Write your name here

Surname	Other names

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International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Unit: KBI0/4BI0
Science (Double Award) KSC0/4SC0
Paper: 1B

Tuesday 10 January 2017 – Afternoon
Time: 2 hours

Paper Reference
KBI0/1B 4BI0/1B
KSC0/1B 4SC0/1B

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 120.
- 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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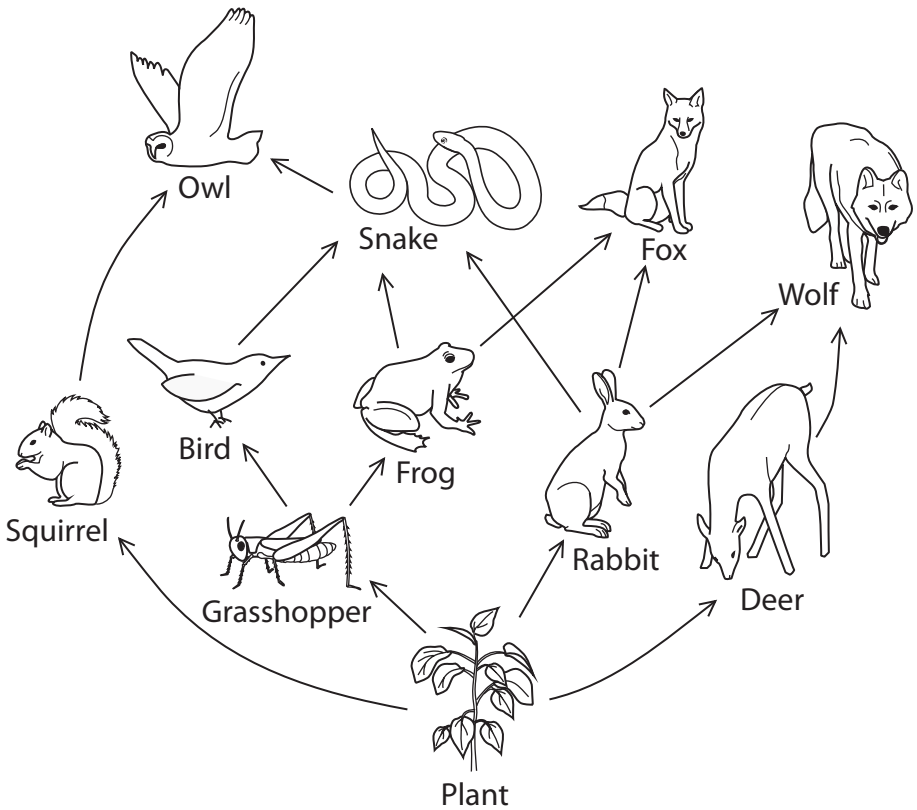
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Pearson

Answer ALL questions.

1 The diagram shows a food web from a forest.



(a) Use information from the food web to complete the table.

The first one has been done for you.

(3)

number of organisms	11
number of food chains	
number of primary consumers	
number of organisms that belong to more than one trophic level	

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(b) Plant cell walls are made of cellulose.

Cellulose is an insoluble molecule made from the same simple sugar as starch.

The rabbit's intestine contains bacteria that can digest cellulose.

Suggest why this is an advantage for the rabbit.

(2)

(c) The deer runs away when it sees the wolf.

(i) Name the effector in this response.

(1)

(ii) The deer releases a hormone when it sees the wolf.

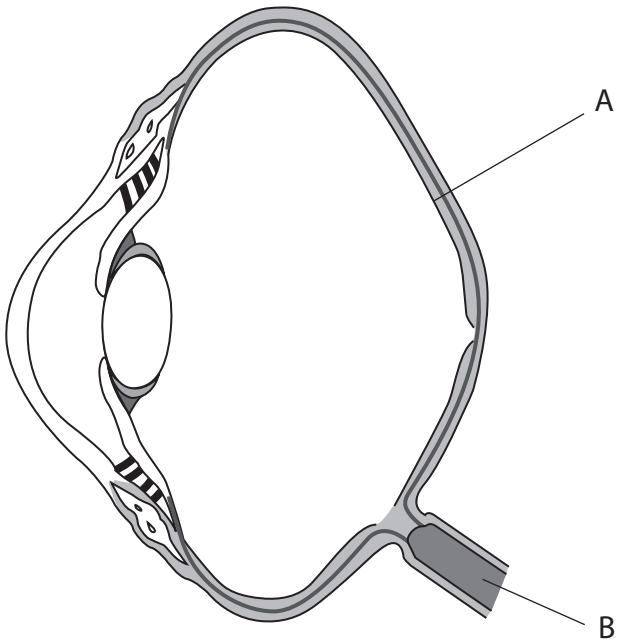
Explain how this hormone helps the deer to run away.

(3)

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(d) The owl uses its eyes to find prey.

The diagram shows a section through the owl's eye.



(i) Name the parts labelled A and B.

(2)

A .....

B .....

(ii) Describe the function of part A.

(1)

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(iii) Describe the function of part B.

(1)

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(Total for Question 1 = 13 marks)

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2 The photograph shows a chicken with feathers.



(a) Scientists can use selective breeding to produce chickens with no feathers.

Explain how a chicken with no feathers can be produced by selective breeding.

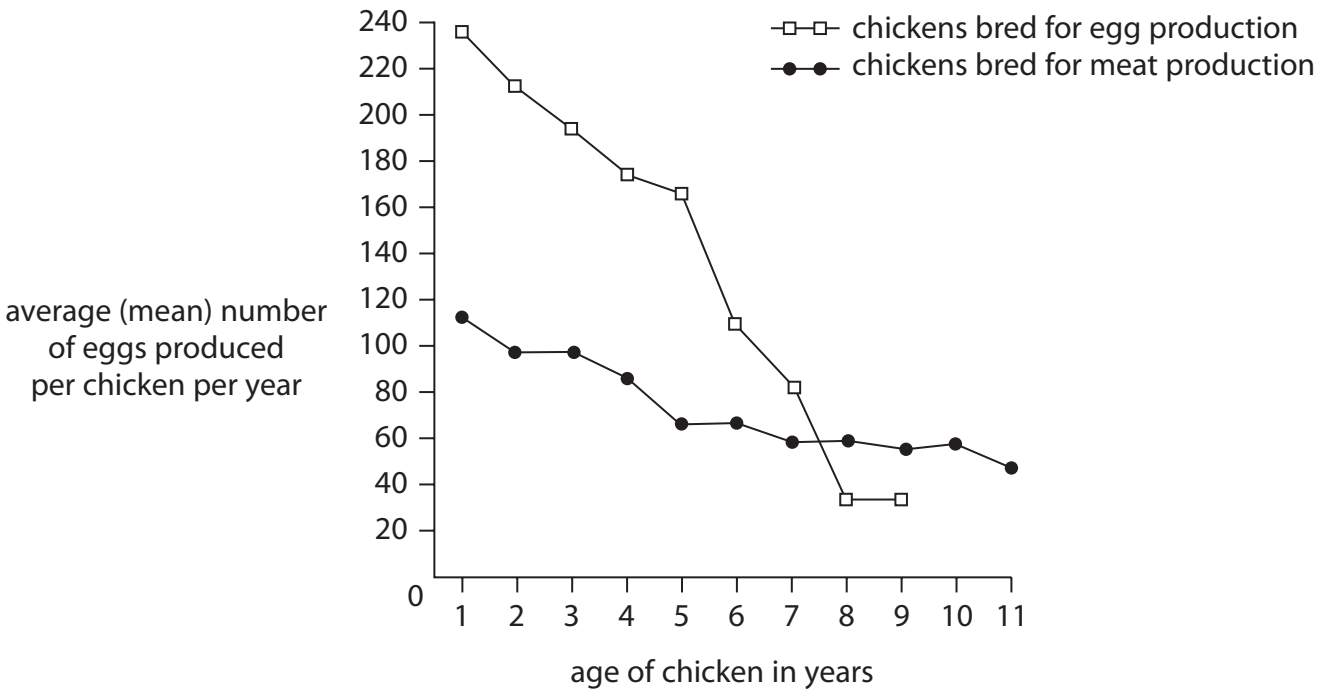
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(b) Selective breeding is also used to breed chickens for egg production and chickens for meat production.

The graph shows how age affects the average (mean) number of eggs produced per chicken per year.

The graph shows this information for chickens bred for egg production and for chickens bred for meat production.



Describe how age affects the number of eggs produced by each group of chickens.

(2)

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(c) Chickens in factory farms are kept in cages inside buildings rather than being kept outdoors.

Suggest how factory farming can affect egg production.

(3)

(Total for Question 2 = 8 marks)

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3 Chemotherapy is often used to help people with cancer. Chemotherapy kills cancer cells but may affect haemoglobin production in the body.

A drug called EPO increases haemoglobin production in the body. Scientists investigated the effect of EPO on patients who had received chemotherapy.

They injected EPO into these patients and blood samples were taken for several months to measure their haemoglobin levels.

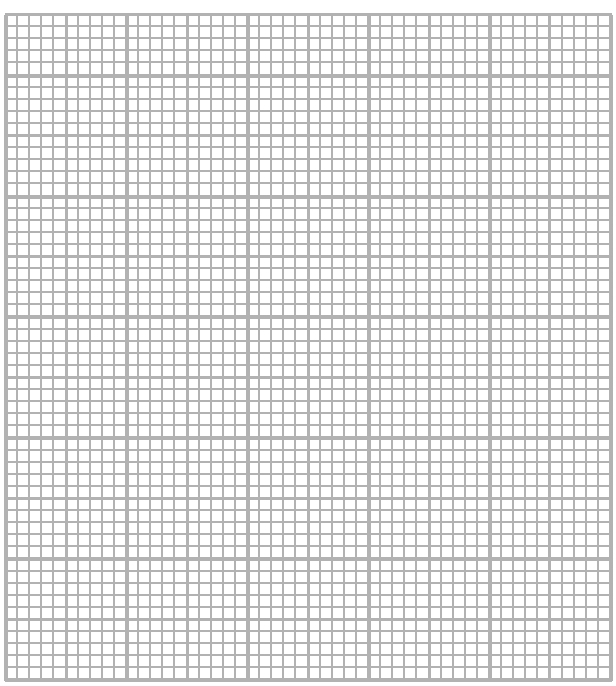
The table shows the results.

Time after EPO injection in months	Average (mean) haemoglobin level in g per 100 cm^3
0	5.0
1	7.6
2	8.2
3	9.3
4	9.8
5	10.2

(a) Plot a line graph to show the relationship between time and average haemoglobin level.

Use a ruler to join the points with straight lines.

(5)



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(b) (i) Name the dependent variable in this investigation.

(1)

(ii) Explain how the scientists made sure their results were reliable.

(2)

(iii) The scientists controlled biotic (living) factors so their results would be valid.

Name two biotic factors that the scientists should have controlled.

(2)

1

2

(c) Cancer patients often complain of tiredness after chemotherapy.

Explain how EPO helps to reduce tiredness in these patients.

(4)

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(d) The scientists obtained blood samples using a needle attached to a syringe.

Explain which type of blood vessel they should use to obtain the blood samples.

(3)

(Total for Question 3 = 17 marks)

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4 (a) Nile tilapia are fish. Their body colour is controlled by a single gene.

The allele N produces normal body colour and the allele n produces pink body colour.

Diagram 1 shows the phenotypes and the genotypes of Nile tilapia.

normal body colour (NN) normal body colour (Nn) pink body colour (nn)

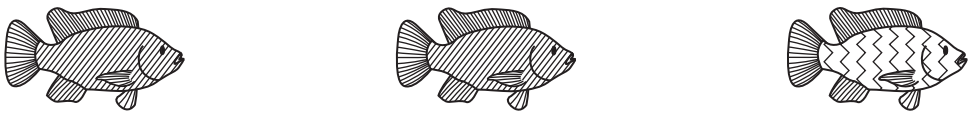


Diagram 1

Diagram 2 shows all the possible crosses between the phenotypes and genotypes of Nile tilapia parents.

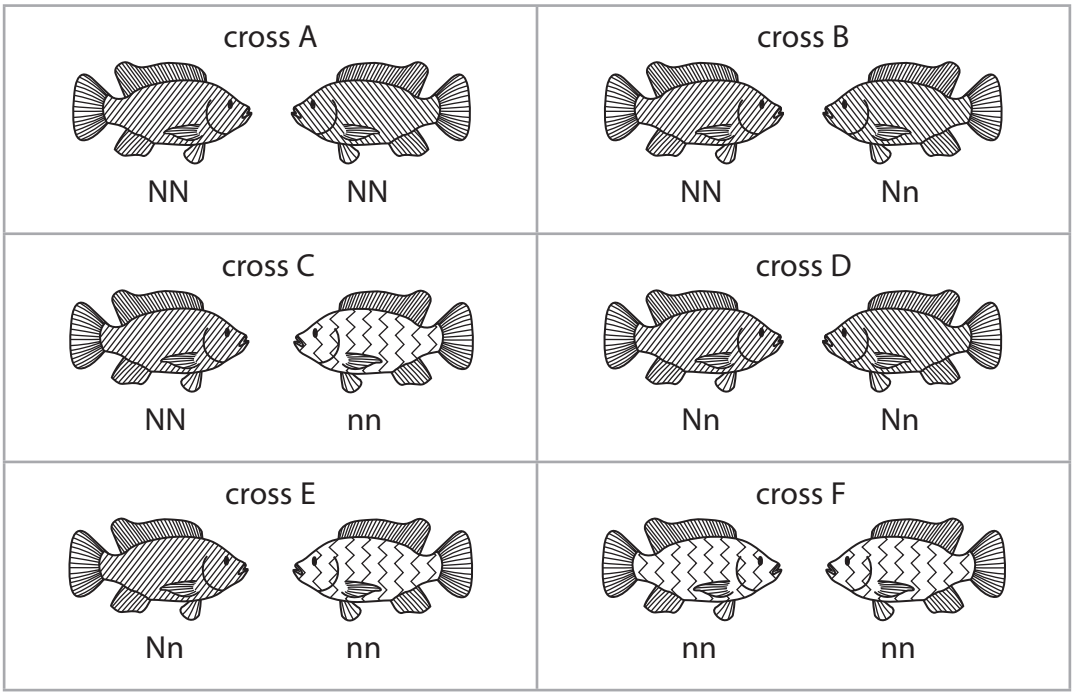


Diagram 2

The table gives some descriptions of offspring.

Complete the table by giving the number of crosses that would produce each description of offspring. The first one has been done for you.

(3)

Description of offspring	Number of crosses
all are homozygous	2
50% are heterozygous	
show a phenotype ratio of 1:1	
have a genotype ratio of 1:1	

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(b) Tilapia are farmed in many parts of the world to provide a source of protein.

Farmers build large ponds and fill them with fish.

The ponds are exposed to sunlight and the farmers add manure to help the growth of the fish.

Some of the water in the ponds is changed every day.

(i) Suggest how sunlight and manure help the growth of the fish.

(5)

(ii) Suggest why some of the water is changed every day.

(2)

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(c) A fish farm contains 6000 fish.

The average (mean) increase in mass of a fish over a period of 32 weeks is 700 g.

Estimate the total mass of fish, in kg, that the fish farm could produce after 32 weeks.

(2)

mass = ... kg

(Total for Question 4 = 12 marks)

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5 This question is about the effect of salt on plant growth.

(a) Explain what happens to a plant cell if it is put into a concentrated salt solution.

(3)

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(b) In the UK, salt is spread over road surfaces in winter to prevent ice from forming.

When it rains this salt is washed on to the soil by the side of the road.

Design an investigation to find out if plant growth is affected by the increased salt concentration in the soil.

Your answer should include experimental details and be written in full sentences.

(6)

(Total for Question 5 = 9 marks)

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6 Plants make food by the process of photosynthesis.

(a) Write a balanced chemical symbol equation for photosynthesis.

(2)

(b) The leaf of a plant is adapted to carry out photosynthesis.

Explain how the following parts of the leaf are adapted for photosynthesis.

(i) palisade mesophyll layer

(2)

(ii) spongy mesophyll layer

(2)

(iii) guard cells

(2)

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(c) A student uses this method to show that starch is produced during photosynthesis.

Step 1 put a potted plant in a dark cupboard for 24 hours

Step 2 then put the plant in bright sunlight for 12 hours

Step 3 remove a leaf from the plant and put it in a beaker of boiling water for 30 seconds

Step 4 put the leaf in a boiling tube containing hot ethanol for 10 minutes

Step 5 wash the leaf in cold water and put it on a white tile

Step 6 add enough iodine solution to cover the leaf and observe the change in colour

(i) Explain why the student put the plant in a dark cupboard for 24 hours in step 1.

(2)

.....

.....

.....

.....

(ii) Describe how the student could carry out step 4 safely.

(2)

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(iii) State the colour of the leaf observed in step 6.

(1)

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(iv) The student concludes that starch is produced by photosynthesis in the leaf.

State a suitable control that she should use to make her conclusion valid.

(1)

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(d) Plants need to absorb mineral ions from the soil to enable them to produce other biological molecules.

Complete the table by giving the missing information.

(2)

Mineral ion absorbed	Biological molecule produced
magnesium	
	protein

(Total for Question 6 =16 marks)

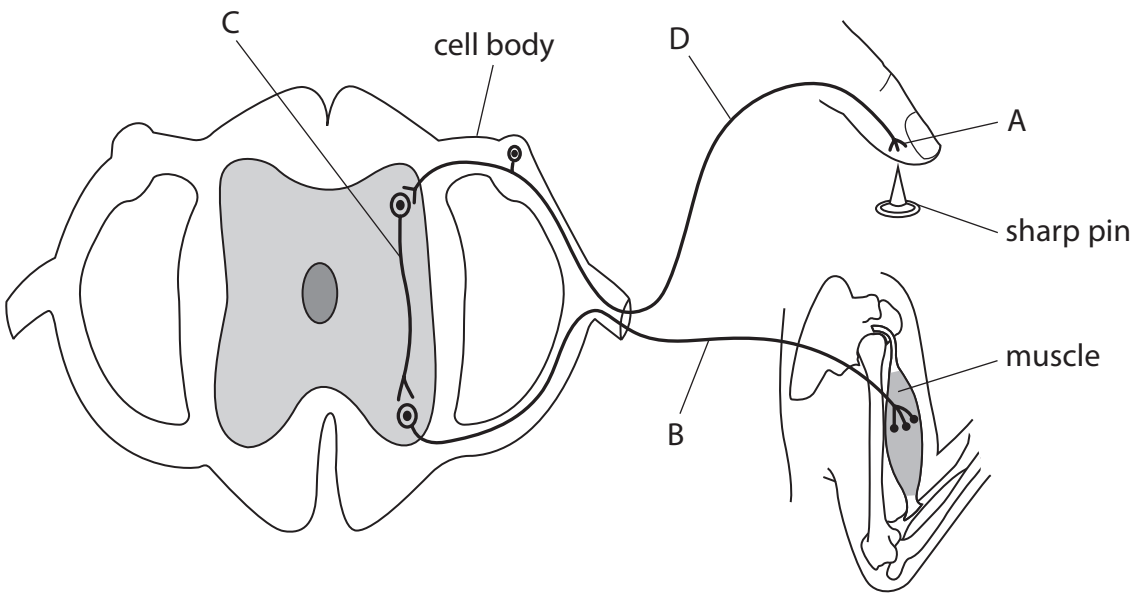
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7 (a) A person touches a sharp pin.

The diagram shows the reflex arc involved in the response to this stimulus.



(i) Name the parts labelled A, B, C and D.

(4)

A .....

B .....

C .....

D .....

(ii) Explain how this reflex arc protects the body.

(2)

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(b) Reflexes in animals and phototropism in plants are both responses to stimuli.

(i) Give two **similarities** between the mechanisms involved in each response.

(2)

1 .....

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2 .....

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(ii) Give two **differences** between the mechanisms involved in each response.

(2)

1 .....

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2 .....

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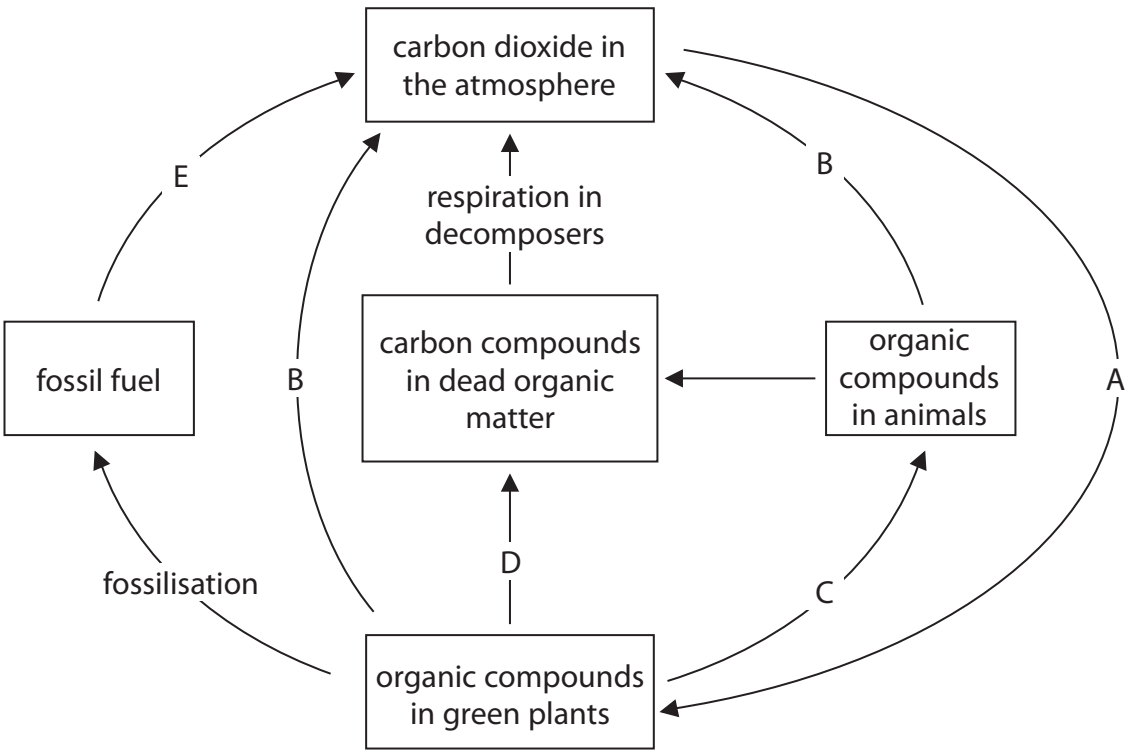
(Total for Question 7 = 10 marks)

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8 The diagram shows the carbon cycle with processes labelled A, B, C, D and E.



(a) (i) Name the process labelled A.

(1)

.....

(ii) Give the letters of the processes that add carbon dioxide to the atmosphere.

(1)

.....

(b) Many people are concerned that too much carbon dioxide is being released into the atmosphere.

(i) Suggest two actions that could be taken to reduce the amount of carbon dioxide being released into the atmosphere.

(2)

1 .....

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2 .....

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(ii) Describe the consequences of an increase in carbon dioxide for the world's ecosystems.

(6)

(Total for Question 8 = 10 marks)

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9 A student carries out an experiment to investigate the effect of different concentrations of a food dye on diffusion.

(a) Describe what is meant by the term **diffusion**.

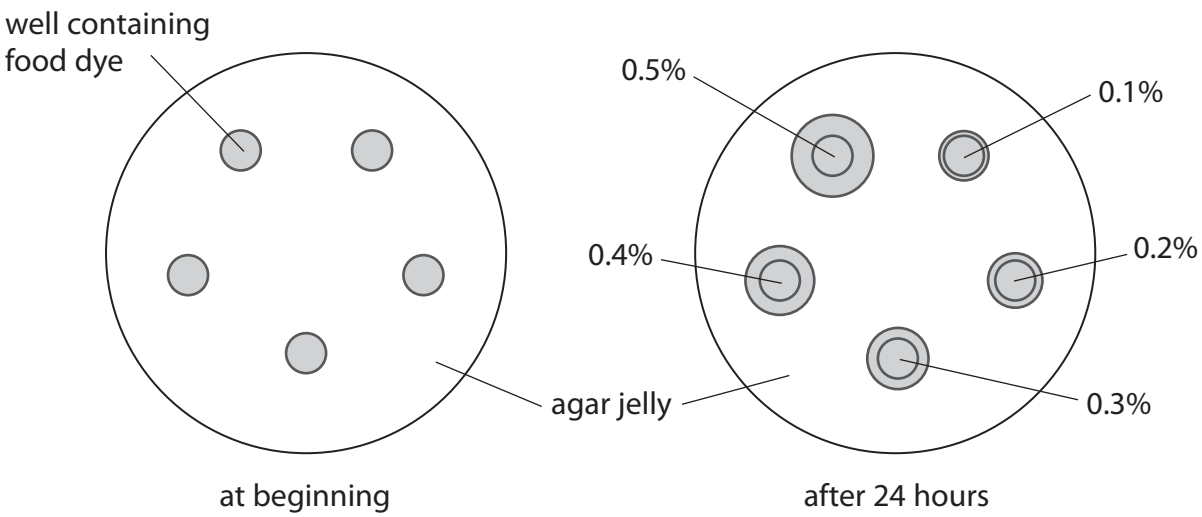
(1)

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(b) The student adds a different concentration of coloured food dye to each of five wells in an agar plate.

The diagram shows the agar plate at the beginning of the experiment and after 24 hours.



The student does the experiment using three plates.

For each plate he measures the diameter of each circle to see how far the food dye has diffused.

The table shows his results.

Concentration of food dye in well (%)	Diameter of circle in cm			
	plate 1	plate 2	plate 3	average (mean)
0.1	0.7	0.6	0.7	0.7
0.2	1.5	1.4	1.4	?
0.3	1.7	1.6	1.7	1.7
0.4	1.9	1.8	1.9	1.9
0.5	1.9	2.0	2.0	2.0

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(i) Calculate the average diameter for 0.2% concentration of food dye.

(2)

average diameter = ... cm

(ii) Describe the effect of food dye concentration on diffusion.

(2)

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.....

.....

.....

(iii) Explain the relationship between food dye concentration and diffusion.

(2)

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(c) State two variables that the student should control in this experiment to ensure that the results are valid.

(2)

1 .....

2 .....

(Total for Question 9 = 9 marks)

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10 The passage describes human reproduction.

Complete the passage by writing a suitable word or words in each blank space.

(10)

During sexual intercourse the male's ..... is inserted into the vagina. The male gametes, known as ..... , are released from the male urethra into the vagina. The male gametes carry on swimming until one meets a female gamete, known as the ..... . This process is fertilisation and takes place in a tube called the ..... .

The fertilised female gamete, also known as the ..... , moves down this tube. It undergoes the type of cell division called ..... and is now known as an ..... . This structure may then become implanted in the wall of the ..... .

The number of chromosomes in the fertilised female gamete is ..... the number found in the unfertilised gamete and is known as the ..... number.

(Total for Question 10 = 10 marks)

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11 The fungus *Fusarium venenatum* is grown in a fermenter to make a food product called mycoprotein.

(a) (i) Name the molecule that a fungus uses to store carbohydrate.

(1)

(ii) Name the thread-like structures that make up the mycelium of a fungus.

(1)

(b) Mycoprotein contains low levels of fats and is high in protein.

Suggest the benefits of each of these to a human diet.

(2)

(c) Food production can be increased by using genetically modified plants that are resistant to disease.

Explain how enzymes can be used to genetically modify plants.

(2)

(Total for Question 11 = 6 marks)

TOTAL FOR PAPER = 120 MARKS

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