

Write your name here

Surname

Other names

**Pearson Edexcel Certificate**  
**Pearson Edexcel**  
**International GCSE**

Centre Number

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Candidate Number

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# Biology

**Unit: KBI0/4BI0**

**Paper: 2B**

Monday 16 June 2014 – Morning

**Time: 1 hour**

Paper Reference

**KBI0/2B**  
**4BI0/2B**

**You must have:**  
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.
- 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 ►

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**PEARSON**

**Answer ALL questions.**

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

**Bees**



Photographer: Eigene Aufnahme, August 2006

Bees are insects that are important for the pollination of flowers of many plants. Bees are attracted to flowers to collect a sweet substance called nectar. After collecting nectar they return to their nest. Some of the nectar is used to make honey. Humans keep bees in small homes called hives and collect some of the honey. The bees live in a group called a colony inside the hive and they do not mate as individual pairs like most insects.

Each bee colony consists of a single fertile queen bee and her many infertile female offspring called worker bees. The colony also contains her male offspring called drones.

- 10 Under normal circumstances the fertile queen bee will fly out of the hive to mate with a number of drones from different hives. The queen takes the risk of mating in this way so that her offspring have extra genetic variation that may help to combat disease. The sperm are stored in the queen's body and released a few at a time as the eggs are laid.
- 15 Fertilised eggs develop into worker bees with diploid body cells. Unfertilised eggs develop into drones.

- The body cells of the fertile queen bee contain 32 chromosomes. The sperm cells produced by a single drone contain 16 chromosomes which are
- 20 genetically identical to those of the other drones. If a queen bee mates with only one drone all the worker bees in the hive receive identical alleles from the drone and all the genetic variation comes from the queen. If the queen mates with two or more drones from different hives there will be greater variation in the worker bees.

- 25 It has been difficult to improve the characteristics of bees by selective breeding because bees do not mate as individual pairs. However, in the colony there are a small number of virgin queen bees that have not yet mated. These virgin queen bees can be used in selective breeding to form new colonies.



(a) What is meant by the term **pollination** (line 1)?

(1)

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(b) Suggest why the bees collect nectar (lines 2 and 3).

(2)

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(c) Suggest what is meant by the term **fertile** (line 7).

(1)

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(d) Suggest how having 'extra genetic variation' may help the bees to combat disease (lines 12 and 13).

(2)

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(e) How many chromosomes would you expect to find in an unfertilised bee egg?

(1)

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(f) Explain what determines the genetic variation in worker bees.

(2)

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(g) Suggest two characteristics of a colony that would encourage a beekeeper to use the colony for selective breeding.

(2)

1 .....

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2 .....

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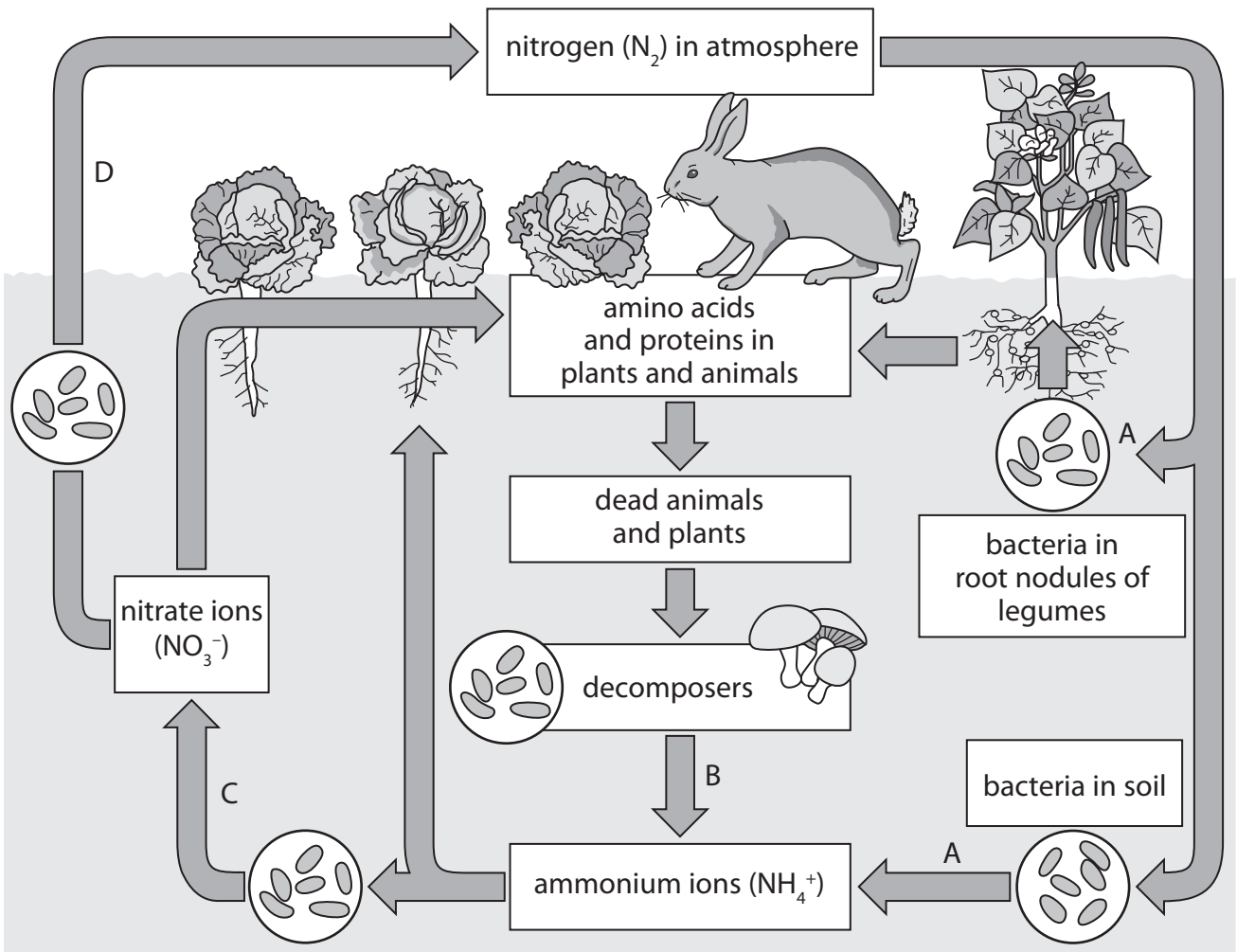
**(Total for Question 1 = 11 marks)**



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2 The diagram shows the nitrogen cycle with four different stages labelled A, B, C and D.



(a) Name the processes A, B, C and D.

(4)

- A .....
- B .....
- C .....
- D .....



(b) Name two different groups of organisms that act as decomposers.

(2)

1 .....

2 .....

(c) The nitrogen in a nitrate ion in the soil can become the nitrogen in a protein molecule in an animal.

Explain how this happens.

(4)

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(d) Farmers sometimes add fertiliser to the fields in which they grow their crops.

Suggest two advantages of using animal waste as a fertiliser rather than using a chemical fertiliser.

(2)

1 .....

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2 .....

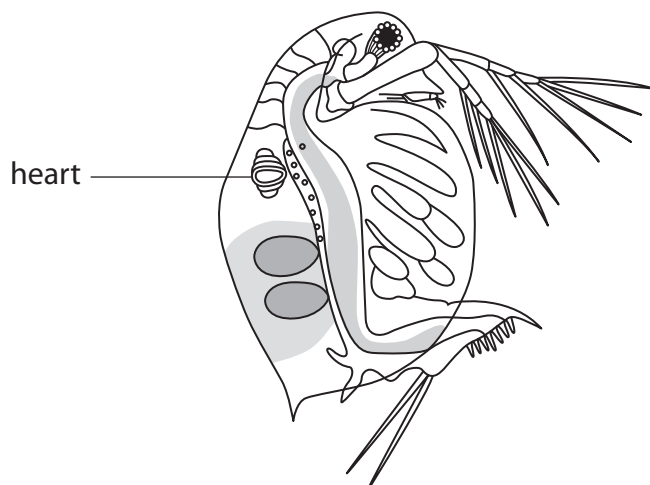
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**(Total for Question 2 = 12 marks)**



- 3 A student wanted to investigate the effect of the drug caffeine on heart rate. She decided to look at the effect by using a small water animal called *Daphnia*.

***Daphnia***



- She put a *Daphnia* on a microscope slide in a drop of water.
- She looked at the *Daphnia* under low power and counted the number of heartbeats in 15 seconds.
- She did this for 10 *Daphnia*.
- She then repeated the method for 10 *Daphnia* in a caffeine solution.

Her results are shown in the table.

<b><i>Daphnia</i></b>	<b>Heartbeats in 15 seconds</b>	
	<b>Water</b>	<b>Caffeine solution</b>
1	23	36
2	27	37
3	25	29
4	24	40
5	23	38
6	25	37
7	26	39
8	23	36
9	26	39
10	23	28





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

(1)

(ii) Name a variable that the student should control in her experiment.

(1)

(iii) Suggest why the student counted the heartbeats in 15 seconds rather than a minute.

(1)

(b) Describe the effect of caffeine on *Daphnia* heart rate.

(1)

(c) Are the student's results reliable?

Give a reason for your answer.

(1)

(d) Caffeine causes the same change in human heart rate as it does in *Daphnia*.

In humans this is because caffeine stimulates the release of a hormone.

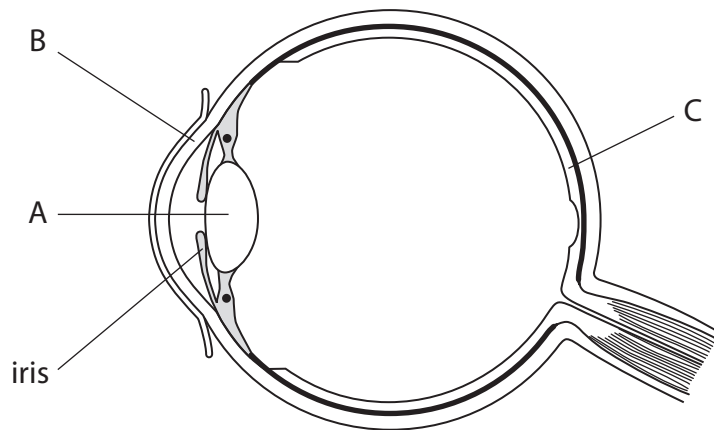
Name this hormone.

(1)

**(Total for Question 3 = 6 marks)**



4 The diagram shows a section through an eye with the iris and parts A, B and C labelled.



(a) Name parts A, B and C.

(3)

A.....

B.....

C.....

(b) When you move from a bright room into a dark room you cannot see very well for a while. After a brief time, a change in the iris helps you to see more clearly.

(i) The iris contains muscle tissue.

What is meant by the term **tissue**?

(1)

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(ii) Describe the changes that take place in the iris when moving into the dark room and explain how they help you to see more clearly.

(3)

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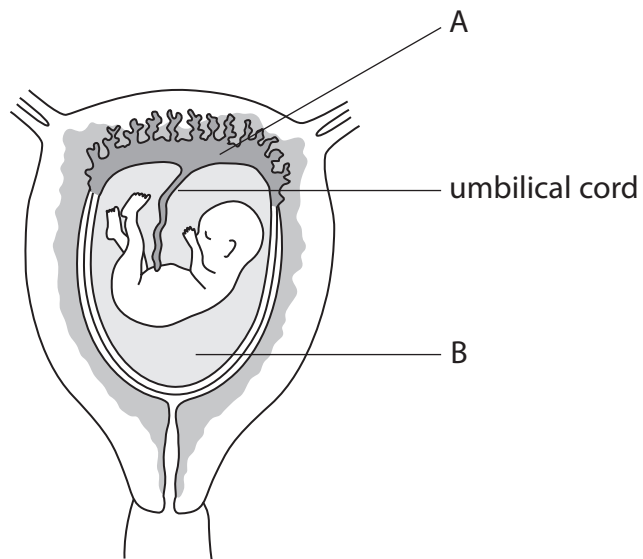
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**(Total for Question 4 = 7 marks)**



5 The drawing shows a fetus developing in the uterus of a woman.



(a) (i) What is the function of part A?

(1)

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(ii) What is the function of part B?

(1)

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(iii) The umbilical cord transports small protein molecules from the mother to the fetus. These molecules help to provide immunity.

Name these small protein molecules.

(1)

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(b) Scientists can take cells from part A and use them to find out if the fetus has a genetic condition.

(i) How many chromosomes would the scientists find in a normal body cell from a fetus?

(1)

(ii) Complete the table by ticking the box that shows the correct sex chromosomes the scientists would find in a body cell from a male fetus.

(1)

Sex chromosomes	Tick
XX	
X	
XY	
YY	
Y	



(c) The table shows the suggested daily intake of various components needed in the diet of a pregnant and a non-pregnant woman.

Daily suggested intake of component	Pregnant woman	Non-pregnant woman
energy in kJ	9660	8820
protein in grams	63	55
calcium in grams	1.2	0.7
iron in milligrams	15	12
vitamin C in milligrams	60	40
vitamin D in micrograms	40	10

(i) Name two components in the table that are important for the development of bones in the fetus of the pregnant woman.

(2)

1.....

2.....

(ii) Suggest two reasons why a pregnant woman needs more energy than a non-pregnant woman.

(2)

1.....

2.....

(iii) Suggest why the daily intake of iron is higher for a pregnant woman than a non-pregnant woman.

(3)

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**(Total for Question 5 = 12 marks)**

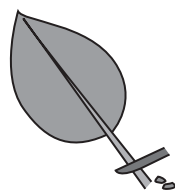


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6 The diagram shows how plants can be produced using micropropagation (tissue culture).

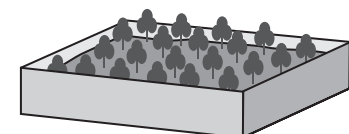
A tissue sample removed from parent plant and transferred to agar medium in Petri dish



B Petri dish containing agar medium with nutrients



C tissue samples developing into small plants



D small plants grown in compost

(a) Suggest how the tissue samples are removed and transferred to the agar medium. (2)

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(b) Nutrients are added to the agar medium to help plant growth.

Give two nutrients that should be added to the agar medium. Explain how each nutrient helps plant growth. (2)

1 .....

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2 .....

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(c) Suggest three precautions needed to ensure healthy growth of the small plants.

(3)

1 .....

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2 .....

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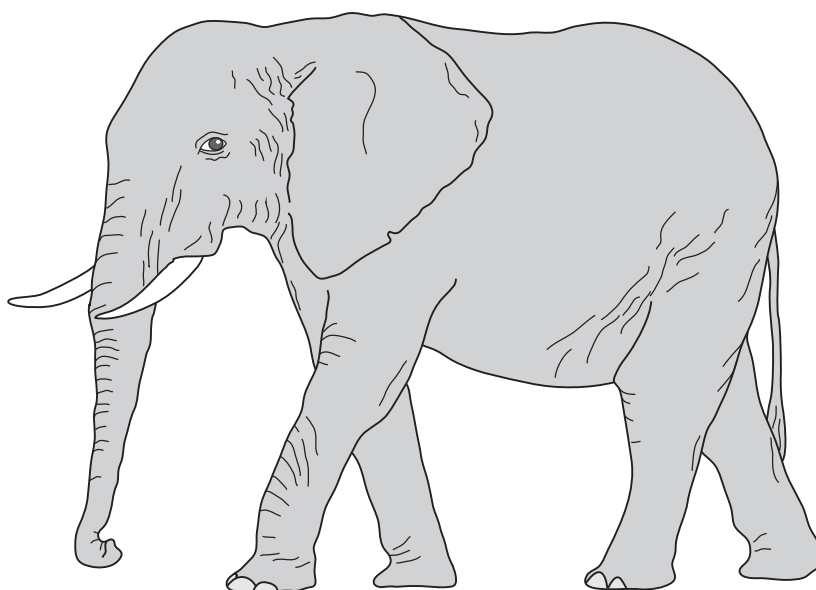
3 .....

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**(Total for Question 6 = 7 marks)**



7 The drawing shows an elephant. Elephants live in Africa where it is hot.



(a) The elephant is adapted to live in a hot environment by having large ears.

Suggest how having large ears helps prevent the body temperature of the elephant from rising too high.

(3)

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(b) Explain why the elephant may die if its body temperature rises too high.

(2)

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**(Total for Question 7 = 5 marks)**

**TOTAL FOR PAPER = 60 MARKS**



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