Chapter 5

1. Give two reasons why tough leaves may be an adaptation to nutrient-poor soils?

Answer

Growing leaves demands nutrients, so leaves should be retained for as long as possible to reduce nutrient demand and robust leaves should last longer; for a similar reason, tough and protected leaves (using thorns, or secondary metabolites) can dissuade herbivores and protect the resources they represent.

2. Decide which of the following would be most indicative of a community organised principally by its species interactions. Justify your choice.
a. The soil invertebrate community undergoes seasonal migration down the soil profile
b. The loss of a key insectivore leads to changes in the plant community
c. The dominant plant species all show similar carbon-gaining strategies
d. The same number of bird species are found in all similar communities

Answer
b – this alone suggests a high degree of connectedness between different parts of the community (insectivore-insect herbivore-plant community); *a* and *b* suggest shared adaptations to abiotic factors; *d* may be indicative but a simple count of species takes no account of migratory species or niches occupied.

3. Explain why competition might limit the capacity of a colonizing species to join an existing guild.

Answer
Essentially such a species needs to occupy a niche in which it is able to secure resources from others already established – those that form the existing guild, sharing a functional role and the same resource spectrum. These are likely to well-adapted to these resources and will be at a competitive advantage. An invader needs to find some part of the resource spectrum which is relatively under-utilised or at which it can exploit effectively. If it is to colonise, the invader will have to induce or cause greater niche separation to occur.

4. Group the five mediterranean regions according to their degree of community similarity and for each grouping, give the main abiotic factors which distinguish them.

Answer
Chile/California – large altitudinal range, relatively fertile soils, high latitudinal extent
South Africa/ SW Australia – Oceanic climate, small altitudinal range, infertile soils
Mediterranean basin – Large longitudinal extent, limestone geology, high altitudinal range, relatively fertile soils, high human impact.

5. Describe the advantages of being a) a cryptophyte, b) a therophyte in a mediterranean-type environment

Answer
a) A cryptophyte has its growing point (meristem) underground. A good example is the tulip with its underground bulb (a species found in the Eastern Mediterranean). This

growth strategy has advantages in mediterranean-type environments where the warm wet winters are followed by hot dry summers. The plants are able to grow when conditions are suitable (either in spring or autumn) and avoid desiccation during the summer months as they are in their dormant below-ground phase.
b) A therophyte takes this one stage further. Its dormant phase consists of a seed. In mediterranean-type environments dormancy as a seed has considerable advantages as it enables the plant to avoid the unfavourable late summer drought. Some fire-adapted species also require charring or smoke to break their dormancy and then germinate on open ground which is free of competition.

6. Explain why a plant like marram (*Ammophila arenaria*) is such a good pioneer species of sand dune ecosystems.

Answer
Marram is not only tolerant of burial by sand it positively responds to it (see Figure 5.22). Growth responses to burial include increased growth of the internodes (stem elongation), increased tiller production (more shoots) and increased adventitious rooting. Like many grasses marram is a hemicryptophyte and has its growing points (meristems) either at or just below ground. When buried the plant responds to grow up through the sand. As a pioneer species marram is adapted to the early stages of an accreting dune (*i.e.* one that is building) and if sand is eroding from a stand of marram it does not grow as well.

7. Consider the two descriptions below (a and b) and decide what type of succession they each represent.

(a) Seeds and propagules in a ploughed field are able to use the existing nutrients and organic matter to establish a community with a wide variety of plant species.
(b) A few pioneer species colonise wind-blown sand along a seashore. The stability they provide enables organic matter to build up and hold the particles together.

Answer
a. Secondary succession, *b.* Primary succession

8. Arrange the following successional stages of an idealized Mediterranean sand dune in their correct chronological sequence (youngest to oldest).

Stage	Characteristic vegetation
(a) Dune scrub	Shrubs such as juniper (*Juniperus*) and mastic (*Pistacia)*
(b) Dune woodland	Trees such as oak (*Quercus)* and pine (*Pinus*)
(c) Yellow dune	Herbaceous plants such as marram (Ammophila) and sea medick (*Medicago marina*)
(d) Dune garrigue	Sclerophyllous, chamaephytes such as *Lavandula*

Answer
c, d, a, b