THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

BIOLOGY

F214

Communication, Homeostasis and Energy

OCE/23852

Candidates answer on the Question Paper

OCR Supplied Materials:
- Insert (inserted)

Other Materials Required:
- Electronic calculator
- Ruler (cm/mm)

Monday 25 January 2010
Afternoon

Duration: 1 hour

F214

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 **(a)** Excretion and secretion are two processes that take place in the body of a mammal.

Complete the table below to compare the processes of excretion and secretion.

	excretion	secretion
one difference		
one example of a product		
one similarity		

[3]

(b) Aerobic respiration may be summarised by the following equation:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$

Although carbon dioxide and water are products of aerobic respiration, this equation makes the process seem too simple.

State **and** explain **one** way in which this equation makes it seem too simple.

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..... **[2]**

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(c) Over 2.3 million people in the UK are known to have diabetes. It is also estimated that 0.5 million more people have the condition but are unaware of it.

(i) Explain how **Type 1** diabetes is caused.

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..... **[2]**

(ii) Describe **three** factors that increase a person's risk of developing **Type 2** diabetes.

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..... **[3]**

[Total: 10]

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2 **(a)** Fig. 2.1 represents the first stage of respiration.

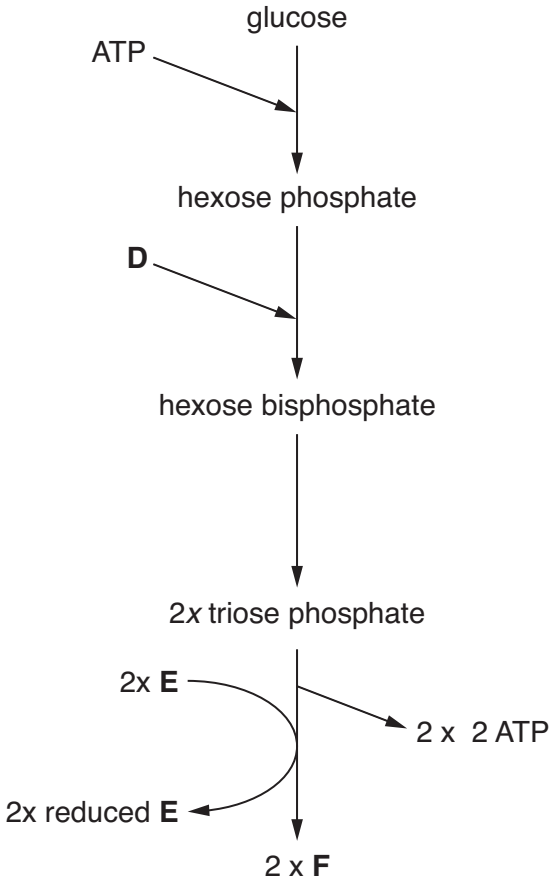


Fig. 2.1

(i) Name the stage represented by Fig. 2.1.

..... **[1]**

(ii) State precisely where this stage takes place in the cell.

..... **[1]**

(iii) Identify the compounds **D**, **E** and **F**.

D .....

E .....

F ..... **[3]**

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(b) Compound **F** does not proceed to the link reaction in **anaerobic** conditions.

Describe the fate of compound **F** during anaerobic respiration in an animal cell **and** explain the importance of this reaction.

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..... **[5]**

TURN OVER FOR QUESTION 2(c)

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(c) Fig. 2.2 is a drawing of a common seal, *Phoca vitulina*, an aquatic mammal.

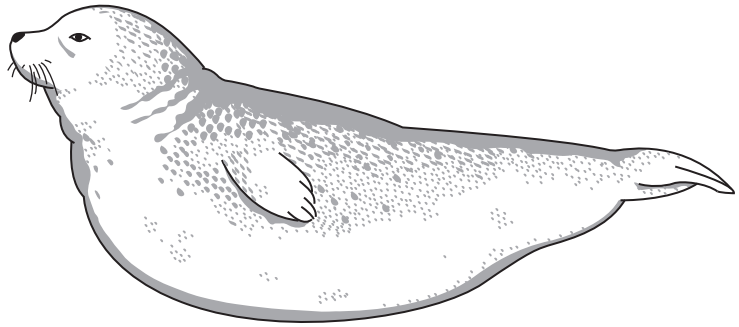


Fig. 2.2

The seal comes to the surface of the water to obtain air and it can then stay underwater for over 20 minutes.

Fig. 2.3 shows a seal at the surface of the water and Fig. 2.4 shows the same animal then submerging again.

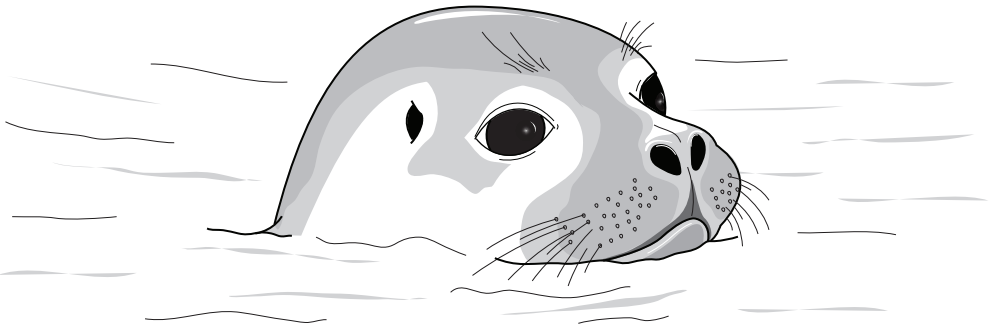


Fig. 2.3

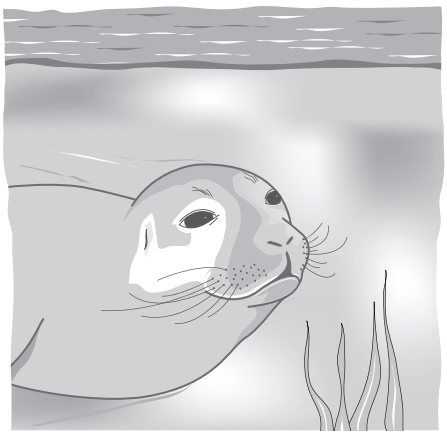


Fig. 2.4

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Suggest how the seal is adapted to respire for such a long time underwater.

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..... **[3]**

[Total: 13]

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3 **(a)** Fig. 3.1 represents part of the axon of a neurone.

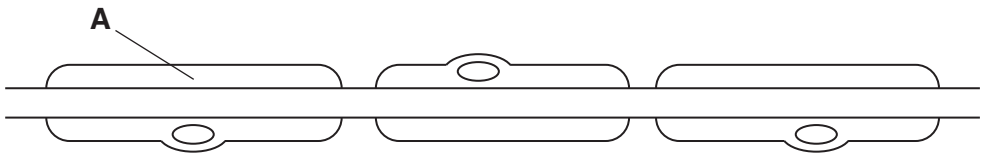


Fig. 3.1

Describe the **structure** of the feature labelled **A**.

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..... **[2]**

Table 3.1 shows details of the diameter and speed of conduction of impulse along the neurones of different animal taxa.

Table 3.1

type of neurone	axon diameter (μm)	speed of conduction ($m\,s^{-1}$)	animal taxon
myelinated	4	25	mammal
myelinated	10	30	amphibian
myelinated	14	35	amphibian
unmyelinated	15	3	mammal
unmyelinated	1000	30	mollusc

(b) Using **only the data in Table 3.1**, describe the effect of each of the following on the speed of conduction:

(i) myelination,

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..... **[2]**

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(ii) axon diameter.

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..... **[2]**

(c) Temperature also affects the speed of conduction of a nerve impulse.

(i) Suggest why an increase in temperature results in an increase in the speed of conduction.

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..... **[1]**

(ii) As the temperature continues to increase, it reaches a point at which the conduction of the impulse ceases. Suggest why.

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..... **[1]**

(d) Outline the sequence of events following the arrival of an action potential at the synaptic knob until the acetylcholine has been released into the synapse.



In your answer, you should use appropriate technical terms, spelt correctly.

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..... **[4]**

[Total: 12]

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4 **(a)** Blood enters the kidneys through the renal arteries. The human kidneys process 1200 cm^3 of blood every minute. This 1200 cm^3 of blood contains 700 cm^3 of plasma. As this blood passes through a glomerulus, 125 cm^3 of fluid passes into the renal tubule.

(i) Name the process by which the fluid passes from the glomerulus into the renal tubule.

..... **[1]**

(ii) Calculate the percentage of plasma that passes into the renal tubule.

Show your working and **give your answer to one decimal place**.

Answer = ... % **[2]**

(b) Fig. 4.1, **on the insert**, is an electronmicrograph of a transverse section of part of a proximal convoluted tubule.

(i) Name the tissue that lines the proximal convoluted tubule.

..... **[1]**

(ii) Name the structures indicated by **X**.

..... **[1]**

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(iii) Table 4.1 shows the approximate concentration of some of the substances in the blood plasma, the glomerular filtrate and the urine leaving the collecting duct.

Table 4.1

substance	concentration in blood plasma ($g\,dm^{-3}$)	concentration in glomerular filtrate ($g\,dm^{-3}$)	concentration in urine leaving collecting duct ($g\,dm^{-3}$)
amino acids	0.50	0.50	0.00
glucose	1.00	1.00	0.00
inorganic ions	7.30	7.30	15.60
nitrogenous waste (not including urea)	0.03	0.03	0.28
protein	80.00	0.00	0.00
urea	0.30	0.30	21.00

Activity in the proximal convoluted tubule accounts for some of the changes observed between the glomerular filtrate and the urine.

Refer to Table 4.1 to explain how these observed changes in concentration are brought about by the **proximal convoluted tubule**.

In your answer, you should use appropriate technical terms, spelt correctly.

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..... **[4]**

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(c) Renal dialysis may be necessary when the kidneys cease functioning or fail to work effectively.

Fig. 4.2 outlines the procedure of haemodialysis, a type of renal dialysis.

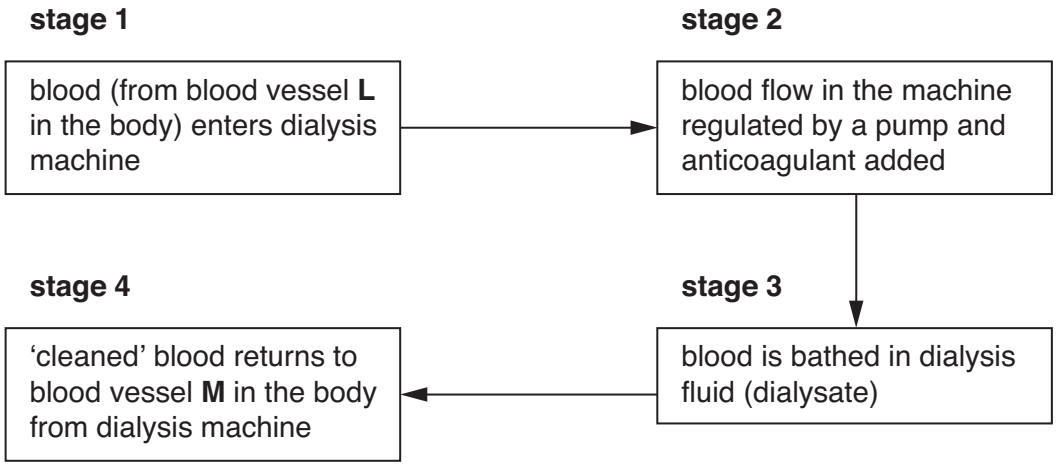


Fig. 4.2

Fig. 4.3 shows further detail of how **stage 3** is achieved.

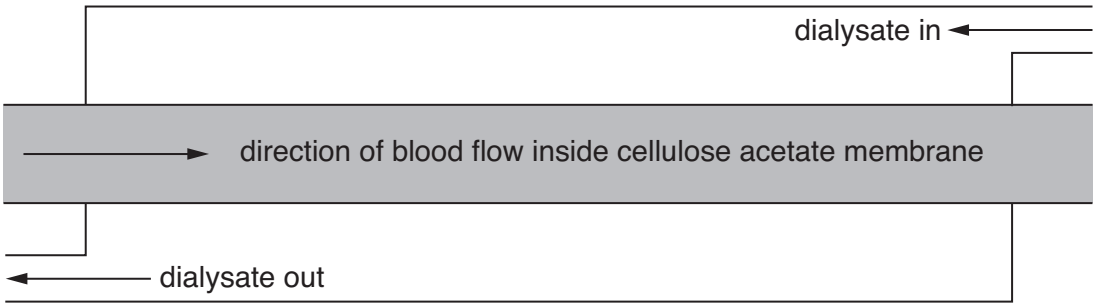


Fig. 4.3

(i) State the **types** of blood vessel represented by **L** and **M** in Fig. 4.2.

L .....

M ..... **[1]**

(ii) Suggest why it is necessary to add an anticoagulant to the blood in **stage 2**.

.....

..... **[1]**

(iii) Suggest why **no** anticoagulant is added to the blood towards the end of a dialysis session.

.....

..... **[1]**

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(iv) State the process by which molecules and ions, **other than water**, will move from the blood into the dialysate.

..... **[1]**

(v) Suggest why the direction of flow of the blood and the dialysate is as it is shown in Fig. 4.3.

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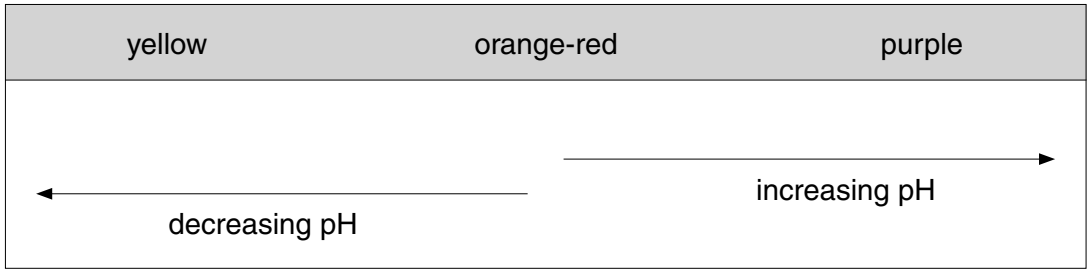
..... **[1]**

[Total: 14]

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5 **(a)** An experiment was carried out into the effect of different wavelengths of light on the rate of photosynthesis.

Four sealed test-tubes were set up. Each one contained three leaf discs from the same plant suspended above hydrogencarbonate indicator solution. This solution changes colour at different pH values, as shown below.



At the start of the experiment, the contents of all four tubes were orange-red.

Each tube was illuminated by a lamp with a coloured filter in front of it. The tubes were illuminated for the same length of time. The colour changes were noted and the results are shown in Table 5.1.

Table 5.1

colour of filter	final colour of hydrogencarbonate indicator
colourless	purple
blue	purple
green	orange-yellow
red	red

A fifth tube was set up in the same way as the other tubes. This tube was then covered in black paper before being illuminated for the same length of time. The final colour of the hydrogencarbonate indicator in this tube was yellow.

(i) State the purpose of the tube covered with black paper.

.....

..... **[1]**

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(ii) State **two** precautions that need to be taken when designing and carrying out this experiment to make sure the results allow valid conclusions to be drawn. Explain the need for each precaution.

precaution 1 .....

explanation .....

.....

precaution 2 .....

explanation .....

..... **[2]**

(iii) Name the pigment at the reaction centre of photosystems I and II.

..... **[1]**

(iv) Explain the change observed in the tube exposed to green light.

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..... **[3]**

TURN OVER FOR QUESTION 5(b)

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(b) Market gardeners often grow plants in glasshouses in order to get maximum production. Light conditions can be controlled along with a number of other factors.

How can factors **other than light conditions** be controlled to increase the rate of photosynthesis and maximise production?

In your answer you should explain why the rate of photosynthesis is affected by the controlled factors you have discussed.

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..... **[4]**

[Total: 11]

END OF QUESTION PAPER

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