

**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)

**Wednesday 20 May 2009  
Afternoon**

**Duration: 40 minutes**



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**MODIFIED LANGUAGE**

**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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, however additional paper may be used if necessary.

**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 **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Sophie takes part in an exercise class.



(a) Changes in Sophie's body temperature cause her to sweat during the exercise.

The changes are detected and processed.

Complete the sentences describing how this happens.

Choose words from the list.

Some words may be used once, more than once, or not at all.

**brain**

**heart**

**kidneys**

**liver**

**lungs**

**skin**

Changes in the temperature of the blood are detected by temperature receptors in

the .....

Changes in the external temperature are detected by temperature receptors in

the .....

Information received from the temperature receptors is processed by

the .....

(b) Sophie loses water when she sweats.

How can Sophie replace some of this lost water?

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

**breathing**

**growing**

**respiring**

**excreting urine**

[1]

(c) Sweating is involved in homeostasis.

What is **homeostasis**?

Draw **two** straight lines to link the correct **beginning**, **middle** and **end** to complete the sentence.

**beginning**

The change ...

or

The maintenance ...

or

The increase ...

or

The decrease ...

**middle**

... of a constant ...

or

... of a varying ...

or

... of a different ...

**end**

... total environment.

or

... internal environment.

or

... external environment.

or

... natural environment.

[2]

[Total: 5]

2 Alex is investigating enzyme activity.

(a) What are enzymes and what do they do?

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

**Enzymes are ...**

... carbohydrates that slow down chemical reactions in cells.

...carbohydrates that speed up chemical reactions in cells.

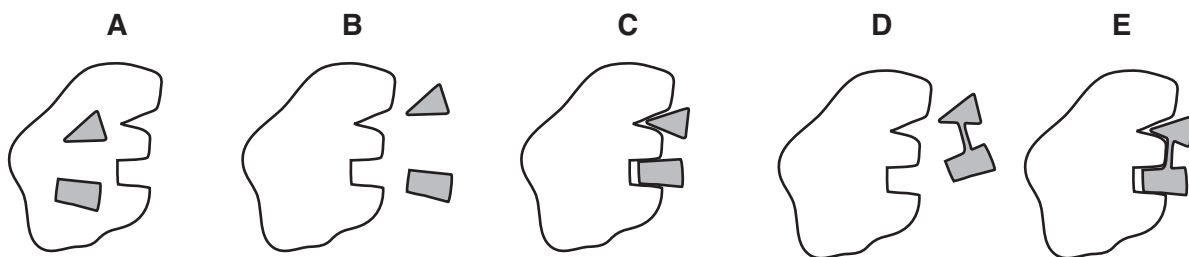
... proteins that slow down chemical reactions in cells.

... proteins that speed up chemical reactions in cells.

[1]

(b) Alex draws a set of diagrams to show what happens during a reaction involving an enzyme.

He makes a mistake and draws one **incorrect** stage.



The stages are **not** drawn in the correct order.

Put the correct stages in the right order.

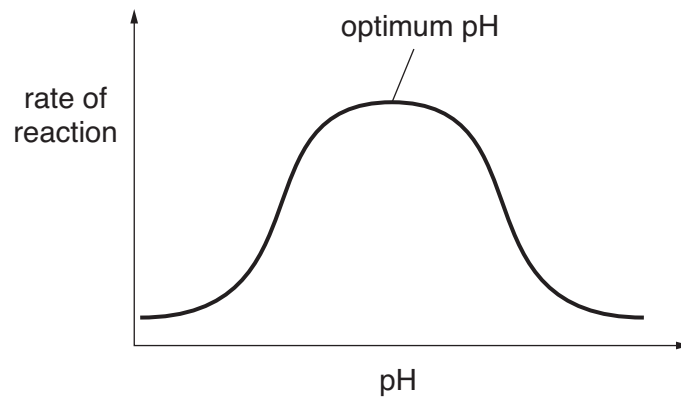
The last stage has been done for you.

			<b>D</b>
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[2]

(c) Alex carries out an experiment to find out the effect of pH on the rate of an enzyme reaction.

He uses the results to plot a graph.



Which statement explains the shape of the curve?

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

**The pH value ...**

... is dependent on temperature.




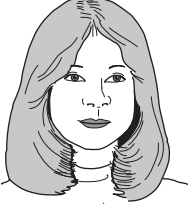
... only affects the substrate molecules.

... affects the shape of the active site of the enzyme.

... affects the collision rate between the enzymes and the molecules.

[1]

- (d) Alex asks four friends to explain what happens when enzymes are involved in reactions at **very** high temperatures.

<p><b>Paul</b> The molecules now fit into the active sites of the enzymes more easily.</p>	<p><b>Jane</b> The collision rate between the enzymes and molecules is higher.</p>
	
	
<p><b>Scott</b> The enzyme's reaction rate increases.</p>	<p><b>Sharon</b> The shape of the enzyme's active site is changed.</p>

His friends give either right or wrong answers.

Write the **names** of each of his friends in the correct boxes.

gives a <b>right</b> answer	gives a <b>wrong</b> answer

[2]

[Total: 6]

**7**  
**BLANK PAGE**

**Question 3 starts on page 8.**  
**PLEASE DO NOT WRITE ON THIS PAGE**

**3** Some patients suffer from kidney failure.

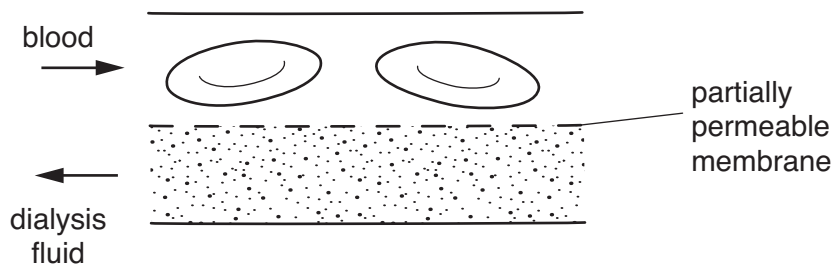
A dialysis machine may be needed to take over the work of the failing kidney.

The dialysis machine contains dialysis fluid and receives blood from the patient.

Dialysis fluid and the patient's blood are pumped through the machine in opposite directions. They are separated by a partially permeable membrane.

The blood is then returned to the patient.

The diagram shows what happens.



**(a)** Complete the sentences about the dialysis machine.

Choose words from the list.

The words may be used once, more than once, or not at all.

**blood**

**protein**

**sugar**

**urea**

**urine**

**water**

The membrane allows waste ..... to leave the blood.

The fresh dialysis fluid contains salts, ..... and .....  
so that it balances with the levels of these chemicals in the blood. **[3]**



(b) (i) Which hormone controls the concentration of urine produced by a healthy kidney?

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

**ADH**

**adrenaline**

**insulin**

**LH**

**oestrogen**

[1]

(ii) How does dehydration affect the production of the hormone involved?

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

**The amount of hormone produced ...**

... decreases.

... increases.

... stays the same.

... stops completely.

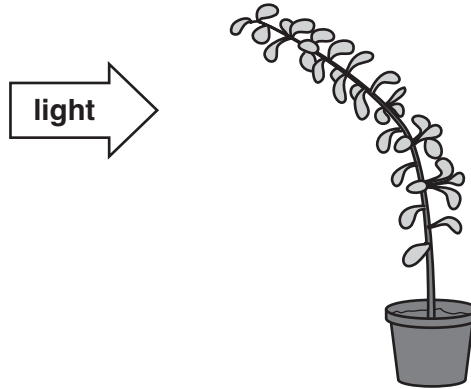
[1]

[Total: 5]

4 Helen is studying the growth of plants.

She puts a plant next to a source of light.

After a few days the plant stem has grown towards the light.



(a) Name the process which causes plant stems to grow towards light.

..... [1]

(b) Helen does not want her plant to have a 'curved' stem.

What should Helen do?

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

**Helen should ...**

... give the plant more water.

... grow the plant next to another plant.

... give the plant a light source from above.

... grow the plant in the same position but in brighter light.

[1]

(c) Helen decides to take a cutting from her plant.

Complete the sentences about taking cuttings.

Choose words from the list.

**enzymes**

**hormones**

**leaves**

**roots**

**specialised**

**sugar**

**unspecialised**

**xylem**

The cut stem is dipped in plant .....

The cut end starts to grow new .....

This new growth is from ..... cells.

**[3]**

**[Total: 5]**

5 Human enzymes can now be produced by genetically modified yeast cells.

The enzymes are produced on a large scale using special fermenters.

Yeast cells are cultured in the fermenters.

Human DNA is inserted into yeast cells to change them.

The **modified yeast** now has the ability to produce human enzymes.

(a) Complete the sentences about the production of human enzymes by modified yeast.

Choose words from the list.

**amino acids**

**bases**

**fatty acids**

**proteins**

**sugars**

The modified yeast DNA can code for the production of the human enzymes because it contains the correct sequence of .....

Human DNA is added to the yeast cells so that the enzyme produced has the correct order of ..... [2]

(b) The yeast cells in the fermenter carry out their **cell cycle** and reproduce to form a culture.

The two main phases of the cell cycle are cell growth and mitosis.

Which statement about the cell cycle is true?

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

Parts of the DNA strands are exchanged with each other.

The chromosomes are copied to form two new strands of DNA.

The numbers of organelles decrease as the cells grow.

The strands of DNA stay together when the cells divide during mitosis.

[1]

(c) Meiosis is another type of cell division which takes place in humans.

**Meiosis** differs from **mitosis**.

The chromosome number in an adult human body cell is **46**.

Some of the sentences about cell division are true and some are false.

Put ticks (✓) in the boxes next to the **true** sentences.

Meiosis produces gametes.

Mitosis produces new cells identical to each other.

Mitosis produces four new cells from one parent cell.

The new cells produced by meiosis in humans each contain 92 chromosomes.

The new body cells produced by mitosis in humans each contain 46 chromosomes.

[2]

[Total: 5]

6 This question is about stem cells and cloning.

(a) Complete these sentences about human stem cells.

Choose words from the list.

**diffusion**

**meiosis**

**mitosis**

**specialised**

**unspecialised**

Human stem cells divide by .....

The stem cells are .....

[1]

(b) Stem cells can be obtained by removing them from embryos.

Which is the **best** stage of development for collecting embryo stem cells?

Put a **ring** around the best stage.

**8 cell stage**

**16 cell stage**

**32 cell stage**

**64 cell stage**

[1]

(c) The statements about cells are either true or false.

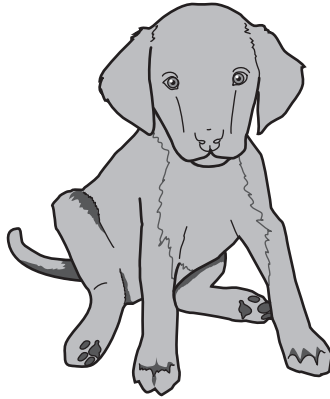
Put a tick (✓) in the correct box for each statement.

	<b>true</b>	<b>false</b>
All animal cells remain unspecialised in the adult.	<input type="checkbox"/>	<input type="checkbox"/>
All plant cells become specialised in the fully grown plant.	<input type="checkbox"/>	<input type="checkbox"/>
Nuclei from plant and animal cells can be used to form clones.	<input type="checkbox"/>	<input type="checkbox"/>
Many cells in plants and animals have some of their genes inactive.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

[Total: 4]

7 Pip is a young puppy.



Pip's brain contains billions of neurons.

(a) What will happen to neuron pathways in Pip's brain as he **develops**?

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

**Neuron pathways ...**

... carry more blood.

... stay the same.

... are formed.

... get shorter.

[1]



(b) Pip learns how to bring a ball back to his owner.

Complete the sentences about learning these types of skills.

Choose words from the list.

**chance    growing    new    old    recent    recognition    repetition    the same**

Some skills, like learning to fetch a ball, are best learnt by .....

The variety of potential pathways in the brain makes it possible for dogs, like Pip, to adapt to  
..... situations. [2]

**[Total: 3]**

8 This question is about synapses.

(a) A number of different stages take place when an impulse is carried across a synapse.

Some of the stages are listed but they are in the **wrong** order.

**One stage is incorrect** and should not be used.

- A synapse chemical initiates transmission of impulse
- B receptor molecule produces the synapse chemical
- C synapse chemical diffuses across the synapse
- D sensory neuron transmits an impulse
- E synapse chemical is released
- F synapse chemical is recognised by a receptor molecule

Put the correct stages in the right order.

Do not use the incorrect stage.

Write either **A, B, C, E** or **F** in each box.

The first stage has been done for you.

<b>D</b>				
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[3]

(b) Receptor molecules are **not** found in sensory neurons.

How does this affect the transmission of nerve impulses?

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

The speed of the nerve impulse transmission is reduced.

The nerve impulses can only travel in one direction.

The speed of the nerve impulse transmission is increased.

The strength of the nerve impulse is increased.

[1]

[Total: 4]

9 There are different types of reflexes found in animals.

(a) Which statements in the table are examples of **conditioned** reflexes?

Put ticks (✓) in the boxes next to the correct statements.

a change in the pupil size in a person's eye when a bright light is shone into the eye

a new born baby grasping its mother's finger

an earthworm escaping from predators by rapidly pulling itself back into the soil

the production of saliva by a dog when a bell rings

the rejection of brightly-coloured caterpillars by insect-eating birds

[2]

(b) A conditioned reflex action has certain characteristics.

Put ticks (✓) in the boxes next to the correct characteristics.

A secondary stimulus is associated with a primary stimulus.

A stimulus is not needed.

More than one secondary stimulus is used.

The final response has no direct connection to a stimulus.

[1]

- (c) Holding a hot dinner plate can be painful.

The natural response is to drop the plate.

However, this reflex response can be modified so that the plate is not dropped.

Complete the sentences about modifying reflexes.

Choose words from the list.

**brain**

**effector**

**eye**

**motor**

**neuron**

**receptor**

**reflex arc**

**sensory**

**spinal cord**

In some circumstances, the ..... can modify a reflex response.

This modification involves a ..... connected to

the ..... neuron, which is part of the ..... [2]

[Total: 5]

**END OF QUESTION PAPER**



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