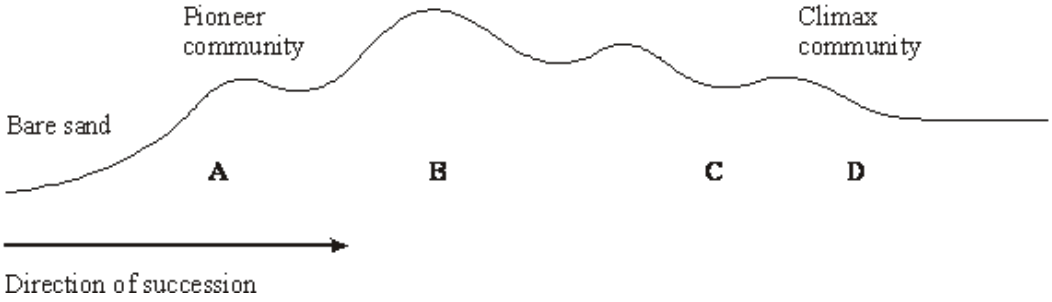
Q1. In a sand dune succession the pioneer community (**A**) colonises bare sand. This community is replaced over time by other communities (**B** and **C**) until a climax community of woodland (**D**) is formed.



(a) The communities **A** to **D** are composed of different species. Explain how the change in species composition occurs in a succession.

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(3)

(b) Which community, **A** to **D**, is the most stable? Explain what makes this the most stable community.

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(2)

S (c) Many species in the pioneer community are xerophytes. Suggest and explain how having sunken stomata is an advantage to these plants.

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(d) Explain why it would be more appropriate to use a transect rather than random quadrats when investigating this succession.

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(1)
(Total 9 marks)

Q2. (a) Succession occurs in natural ecosystems. Describe and explain how succession occurs.

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(b) Managed ecosystems such as wheat fields are prone to pest infestations. Describe the advantages and disadvantages of using biological agents to control pests.

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(5)

(c) Changes in ecosystems can lead to speciation. In Southern California 10 000 years ago a number of interconnecting lakes contained a single species of pupfish.

Increasing temperatures caused evaporation and the formation of separate, smaller lakes and streams. This led to the formation of a number of different species of pupfish. Explain how these different species evolved.

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(5)
(Total 15 marks)

Q3. Glaciers are masses of moving ice. When glaciers shrink, the thick covering of ice gradually disappears to leave behind bare land. Land exposed by a shrinking glacier in Alaska became covered by dense forest in 150 years.

(a) Explain how succession resulted in the formation of the forest.

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(4)

(b) In areas of poor drainage the soil is waterlogged. In these areas the climax community is bog dominated by the moss, *Sphagnum*. Explain why bog is described as the climax community.

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(1)

(c) Waterlogged soils lack oxygen. Suggest why trees are unable to survive in waterlogged soils.

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(d) The water and soil in *Sphagnum* bogs are usually acidic. Suggest why *Sphagnum* is not fully decomposed after it dies.

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(3)
(Total 10 marks)

Q4.S (a) What is meant by a community?

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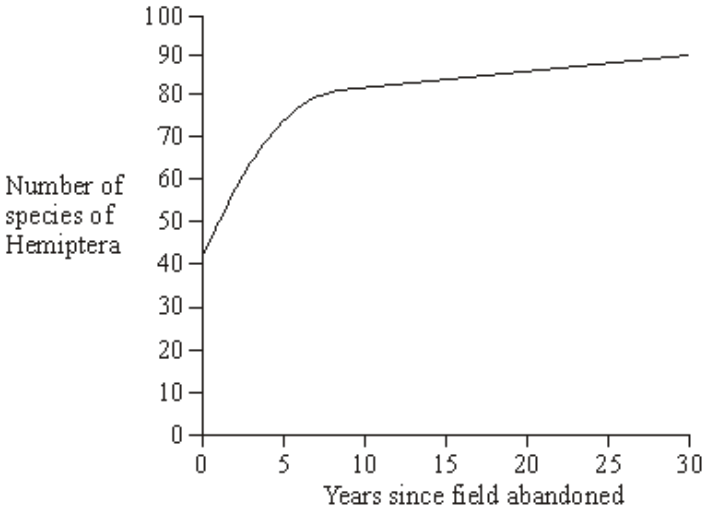
(b) A farmer stopped using a field for growing crops. Scientists studied succession in the field over the next 30 years. The graph shows the number of species of Hemiptera (an order of insects) present during that period.



Explain the increase in the number of species of Hemiptera.

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(3)

(c) To calculate a diversity index at a given time, it is necessary to know the number of insects in each population. Name **one** method that could be used to estimate the total number of insects in a population.

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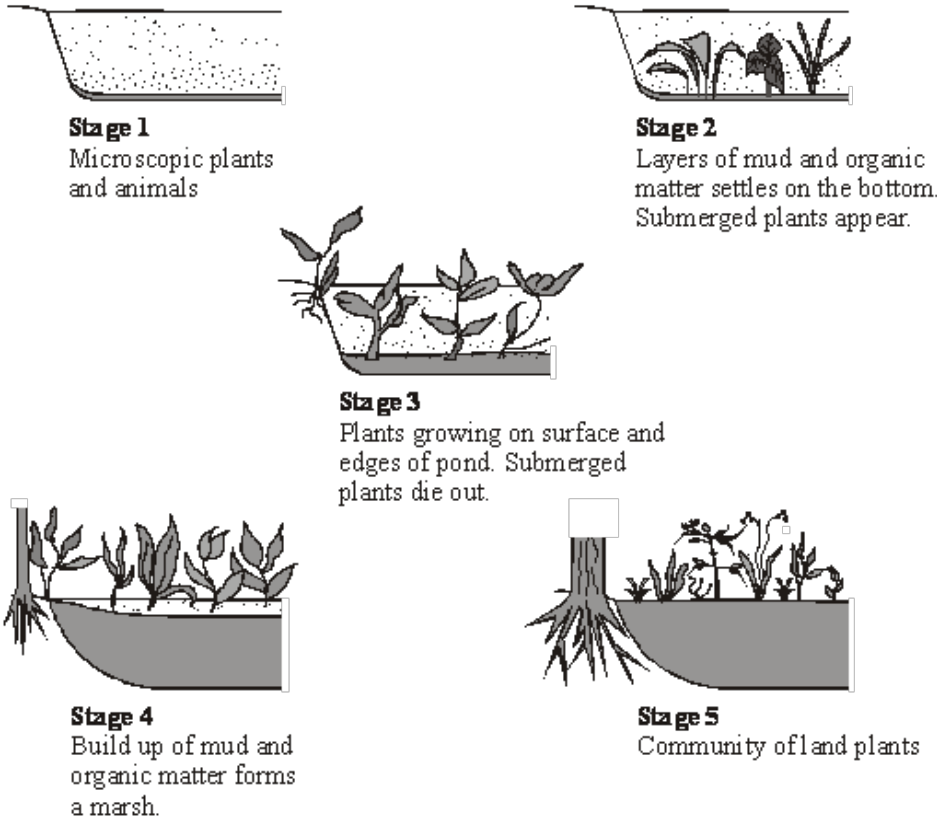
(1)

(Total 6 marks)

Q5. (a) The diagram shows a number of stages in an ecological succession in a lake.



Explain how the diagrams illustrate the features of an ecological succession.

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(b) Several small rivers flow into this lake. These rivers flow through forested areas. Explain how deforestation might affect the process of succession in the lake.

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S (c) **Stage 5** illustrates the final stage of succession which is known as the climax community. During this stage the number of different species in the habitat and the size of each population remain fairly constant. Explain what limits the size of populations in a climax community.

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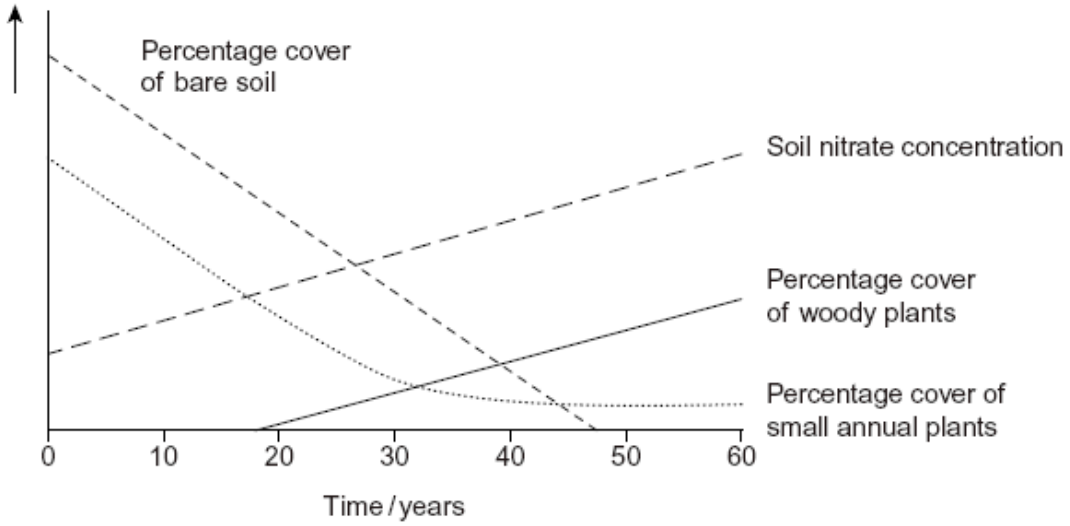
(5)
(Total 13 marks)

Q6. Ecologists investigated succession in some abandoned crop fields. The data that they collected are shown in the graph. The curves show the trends that occurred over a period of 60 years.



(a) Explain the change in soil nitrate concentration shown on the graph.

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(2)

(b) The pioneer plants had different characteristics from the plants that colonised the fields after 50 years.

(i) The pioneer plants had seeds that germinate better when the temperature fluctuates.

Explain the advantage of this to these pioneer plants.

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(2)

(ii) Explain the advantage to a plant that colonises after 50 years of having a high rate of photosynthesis at low light intensities.

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(1)

(c) Conservation of grassland habitats involves management of succession. Use the data in the graph to explain why.

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(2)
(Total 7 marks)

Q7. Biologists studied the process of succession in an area of wasteland over a period of ten years. They calculated the index of diversity of the area every year. After three years, the index of diversity was 1.6. After ten years, it had risen to 4.3.

(a) What information concerning the organisms present in the area is suggested by the increase in the index of diversity?

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(2)

(b) The increase in the index of diversity is one indication that a biological succession is taking place in the area. Describe those features of a succession that would bring about an increase in the index of diversity.

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(3)
(Total 5 marks)

Q8. (a) Explain what is meant by

(i) succession;

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(2)

(ii) a climax community.

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(1)

Heather plants are small shrubs. Heather plants are the dominant species in the climax community of some moorlands. The structure and shape of a heather plant changes as it ages. This results in changes in the species composition of the community. A large area of moorland was burnt leaving bare ground. The table shows four stages of succession in this area.

Time after burning / years	Appearance of heather plant	Mean percentage cover of heather	Other plant species present
4		10	Many
12		90	Few
19		75	Several
24		30	Many

(b) Explain why the number of other plant species decreases between 4 and 12 years after burning.

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(2)

S (c) The rate at which a heather plant produced new biomass was measured in g per kg of heather plant per year. This rate decreased as the plant aged. Use the information in the table to explain why.

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(Total 8 marks)