

Candidate Forename						Candidate Surname				
Centre Number						Candidate Number				

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A222/02

**TWENTY FIRST CENTURY SCIENCE
BIOLOGY A**

**Unit 2: Modules B4 B5 B6
(Higher Tier)**

**WEDNESDAY 20 MAY 2009: Afternoon
DURATION: 40 minutes**

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**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)**

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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.**

BLANK PAGE

Answer ALL the questions.

1 Sophie takes part in an exercise class.

(a) During the exercise, changes in Sophie's body temperature cause her to sweat.

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 _____ .

[2]

(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?

On the opposite page 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. ☐

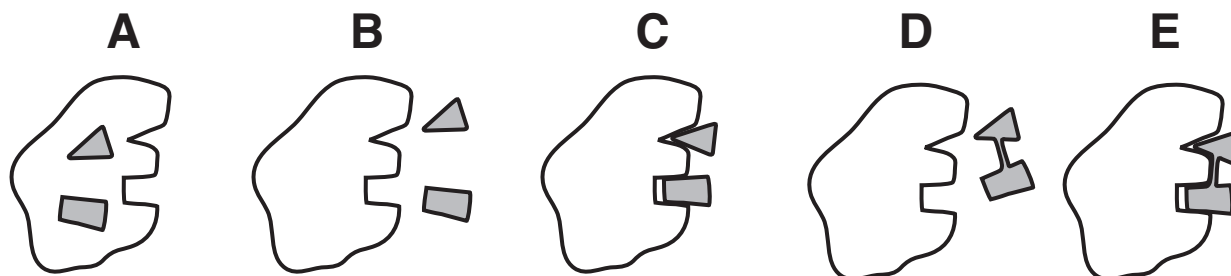
... proteins that slow down chemical reactions in cells. ☐

... 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.

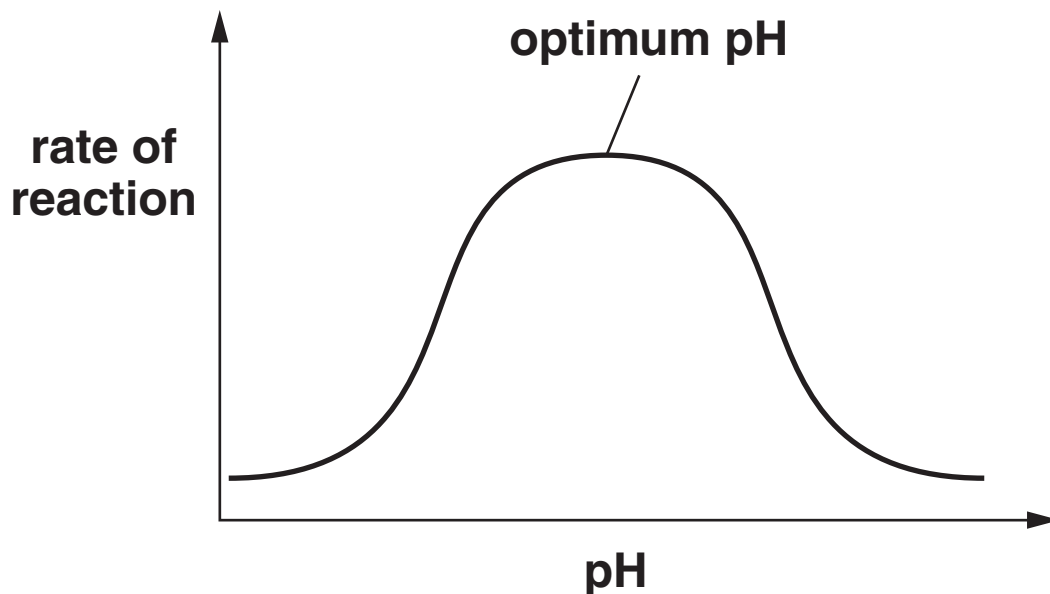
The last stage has been done for you.

			<u>D</u>
--	--	--	----------

[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]

BLANK PAGE

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

Paul

The molecules now fit into the active sites of the enzymes more easily.



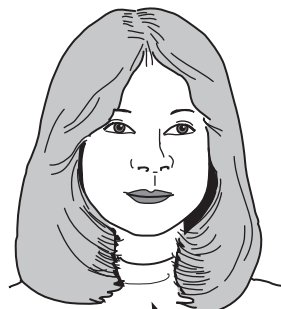
Jane

The collision rate between the enzymes and molecules is higher.



Scott

The enzyme's reaction rate increases.



Sharon

The shape of the enzyme's active site is changed.

His friends give either right or wrong answers.

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

gives a <u>RIGHT</u> answer	gives a <u>WRONG</u> answer

[2]

[Total: 6]

3 Some patients suffer from kidney failure.

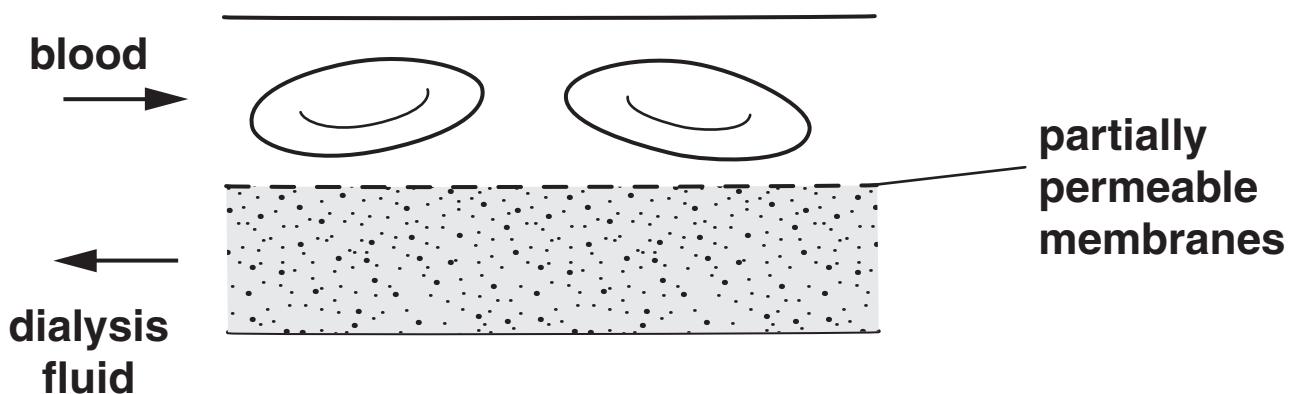
A dialysis machine may be needed to take over the work of the failing kidney.

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]

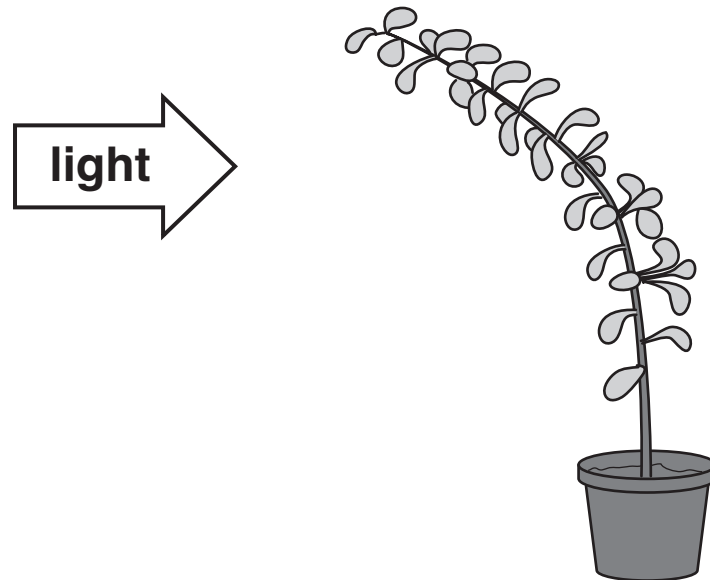
[Total: 5]

BLANK PAGE

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]

BLANK PAGE

- 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]

BLANK PAGE

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.

	<u>TRUE</u>	<u>FALSE</u>
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.**

<u>D</u>				
----------	--	--	--	--

[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



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1PB.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.