



BIOLOGY – FORM V
TIME: 2 HOURS

NAME: _____ CLASS: _____

Question No.	Section A							Section B					
	1	2	3	4	5	6	7	1	2	3	4	5	
Max mark	6	10	8	5	11	6	9	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. Bats of the genus *Pteropus* are the largest bats in the world. They are commonly known as fruit bats or flying foxes. Scientists are urging the government of Malaysia to ban the hunting of the world's largest fruit bat. The bats are hunted for food, medicine, and sport. Shooting takes place at dusk as the bats set out to forage overnight. The researchers remark that population models suggest that if current hunting rates continue, the species can be hunted to extinction. Flying foxes can have a wing span of 1.5m and are crucial for the rainforest ecosystems in this part of Asia. They eat fruit and nectar and in doing so they drop seeds around and pollinate trees. So they are critical to the propagation of rainforest plants.

Adapted from <http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8221132.stm>

- a. From the passage above write the term that best describes **each** of the following descriptions:

- (i) a fertilised ovule _____
- (ii) sugary fluid found in flowers _____
- (iii) the part that develops from the ovary of a flowering plant. _____

(1, 1, 1 mark)

- b. Name the taxonomic group that comes before genus.

_____ (1 mark)

- c. Describe the body covering of bats.

_____ (1 mark)

- d. List ONE other human activity (besides overhunting) that can result in extinction of a species.

_____ (1 mark)

Total: 6 marks

2. Rett syndrome is a neurodevelopmental disorder of the grey matter of the brain. Rett syndrome is a sex-linked dominant condition (represented by **R**) and the disease-causing gene is located on the X chromosome.

- a. The grey matter in the brain includes regions involved in muscle control and sensory perceptions such as seeing and hearing.

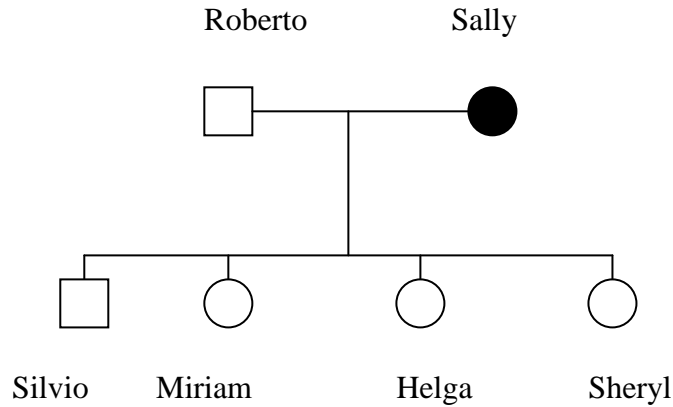
- (i) Name the part of the brain responsible for co-ordination of movement.

- (ii) Name the endocrine gland present within the brain.

- (iii) Describe ONE structural feature that protects the brain.

(1, 1, 1 mark)

- b. The following diagram shows the pattern of inheritance of the Rett syndrome in a family.



Key:



In the space below draw a genetic diagram to explain why all four children (Silvio, Miriam, Helga and Sheryl) are not affected by the Rett Syndrome. In your answer indicate clearly the genotype of the son (Silvio) and the genotype of the daughters (Miriam, Helga and Sheryl).

(6 marks)

- c. Explain why the sons of a father affected with Rett syndrome will not be affected by the disorder.

(1 mark)

Total: 10 marks

3. Sports drinks are beverages designed to help athletes rehydrate when fluids are lost after training. Sports drinks are divided into three types as indicated in the table below.

<i>Type of Sports drinks</i>	<i>Contents</i>
Hypotonic drinks	Have a lower sugar concentration than the body fluids
Isotonic drinks	Have the same concentration of sugar as the body fluids
Hypertonic drinks	Have a higher sugar concentration than the body fluids

- a. From the table above, name the best type of sports drink suitable in **each** of the following situations:

(i) a long distance runner who needs a quick replacement of fluids lost by sweating and a boost of carbohydrate

(ii) a drink necessary during heavy exercise to meet the energy demands

(iii) a jockey who needs fluid without the boost of carbohydrates.

(1, 1, 1 mark)

- b. Athletes should gain weight through muscle mass and not fat. Name the important food substance necessary to gain muscle mass.

_____ (1 mark)

- c. Female Athlete Triad is a serious health problem that involves disordered eating, low bone mass and amenorrhea (stopping of the menstrual cycle) in female athletes. Name ONE other situation when a woman of reproductive age does not menstruate.

_____ (1 mark)

- d. A serious risk of amenorrhea is osteoporosis. This is a disease of bones that leads to an increased risk of fracture. The Health Department circulated the following poster in gymnasiums to help reduce the incidence of osteoporosis.

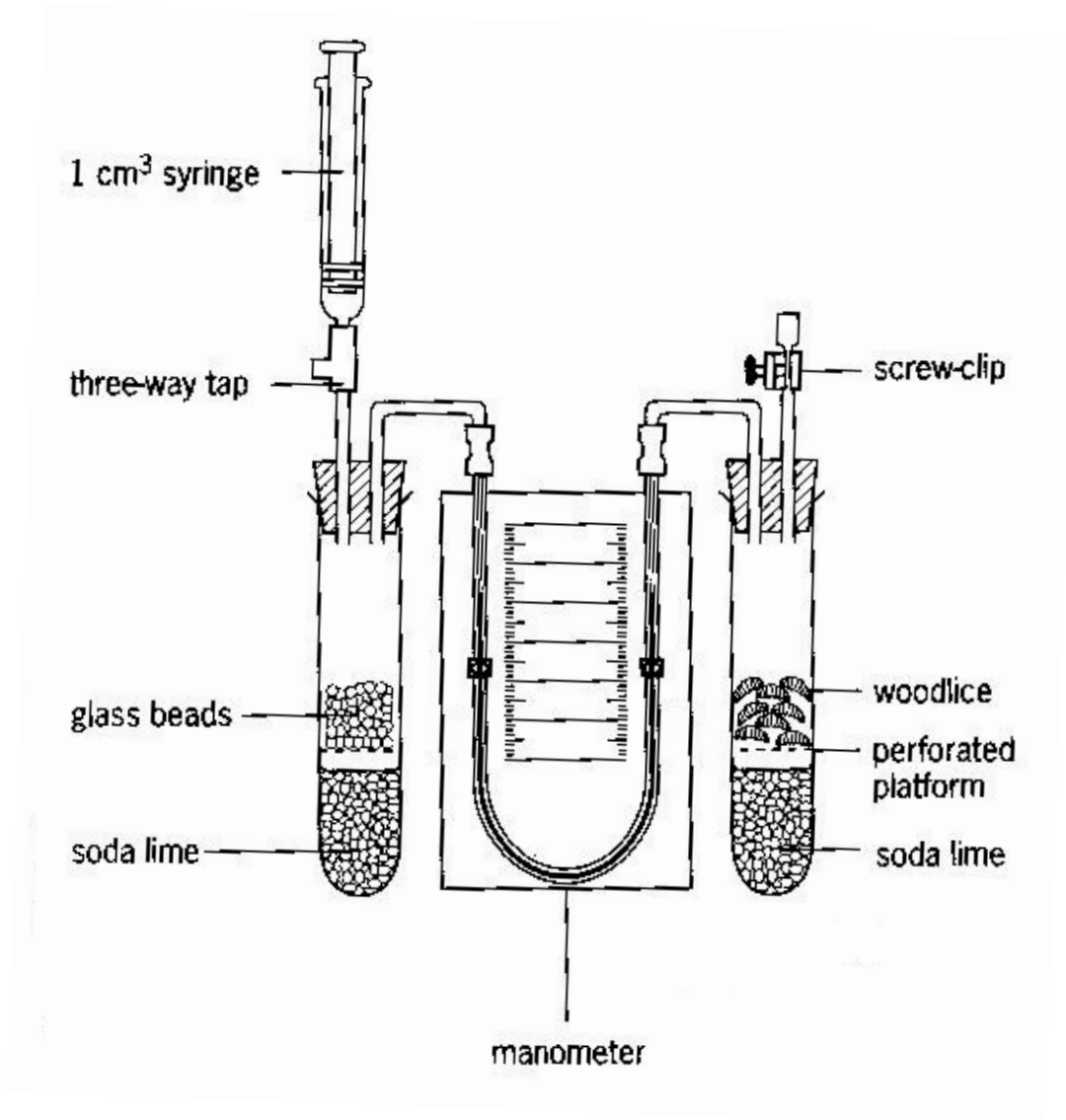


Discuss the biological significance of the poster.

(3 marks)

Total: 8 marks

4. The following diagram shows the apparatus set up by a biology teacher to investigate the rate of oxygen uptake in woodlice.



- a. From the diagram, name the part acting as the control.

(1 mark)

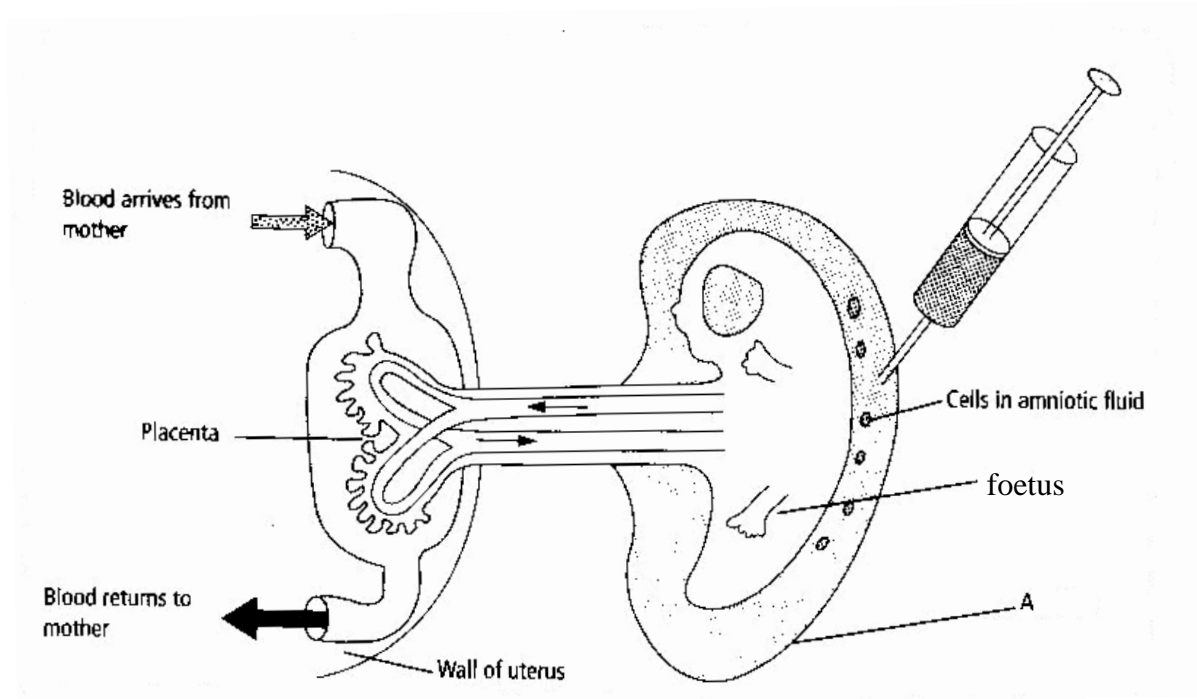
- b. Describe how the biology teacher ensures a constant temperature during the course of the experiment.

(1 mark)

- c. The soda lime absorbs carbon dioxide evolved during respiration. Explain the importance of absorbing the carbon dioxide produced by the woodlice during respiration in this experiment. (1 mark)
- d. The apparatus can only be used for a short while before renewing the air supply. Name the process that takes place if the oxygen is depleted. (1 mark)
- e. If the respirometer is used with plant material it is essential to ensure that no photosynthesis can take place. Describe ONE method that a biology teacher can use to ensure that no photosynthesis takes place in a respirometer with plant material. (1 mark)

Total: 5 marks

5. The following diagram shows the process of amniocentesis. In this process a sample of amniotic fluid is removed using a long needle.



- a. Name the part labelled A. (1 mark)
- b. Describe what happens to the part labelled A just before birth. (1 mark)
- c. On the diagram above label the umbilical cord. (1 mark)
- d. List ONE form of protection that the amniotic fluid provides to the foetus. (1 mark)

- e. Amniocentesis is used to detect common abnormalities such as Down Syndrome, Edwards Syndrome and Turner's Syndrome. Edwards Syndrome is caused by the presence of three copies of chromosome 18, while Turner's Syndrome is a chromosomal abnormality in which one of the sex chromosomes is absent.

(i) Write the term that describes two chromosomes belonging to a pair that look exactly alike.

(ii) Compare the full number of chromosomes of an individual suffering from Edwards Syndrome with that of an individual suffering from Turner's Syndrome.

Edwards syndrome: _____ Turner's syndrome: _____ (1, 1 mark)

- f. Explain why the placenta is considered as a unique organ.

_____ (1 mark)

- g. The umbilical artery takes blood from the foetus to the placenta while the umbilical vein carries blood from the placenta to the foetus. Compare the blood in the umbilical artery with that in the umbilical vein.

(2 marks)

- h. Name the:

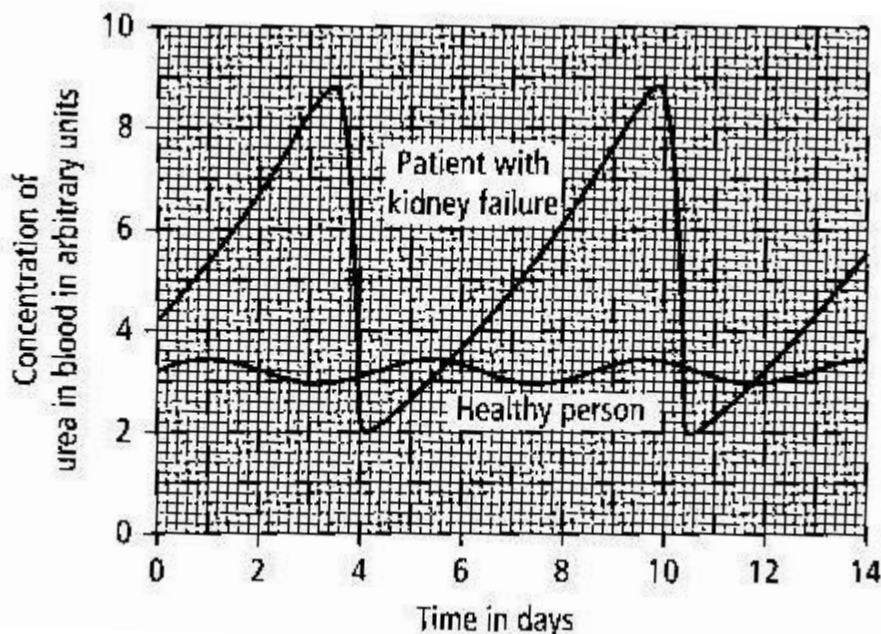
(i) lower end of the uterus that opens into the vagina

(ii) hormone that causes the lining of the uterus to thicken during pregnancy.

(1, 1 mark)

Total: 11 marks

6. A patient has kidney failure. The patient visits hospital every few days for dialysis. The following graph shows the concentration of urea in the blood of a healthy person and of a patient with kidney failure.

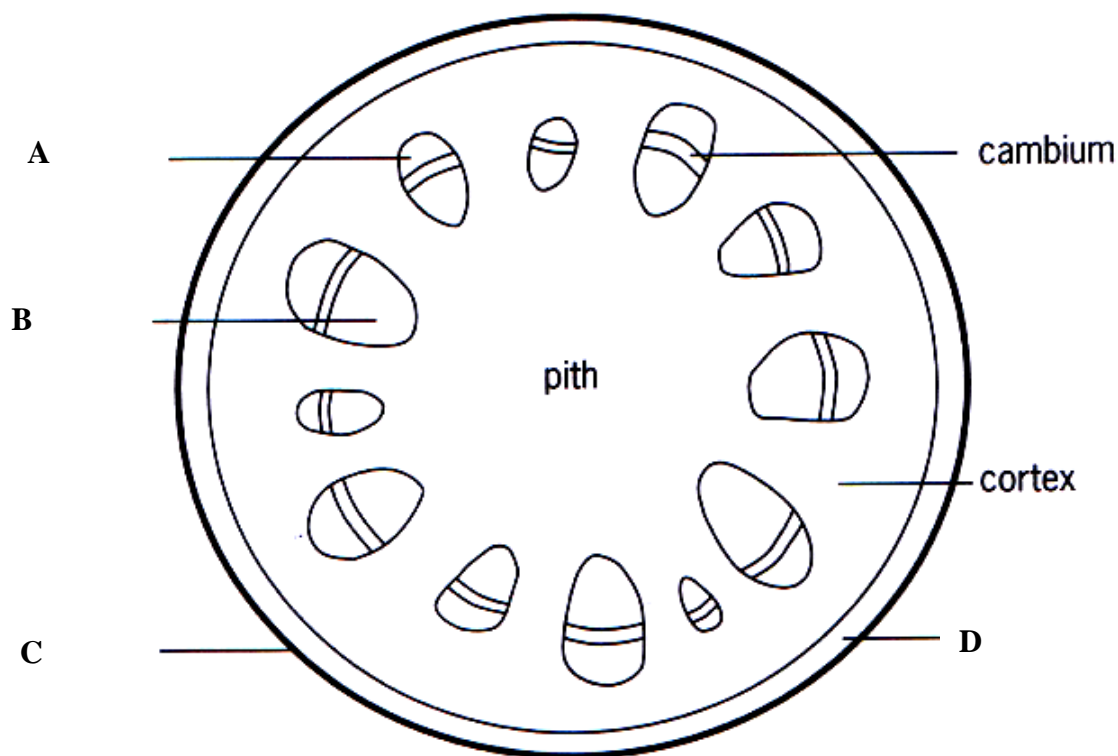


- a. Describe the pattern of the concentration of urea in the patient's blood over the 14-day period.
 _____ (1 mark)
- b. The patient undergoes dialysis on day 4. Compare the concentration of urea in the patient's blood on day 4 with that of the healthy person.
 _____ (1 mark)
- c. Dialysis works on the principles of the diffusion of solutes and ultrafiltration of fluid across a semi permeable membrane.
- (i) Describe the process of ultrafiltration.

- (ii) List TWO conditions that facilitate a faster rate of diffusion across a surface.

(2, 2 marks)
Total: 6 marks

7. The following diagram shows the transverse section of a young dicotyledonous stem.



a. Label the parts **C** and **D**.

C: _____ D: _____ (1, 1 mark)

b. Compare the substances transported in A and B.

(2 marks)

c. Tree squirrels like the Gray Squirrel kill trees by gnawing (chewing) at the stem. Explain why gnawing by squirrels kills trees.

(2 marks)

d. The squirrel pox virus is a virus that causes squirrel pox. Gray squirrels are carriers of the infection and can spread the disease to red squirrels. Gray squirrels have developed immunity to the virus after a long exposure to the virus but the disease is fatal to red squirrels.

(i) Describe how the squirrel pox virus affects the population of red squirrels.

(ii) Describe the basic structure of a virus.

(1, 2 marks)

Total: 9 marks

Section B

Answer question 1 and choose TWO other questions. Answers the questions of section B foolscap.

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

The Great Barrier Reef is the world's largest coral reef system, located off the coast of Queensland in Australia. The Great Barrier Reef supports a diversity of life including many endangered species. Thirty species of dolphins, whales and porpoises have been recorded in the Great Barrier Reef. The Great Barrier Reef's environmental pressures include lowered water quality from runoff water including suspended sediment, excess nutrients and pesticides. The effects of climate change including increased temperature, storms and coral bleaching are also having negative effects. Cyclic outbreaks of the crown-of-thorns starfish, overfishing that disrupts food chains and oil spills also damage the reef.

- a. Corals are marine animals that belong to the phylum Cnidaria.
 - (i) List ONE typical characteristic feature of the Cnidarians.
 - (ii) Name the class to which dolphins, whales and porpoises belong. (1, 1 mark)
- b. Seventeen species of sea snake (a reptile) live on the Great Barrier Reef in warm waters up to a depth of 50 metres.
 - (i) Most sea snakes are able to respire through their skin. Explain why this is unusual for reptiles.
 - (ii) The vast majority of sea snake species are ovoviviparous – this means that the young are born alive in the water. Why is this different from typical reptiles? (1, 1 mark)
- c. List ONE possible reason for the cyclic outbreaks of crown-of-thorns starfish. (1 mark)
- d. The corals that form the structure of the Great Reef ecosystem depend upon a symbiotic relationship with a unicellular flagellate protozoa called zooxanthellae that are photosynthetic and live within their tissues. Zooxanthellae give coral its colouration. Any environmental trigger that affects the coral's ability to supply the zooxanthellae with nutrients for photosynthesis will lead to expulsion. Coral which loses a large fraction of its zooxanthellae becomes white and is said to be bleached.
 - (i) List ONE benefit of the symbiotic relationship for the zooxanthellae.
 - (ii) Give ONE other example of a symbiotic relationship in which both organisms benefit.
 - (iii) Explain why coral reefs grow only up to a depth of 50m in water. (1, 1, 1 mark)
- e.
 - (i) Explain why overfishing can lead to low biological growth rates of the fish population.
 - (ii) List ONE other negative impact of overfishing on the reef besides disruption of food chains.
 - (iii) Fish farming involves raising fish commercially in tanks usually for food. Environmentalists have remarked about the widespread use of pesticides in fish farms. Explain why pesticides are commonly used in fish farms. (1, 1, 2 marks)
- f. Explain the effect of excess nutrients in runoff water. (2 marks)
- g. Describe ONE control measure to prevent oil spills. (1 mark)

Total: 15 marks

2. Compare and contrast **each** of the following:
 - a. diaphragm cap and the sheath (condom) (3 marks)
 - b. sweat glands and sebaceous glands (3 marks)
 - c. continuous and discontinuous variation (3 marks)
 - d. magnesium and nitrogen mineral ions in plants (3 marks)
 - e. colour blindness and night blindness. (3 marks)

Total: 15 marks

3. A biology student was conducting research about different heart and lung diseases. The student delivered a brief presentation about hypoplasia. Hypoplasia is a heart disease, typically resulting in underdevelopment of the right or the left ventricle.

- a. Describe the structure of the wall of the left ventricle. (1 mark)
- b. Hypoplastic Left Heart Syndrome (HLHS) is a rare heart defect affecting the left ventricle of the heart. In babies with HLHS, the aorta and left ventricle are underdeveloped. Explain the effect of this on blood circulation. (2 marks)
- c. Hypoplastic Right Heart Syndrome (HRHS) is a heart condition where the right atrium and right ventricle are underdeveloped. Explain the effect of this on blood circulation. (2 marks)
- d. Two common lung diseases are pneumonia and lung cancer. Pneumonia is an infection in one or both lungs. The infection inflames the lungs' air sacs. Lung cancer is a disease characterized by uncontrolled cell growth in lung tissues.
 - (i) Describe the effects of emphysema on the air sacs.
 - (ii) List TWO ways of reducing one's risk of developing lung cancer. (2, 4 marks)
- e. An anxious person often suffers from hyperventilation or overbreathing – this means that there is fast or deep breathing.
 - (i) Compare the role of the intercostal muscles during breathing in and breathing out.
 - (ii) Describe the effect of hyperventilation on the concentration of carbon dioxide in the blood. (2, 2 marks)

Total: 15 marks

4. *Passiflora edulis* is a vine species of passion flower that is native in Brazil commonly referred to as the passion fruit. Passion fruit juice is a good source of Vitamin C and fresh passion fruit is high in potassium and dietary fibre.

- a. List TWO advantages of including passion fruit in the diet. (2 marks)
- b. The passion fruit plant uses gravity for seed dispersal.
 - (i) Some plant species produce adhesive mucus and hooks as an adaptation for dispersal. Name the type of seed dispersal of such plant species.
 - (ii) The fruits of the nutmeg tree are eaten by the bird of paradise. The outer fruit is digested but the inner seed (the nutmeg) is protected by a thin hard shell. Explain how a nutmeg seed is dispersed by the bird of paradise. (1, 2 marks)
- c. List TWO types of plants that do not produce seeds. (2 marks)
- d. Compare the seeds produced in angiosperms with those produced in gymnosperms. (2 marks)
- e. List ONE advantage of seed dormancy. (1 mark)
- f. Name the part of the plant that first emerges from the seed and describe its function. (3 marks)
- g. Explain why gardeners make sure that seeds are not buried too deep within the soil or in waterlogged soils. (2 marks)

Total: 15 marks

5. The marine iguana is an endemic species to the Galapagos Islands. It is the only lizard that lives partly in seawater.
- a. Marine iguanas must raise their body temperature to approximately 36°C before going into cold water to feed.
 - (i) Define the term *species*.
 - (ii) Describe the typical behavioural adaptation used by lizards including the marine iguanas to raise their body temperature.
 - (iii) List ONE possible physical change that marine iguanas undergo when they dive in the cold seawater. (1, 1, 1 mark)
- b. Wild goats and cats were brought accidentally or willingly to the Galapagos Islands by humans. List TWO reasons for the rapid increase in the number of these animals in the area. (2 marks)
- c. The Galapagos tortoise is the largest living species of tortoise. Tortoises have a mutualistic relationship with some species of Galapagos finches. The tortoise will extend its neck to allow the finch to pick off ticks that live on the tortoise.
 - (i) Write the term that describes the type of relationship between the tick and the tortoise.
 - (ii) Ticks are arachnids. Write the number of legs present in ticks.
 - (iii) In the Galapagos Islands there are fifteen different species of finches. During his trip to the Galapagos Islands, Charles Darwin observed the Large Tree Finch *Camarhynchus psittacula*, the Warbler Finch *Certhidea olivacea*, the Large Cactus Finch *Geospiza conirostris* and the Cocos Island Finch *Pinaroloxias inornata*. Explain why the first name of these four types of finches is different. (1, 1, 1 mark)
- d. Introduced rats namely the black rat (*Rattus rattus*) and the Norway rat (*Rattus norvegicus*) were taken to the Galapagos Islands in pirate boats. The Galapagos hawk feeds on rodents such as rats. Explain how the population of the Galapagos hawks will be affected if a poison is used to eradicate the introduced rats. (2 marks)
- e. During his trip to the Galapagos Islands Charles Darwin wrote the following observations:
The hawk feeds mainly on giant centipedes as well as on lava lizards, snakes and mocking birds. Snakes and hawks feed on young marine iguanas. Scorpions prey on insects and in turn are preyed upon by lava lizards. Giant centipedes feed on lava lizards and insects. Mocking birds feed on insects, lava lizards and giant centipedes. Insects crawl up different plants for feeding, while marine iguanas dive in the water to feed on algae and seaweed.

Construct a food web to represent the feeding relationships between the organisms mentioned in the passage above. (5 marks)

Total: 15 marks