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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

A222/02

**TWENTY FIRST CENTURY SCIENCE
BIOLOGY A**

Unit 2: Modules B4 B5 B6 (Higher Tier)

TUESDAY 31 JANUARY 2012: Morning

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, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **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).**

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

Please turn over for Question 1

Answer ALL the questions.

1 Ruth wants to find out about osmosis in animal cells.

She already knows that animal cells are surrounded by a partially permeable membrane.

(a) Describe the process of osmosis.

[2]

(b) Ruth puts some animal cells into three different beakers, A, B and C.

The three beakers contain

A pure water

B a salt solution that is the same concentration as the inside of the cells

C a salt solution that is more concentrated than the inside of the cells.

She uses a microscope to look at the cells before and after the experiment.

What will happen to the cells?

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

		CELLS BURST	CELLS SHRINK	CELLS STAY THE SAME
A	cells in pure water			
B	cells in a salt solution that is the same concentration as the inside of the cells			
C	cells in a salt solution that is more concentrated than the inside of the cells			

[2]

[Total: 4]

2 This question is about enzymes.

(a) Complete the sentence about enzymes.

Use words from this list.

genes

lipids

proteins

slow down

stop

speed up

sugars

start

Enzymes are _____

that _____ chemical reactions.

[2]

(b) Enzymes are used in biological washing powders.



The temperature of the water in a washing machine is important when using a biological washing powder.

Why is this?

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

Enzyme activity is not affected by cold temperatures.

Enzymes can become denatured at very high temperatures.

Enzymes need a specific constant temperature to work at their optimum.

Very high temperatures increase the reaction rate between enzymes and other molecules.

Small increases in temperature are not linked to the frequency of collisions between an enzyme and other molecules.

[2]

(c) One type of enzyme in the washing powder can only break down proteins and not other molecules.

Explain why.

[3]

[Total: 7]

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3 Read this information about the use of an artificial kidney machine.

Mr Armit has kidney problems.

A nurse uses an artificial kidney machine to treat Mr Armit.

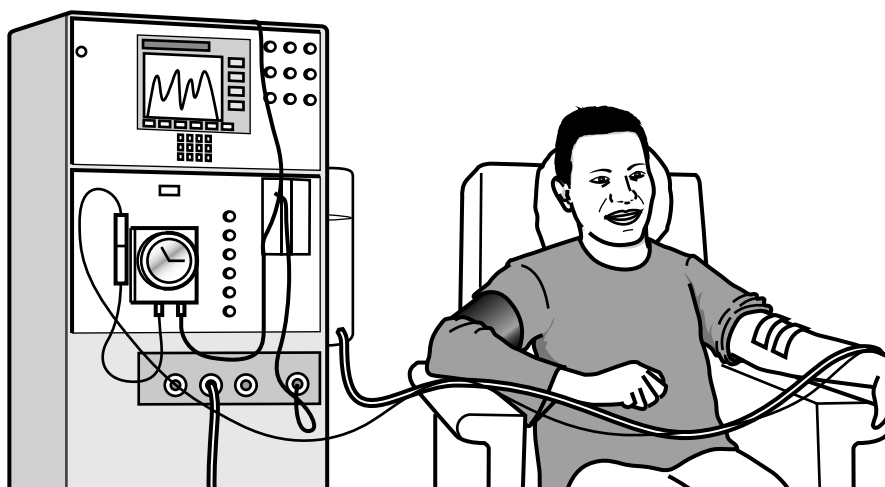
This carries out the functions of the kidney, including removing waste molecules from the blood.

Mr Armit's blood flows through the machine on one side of a membrane. On the other side of the membrane is a fluid. This is called DIALYSIS FLUID.

Smaller molecules, including glucose, water, salt and urea, can cross the membrane between the patient's blood and the dialysis fluid. They move by the process of DIFFUSION.

Larger molecules, such as protein, cannot cross the membrane.

After passing through the machine, treated blood returns to Mr Armit.



(a) What type of membrane is used?

_____ [1]

(b) The dialysis fluid is continuously drained out of the kidney machine and replaced with fresh dialysis fluid during the period of treatment.

(i) Why is this process carried out?

_____ [2]

- (ii) Suggest what the DIALYSIS FLUID will contain going into, and coming out of, the artificial kidney machine.

Use your knowledge of diffusion and the functions of the kidney, together with the information provided.

Put ticks (✓) in the correct boxes to complete the table.

You should use ONE tick in each row. One row has been done for you.

	only going in	only coming out	both in and out	neither in nor out
water	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
glucose	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
protein	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
salt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
urea [3]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[Total: 6]

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4 A plant scientist is studying an apple tree.



(a) The scientist collects a seed from the apple tree and grows a seedling.

All of the cells in the seedling are produced from the same fertilised cell.

The cells specialise to do certain jobs.

(i) Which statements about cell specialisation are correct?

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

Each specialised cell only produces the specific proteins it needs.

Many of the genes in a specialised cell are not active.

New genes are produced during cell specialisation.

Some of the genes are lost as each cell becomes more specialised.

Specialised cells in the same seedling contain different genes.

The specialised cells only contain half the number of genes needed.

[2]

(ii) Complete the sentences about the development of cells.

Use words from this list.

alive

grow

respire

specialised

unspecialised

Unlike animal cells, some plant cells remain

_____ and can develop into any type of plant cell.

Unlike animals, most plants continue to

_____ throughout their lives.

[1]

(b) The seedling is kept on a bench near a window.

The seedling grows towards the light.

(i) What happens to the auxin in the shoot tip of the seedling?

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

THE AUXIN ...

... breaks down in the dark.

... is evenly distributed across the shoot tip.

... is no longer produced by the shoot tip.

... collects on the side of the shoot tip in the shade.

[1]

(ii) Describe how the process of growing towards light is an advantage to the plant.

[3]

[Total: 7]

5 A gene is made from DNA.

DNA contains four types of base, A, T, C and G.

The base sequence codes for the production of a specific protein.

A sequence of three bases is called a triplet. Each triplet is a code for an amino acid found in the protein.

The table shows how the base triplets code for four different amino acids, numbered 1, 2, 3 and 4.

amino acid found in the protein	first base in the triplet	second base in the triplet	third base in the triplet
1	A	T	G
2	C	C	A
3	T	A	G
4	T	T	A

- (a) One gene contains the sequence of bases shown in the diagram.

C C A T T A A T G C C A



direction of base sequence (from left to right)

What will be the order of amino acids in the protein produced?

Write the amino acid number, **1, 2, 3** or **4**, in each box.

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

[1]

(b) If the sequence of bases is read in the opposite direction (from right to left), how many of the four different amino acids will appear in this protein?

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

0

1

2

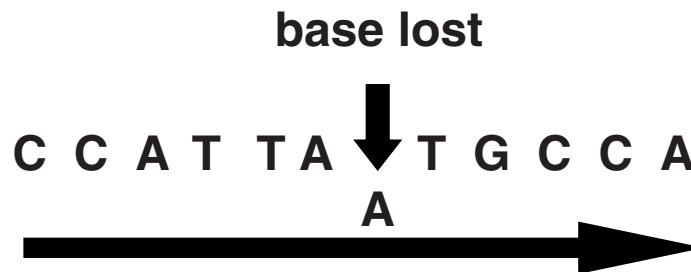
3

4

[1]

(c) Mutations can occur at any point along the sequence of DNA bases.

For example, the base A could be lost from the sequence.



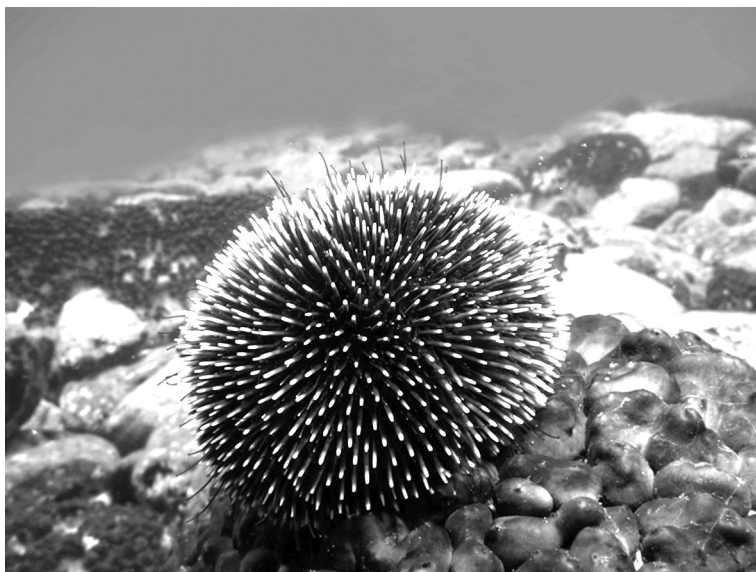
direction of base sequence (from left to right)

Which amino acids will remain in the protein?

_____ [1]

[Total: 3]

6 Sea urchins have been used for many years to study the GROWTH and DIVISION of cells.



Growth and cell division are parts of the cell cycle.

Describe the main processes of the CELL CYCLE.

Include in your answer ideas about

- **cell growth**
- **mitosis.**

[4]

[Total: 4]

7 Humans have large brains containing billions of neurons.

(a) Complete the sentences about the development of complex behaviour in humans.

Use words from this list.

brain

forgetting

impulses

learning

patterns

peripheral nervous system

a reflex

repetition

sensors

spinal cord

During development, the interaction between humans and their environment results in neuron pathways forming in the

_____ .

In humans, _____ is the result of experience where certain neuron pathways become more likely to transmit

_____ than others.

Some skills are learnt through

_____ . [2]

(b) Some actions can be learned.

Which of these actions are learned?

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

Jumping in response to a sudden, loud noise.

Maintaining a constant body temperature.

Quickly moving your hand from a sharp object.

Reducing the size of the pupils in the eyes.

Remembering a telephone number.

Speaking a language.

[1]

[Total: 3]

8 Synapses allow impulses to be transmitted from one neuron to the next.

(a) A series of steps take place at the synapse between a sensory neuron and a motor neuron.

The list shows some of the steps.

One of the steps is incorrect.

- A Synapse chemicals bind to the receptor molecules.**
- B The impulse travels along the sensory neuron.**
- C Synapse chemicals are reabsorbed back into the motor neuron.**
- D Synapse chemicals diffuse across the synapse.**
- E Synapse chemicals are released.**
- F The motor neuron transmits an impulse.**

Write the correct letter in each box to show the order of the steps at the synapse.

The first box has been completed for you.

Do not include the incorrect step.

B				
----------	--	--	--	--

[3]

(b) Some drugs block the receptor molecules.

How will this affect the function of the synapse?

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

The secretion of synapse chemicals will stop.

The motor neuron may stop transmitting impulses.

The synapse chemicals will have a changed shape.

The synapse chemical will not bind to the receptor molecules.

The concentration of synapse chemical in the gap between the two neurons will suddenly drop.

[2]

[Total: 5]

9 Dawn bakes a cake.



Dawn removes the cake from the oven.

The cake tray is very hot.

Dawn burns her fingers.

She drops the tray.

(a) Complete the sentences about Dawn's reaction.

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

This type of reflex is

simple	
complex	
conditioned	

The response is

voluntary	
involuntary	
learned	

[1]

(b) It is possible for Dawn to keep hold of the hot tray.

A number of steps will need to take place in her nervous system.

- A The muscles continue to contract and the tray is not dropped.**
- B Receptors are stimulated.**
- C Impulses pass along the spinal cord to the brain.**
- D Motor neurons carry impulses.**
- E A special neuron carries an impulse from the brain to the motor neurons.**
- F Sensory neurons carry impulses to the spinal cord.**

Put the correct letter, B, C, D, E or F, in each box.

The last box has been done for you.

					A
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[2]

[Total: 3]

END OF QUESTION PAPER

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