

A-level Biology example for required practical 10

Investigation into the effect of an environmental variable on the movement of an animal using either a choice chamber or a maze:

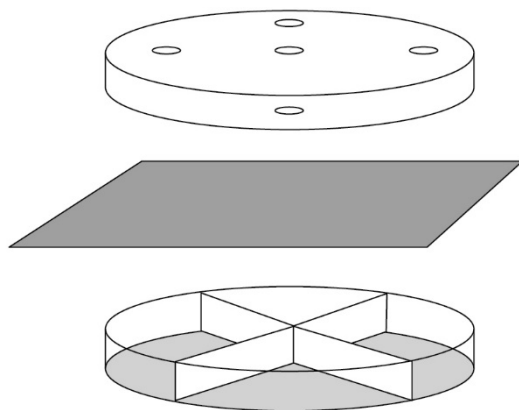
Using choice chambers to investigate responses of invertebrates to light/dark and humid/dry conditions

Student sheet

Method

You are provided with the following:

- a choice chamber with nylon mesh fabric
- silica gel
- humidity test strips (cobalt chloride strips which have been dried – blue when dry and pink when moist)
- paper towels (or filter paper or cotton wool)
- water
- black paper
- adhesive tape
- maggots (or woodlice)
- beaker
- teaspoon
- forceps.



Holes in the lid allow maggots to be put into the chamber. Covering the top and sides with card can create light and dark areas.

Trap the fabric between the lid and the base. The maggots can move freely on this surface.

The base of choice chamber is divided into four quarters. Each one can have a different environment.

Water in one half of the base will create an area with a moist environment. Silica gel in the other half will create a dry environment.

Control experiment

1. Set up the choice chamber with nothing in the base quarters.
2. Place 12 maggots in the chamber through the central hole, using the teaspoon.
3. Wait four minutes then record the number of maggots in the left and right halves of the choice chamber. Record your results.

If the left and right halves have no effect on the distribution of the maggots the expected results would be six in each half, but this will not always occur because of chance distribution. If your results are not 6 in each half, do a statistical test on your results to discover the probability of them occurring by chance. If this test shows a greater than 5% probability of the results occurring by chance, you can proceed with the experiment.

The effect of light

1. Cover half the choice chamber with black paper to make it dark.
2. Place 12 maggots in the chamber through the central hole, using the teaspoon.
3. Wait four minutes and then record the number of maggots in the dark and the light halves.

If light has no effect on the distribution of maggots the expected results would be six in each half. Now do a statistical test on your results to find the probability of the difference between your results and your expected results occurring by chance.

The effect of humidity

1. Place damp paper towel, damp filter paper or damp cotton wool in one half of the choice chamber. Being careful not to get the gauze wet, put a small amount of water in the test area in one half of the choice chamber. Then add some paper towel or filter paper to soak up the water. Cotton wool can also be used in a thin layer.
2. Add silica gel in the other half of the choice chamber
3. Use the humidity test strips to ensure that a humidity gradient exists in the chamber before adding the maggots. The humidity can be tested by trapping the humidity test strip in the edge of the choice chamber on the surface of the gauze. Use the forceps to place the humidity test strip.
4. Leave for five minutes.
5. Place 12 maggots in the chamber through the central hole.
6. Wait four minutes and then record the number of maggots in the humid and the dry halves.

The effect of light and humidity

In reality, living organisms do not have simple choices between one pair of contrasting environmental factors. If you have time, do a final experiment with the choice between dark and dry, dark and humid, light and dry, light and humid. Again test the probability of any difference between your results and your predicted results occurring by chance with an appropriate statistical test.

Alternative practical using a maze

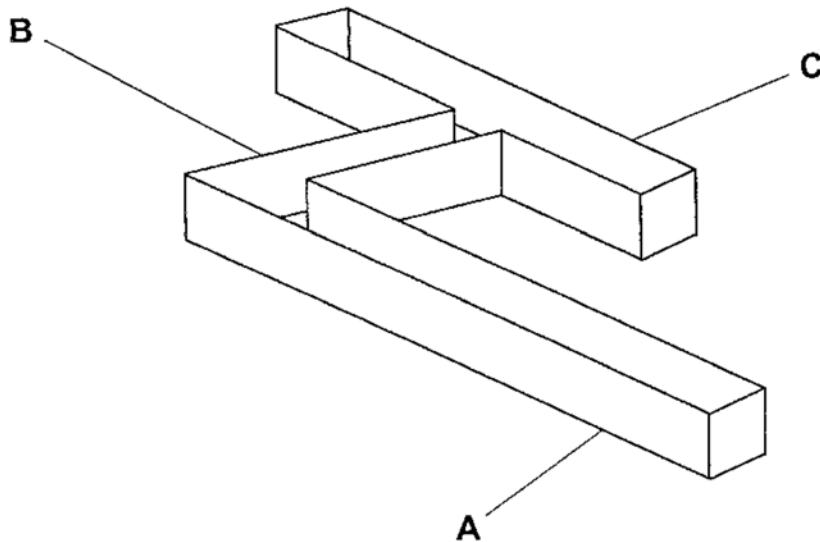
Turning behaviour in maggots

You are provided with the following:

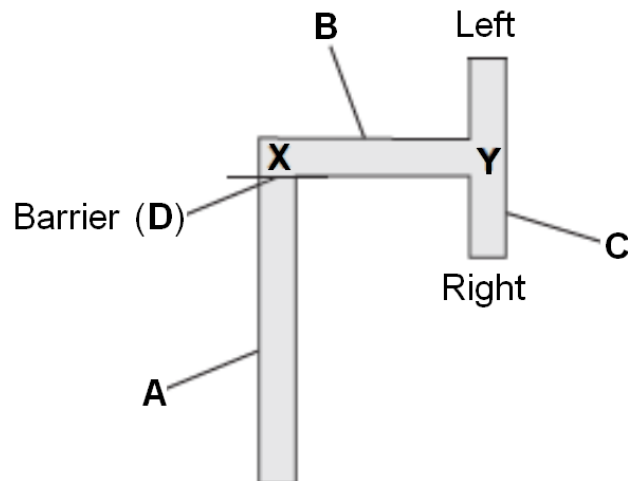
- a maze printed on card
- scissors
- glue
- maggots
- cotton wool buds
- a plastic teaspoon.

You should read these instructions carefully before you start work.

1. Cut out pieces **A**, **B** and **C** from the card by cutting along all the solid lines.
2. Fold along the dashed and dotted lines, keeping dashes on the inside and dots on the outside.
3. Glue the tabs to form the maze shown below.



Cut out the barrier (piece **D**) and place it at the position shown below.



4. Place a maggot at point **X** using the plastic teaspoon.
5. Record in a table whether the maggot turns **left** or **right** when it reaches the junction at **Y**.
6. Remove the maggot from the maze.
7. Wipe the inside of the maze with a cotton wool bud.
8. Repeat steps five to eight until you have results for 10 maggots.
9. If a maggot stops moving, remove it from the maze and carry out another trial.

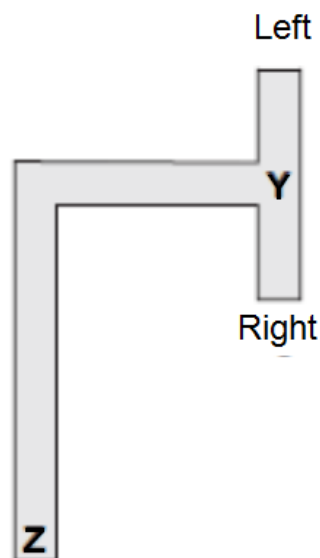
This experiment should give equal numbers turning **left** and **right**. This section of the maze could be used to investigate the effect of variables such as light by covering one side of the maze with **black paper** and then the other.

Turn alternation in maggots

Many animals show behaviour called turn alternation. This means if the animal is forced to turn in one direction it is more likely to turn in the opposite direction next time it has a choice. The maze can be used to allow you to investigate whether maggots show turn alternation.

1. Use the maze you made in Task 1, with barrier **D** removed.

Plan of the maze



2. Place a maggot at point **Z** in the maze.
3. Record whether the maggot turns left or right when it reaches the junction at **Y**.
4. Repeat steps two and three until another 9 times.
5. Record your data in a suitable table.