Write your name here

Surname	Other names

Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology

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

Monday 9 January 2012 – Morning
Time: 2 hours

Paper Reference
4BI0/1B
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.
- Keep an eye on the time.
- 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 ▶

P40124A

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PEARSON

Answer ALL questions.

1 The following organisms can be classified into major groups.

Amoeba	*Lactobacillus*	bean	*Mucor*	mosquito

(a) From the list above give the name of

(4)

(i) a bacterium .....

(ii) a fungus .....

(iii) a flowering plant .....

(iv) an animal .....

(b) Viruses are not included in most classification systems.

(i) Give **three** ways in which viruses differ from other living organisms.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(ii) Give **one** example of a disease caused by a virus, name the organism it infects and describe its effect on the organism.

(3)

Disease .....

Organism infected .....

Effect .....

.....

.....

(Total for Question 1 = 10 marks)

2 The following passage describes inheritance.

Complete the passage by writing a suitable word or words on each dotted line.

(6)

A gene is a section of a double-stranded molecule known as ..... .

This molecule is found within the ..... of the cell,

contained in threadlike structures called ..... .

The two strands form a double helix linked by a series of paired bases.

The base adenine is always linked to ..... and the base cytosine

is always linked to ..... .

Sometimes the genetic material of a cell changes. This is known as a ..... .

These changes occur very rarely but their incidence can be increased by chemicals or ionising radiation.

(Total for Question 2 = 6 marks)

3 Frances likes to spend time in her garden. She grows many different types of flowering plants.

(a) Explain how each of the following factors could affect the growth of a flowering plant.

(i) Height of the parent plants

(2)

(ii) Microorganisms in the soil

(2)

(b) Frances says that she likes to keep her grass lawn free of weeds.

(i) Suggest what Frances means by the word **weed**.

(1)

(ii) Explain why removing the weeds from her lawn would improve the quality of the grass plants.

(2)

(iii) How could Frances reduce the number of weeds in her lawn?

(1)

(Total for Question 3 = 8 marks)

4 Global warming may affect the number of insect pests by increasing their ability to produce offspring. An experiment was carried out to find out the effect of different air temperatures on the ability of insects to produce offspring.

Five tubes were set up at an air temperature of 16 °C. Each tube contained a male and a female insect and some food. This procedure was repeated at air temperatures of 25 °C, 30 °C, 35 °C and 45 °C.

The insects were allowed to mate and the number of offspring they produced after two weeks was counted.

The table shows the results.

Temperature in °C	Number of offspring in each tube					Total number of offspring
	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	
16	14	17	14	15	12	72
25	88	92	95	100	87	462
30	39	36	90	40	36	241
35	19	17	15	22	16	89
45	0	0	0	0	0	0

(a) Identify the anomalous result in the table and suggest a reason for the anomaly.

(2)

.....

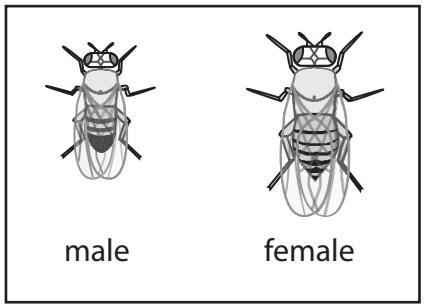
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(b) The diagram shows the insect offspring collected from one of the tubes in the experiment.





(i) Use the key to count the number of male and female offspring in this tube.

(1)

number of males .....

number of females .....

(ii) Which tube did these insect offspring come from?

(1)

.....

(c) Explain why the results in the table are reliable.

(2)

(d) Describe the results in the table and write a conclusion for this experiment.

(3)

(Total for Question 4 = 9 marks)

5 Emperor penguins live in the southern Polar Regions. The temperature here can be as low as –30 °C.

They have a number of adaptations that enable them to survive in such a cold climate.



(a) Fully grown penguins are large, often weighing up to 30 kg. Most other birds are much smaller.

Explain how being large helps the penguin to survive at very low temperatures.

(2)

(b) Penguins also have soft downy feathers and a thick layer of fat just below the skin.

Suggest how these features help penguins to survive.

(2)

(c) One part of the penguin that is especially exposed to the cold is their feet. The muscles that operate the feet are located in the penguin's body rather than in the feet themselves.

(i) Suggest how this benefits the penguin.

(3)

(ii) The penguin's feet move when the muscles pull on string-like structures called tendons.

Suggest a property that these tendons should have.

(1)

(d) Penguins huddle together to maintain their body temperature.

Explain how this behaviour is an advantage to penguins.

(2)

(Total for Question 5 = 10 marks)

6 The diagram shows one side of an organ donor card.

I request that after my death

A. any part of my body may be used for the treatment of others ☐, or

B. my kidneys ☐ corneas ☐ heart ☐ lungs ☐ liver ☐ pancreas ☐ be used for transplantation.

Signature _____ Date _____

Full name _____
(BLOCK CAPITALS)

In the event of my death, if possible contact:

Name _____ Tel. _____

Remember to tell someone close to you that you want to be an organ donor. We'll need their agreement if the time ever comes.

(a) The table lists different human illnesses.

Complete the table by giving the donated organ **named on the card** needed to cure each illness. The first one has been done for you.

(5)

Illness	Organ needed to cure illness
uremia	kidney
emphysema	
coronary failure	
diabetes	
hepatitis	
poor vision	

(b) Describe the role of the liver in digestion.

(2)

(c) There is a shortage of people willing to donate their organs. Scientists hope to create cloned organisms to solve this problem.

(i) What is a **cloned** organism?

(2)

(ii) Suggest **two** advantages of using cloned organisms to provide organs rather than relying on people to donate organs.

(2)

1

2

(Total for Question 6 = 11 marks)

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7 John wanted to investigate the effect of the size of potato tissue on the rate of osmosis.

He cut three different sized cubes of potato, one 0.5 × 0.5 x 0.5 cm, one 1 × 1 × 1 cm and one 2 × 2 × 2 cm.

He weighed the potato cubes and recorded their masses.

He then placed each cube into a beaker of distilled water and left them for 1 hour.

He weighed them again and recorded their new masses.

In each case the mass of the potato cubes increased.

The table shows his results.

Potato cube size in cm	Original mass in g	Final mass in g	Percentage change in mass (%)
0.5 × 0.5 x 0.5	0.06	0.07	16.67
1 × 1 × 1	0.51	0.56	
2 × 2 × 2	4.04	4.10	1.49

His teacher told him to calculate the percentage change in mass of each cube.

(a) (i) Calculate the percentage change in mass for the 1 × 1 × 1 cm cube.
Show your working.

(2)

Answer .....

(ii) Explain why John converted change in mass to percentage change in mass.

(1)

.....

.....

(b) Use your knowledge of osmosis to explain why the mass of each cube increased.

(3)

(c) John's teacher suggested that the different sized cubes have a different surface area and volume.

Use the formulae below to calculate the surface area (SA) of each cube, the volume (Vol) of each cube and their SA:Vol ratios.

$SA = 6 \times (\text{cube side in cm})^2$

$Vol = (\text{cube side in cm})^3$

Write your answers in the table below. One cube has been done for you.

(3)

Cube side in cm	Surface area in cm^2	Volume in cm^3	SA:Vol ratio
0.5	1.5	0.125	12
1.0			
2.0			

(d) Explain the effect of the different SA:Vol ratios on the rate of osmosis into the potato.

(2)

.....

.....

.....

.....

.....

.....

(e) Potato tissue is made from plant cells.

Draw and label a plant cell in the space below.

(3)

(Total for Question 7 = 14 marks)

8 (a) There are several different stages during the process of human reproduction. Some of these stages are shown in the box.

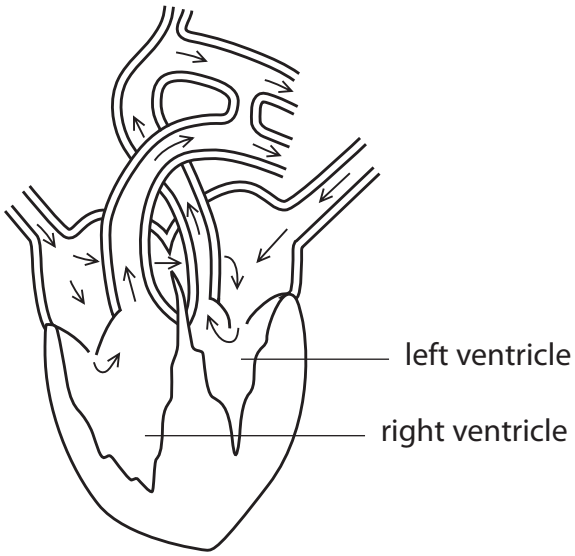
baby	embryo	fetus	gametes	zygote

Complete the table by writing the name of the stages in each empty box to show the correct order in which they occur.

(4)

Order	Name of stage
1	
2	
3	
4	
5	

(b) The diagram shows a section through the heart of a fetus. The arrows show the direction of blood flow.



Describe **two** differences, shown in the diagram, between the heart of a fetus and an adult heart.

(2)

1 .....

.....

2 .....

.....

(c) The sex chromosomes in the cells of a mother are XX. The sex chromosomes in the cells of a father are XY.

(i) Use this information to give the sex chromosomes in the cells of their male fetus.

(1)

.....

(ii) Give the number of chromosomes in a body cell of the male fetus.

(1)

.....

(Total for Question 8 = 8 marks)

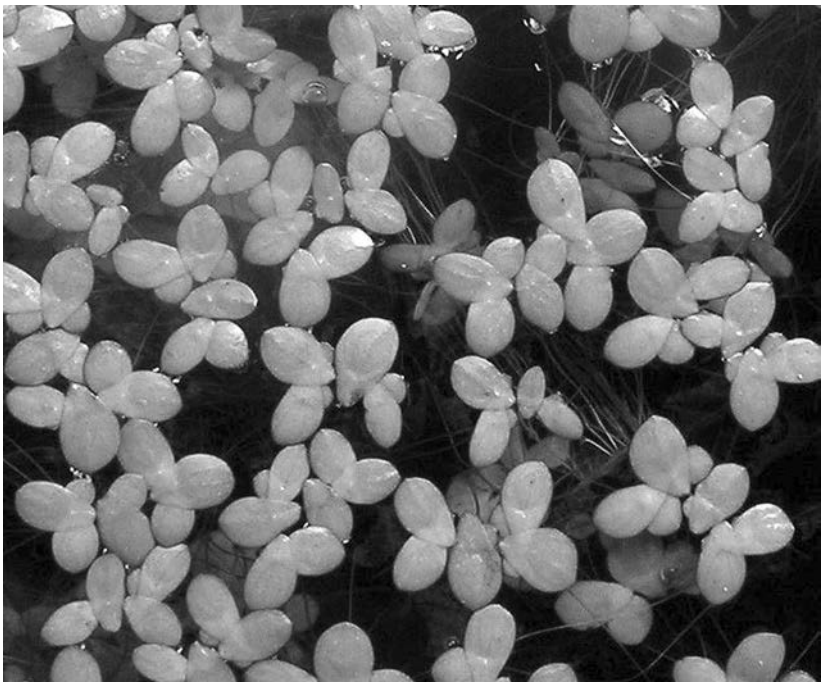
9 Plants obtain their food by the process of photosynthesis.

Explain how the structure of the leaf is adapted for its role as the organ of photosynthesis.

(6)

(Total for Question 9 = 6 marks)

10 The photograph shows a water plant growing on the surface of a lake.



This water plant grows by increasing the number of its leaves. Many mineral ions help plants to grow.

(a) Describe how **one** named mineral ion helps plants to grow.

(2)

(b) Copper ions inhibit the growth of this water plant.

To investigate this effect, a student put four plants with a total of 10 leaves into a beaker containing 400 cm^3 of mineral ion solution together with a copper coin. She repeated this with 400 cm^3 of the mineral ion solution without a copper coin.

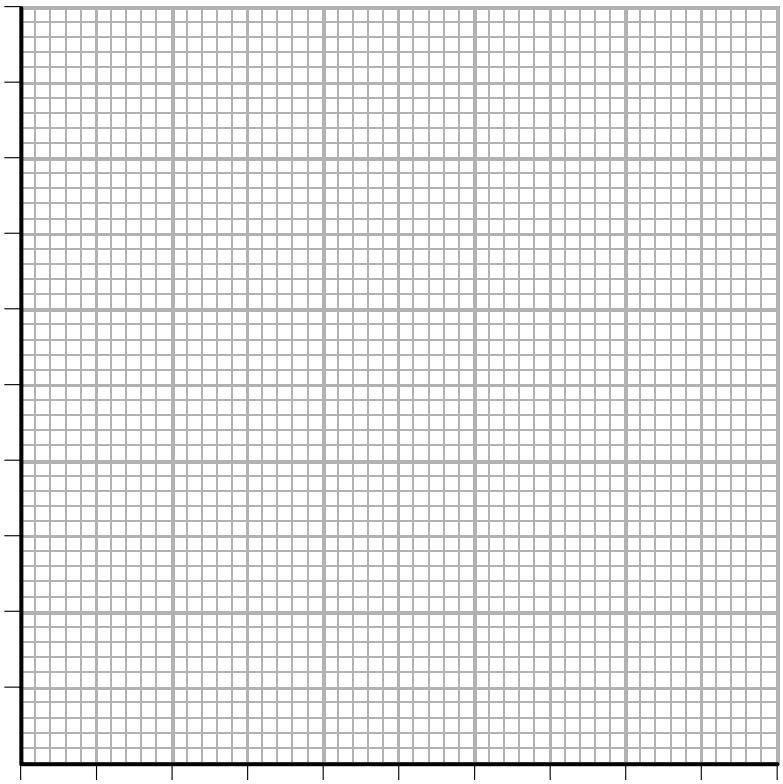
She counted the number of living leaves each day for the next eight days.

The table shows her results.

Day	Number of living leaves	
	Mineral ion solution with a copper coin	**Mineral ion solution without a copper coin**
1	10	10
2	10	10
3	11	12
4	12	16
5	12	18
6	7	23
7	2	33
8	0	42

(i) Plot a line graph on the grid below to show the results of her investigation. Use a ruler to join the points with straight lines.

(6)



(ii) In this investigation, the concentrations and volumes of the mineral ion solution and the species of water plant were kept the same.

Name **three other** variables that need to be kept the same for the results of this investigation to be valid.

(3)

1 .....

.....

2 .....

.....

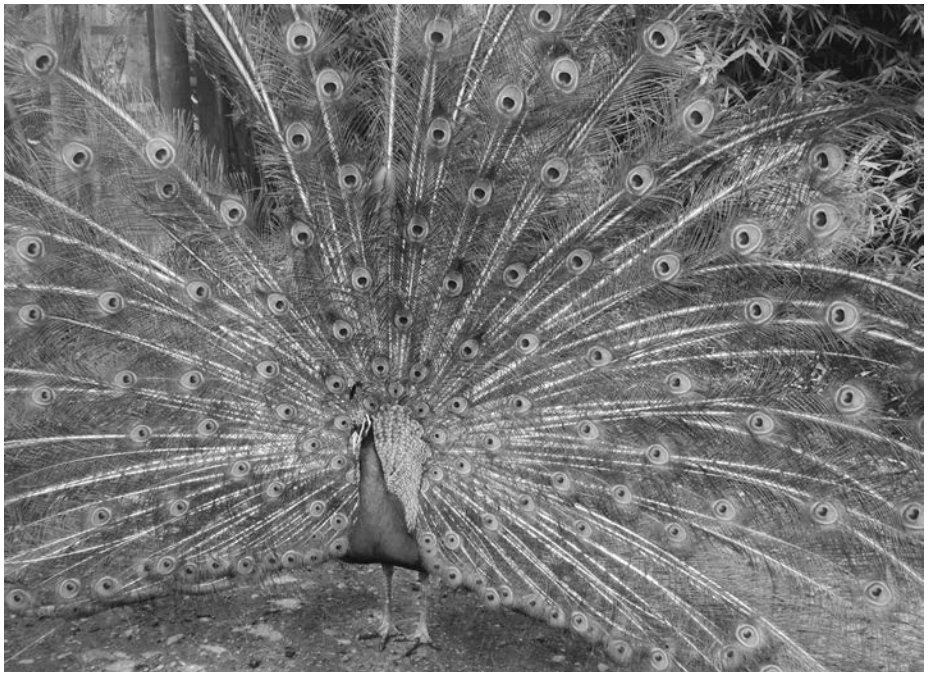
3 .....

.....

(Total for Question 10 = 11 marks)

11 The peacock is a bird found in the jungle in India.

The male has a large, colourful tail that he displays during courtship to attract a female to mate with.



Use your knowledge of natural selection to suggest how the peacock's tail has evolved.

(5)

(Total for Question 11 = 5 marks)

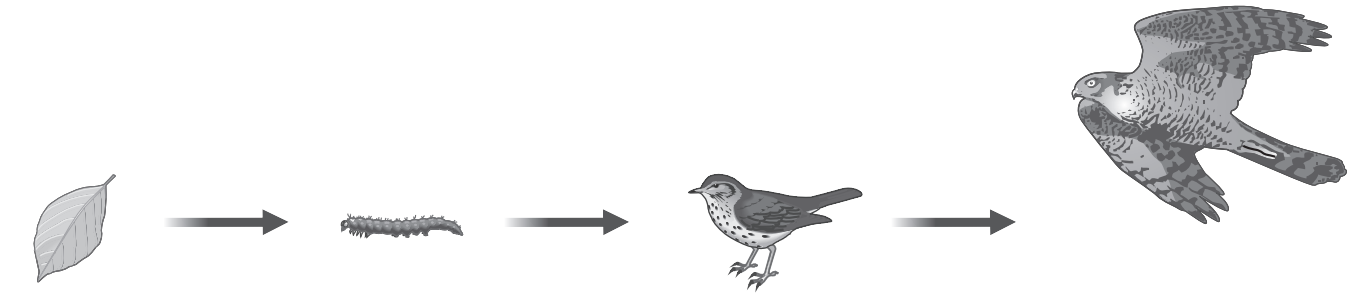
12 Farmers use bird scarers that make a sudden loud noise to frighten birds away from their crops.

Design an investigation to find out if noise affects the amount of crops birds eat.

(6)

(Total for Question 12 = 6 marks)

13 Caterpillars feed on hawthorn bushes. The caterpillars are eaten by small birds such as the dunnock. The dunnocks are preyed on by a larger carnivorous bird, the sparrowhawk.



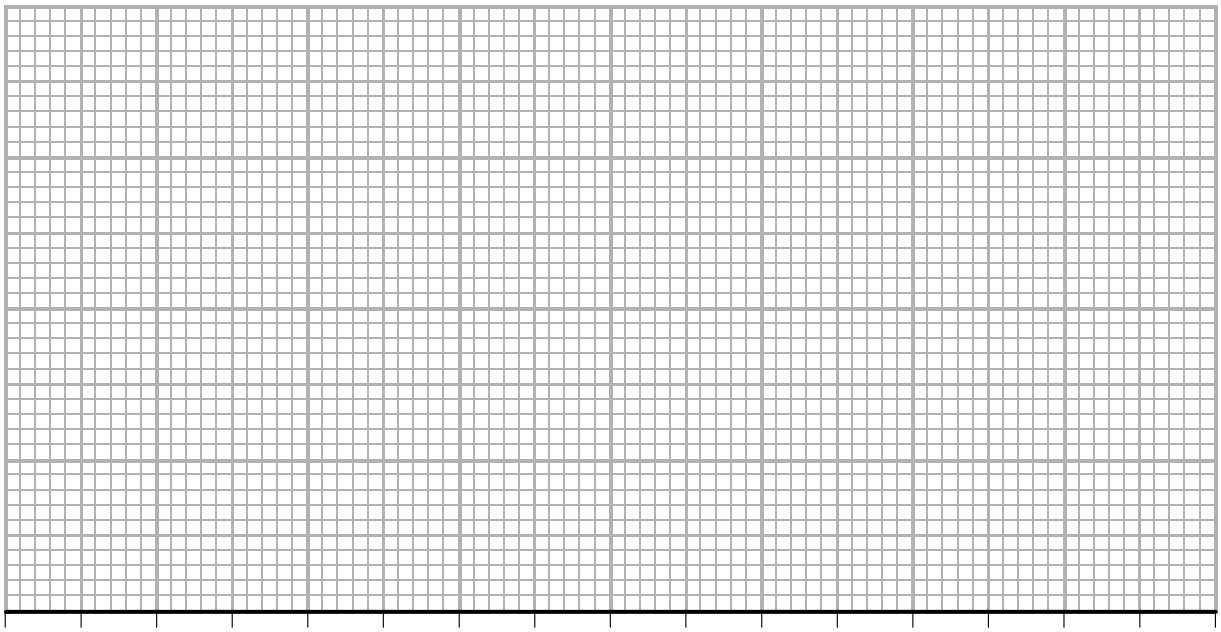
producer primary consumer secondary consumer tertiary consumer

This data was collected from a hedgerow.

Organism	Trophic level	Number of organisms
caterpillar	primary consumer	80
dunnock	secondary consumer	8
hawthorn bush	producer	4
sparrowhawk	tertiary consumer	1

(a) Use the information in the table to draw an accurate pyramid of numbers for this data on the grid below.

(4)



(b) Describe how a pyramid of biomass from the same data would differ from the pyramid of numbers.

(2)

(c) Explain why not all the energy in a producer passes to the primary consumer.

(2)

(d) Some farmers are removing hedges in order to increase the size of their fields. This means that the number of hawthorn bushes is decreasing.

Suggest how removing hawthorn bushes will affect the size of the dunnock population.

(2)

(Total for Question 13 = 10 marks)

14 Explain the methods used to produce large numbers of fish in a fish farm.

(6)

(Total for Question 14 = 6 marks)

TOTAL FOR PAPER = 120 MARKS

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