

DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
Department for Curriculum Management and eLearning
Educational Assessment Unit
Annual Examinations for Secondary Schools 2012



Track

BIOLOGY – FORM V
TIME: 2 HOURS

NAME: _____ CLASS: _____

Question No.	Section A								Section B					
	1	2	3	4	5	6	7	8	1	2	3	4	5	
Max mark	6	10	6	11	6	5	6	5	15	15	15	15	15	
Actual mark														TOTAL MARK

85% Theory Paper	15% Practical	100% Final Score

Section A

Answer all questions in this section.

1. More than 900 new alien species including the poisonous pufferfish have been encountered in the coastal environments of the Eastern Mediterranean Sea in recent decades. The invasion of alien species affects food chains. The Mediterranean is the world's most invaded sea. Researchers still lack basic knowledge of how alien species affect ecosystems since there is limited information about the animal and plant communities on the coast. The biologist Stefan Kalogirou of the Department of Marine Ecology at the University of Gothenburg remarks that once a species has become established in the Mediterranean Sea, it is almost impossible to eradicate it.

Adapted from Mediterranean Sea invaded by alien species: <http://biologynews.net/archives>

- a. From the passage above, find the term that matches **each** of the following descriptions and write it down in the space provided:

(i) a unit containing all the organisms and their environment interacting together

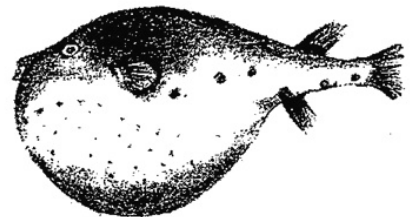
(ii) a group of organisms with similar characteristics that can interbreed with each other to produce fertile offspring

(iii) the organisms of all the different species living in an area at the same time

(iv) a chart showing the flow of energy (food) from one organism to the next, beginning with a producer.

(1, 1, 1, 1 mark)

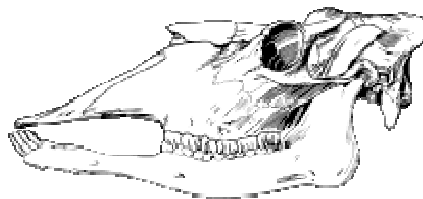
- b. Pufferfish inflate in a ball shape to escape predators. List TWO other possible ways in which organisms avoid being caught by their predators.



_____ (2 marks)

Total: 6 marks

2. Moose are large herbivorous animals. The following diagram shows a moose skull.



- a. On the diagram label the:

(i) teeth used for cropping, as **A**

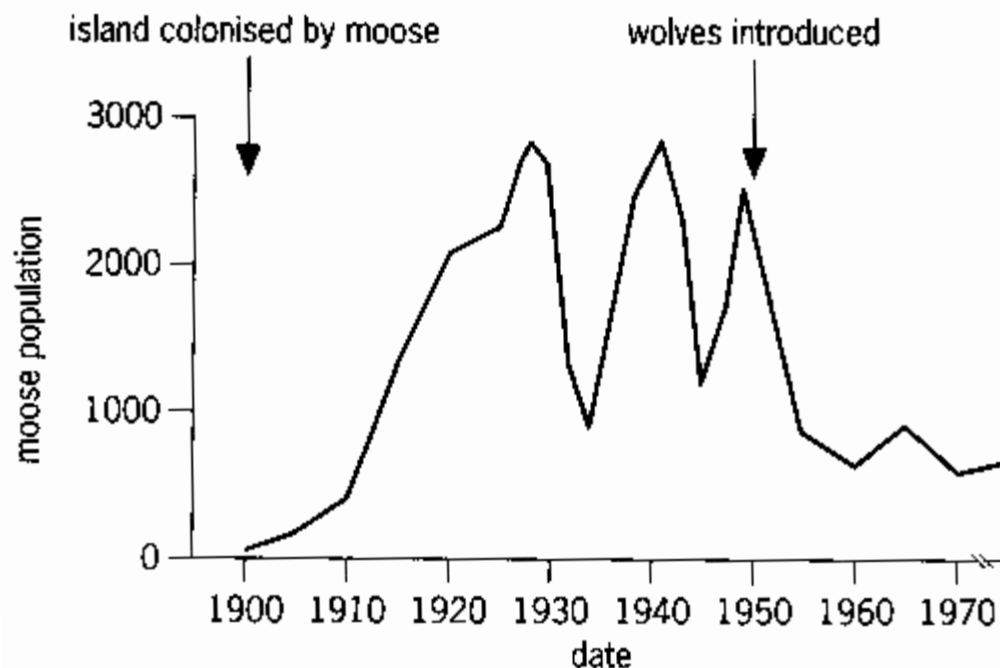
(ii) teeth used for grinding and chewing the chopped vegetation, as **B**.

(1, 1 mark)

- b. Moose (*Alces alces*) first colonised the island Isle Royale in 1900. Initially there were no predators on the island. Wolves (*Canis lupus*) which are the predators of moose were introduced on the island in 1950. Coyotes (*Canis latrans*) used to inhabit Isle Royale but were hunted to extinction by wolves.

(i) From the passage above name the TWO animals that are closely related.

(ii) The following graph shows the population curves of the moose before and after the introduction of wolves.



Explain the changes in the moose population before the introduction of wolves.

(iii) Wolves catch young, old and sick moose. Why is this beneficial to the wolves?

(1, 2, 1 mark)

- c. In 1980 the canine parvovirus was spread to the wolves on the island. Predict how this affected the wolf population.

(1 mark)

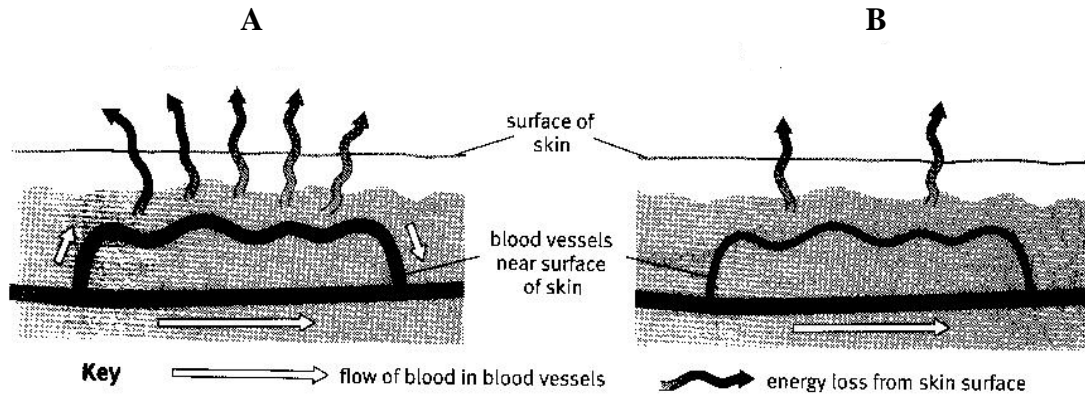
- d. Large numbers of ticks commonly known as Winter Ticks are able to parasitize individual moose. The biting ticks cause a lot of discomfort to the moose, so the moose try to get rid of the ticks by biting off their hair, causing loss of hair. Explain the effect of this hair loss in moose during the cold winter months.

(1 mark)

- e. Research studies show that the moose population in Isle Royale is currently at a low level. Predict how this will affect the wolf population. Give a reason for your answer.

 _____ (2 marks)
Total: 10 marks

3. The following diagrams A and B show two responses that help to control body temperature.



- a. Name **each** process.

A: _____ B: _____ (1, 1 mark)

- b. List TWO other body changes that may take place along with process B.

 _____ (2 marks)

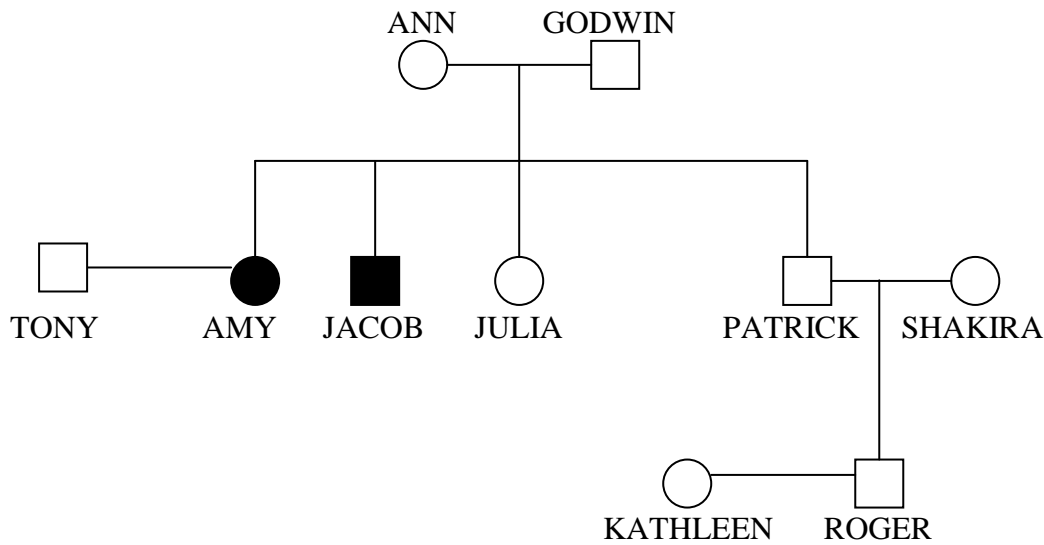
- c. Give a biological explanation for **each** of the following statements:

(i) On a hot day a kangaroo rat produces a lot of saliva which it then licks over the body.

(ii) A mouse exposed to low environmental temperatures lies curled up in a ball.

(1, 1 mark)
Total: 6 marks

4. Canavan disease is an autosomal recessive disorder that causes progressive damage to nerve cells in the brain. The following diagram shows the pattern of inheritance in a family.



Key:



Affected female



Affected male



Normal female



Normal male

- a. Using the letter **R** to represent 'normal' and **r** to represent 'Canavan disease' write the genotypes of:

(i) Godwin _____

(ii) Ann _____

(iii) Jacob. _____

(1, 1, 1 mark)

- b. Roger and his future wife Kathleen were advised by the genetic counsellor that they have a small chance of having a child suffering from the Canavan disease. Use genetic diagrams to work out the percentage chance of having an affected child.

(4 marks)

- c. The genetic counsellor informed Amy and her partner Tony that their children are not affected by the Canavan disorder even though Amy is affected. Explain this by using a pedigree diagram.

(4 marks)

Total: 11 marks

- 5a. Name TWO possible pollutants shown in the following picture.

(2 marks)



- b. List TWO harmful effects of the type of pollution shown in **each** of the following pictures.



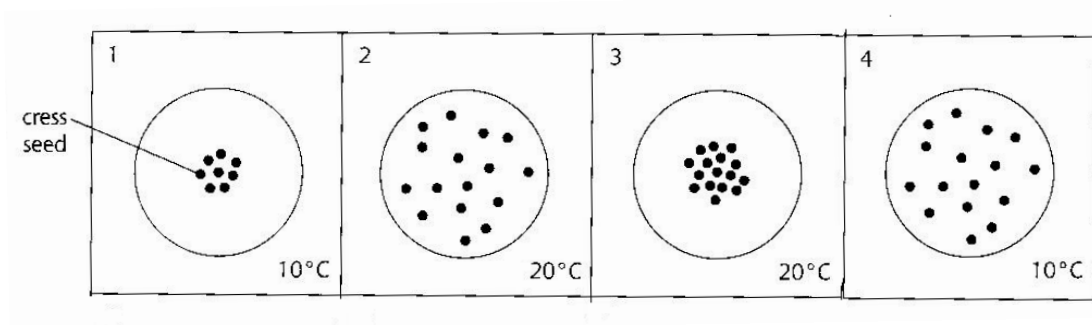
- (i) _____
-
-
-
-
-

(ii) _____

(2, 2 marks)
Total: 6 marks



6. A biology teacher set up an experiment to investigate the effect of temperature on germination and the effect of spacing between seeds on germination. The teacher used cress seeds and a growth medium to set up four Petri dishes (1 to 4) as shown below.



- a. Write the numbers of the TWO Petri dishes that should be compared to find the effect of temperature on germination.
 _____ (1 mark)
- b. Write the numbers of the TWO Petri dishes that should be compared to investigate the effect of spacing between seeds on germination.
 _____ (1 mark)
- c. List TWO variables that need to be kept the same in both investigations.

 _____ (2 marks)
- d. Describe ONE method that the teacher can use to measure how much germination has taken place within each Petri dish.

 _____ (1 mark)

Total: 5 marks

7. The table below shows the results of an investigation into how the distribution of three species of grass varied with soil depth.

Soil depth (m)	Species of grass		
	<i>Panicum maximum</i>	<i>Themedia triandra</i>	<i>Eragrostis superba</i>
0-0.4	64.9	66.5	73.6
0.4-0.8	14.2	25.9	15.5
0.8-1.2	12.1	5.6	7.4
1.2-1.6	4.7	1.4	2.6
1.6-2.0	2.6	0.6	0.8
2.0-2.4	1.2	0	0.1
2.4-2.8	0.3	0	0
Total dry mass (g per plant)	114	58	27

- a. List ONE reason why the three grass species have the bulk of the roots close to the soil surface.
_____ (1 mark)
- b. From the table above name the plant that grows best if the ground is lightly sprinkled with water at regular intervals.
_____ (1 mark)
- c. All three species of grass grow in hot dry conditions. From the table above name the species that is able to survive better than the other two species during lengthy periods of hot dry weather. Give a reason for your answer.

_____ (2 marks)
- d. The following diagrams A and B show two types of root systems.



A



B

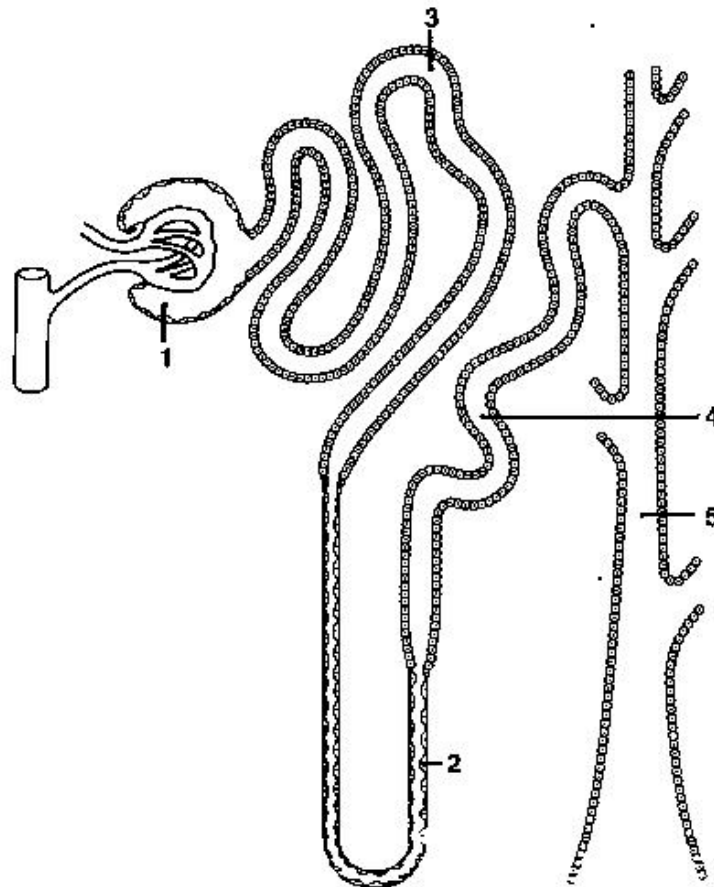
Write the letter of the root system you would expect to find in a dicot plant.

- _____ (1 mark)
- e. Root hair cells have a large surface area (relative to other cells). List the advantage of this adaptation in root hair cells.

_____ (1 mark)

Total: 6 marks

8. The following diagram represents a single nephron from a mammalian kidney.



- a. Write the number of the region that is:
- (i) the main site for the reabsorption of glucose and amino acids _____
 - (ii) the site of ultrafiltration _____
 - (iii) the site that takes urine to the pelvis of the kidney. _____

(1, 1, 1 mark)

- b. Which of the numbered regions would be particularly long in a desert mammal? Give a reason for your answer.

_____ (2 marks)

Total: 5 marks

Section B

Answer question 1 and choose TWO other questions. Answer the questions of Section 1 in your answer book. **foolscap.**

1. Read the following passage and answer the questions that follow.

The water hyacinth story

The water hyacinth is a plant that floats on the water surface. Parts of it break off easily and regenerate to form new plants. In many subtropical and tropical countries it is a significant weed that completely covers many lakes and rivers. This prevents boats from using the waterways. A series of experiments was carried out on a beetle *Neochetina eichhorniae* to find out if it was suitable to use for the biological control of water hyacinth.

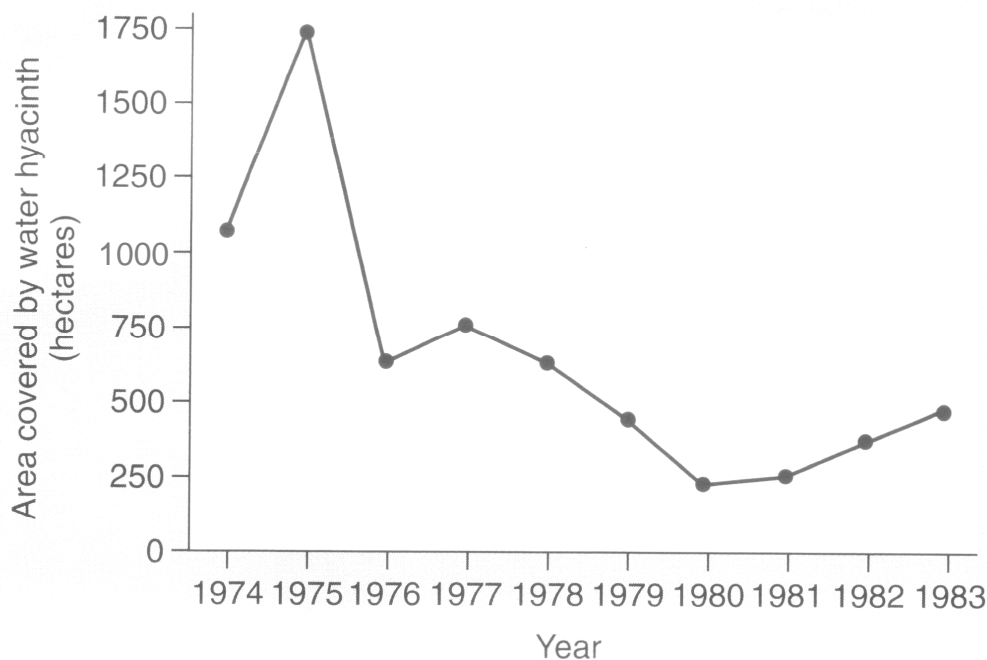
- a. The water hyacinth is a monocot.
 - (i) Define the term *monocot*.
 - (ii) What thickness of cuticle would you expect to find in the leaves of aquatic plants?
 - (iii) Explain why aquatic plants usually have smaller roots. (1, 1, 1 mark)
- b. Explain why few species of fish can survive in lakes covered by a dense mat of water hyacinth plants. (1 mark)
- c. Explain how the dense cover of water hyacinth plants affects the native aquatic plants underneath. (1 mark)
- d. The water hyacinth plants create a prime habitat for a species of snail known to host a parasitic flatworm that causes a disease called schistosomiasis (snail fever).
 - (i) Explain why flatworms lack a specialised transport system.
 - (ii) Name the phylum to which the snail belongs. (2, 1 mark)
- e. Mature hyacinth plants were placed individually in identical pots in a glasshouse. Two pairs of beetles were added to each pot and measurements of the plants' mean length of longest root and mean leaf area were made in both the experimental pots and in the control pots at monthly intervals.

The following table summarises the results.

Month	Mean length of longest root (cm)		Mean leaf area (cm ²)	
	Experimental	Control	Experimental	Control
August	7	10	61	73
September	20	19	40	68
October	21	20	74	122
November	11	20	46	120
December	11	23	41	119

What conclusion about the growth of the roots and leaves can be obtained from these experiments? (1 mark)

- f. The following graph shows the change in the area of a lake covered with water hyacinth after the release of the beetles *Neochetina eichhorniae*.



- Explain why there was an increase in the area covered by water hyacinth plants in the year 1974, following the release of the beetles.
- Explain the rapid decrease in the area covered by water hyacinth plants in 1975.
- Before a pest can be successfully controlled by another organism, extensive research needs to be carried out. Only then can the biological control agent be released safely. List ONE factor that needs to be ensured prior to the release of the beetle in the lakes affected by water hyacinth.
- List TWO possible limitations of using biological control methods. (1, 2, 1, 2 marks)

Total: 15 marks

2. Chlamydia is a sexually transmitted disease named for the bacterium *Chlamydia trachomatis* that causes it. Chlamydiae were initially considered to be more closely related to viruses than to bacteria but research indicates that these organisms are cellular. Even so they are obligate parasites due to their inability to produce ATP molecules.

- Define the term *parasite*. (1 mark)
- Describe the structure of a virus. (2 marks)
- Give a biological explanation for **each** of the following statements:
 - Bacteria are called prokaryotic cells.
 - Some bacteria are symbiotic. (1, 2 marks)
- Explain the role of lymphocytes when bacteria invade body tissues. (1 mark)
- Name the
 - body physical defence barrier to most bacteria and viruses
 - chemical defence present in the stomach to destroy bacteria in food. (1, 1 mark)
- List TWO
 - differences between viruses and bacteria
 - ways in which sexually transmitted diseases can be prevented. (2, 2 marks)

- g. Patients suffering from Chlamydia can develop pelvic inflammatory disease (PID) in which infection spreads from the cervix to the oviducts. As a result there is blockage of the oviducts. What is a possible consequence of this? (1 mark)
- h. Compare the ATP production in aerobic and anaerobic respiration. (1 mark)

Total: 15 marks

3. Describe the role of:
- mineral ions in plant growth (3 marks)
 - the pancreas in digestion (4 marks)
 - amniotic fluid in the protection of the foetus (3 marks)
 - ovarian hormones in the menstrual cycle (3 marks)
 - intercostal muscles during inspiration (breathing in). (2 marks)

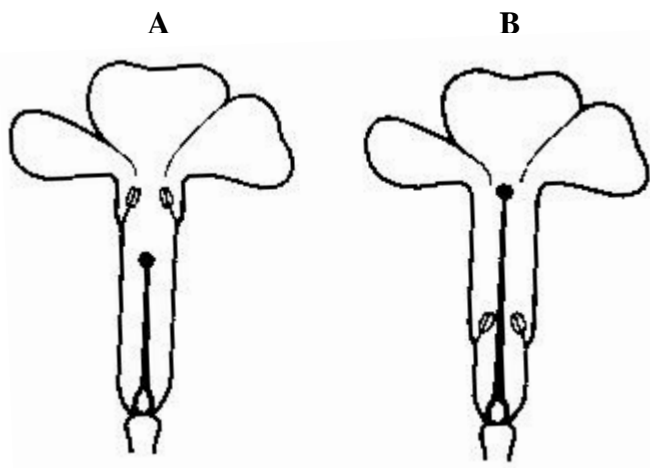
Total: 15 marks

- 4a. A person drinks a glass of lemonade. Name the parts of the brain to which **each** of the following descriptions would apply:
- receives impulses from touch receptors in the lips
 - contains receptors that respond to a change in the concentration of the blood plasma
 - enables the person to coordinate the movements necessary to drink from the glass.
- (1, 1, 1 mark)

- b. When the lemonade touches receptors in the throat a swallowing reflex action occurs.
- Define the term *reflex action*.
 - List TWO other examples of reflex actions. (1, 2 marks)
- c. Compare the functions of sensory neurones and motor neurones. (2 marks)
- d. Name the gland in the brain that acts as a link between the central nervous system and the endocrine system and explain its role in the development of secondary sex characteristics in females. (3 marks)
- e. Blood glucose level is under feedback control by the hormones insulin and glucagon. Explain. (4 marks)

Total: 15 marks

- 5a. Describe the function of the stigma, style and ovary in a flower. (4 marks)
- b. In some flowers the stamens ripen before the carpels. Explain the importance of this. (1 mark)
- c. The following diagram shows two different types of primrose flowers A and B.



- (i) List TWO differences between flowers A and B.
- (ii) Explain the importance of such flower arrangement in primroses. (2 marks)
- d. Holly trees are known for their spiny evergreen leaves and vivid red berries popular during Christmas season. The male and female flowers of the holly tree are produced on separate plants.
- (i) What must a gardener do to ensure berry production?
- (ii) The leaves of holly trees are waxy. Explain the importance of this.
- (iii) Holly trees grow best in acidic soils. Describe ONE method that can be used to increase the pH of acidic soil. (1, 1, 1 mark)
- e. A gardener noticed that the soil in his garden is loose and light. The gardener decides to add humus and a layer of manure to the soil in the garden.
- (i) Explain why it is necessary to add humus and manure to this type of soil. (3, 1 mark)
- (ii) What is the benefit of having soil that is loose and light? (1 mark)

Total: 15 marks