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Biology

Unit: KBI0/4BI0

Paper: 2B

Friday 10 June 2016 – Morning

Time: 1 hour

Paper Reference

KBI0/2B
4BI0/2B

You must have:

Ruler
 Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
 – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
 – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Meat-eating plants

Venus flytraps carry out the process of photosynthesis. The glucose produced is used as a source of energy. In addition to synthesising glucose, plants also need to make amino acids, vitamins and other components to survive. To do this, plants need to absorb minerals.

- 5 In the bogs where Venus flytraps live the mineral content of the soil is low so minerals are scarce. Most plants cannot survive in this environment because they cannot make enough of the building blocks necessary for growth. The Venus flytrap has evolved the ability to grow well in this habitat by finding alternate means of getting minerals. Insects provide a good source of the
10 minerals missing from the soil, and they contain additional carbohydrates.

- Carnivorous plants attract and capture insects, discriminate between food and non-food, and digest the insects. They do this using mechanical and chemical processes. Plants lack the muscles and tendons to eat, chew and swallow food. The Venus flytrap completes the entire process using
15 specialised leaves that carry out the role of the mouth and the intestines.

- Most plants have some mechanism to attract insects. The Venus flytrap does this by secreting sweet nectar from the leaves of the trap. When an insect lands or crawls on the trap, it is likely to touch one of six, short, stiff hairs on the trap's surface. These are trigger hairs, and they serve as a motion
20 detector for the plant. If two of these hairs are brushed in quick succession, or one hair is touched twice, the leaves close on the insect.

- The mechanism of trap closure is not clearly understood but it involves changes in the concentration of solution in the cells. The cells expand as water enters causing the trap to close. Once the trap fully closes, the leaves
25 form a seal so that digestive fluid and insects are kept inside the trap and bacteria and fungi cannot get in.

- To make sure that the insects are kept in the trap, the edges of the leaves have projections that fit together when the leaves shut. These projections look like teeth but they are only used to keep the trap shut.
- 30 The leaf trap now serves as a digestive organ to dissolve the soft tissues and cell membranes of the food. It produces acid and enzymes. The insect body is broken down over a period of 5 to 10 days and the products of digestion are absorbed.



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(a) Name the process that the plant uses to release energy from glucose (lines 1 and 2). (1)

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(b) Carnivorous plants attract insects for food.
Give a reason why other plants need to attract insects (line 11). (1)

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(c) The Venus flytrap can be placed at two different trophic levels.
Name these levels. (2)

1

2

(d) The trap only closes 'If two of these hairs are brushed in quick succession, or one hair is touched twice' (lines 20 and 21).
Suggest why this is an advantage to the plant. (2)

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(e) Explain how changes in the concentration of solution in the cells can lead to water entering the cells (lines 23 and 24). (2)

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(f) Suggest two reasons why the traps need to prevent the entry of bacteria or fungi (line 26). (2)

1
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(g) (i) The trap lacks teeth that function as they do in animals.
Explain how this may affect the rate at which the insect is digested. (2)

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(ii) Name one enzyme that may be present in the digestive fluid produced within the trap (line 25). (1)

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(h) Explain two factors that could affect the length of time taken to digest an insect once it has been caught in a trap.

(4)

1

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(Total for Question 1 = 17 marks)

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2 Fish produce and release nitrogenous waste.

(a) Suggest why two fish of the same size may produce different masses of nitrogenous waste.

(1)

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(b) The table shows the mass of nitrogenous waste released into the environment by four different fish farms.

Type of fish farm	Nitrogenous waste released in kg per 1000 kg fish produced
salmon	48.2
halibut	67.1
cod	72.3
haddock	72.3

Calculate the mass of nitrogenous waste released into the environment when 400 kg of cod fish are produced. Show your working.

(2)

mass = kg

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(c) Nitrogenous waste released into the environment can cause eutrophication.

Describe the process of eutrophication and the effects that it can have on the environment.

(5)

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(d) Fish farms remove nitrogenous waste to improve the growth of fish.
Another method to improve the growth of fish is vaccination.
Explain how the process of vaccination improves the growth of fish.

(4)

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(Total for Question 2 = 12 marks)

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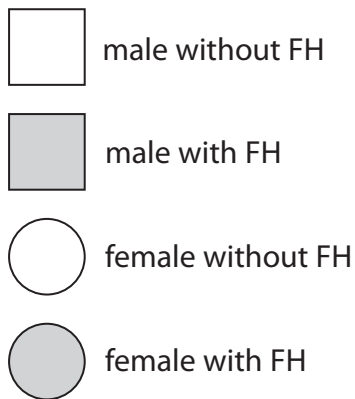
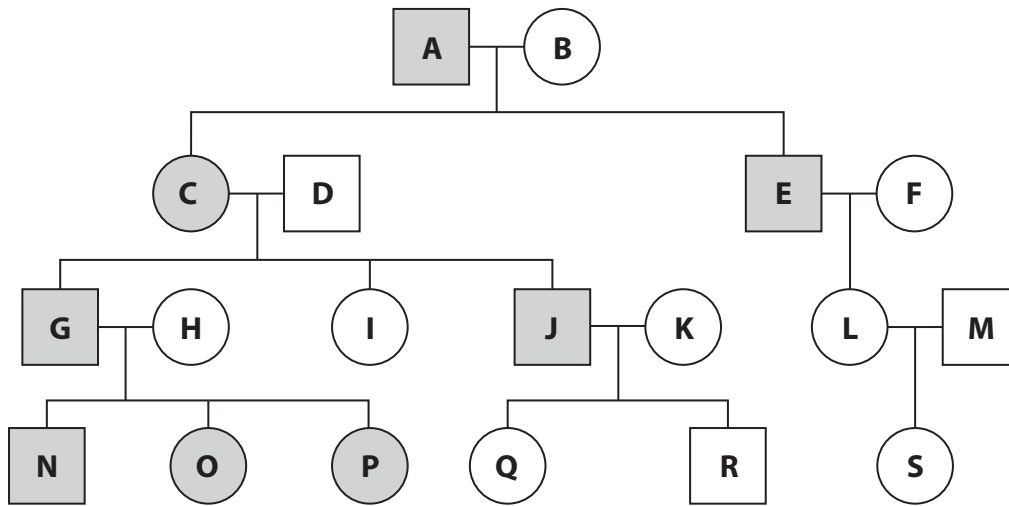
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3 Familial hypercholesterolemia (FH) is an inherited condition caused by a dominant allele. People with the condition have high levels of cholesterol in their blood. This increases the risk of dying from blocked arteries.

The diagram shows the pattern of inheritance in several generations of a family with familial hypercholesterolemia.



(a) (i) Person A is heterozygous for FH. Use this information to complete the table.

(2)

Genotype	Number of people with the genotype
Homozygous recessive	
Homozygous dominant	

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(ii) Person G and person H have three children who all have FH.

What is the probability of G and H having three children who all have FH? (1)

(b) An artery supplies the leg muscles with blood.

Explain what will happen to the muscle cells in the leg if cholesterol builds up in this artery. (5)

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(Total for Question 3 = 8 marks)

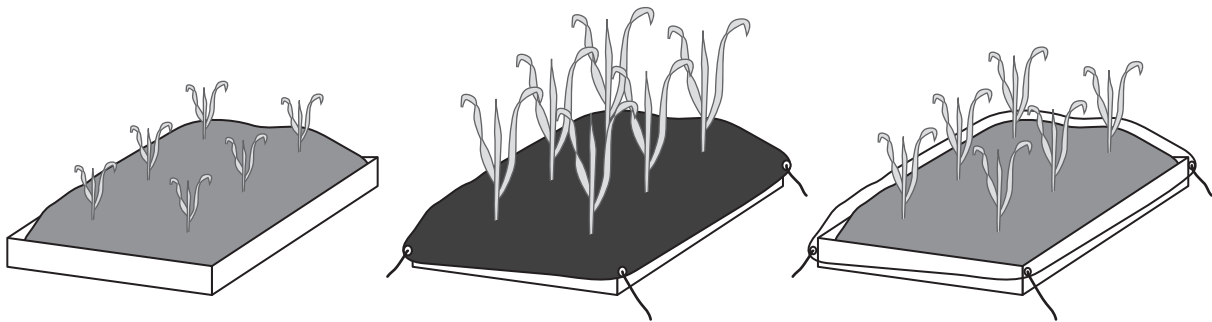


- 4 A farmer often puts sheets of plastic on top of the soil in which his plants are growing. He wants to find out if the type of plastic used affects the growth of his plants.

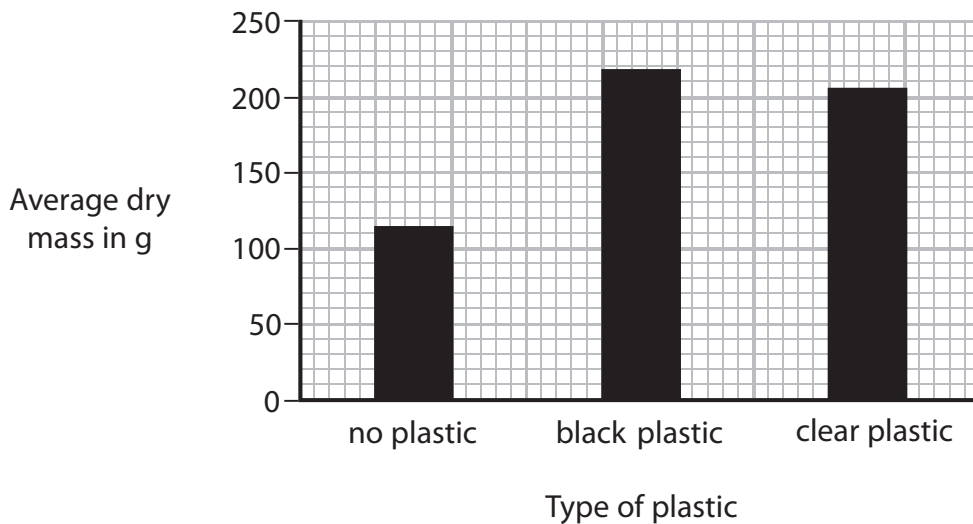
He grows plants in trays containing soil.

- ten trays have the soil uncovered
- ten trays have the soil covered by black plastic
- ten trays have the soil covered with clear plastic

The diagram shows some of the trays.



After three months the farmer measures the dry mass of the plants and calculates the average (mean) dry mass.



- (a) (i) State the independent variable in this investigation.

(1)

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(ii) Describe the steps the farmer takes to make sure his results are reliable.

(2)

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(iii) To make a valid comparison of plant growth the farmer needs to control the abiotic (non-living) factors. He keeps the trays in the same light intensity.

Name three other abiotic factors the farmer should control.

(3)

1

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2

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3

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(b) Suggest two reasons why the plants grow better when the soil is covered with black plastic.

(4)

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(Total for Question 4 = 10 marks)

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5 (a) The average gestation period of an animal is the time from fertilisation to birth.

The table contains data about the length of the average gestation period and the average mass of the different species rather than an individual female deer.

Species of deer	Average mass of a female in kg	Average gestation period in days
muntjac	13	210
sika	35	217
roe	35	294
reindeer	100	224
red	145	233

(i) Describe the relationship between mass and gestation period. (1)

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(ii) In one of the species of deer the embryo stays dormant for some months before it starts to develop in the uterus. Using the information in the table, explain which species of deer this is. (3)

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(b) The placenta supplies the embryo with nutrients during the gestation period.

Describe the role of the placenta in the development of the embryo.

(4)

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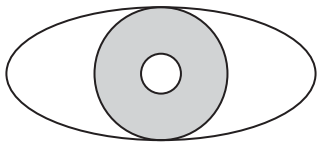
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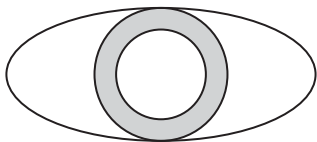
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6 The eye can respond to changes in light intensity.

The diagram below shows how pupil size changes in different levels of light.



bright light



dark room

(a) Use a ruler to measure the change in pupil diameter between bright light and a dark room.

(1)

change in diameter =mm

(b) Where in the eye are the cells that detect the change in the stimulus to cause this response?

(1)

(c) Explain the changes that take place in the pupil as a person moves from bright light into a dark room.

(3)

(Total for Question 6 = 5 marks)

TOTAL FOR PAPER = 60 MARKS

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