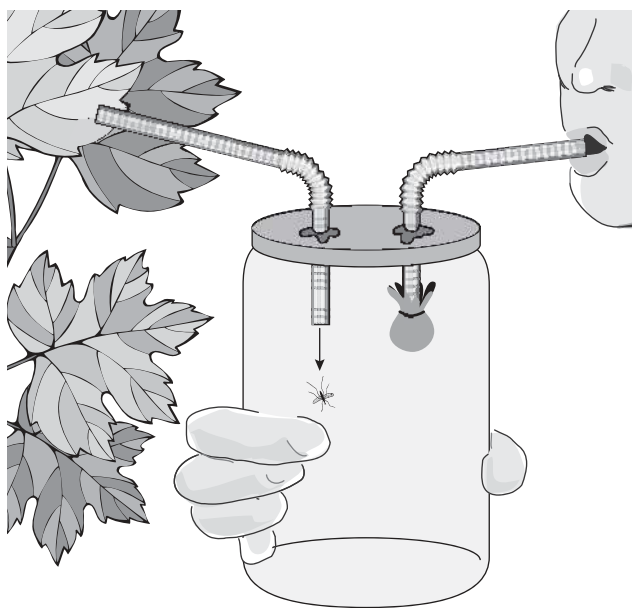


Figure 1.1

Safety considerations

Tell students exactly where on the school grounds they can and cannot search for organisms. You may also need to be aware of various organisms that may be harmful in some environments, for example stinging nettles, snakes or insects that may bite. Students should wash their hands at the end of the investigation.

Common errors to be aware of

Students may have misconceptions from prior learning; they may have used the term 'micro-organisms' when talking about small organisms or invertebrates. It is best to draw this out and clarify early on. Students using the pooter will be naturally apprehensive and may not suck hard enough. A good demonstration should allay this. Students will often use shading and colouring if this is their first attempt at biological drawings; allow them to make this mistake and then learn from the self/peer assessment activity to reinforce the expectations of an accurate drawing.

Supporting your students

Some students (and teachers) will proclaim to have terrible art skills or lack confidence in drawing what they see. Demonstrate how smooth lines for the outline of the specimen and the main features give a suitable shape and proportion to what they are drawing.

Encourage light use of a sharp pencil to allow mistakes to be easily erased and rectified.

Give the more able students the responsibility of identifying the names of organisms and any key features that they can see. Ask students to use these features to classify or place the organism into groups that they know of, such as vertebrates and invertebrates. If they complete identification their own organisms, they can help other students identify theirs.

Discussion points and scientific explanation

Student drawings should aim to meet the criteria set out in the student workbook. This will guide students towards the standards required for a biological drawing. Select different drawings to highlight the difference between those who have met all of the drawing criteria and those that have not. Ask students to point out how to improve drawings. Use the discussion session to reinforce or build upon prior knowledge of the different groups of organisms that you have been working on in class. This may be the different types of plants, different vertebrates and invertebrates, or even the binomial names of the organisms found.

Answers to workbook questions

- 1 Student drawings
- 2 Handling data:
 formula (magnification = $\frac{\text{image size}}{\text{actual size}}$)
 should be used and x used to denote magnification. Answer should be above 1 to show that the drawing is larger than the actual specimen.
- 3 Student marks for drawings
- 4 Student evaluation of areas for improving drawings
- 5 Evaluation: table should include sensitivity and reproduction as well as any suitable features that are observable on the specimens drawn by the student.

Practical investigation 1.2

Observation and drawing of pollen tubes

Planning the investigation

You should make an advance purchase of a quantity, and range, of different flowers that are medium-large, easy to dissect and contain pollen tubes that are highly visible. Daffodils are a good example but you may need to find something similar in your local environment or flower shop. It may be that you give the whole class the same type of flower but a range will encourage them to compare the differences between them and/or make more than one type of drawing. Scalpels or suitable, sharp knife is required as well as an area for dissection. This may be a dissection tray, chopping boards or on the workbench itself. The investigation should take no longer than 20 minutes to dissect and make suitable drawings. This investigation will focus on the following assessment objectives:

- AO3.1 Demonstrate knowledge of how to safely use techniques, apparatus and materials (including following a sequence of instructions where appropriate)
- AO3.3 Make and record observations, measurements and estimates.

Setting up for the investigation

Equipment per group of 2–4 students: scalpel or knife, dissection tray, or board, different flowers with pollen tubes as described above.

Give each student at least one flower to allow each student a cross-section to draw. Students can make more than one drawing on other paper if required and groups could share flowers if you have purchased more than one type of flower.

Safety considerations

Demonstration of safe use of the scalpel or knife is important. Students may need to carry the scalpel across the classroom and a safe method of doing this should be demonstrated, carrying the scalpel with the blade not pointing outwards, walking slowly, and being aware of the surroundings and other people.

Common errors to be aware of

Students may not grip the flower correctly or may not make a clean cross-section to show the pollen tubes. Demonstrate clearly before allowing students to begin.

Supporting your students

If students are struggling with the dissection skills, either the teacher can do this in advance or do so and take photographs of the cross-sections of the flower. This will allow more time to focus on the drawing skills and the labelling of the parts of the flower and the pollen tubes.

Challenging your students

Students can use books and/or the internet to label fully their cross-sections.

Discussion points and scientific explanation

Bring in the knowledge and description of the different angiosperms; monocots and dicots. Link to the different shapes of leaves, for example, that these classes of plants might be expected to exhibit. Discussion of the labelled parts can be related to being able to describe what they see when faced with questions or activities like this one.

Answers to workbook questions

- 1 Any of the criteria that the student has met in their drawing
- 2 Any of the criteria that the student has not met in their drawing
- 3 Answer depends on the flower used

Answers to exam-style question

- 1 a** Award marks as follows for the student drawing:
- smooth outline drawn with a sharp pencil [1]
 - shape and proportion appropriate [1]
 - all observable features of the specimen drawn correctly [1]
 - all features labelled such as wings, body parts, number of legs, antennae [1]
 - drawing is larger than the original picture [1].
- b** Student answer ± 1 mm [1]
- c** Student answer ± 1 mm [1]
- d** Correct formula used [1], correct numbers from previous answers used [1], answer is greater than 1 with correct units. [1]
- e** The yellow-fever mosquito is from the genus *Aedes*. [1]
- f** Mosquitos are insects and belong in the Class Insecta. [1]

Total [12]