



RECOGNISING ACHIEVEMENT

H

A222/02

## GENERAL CERTIFICATE OF SECONDARY EDUCATION

## TWENTY FIRST CENTURY SCIENCE

## BIOLOGY A

UNIT 2 Modules B4 B5 B6 (Higher Tier)

TUESDAY 17 JUNE 2008

Morning

Time: 40 minutes

\* C U P / T 4 4 3 5 8 \*

Candidates answer on the question paper.

## Additional materials (enclosed):

None

Calculators may be used.

Additional materials: Pencil  
Ruler (cm/mm)

Candidate  
Forename
Candidate  
Surname
Centre  
Number

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Candidate  
Number

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## INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

## INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.

FOR EXAMINER'S USE		
Qu.	Max	Mark
1	6	
2	5	
3	5	
4	6	
5	5	
6	3	
7	5	
8	7	
<b>TOTAL</b>	<b>42</b>	

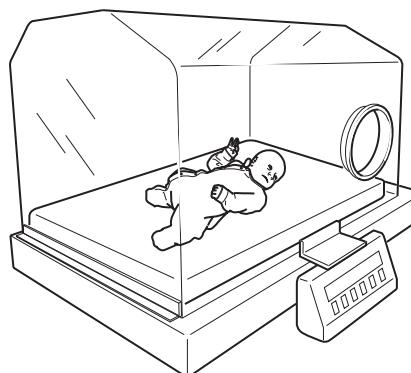
This document consists of **16** printed pages.

Answer **all** the questions.

1 Lee is a premature baby.

Lee has problems in maintaining a constant body temperature.

He is put in an incubator.



The temperature and moisture content of the air in the incubator are kept constant.

(a) Name the process of maintaining a constant body temperature.

Put a **ring** around the correct answer.

haemodialysis

homeostasis

hyperactivity

hypertension

[1]

(b) Temperature control systems in incubators work in a similar way to the body control systems in humans.

Draw a straight line from each part of the **incubator** control system to the matching part of the **body** control system.

**incubator**

**body**

probe used to detect temperature in the incubator

brain

heating system

effector

thermostat

receptor

[2]

(c) The incubator is not working correctly.

(i) The temperature is too high.

Which molecules in Lee's cells may not work at their optimum?

Put a **ring** around the correct answer.

**carbohydrates**

**enzymes**

**lipids**

**water**

[1]

(ii) The air is too dry.

Lee is losing large amounts of water from his body.

Put a **ring** around each of the **two** ways in which Lee could lose **large** amounts of water.

**digestion**

**drinking  
milk**

**excretion  
of urine**

**moving**

**sweating**

[2]

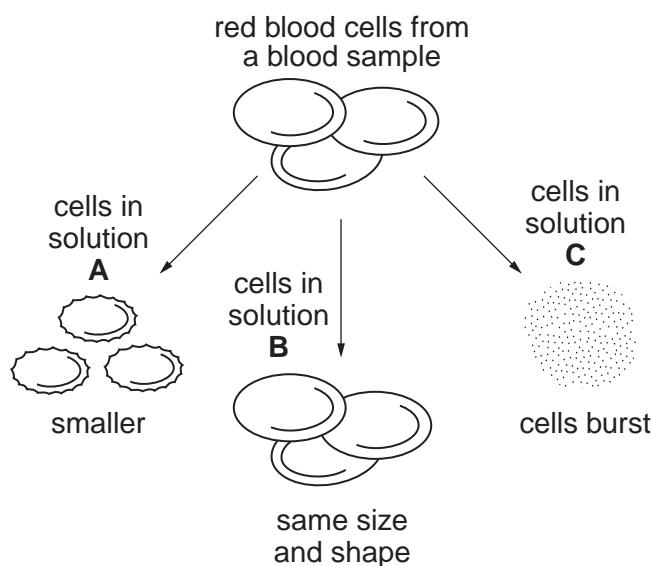
[Total: 6]

2 Scientists can examine red blood cells under the microscope.

Some red blood cells are added to each of three different solutions, **A**, **B** and **C**.

They are left for two hours.

The diagram shows the results.



(a) Identify the solutions **A**, **B** and **C**.

Complete the table by writing the correct letter, **A**, **B** and **C**, in each box.

solution	letter
concentrated sugar solution	
dilute sugar solution	
pure water	

[2]

**(b)** What is osmosis?

Put a tick (✓) in the box next to the best statement.

Osmosis is the movement of water ...

... from a concentrated to a more dilute solution through a completely permeable membrane.

... from a concentrated to a more dilute solution through a partially permeable membrane.

... from a dilute to a more concentrated solution through a completely permeable membrane.

... from a dilute to a more concentrated solution through a partially permeable membrane.

[1]

**(c)** The red blood cells in solution **C** burst.

Which structure in **plant cells** prevents them from bursting?

Put a **(ring)** around the correct answer.

**cell membrane**

**cell wall**

**chloroplast**

**vacuole**

[1]

**(d)** A **very large** volume of **pure water** is added to solution **A**.

What happens to the red blood cells in solution **A**?

Put a **(ring)** around the correct answer.

**the cells  
burst**

**the cells  
get smaller**

**the cells  
return to the  
original size**

**the cells  
stay the same**

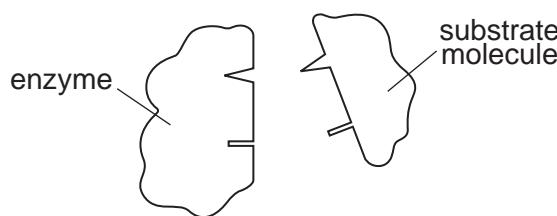
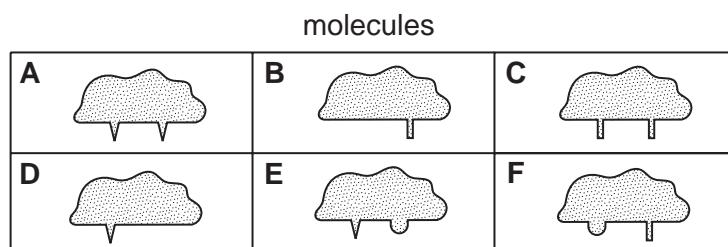
[1]

[Total: 5]

3 Some molecules can inhibit enzyme activity.

The molecules are called **competitive enzyme inhibitors**.

Enzyme inhibitors bind to the enzyme where the substrate normally attaches.



(a) Which **two** of the molecules **A**, **B**, **C**, **D**, **E** and **F** can act as enzyme inhibitors?

Put a **ring** around each of the **two** correct answers.

[2]

**A**

**B**

**C**

**D**

**E**

(b) (i) Write down the **name** of the site where the substrate binds to the enzyme.

.....

[1]

(ii) Which condition will **not** affect the shape of the enzyme?

Put a **ring** around the correct answer.

**pH**

**substrate concentration**

**temperature**

[1]

(iii) What affects the collision rate between the enzyme and substrate molecules in a solution?

Put a tick (**✓**) in the box next to the **one** correct statement.

the pH of the solution

the presence of enzyme inhibitors

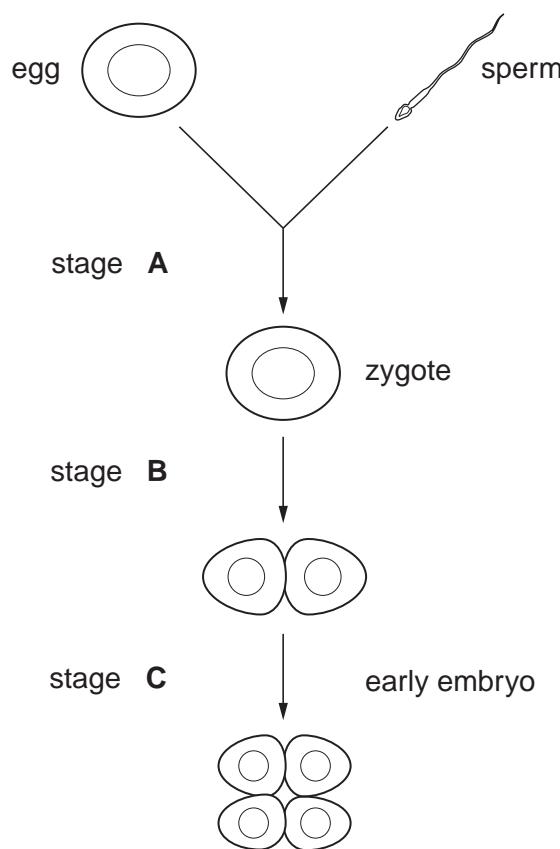
the shape of the enzyme

the temperature of the solution

[1]

[Total: 5]

4 The diagram shows some stages in the formation and growth of a human embryo.



(The drawing is not to scale.)

(a) Name the process taking place at each stage, **A**, **B** and **C**.

Choose your answers from this list.

Each word may be used once, more than once or not at all.

**fertilisation**

**meiosis**

**mitosis**

**pairing**

**A**

**B**

**C**

[3]

**(b)** The egg and sperm cells are produced by parent cells.

What happens to the chromosome number during the production of eggs and sperm?

Put a tick (✓) in the correct box.

The chromosome number in the egg and sperm cells is ...

... double that found in the parent cells.

... half that found in the parent cells.

... the same as that found in the parent cells.

[1]

**(c)** The number of cells in the embryo increases as it grows.

Each cell goes through the cell cycle.

Here is a list of stages in the cell cycle.

They are in the wrong order.

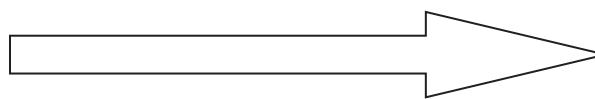
- A** cell divides
- B** chromosomes are copied
- C** chromosomes separate
- D** number of organelles increases

Write the letters **A**, **B**, **C** and **D** in the boxes to show the correct order.

The first one has been done for you.

<b>D</b>			
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start of cell cycle



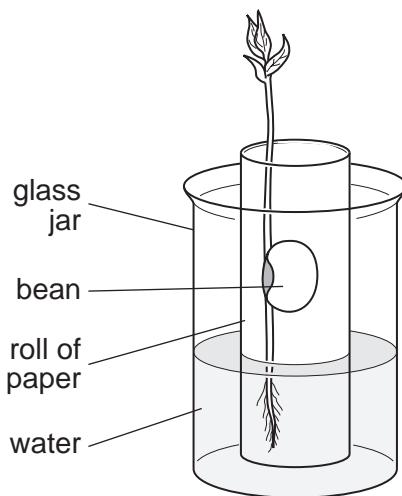
end of cell cycle

[2]

[Total: 6]

5 Joe does an experiment to study the germination and growth of a bean seed.

He sets up the experiment as shown in the diagram.



(a) (i) The seedling contains meristems.

What is the function of a meristem?

Put a tick (✓) in the box next to each correct statement.

A meristem increases the ...

... number of cells.

... rate of photosynthesis.

... uptake of water.

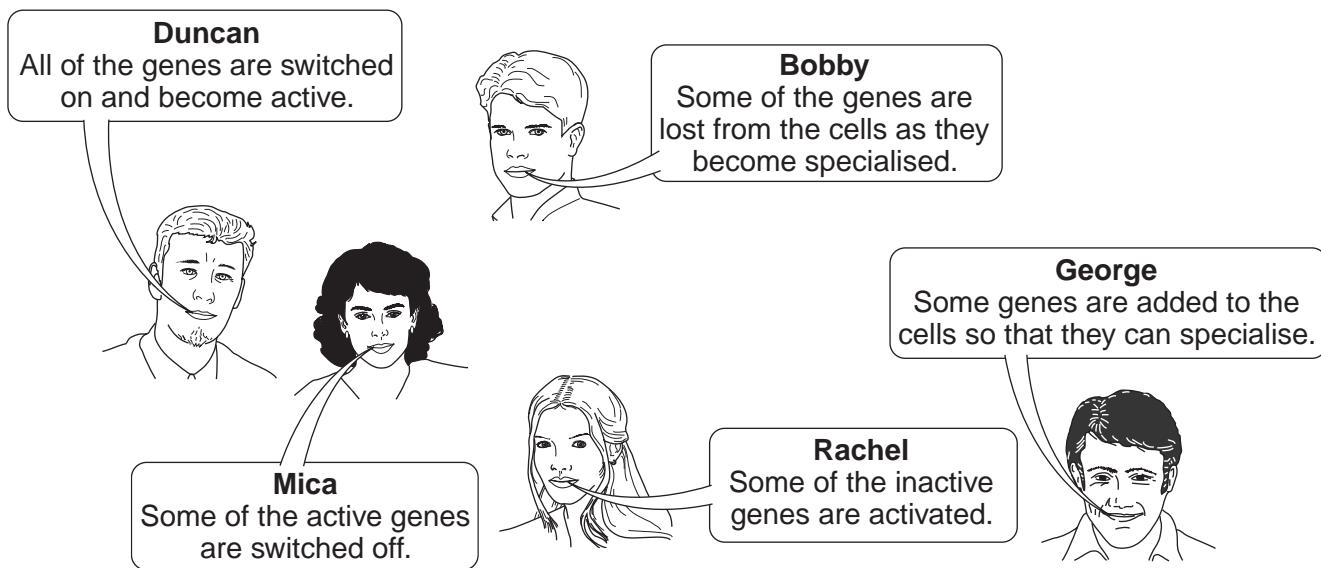
... width of the stem.

[1]

10

(ii) New cells in the seedling become specialised.

Five people were asked to suggest how this might happen.



Which **two** people gave the **best** explanations?

answer ..... and .....

[2]

(b) Joe places his glass jar containing the bean seedling on a window ledge.

He notices that the tip of the stem grows towards the light.

This effect is linked to the production of auxin at the tip of the stem.

(i) What happens to the auxin in the stem?

Put a tick (✓) in the correct box.

There is more auxin on the shaded side.

There is more auxin on the light side.

The auxin is evenly distributed.

[1]

(ii) What is the effect of auxin on the rate of cell growth in the stem?

Put a **ring** around the correct answer.

**rate of cell growth decreases**

**rate of cell growth increases**

**rate of cell growth is not affected**

[1]

[Total: 5]

6 This question is about the genetic code and protein synthesis.

Genes code for proteins.

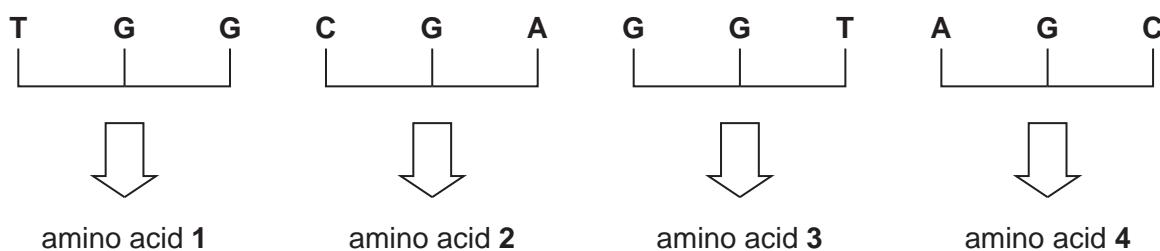
Each gene has a unique sequence of the bases A, T, C and G.

The bases operate in triplets.

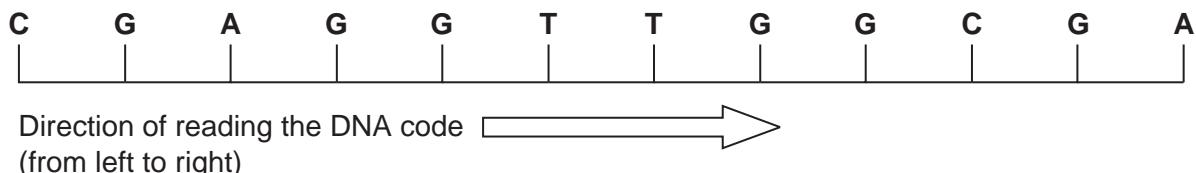
Each triplet codes for an amino acid.

The order of amino acids determines the protein produced.

The diagram shows examples of how this works.



(a) Look at the DNA base sequence in the following diagram.

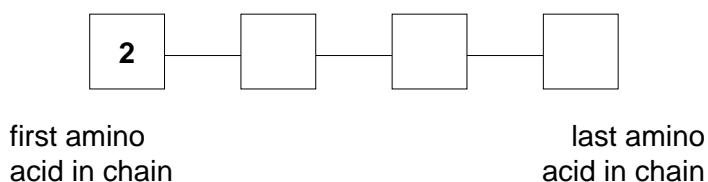


Write the correct sequence of amino acids in the boxes.

For each box choose from numbers 1, 2, 3 or 4.

Each number may be used once, more than once or not at all.

The first one has been done for you.

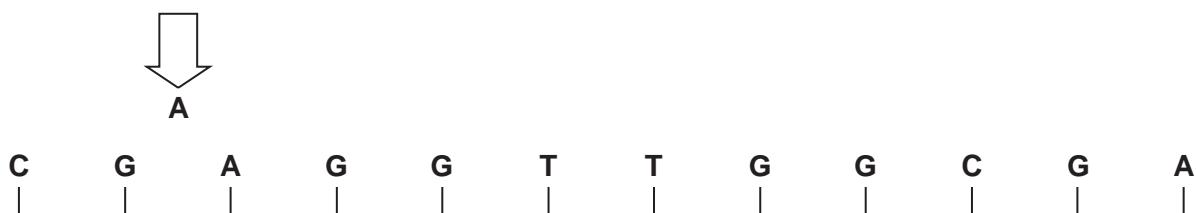


[2]

12

(b) **Mutations** can occur in the genetic code.

A mutation causes an extra **base A** to be inserted in the DNA base sequence **between G and A**.



Direction of reading the DNA code (from left to right)

How many of the amino acids codes will **not** be affected?

Put a **(ring)** around the correct answer.

1

2

3

4

[1]

[Total: 3]

7 Jenny has an accident at work and hurts her leg.

She is taken to her local hospital.

(a) A nurse does some tests.

She tests Jenny's reflexes.

(i) Which **two** words describe a simple reflex?

Put ticks (✓) in the **two** correct boxes.

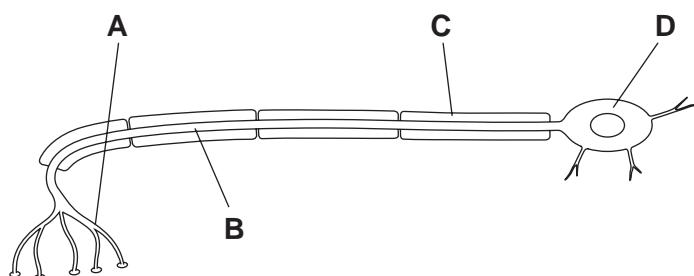
involuntary	<input type="checkbox"/>
rapid	<input type="checkbox"/>
slow	<input type="checkbox"/>
voluntary	<input type="checkbox"/>

[1]

(ii) Jenny can move her toes.

The motor neurons in her leg have not been damaged.

The diagram shows a motor neuron.



Which structure, **A**, **B**, **C** or **D**, is the **fatty sheath**?

.....

[1]

(iii) What are the functions of the fatty sheath?

Put ticks (✓) in the boxes next to the **two** correct functions.

to allow the neuron to connect to other cells	<input type="checkbox"/>
to allow the neuron to grow longer	<input type="checkbox"/>
to insulate the neuron from neighbouring cells	<input type="checkbox"/>
to speed up nerve impulses	<input type="checkbox"/>

[2]

14

(b) Jenny is then asked if she can feel a pin touching different parts of her leg.

What is the function of the **receptors** in Jenny's skin?

Put a tick (✓) in the box next to the correct function.

to carry impulses from the central nervous system to an effector

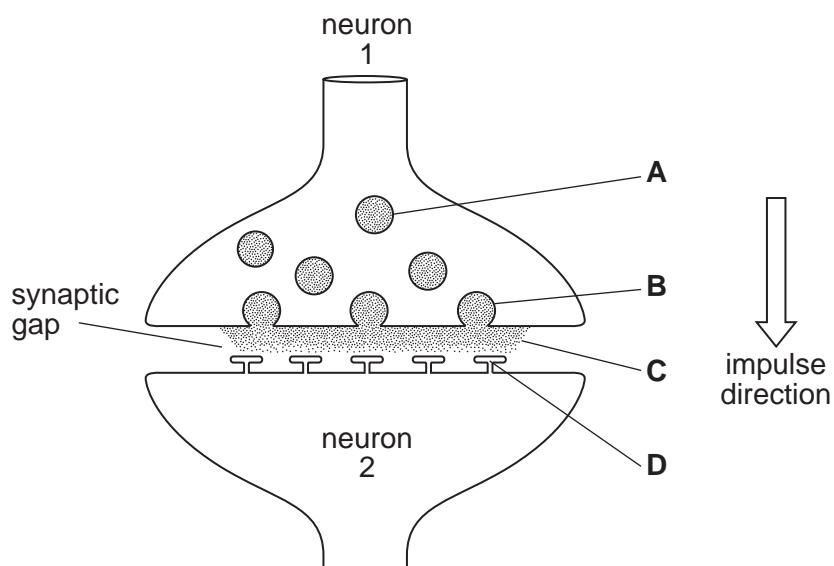
to carry impulses to the central nervous system

to stimulate the muscle

to detect the stimulus  [1]

[Total: 5]

8 This question is about **synapses**.



(a) The nerve impulse is transmitted from one neuron to the next through a series of steps, **A, B, C and D**.

The table shows these steps but they are in the wrong order.

Write the correct letter, **A, B, C or D**, in the box next to each step in the table.

steps	letter
The receptor sites are stimulated.	
The transmitter substances are released.	
The transmitter substances collect inside the vesicles.	
The vesicles fuse with the outer membrane.	

[3]

(b) What effect will the synapse have on the speed of nerve impulse transmission?

Put a **(ring)** around the best answer.

**decrease**

**increase**

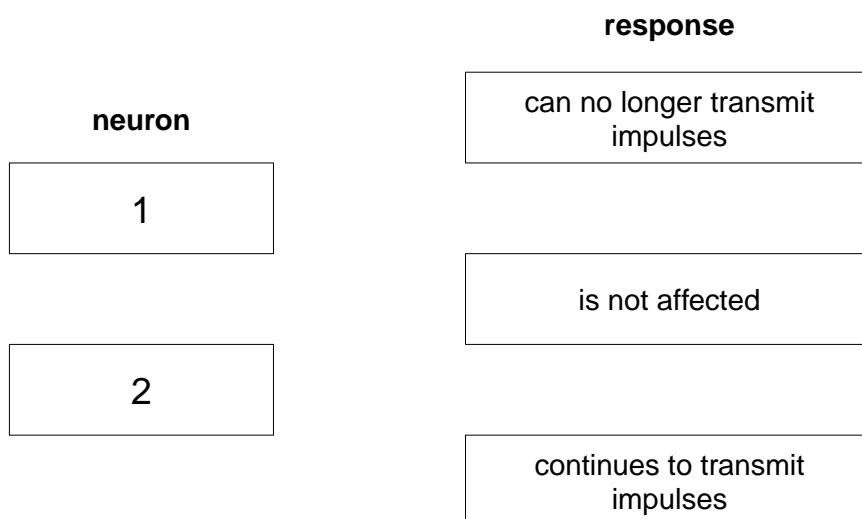
**no effect**

[1]

(c) The synapse chemicals normally break down and diffuse back into neuron 1.

Some poisons stop this happening.

Draw a straight line from each **neuron** to show its **response** to the poison.



[2]

(d) One type of transmitter substance in the brain is **serotonin**.

The illegal drug ecstasy is described as 'mood enhancing'.

What happens to the **amount of serotonin** collecting in the **synaptic gap** when ecstasy is used?

Put a **(ring)** around the correct answer.

**decreases**      **increases**      **stays the same**      **falls to zero**

[1]

[Total: 7]

**END OF QUESTION PAPER**