1. The National Vegetable Research Station stores a collection of seeds from many species and varieties of vegetables. These include old and rare varieties.

S (a) Why is it important to keep seeds from old and rare varieties of vegetables?

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(2)

S (b) Every few years, seeds of each variety in the collection are germinated and grown into mature plants. New seeds obtained from these plants are added to the collection.

(i) Suggest why it is necessary to obtain new seeds every few years.

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(1)

(ii) Within each variety, the scientists cross plants with different genotypes. Explain the advantage of this.

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(2)

(Total 5 marks)

2. Lacewings are insects that feed on aphids and mites, which are crop pests.
The numbers of six species of lacewings, **A** to **F**, were counted on samples of apple and strawberry crops. The results are shown in the table.

Crop	**Number of adults of each species of lacewing**						**Diversity index**
	A	**B**	**C**	**D**	**E**	**F**	
Strawberry	31	0	3	29	17	1	3.2
Apple	10	1	1	7	0	1	

The diversity index (d) is calculated from the formula

$$d = \frac{N(N-1)}{\Sigma\, n\,(n-1)}$$

where N is the total number of organisms of all species
and n is the total number of organisms of each species.

(i) Calculate the diversity index for lacewing species in the apple crop and write the figure in the table. Show your working.

(2)

(ii) Suggest a reason why the diversity index for the lacewings is different between the two crops.

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(1)
(Total 3 marks)

3. (a) Explain what is meant by monoculture.

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(1)

(b) (i) Where monoculture takes place on a large scale, farmers often remove hedges. Explain **two** benefits to the farmer of removing hedges.

1 .....

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(2)

(ii) Usually, the older a hedge the more species of shrub it contains. Explain why removal of hedges that are several hundred years old affects more animal species than the removal of young hedges.

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(2)

(c) Monoculture often involves the use of large amounts of pesticides. Some of these pesticides are toxic to species that are not pests. These animals may be killed immediately when the pesticide is applied. Explain **one** other way by which the use of pesticides can lead to the death of animals that are not pests.

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(2)
(Total 7 marks)