

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
BIOLOGY A**

A222/02

Unit 2: Modules B4 B5 B6 (Higher Tier)

Candidates answer on the question paper.
A calculator may be used for this paper.

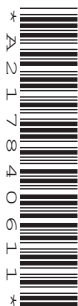
OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

**Monday 24 January 2011
Afternoon**

Duration: 40 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

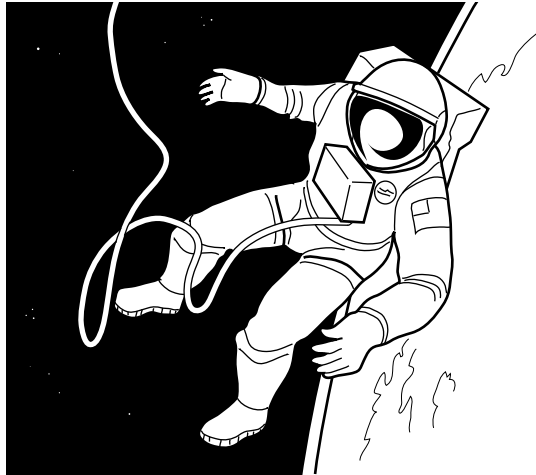
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Lizzie is an astronaut.

She is doing a space walk.

Space is very cold.



(a) Lizzie's body maintains a constant internal temperature.

This is an example of which process?

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

denaturation

homeostasis

hypothermia

respiration

[1]

(b) The temperature of the air inside Lizzie’s space suit is maintained at a constant level.

The temperature control system in a space suit is designed to work in a similar way to the body control system in humans.

Draw a straight line to link each **part of the space suit control system** to the matching **part of the body control system**.

Then draw a straight line to link each **part of the body control system** to its **function**.

part of the space suit control system	part of the body control system	function
temperature probe	brain	detects the temperature
heating system	effector	processing centre
control circuit	receptor	produces the response

[2]

(c) Lizzie’s space suit is not working properly.

The air temperature inside her suit increases.

This causes a small increase in Lizzie’s body temperature.

Write down what effect, if any, this has on the rate of reactions in Lizzie’s body.

Explain your answer.

effect on rate

explanation

.....

..... [3]

(d) The temperature control system in Lizzie's suit is adjusted.

Her core body temperature starts to drop.

This is shown in the table.

time after adjustment in minutes	core body temperature in °C
0	39.0
5	38.5
10	37.0
15	36.3
20	35.0
25	34.8
30	34.5

(i) Calculate the percentage decrease in Lizzie's core body temperature during the 30 minutes.

Show your working.

answer = % [2]

(ii) During the 30-minute period, Lizzie starts suffering from hypothermia.

After how many minutes does this start to occur?

answer = minutes [1]

[Total: 9]

2 Jake is studying osmosis in **animal cells** under the microscope.

(a) What is osmosis?

.....

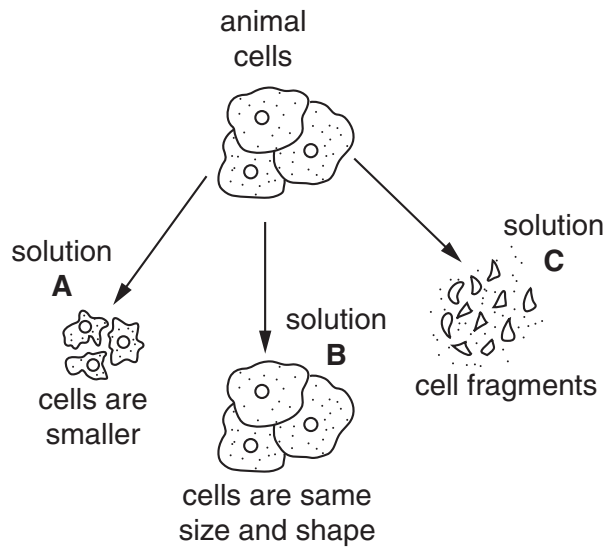
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..... [1]

(b) Jake adds some of the cells to each of three different solutions, **A**, **B** and **C**.

They are left for two hours.

The diagram shows the results.



Identify the solutions **A**, **B** and **C**.

Write the correct letter in each box.

solution	letter
concentrated salt solution	
dilute salt solution	
pure water	

[1]

(c) A large volume of **pure water** is then added to the three solutions with animal cells or cell fragments in.

Suggest what would happen to the animal cells and cell fragments in each of the solutions.

.....

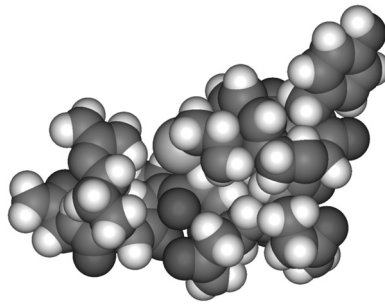
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..... [2]

[Total: 4]

Turn over

3 This question is about the hormone ADH.



ADH is involved in maintaining balanced water levels in the human body.

(a) Which part of the brain releases ADH into the bloodstream?

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

- cerebral cortex** **hypothalamus** **pituitary gland** **medulla**

[1]

(b) Alcohol and Ecstasy both affect the production of ADH and urine.

Draw a straight line between each **drug** and its effect on the **production of ADH**.

Then draw a straight line between each **drug** and its effect on the **urine**.

production of ADH	drug	urine
decreases	alcohol	greater volume and more dilute
increases		smaller volume and less dilute
stays the same	Ecstasy	greater volume and less dilute
stops		smaller volume and more dilute

[2]

(c) Describe how ADH secretion is controlled by **negative feedback**.

.....

.....

.....

.....

[2]

[Total: 5]

- 4 Two scientists, Watson and Crick, are famous because they discovered the structure of DNA in 1953.



- (a) Watson and Crick found that DNA is made from different bases.

Draw **one** straight line between the correct **number of types of bases** and the way in which they are **joined together**.

number of types of bases	joined together
two	in twos
three	in fours
four	in eights

[1]

- (b) Since the 1950s, much more is known about DNA and the cell cycle.

What happens to the strands of DNA during cell growth in the cell cycle?

.....

.....

..... [2]

(c) DNA is the basis of the genetic code.

Explain the link between the genetic code and protein synthesis.

.....

.....

.....

..... [2]

(d) **Mutations** can occur in DNA.

Some mutations result in an **extra base** being added to the base sequence in a gene.

What will happen if this type of mutation takes place?

Put a tick (✓) in the correct box for each row.

	true	false
The sequence of bases in the DNA molecule will stay the same.		
The sequence of amino acids used in the protein molecule will change.		
The protein molecule produced is likely to stay the same.		
Different amino acids may be used in protein production.		

[1]

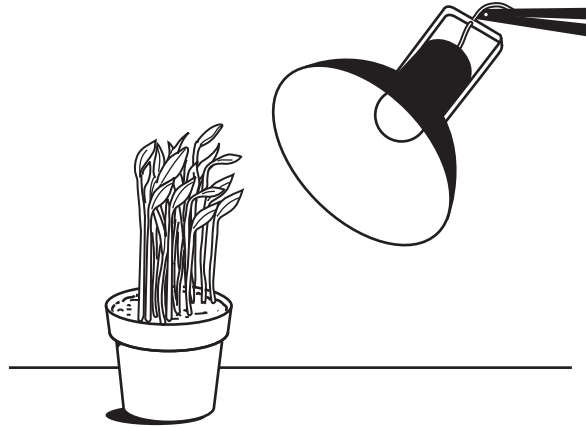
[Total: 6]

5 Emma carries out a simple experiment.

She puts a pot of plant shoots next to a light source.

She returns to see what has happened to the plants after 3 days.

The plants are showing phototropism.



(a) The plant shoots grow towards the light source.

Complete the sentences to explain how phototropism increases the plants' chances of survival.

Use words from this list.

leaves

roots

photosynthesis

respiration

carbon dioxide

sugars

light

minerals

diffusion

osmosis

The curved shoots result in the getting more

.....

The rate of increases, producing more

[2]

(b) Which **two** terms can be used to describe the chemical that causes phototropism?

Put a **ring** around the two correct terms.

auxin

chlorophyll

enzyme

hormone

nucleotide

serotonin

[1]

(c) How does a **single** source of light affect the distribution of this chemical in a shoot tip?

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

The chemical collects ...

... at the tip of the shoot.

... on both sides of the shoot.

... on the side of the shoot in the dark.

... on the side of the shoot in the light.

[1]

[Total: 4]

6 Some students are talking to a research scientist about specialisation of cells.

(a) The scientist asks the students to give her some ideas about **human** cells and their specialisation.

Andrew
Each body cell in a human contains different genes.

Charley
Many genes in a specialised human cell are not active.

George
When human cells specialise, they produce only the proteins they need.

Lisa
Cells collected from a human embryo at the 16 cell stage can become any type of specialised cell.

Rachel
Some genes are missing in specialised human cells.

Which **two** students suggest correct ideas?

answers and [2]

(b) Plants also have specialised and un specialised cells.

Which part of a **plant** contains **only** un specialised cells?

answer [1]

[Total: 3]

7 The tiny gaps between adjacent neurons are called **synapses**.

Synapses can be found between sensory and motor neurons.

(a) Complete the sentences about nerve impulse transmission and synapses.

Use terms from the list.

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

active transport

break down

diffusion

effector

fatty sheath

production

receptor

spinal cord

unaffected

The nerve impulse starts at the

The impulse continues along the sensory neuron.

The impulse is transmitted across the synapse between the sensory and motor neuron. This involves the of chemicals across the gap.

These chemicals then bind with molecules on the surface of the motor neuron.

The motor neuron continues to carry the impulse and triggers the activity of the

[2]

- (b) Impulses only travel in **one direction** across the synapse from a sensory neuron to a motor neuron.

Put ticks (✓) in the boxes next to the **two** statements that, taken together, correctly explain this.

Only the sensory neuron releases the synapse chemicals at this synapse.

The synapse chemicals are lost from the site of the synapse.

The chemicals released into the synapse are reabsorbed into the motor neuron.

The chemicals released into the synapse only collide with the membrane of the motor neuron.

The sensory neuron membrane does not contain molecules capable of binding with the synapse chemical.

[2]

- (c) The drug Ecstasy affects the sites in the brain's synapses where the chemical serotonin is reabsorbed.

Draw a straight line between **Ecstasy** and its effect on the **removal of serotonin in the brain's synapses**.

Then draw another straight line between **Ecstasy** and its effect on the **concentration of serotonin in the synapse**.

removal of serotonin in the brain's synapses

concentration of serotonin in the synapse

[1]

[Total: 5]

8 This question is about memory.

(a) What is memory?

.....

.....

..... [1]

(b) Different factors affect a person’s memory.

Which **factors enhance** memory and which **inhibit** memory?

Put a tick (✓) in the correct box in each row.

factor	enhance	inhibit
the information has a pattern		
the information is repeated		
the cerebral cortex is damaged		
the information is associated with a colour		

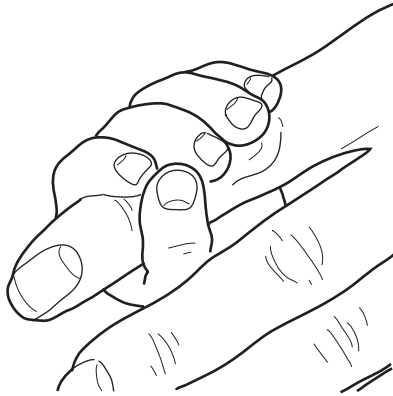
[2]

[Total: 3]

9 Mark is a newborn baby.

He holds onto his mother's finger very soon after he is born.

He is showing a simple reflex.



(a) Mark will develop conditioned reflexes as he grows older.

What connection is there between the final response in a conditioned reflex and the primary stimulus?

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

The final response only occurs after the primary stimulus.

There is no direct connection between them.

The primary stimulus only occurs after the final response.

They both occur at the same time.

[1]

(b) Mark will be able to **modify** a reflex response under some circumstances.

Complete the sentences about modifying reflex responses.

Use words from this list.

brain

motor

pituitary gland

receptor

sensory

spinal cord

The can modify reflex responses.

This process involves the transmission of an impulse along a neuron to the

.....neuron of the reflex arc.

[2]

[Total: 3]

END OF QUESTION PAPER



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