# Guidance for Topic 4 – Practical 1

## *Setting up a mesocosm*

### Safety

Although great care has been taken in checking the accuracy of the information provided in this guidance, Cambridge University Press shall not be responsible for any errors, omissions or inaccuracies.

Teachers and technicians should always follow their school and departmental safety policies. You must ensure that you consult your employer’s model risk assessments and modify them as appropriate to meet local circumstances before starting any practical work. Risk assessments will depend on your own skills and experience, the skills and experience of your students, and the facilities available to you. Everyone has a responsibility for his or her own safety and for the safety of others. The notes below should not be regarded as a risk assessment.

You should carry out the practical yourself before presenting it to students. Make sure you are comfortable with the procedures, and can anticipate any difficulties any of your students may encounter.

### Guidance

A mesocosm is a self-sustaining system which, once set up, should require little or no inputs for long periods of time. A terrestrial mesocosm can be established in a large, sealed, clear-glass container. Since the mesocosm takes time to study effectively, it may be best to set up the container at the start of the students’ course so that they can observe it over the 2 years of their study. Once established, it can be used year on year.

### Apparatus and materials

Each class will need:

• a large glass container, such as a carboy, with a narrow, sealable neck

• good-quality potting compost

• grit or shingle

• a selection of small plants such as small ferns (indoor ‘maidenhair’ or *Adiantum* sp.), *Tradescantia* sp. and small *Chlorophytum* sp., small trailing plants such as *Soleirolia* sp. (‘Mind your own business’) or other suitable plants available locally

### Setting up the practical

The mesocosm is lined with grit, which is covered with a layer of compost about 8 cm deep. These layers should reflect the size of the available container, which should have as large a volume as possible.

The plants chosen should be small ferns and other slow-growing species available locally. Long tongs or chopsticks are useful for planting. A thin layer of grit around the new plants will keep them in place.

Watering should be minimal and done with care. Excess water will cause fungal growth. It is important that the container is tightly sealed and not placed in direct sunlight – excessive heating through the glass may damage the plants.

### Answers to questions

**1** Students should see water vapour on the sides of the container and should be able to discuss the water cycle that is occurring on a small scale inside. They should also reflect on the various nutrients being cycled in the mesocosm.

**2** Some plants will thrive better than others and faster-growing plants may out-compete other species. Students should be able to relate this to competition in a natural situation that they may have studied.

**3** ‘Scrubbing’ involves removal of waste from an environment. Plants can remove excess carbon dioxide from air and take in other pollutants from their surroundings (for example, heavy metals on old mining works). Students could discuss the concept of a space station as a mesocosm.

**4** The systems approach considers the inputs and outputs of a system and how energy and materials flow through the different components of a system. After the initial setting up of the mesocosm, the key input is just light energy. Students can draw a diagram to show the flows between the plants and their environment in this system.

# Guidance for Topic 4 – Practical 2

## *Comparing the distribution of two plant species using quadrat sampling*

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### Guidance

The selection of the sites for quadrat sampling is important. They should differ in some way that is obvious to the students. For example, an area of grassland may be undisturbed or trampled, exposed or shaded, so that one or more common species are different in their distribution. If a smaller area such as a plant-covered wall is chosen the size of the sampled area and quadrat must be amended accordingly.

Students may not be familiar with using random number tables so may need help with them. Alternatively random numbers can be given to them.

### Apparatus and materials

Each pair or group will need:

• 0.5 m × 0.5 m (0.25 m2) quadrat

• two 20 m tapes or ropes marked out at 1 m intervals

• random number tables

• clipboard, pencil and paper

### Supporting the practical

Ensure that students are consistent in laying their quadrats on the selected points. If the tapes are marked in 1 m lengths and the quadrats are 0.5 m in length they should always be set at the same position in a 1 m section of tape. At least ten quadrats should be sampled in the chosen area so that a more accurate value for the density of the chosen species can be calculated.

### Answers to questions

**1** Students’ responses will depend on their results.

**2** Disturbance and availability of light, water or nutrients are the most likely causes of distribution differences.

**3**, **4** Students’ responses will depend on their results.