1 This question considers some similarities and differences in plant and animal biology.

(a) (i) Describe two **similarities** in the action of plant and animal hormones **in cell signalling**.

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[2]

(ii) Asexual reproduction and the ability to produce natural reproductive clones is common in plants but rare in animals.

Explain why plants are more able to form **natural** reproductive clones than animals.

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..... **[2]**

(iii) Polyploidy is the possession of more than two sets of chromosomes in the nucleus. Polyploidy is common in plants.

Suggest an explanation for the significance of polyploidy in forming new species of plant such as bread wheat, *Triticum aestivum*.

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..... **[2]**

(b) A student setting up an experiment to investigate the effect of light on cress plant seedlings accidentally shone the bright light onto one side of the face of another student. He noticed that the student immediately responded by raising her hand to shield her eye from the light.

The response of the cress seedlings to light shining from one direction was slower, but after 24 hours the cress seedlings had grown towards the light.

Describe the mechanisms that produced the responses to light in the cress seedlings **and** in the human.

cress seedlings .....

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human .....

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[7]

[Total: 13]

2 Fig. 4.1 shows some notes that a gardener pinned to his notice board to remind him of jobs to do.

Each is based upon a different biological principle.

A Pin any trailing blackberry shoots onto the soil so that they grow roots and form new plants.

B Remove the tops of chilli plants to encourage bushy growth.

C Leave vegetable waste in a well-aerated container for six months to make compost to add minerals to soil.

D Sow a leguminous crop like clover in bare soil in the autumn, and dig this crop into the soil in the spring to add nitrates.

E Save seeds from the biggest pumpkin grown, and plant these seeds next year, hoping to get a better crop.

F Dip cut stems of rosemary plants in rooting powder before planting them in soil.

G Bring carnivorous ladybirds into the greenhouse to reduce the numbers of plant-eating pests.

H Encourage pollinating insects by growing flowers with a strong sweet smell near crop plants.

Fig. 4.1

(a) Match the notes, **A** to **H**, with the biological principles on which they are based.

Write the correct letter next to the description of each principle.

Biological principle	**Letter**
artificial selection	.....
predator-prey interaction	.....
apical dominance	.....
nitrogen fixation	.....
reproductive cloning	.....
positive chemotaxis	.....
decomposition	.....
use of plant hormones	.....

[8]

(b) Four **other** procedures associated with growing or storing crops are described in Table 4.1 below.

Name a biological process that is slowed down or stopped by each procedure.

Procedure	Biological process slowed down or stopped
storing apples at a low temperature of 5° C	
removing weeds from a vegetable garden	
placing seedlings so they are lit from all sides equally	
removing elm suckers and self-sown tree seedlings from farmland	

Table 4.1 **[4]**

(c) Suggest **three** ways that farmers can maximise the efficiency of the transfer of energy up food chains from **primary consumers** to humans.

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..... **[3]**

[Total: 15]

3 **(a)** Organisms do not live in isolation, but interact with other organisms and with their physical environment.

State the word used to describe:

(i) the study of the interactions between organisms and their environment

..... **[1]**

(ii) the physical (non-living) factors in the environment

..... **[1]**

(iii) a physical area that includes all the organisms present **and** their interactions with each other **and** with the physical environment.

..... **[1]**

(b) State and describe **two types** of ecological interaction that can occur between different species in a habitat.

As part of each description, you should **name** the two species involved in your chosen example.

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..... **[6]**

(c) Plants are able to respond to changes in their environment.

(i) Describe **two** ways in which hormones may alter a plant's growth in response to overcrowding by other plants.

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..... **[4]**

(ii) Suggest how hormones alter a plant's growth if the top of the plant shoot is eaten by an animal.

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..... **[3]**

(d) The distribution and abundance of plants in a habitat can show how a physical factor varies across the habitat.

Describe how you would measure the distribution and abundance of plants over a distance of 100 metres.

In your answer you should make clear the sequence of procedures you would follow.

[6]

[Total: 22]

4 **(a)** Fig. 5.1 represents the sequence of events that takes place when adrenaline reaches a liver cell.

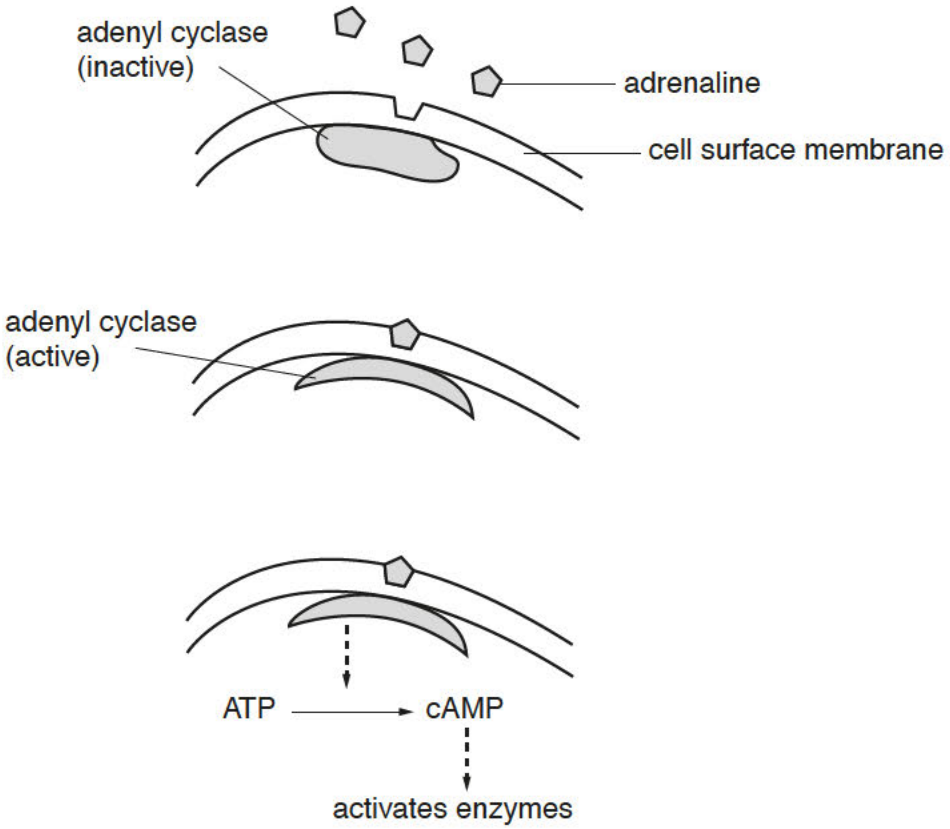


Fig. 5.1

(i) In terms of cell signalling, name the compound in Fig. 5.1 that is acting as:

the second messenger .....

the first messenger ..... **[2]**

(ii) Suggest what happens to polysaccharides in the liver cell as a result of the events shown in Fig. 5.1.

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..... **[1]**

(iii) Adrenaline affects a range of target tissues in the body.

Suggest how the adrenaline molecule can cause different effects in different target tissues.

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..... **[2]**

(b) Outline the **hormonal** and **nervous** mechanisms involved in the control of heart rate.

In your answer, you should use the appropriate technical terms, spelt correctly.

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..... **[5]**

[Total: 10]