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Chapter 6 Changes in ecosystems

Question set 6.1

Remembering

1 **a** Endemic refers to a species that occurs naturally found only in a particular region.

b As the land mass of Australia broke off from Gondwana, it was isolated from other land masses. The isolation meant that Australia evolved different species to other land masses that were still connected.

2 Changes in the climate have drastically altered the water cycle over time. These abiotic factors include lower levels of atmospheric water leading to less rainfall and creating more arid ecosystems. A drop in temperature over thousand years caused the glaciation (water freezing) over large regions of the Earth.

3 Australia became a desert a little over 15 000 years ago. Prior to this, inland Australia was covered with seas and tropical ecosystems.

Understanding

4 Low sea levels meant there were land links between Australian and other islands to the north, which made it possible for species to migrate between these locations.

Question set 6.2

Remembering

1 A climax community is the stable community present at the final stage in a succession. It is stable as long as environmental factors remain unchanged.

2 Primary succession occurs when organisms colonise bare sites that previously had no organisms inhabiting them, whereas secondary succession deals with the changes in communities that are already established. In this instance, organisms recolonise recently disturbed communities.

3 The following factors may prevent a climax community from forming:

- human events, such as forestry, cattle grazing, fires and land clearance
- natural events, such as lightning strikes, lava flows and irregular flooding.

Understanding

4 Bare rock → lichens colonise rock, secreting acids which attack the rock's surface; dust accumulates in cracks in the rock → mosses grow → organic matter produced, resulting in simple soils → grasses and small herbaceous plants start to grow → small shrubs grow → larger trees grow → climax community is established

5 The characteristic features of *r*-selected species make them successful in the early stages of succession. They generally have effective seed dispersal, rapid growth and rapid reproduction. *K*-selected species live in more stable environments and outcompete other species around them. They live longer and grow slower than *r*-selected species, making them better suited to the later stages of succession and leading to a climax community.

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Question set 6.3

Remembering

1 Three positive effects of fire on a community are: smoke acts as a germinating agent; heat acts as a germinating agent; older trees with large canopy are cleared so sunlight can enter a forest, allowing plants under the canopy to receive more light.

2 Three negative, short-term effects of fire on a community are: animals burn and suffer; animals die; endangered species may become extinct.

3 Figure 6.7 on page 184 in the student text shows a thriving biological community in the tsunami-affected area years after complete devastation by the tsunami. Another piece of evidence is seen in the regrowth of corals in areas that were damaged and destroyed by the tsunami.

Understanding

4 If burning is done too often (less than the life cycle of a plant), then plants will not have enough time to produce seeds and reproduce. This can cause some species of plants to become locally extinct.

5 The type of fire will affect succession in different ways. It can open up spaces and create a nutrient-rich seedbed, resulting in secondary succession. Fire can also stimulate regrowth in some plant species. This proliferation of new growth may attract many animal species that can move into the area.

Chapter review questions

Remembering

1

Positive effects	Negative effects
Seed germination	Loss of vegetation
Enables other species to grow	Reduction of leaf litter
Sunlight can reach below the canopy	Decrease in animal numbers
Return of some nutrients to soil	Increase in suffering of animals

Understanding

2 Comparing present biota with those in the fossil record helps us to understand changes in living components of ecosystems over time. The layers and positions of sedimentary rocks in which fossils are embedded indicate the relative ages and relationships between organisms in past ecosystems.

3 The endemic nature of Australia's biota is due to a combination of three major events:

- The extinction of the dinosaurs 65 million years ago, which opened up many new niches for rapid speciation
- The separation from Antarctica 40 million years ago, causing Australia to become an isolated, island continent
- The gradual cooling and drying of the Australian continent, which placed the existing biota under intense evolutionary pressure.

Applying

4 If dingoes had entered and spread throughout Australia before the last ice age, they would have been able to cross the land bridge that formed between Tasmania and Victoria some 10 000 years ago. They do not appear to have ever inhabited Tasmania, which implies that their dispersal throughout mainland Australia must have occurred after the last ice age (within the last 10 000 years), after the land bridge disappeared.

5 A fire regime that involves prescribed burning every 10 years would enable the correct structure and composition for the dunnart to find a sheltered habitat with more protection from feral animals. The prescribed burning will also help germination and therefore the reproduction of vegetation that dunnarts use in their niche. The desired time between burns is long enough for most plants to produce seed and fruit.

Analysing

6 It is likely that species B and C are *r*-selected and the green and purple species are *K*-selected. Reasons include the fact that *r*-selected species are typically fast growing and are first to occupy a disturbed area. They increase rapidly but also decline rapidly when competitive species move in. *K*-selected species are slow growing and live in more stable environments.

7 Traditional owners will have different ways of managing the land compared to some conservation biologists. The combined expertise will increase the effectiveness of management strategies.

8 **a** Between 1907 and 1915, the tablelands supported seven species of herbivorous mammal – the highest diversity recorded.

b Two of the three introduced mammals have successfully exploited the environmental conditions to increase, or at least maintain, population numbers. All of the native mammals have had significant declines in their populations.

c Between 1880 and 1900, land management practices and/or environmental conditions enabled most species of herbivorous mammals to increase in number. The early exception to this was eastern grey kangaroos. Their population dropped sharply as introduced sheep populations expanded. This may be due to increased competition for food resources or as a result of culling operations. The late exception is the rat kangaroo, which decreased at around the same time rabbit populations increased. Again, this may be due to competition for food resources or the introduction of new predators. From 1900 onwards, all native herbivorous mammal populations declined, including the introduced bridled nail-tail wallaby in 1905. In contrast, rabbit populations continued to increase, thereby reducing food available to other herbivorous mammals.

9 The current distribution of the Proteaceae family indicates that it is largely restricted to former Gondwana landmasses, and hence must have evolved prior to Gondwana's break-up more than 100 million years ago.

Evaluating

10

Factor	Primary	Secondary
Beginning feature	Lifeless and barren	Disturbance (natural or artificial)
Soil	No soil present	Soil present
First signs of life	Pioneer plants such as lichen	Seeds and/or roots or spores
Biomass (relative)	Low and slow to build due to low primary productivity (fewer plants)	High and increases quickly due to a higher primary productivity

11 Responses will vary.

Creating

12 Responses will vary.

13 Responses will vary.

Reflecting

14 Responses will vary.

Practice exam questions

1 D

2 C

3 B

4 The stable community present at the final stage in a succession; it is stable as long as environmental factors remain unchanged (e.g. rainforests).

5 Any 10 of the following, in appropriate order, for 1 mark each:

- starts with primary succession
- the cleared area is lifeless and barren
- pioneer plants/wild species invade the cleared land
- examples include lichen, grasses, ferns
- pioneer plants die, decompose and break down into particles that help form soil
- formation of soil makes it suitable/possible for a new wave of plant species
- seeds germinate and roots grow
- small plant species such as shrubs grow
- larger, slower-growing trees may grow
- as plant biodiversity increases, animal species migrate into area
- there is greater availability of new niches, shelter etc.
- establishment of tree species and larger animals
- climax community forms which is stable and resilient/final stage of succession.