

## Option A – Practical 1

### *Taxis in flour beetles*

#### Safety

- There are no significant hazards.
- Take care that calcium chloride does not come into contact with water.

#### Apparatus and materials

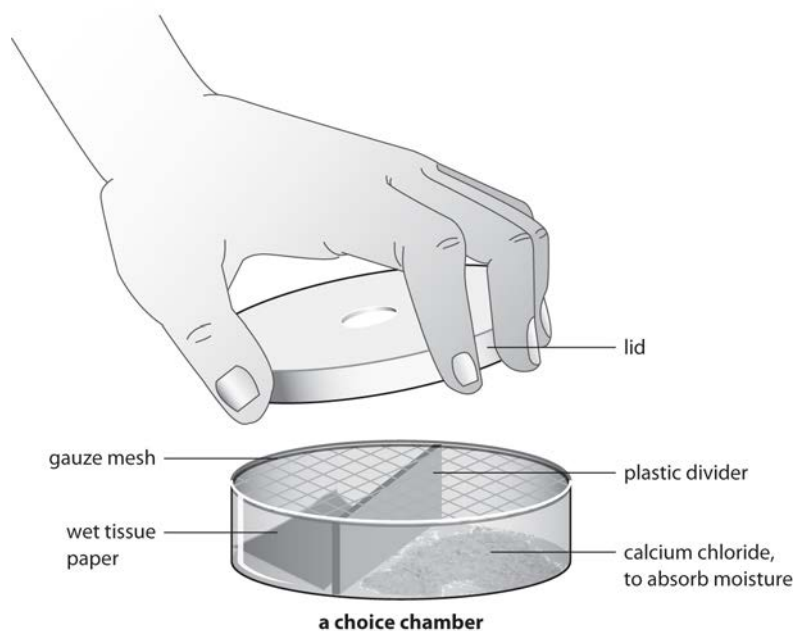
- a choice chamber, with divider and gauze
- calcium chloride granules (a drying agent)
- spoon or large spatula
- tissue paper
- culture of flour beetles (*Tribolium* sp.) or other suitable small invertebrates, such as woodlice
- small paintbrush
- desk lamp
- black fabric or paper
- additional clean Petri dishes and lids
- stopwatch

#### Introduction

Taxis is a directional response to a stimulus, a form of behaviour that has survival implications. Animals' movement towards or away from a stimulus enhances their survival chances. In this practical, you will investigate two pairs of stimuli: darkness and light, and damp and dry conditions.

#### Procedure

- 1 Carry out the experiment using damp/dry conditions first. Fill half the base of the choice chamber with calcium chloride granules using a spoon or large spatula. Place wet tissue paper in the other half. Do not allow water to splash on to the calcium chloride, which gives out heat when it is wet.
- 2 Cover the base of the choice chamber with gauze and replace the lid. Position the chamber in a part of the laboratory that has constant light and temperature conditions.



- 3 Take flour beetles from the stock bottle and place them in a Petri dish. Use the paintbrush to take ten beetles and place them in a clean dish, taking care not to transfer any flour with them.

- 4 Tip the ten beetles through the opening in the lid of the choice chamber. Record their positions (the number in each half of the chamber) after 1 minute and at 1 minute intervals for a further 4 minutes.
- 5 Remove the lid of the choice chamber and gently brush the beetles back into a clean Petri dish.
- 6 Either repeat the procedure twice more, or collect data from two other pairs of students so that you have three sets of data.
- 7 Remove the damp tissue paper from the choice chamber, carefully dry the inside and add more calcium chloride granules to fill the entire base.
- 8 Replace the gauze and lid and cover one half of the chamber with black fabric or paper to make the conditions inside dark. Make sure there is no light spillage from desk lamps or sunlight.
- 9 Add ten beetles as before, and note their positions after 1 minute and at 1 minute intervals for a further four minutes.
- 10 Again, either repeat the procedure twice more, or collect data from two other pairs of students so that you have three sets of data.
- 11 Draw a bar graph to show the number of beetles in each condition at the 5 minute time point. (You should have data for 30 beetles, for each pair of contrasting conditions.)

### Questions and further work

- 1 Describe the conditions that the beetles seem to prefer. These beetles are pests of stored grain, where both adults and larvae feed. Relate your findings to the habitat of the beetles.
  
- 2 How does taxis improve the survival chances of the beetles?
  
- 3 Carry out a chi-squared analysis of your data. (Use separate paper, if necessary.) The null hypotheses should be:  
Flour beetles have no preference for wet over dry conditions.  
Flour beetles have no preference for light over dark conditions.
  
- 4 Suggest improvements to your practical.