Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED GCE

F214

BIOLOGY

Communication, Homeostasis and Energy

MONDAY 25 JANUARY 2010: Afternoon
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper

OCR SUPPLIED MATERIALS:

Insert (inserted)

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SW) MEP10089 23329/1

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.**

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.**

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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, the equation is an over-simplification of the process.

State <u>AND</u> explain <u>ONE</u> way in which this equation is an over-simplification.

_____

_____

_____

_____ **[2]**

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

(i) Explain how <u>TYPE 1</u> diabetes is caused.

_____

_____

_____

_____ **[2]**

(ii) Describe <u>THREE</u> factors that increase a person's risk of developing <u>TYPE 2</u> diabetes.

_____

_____

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_____ **[3]**

[Total: 10]

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

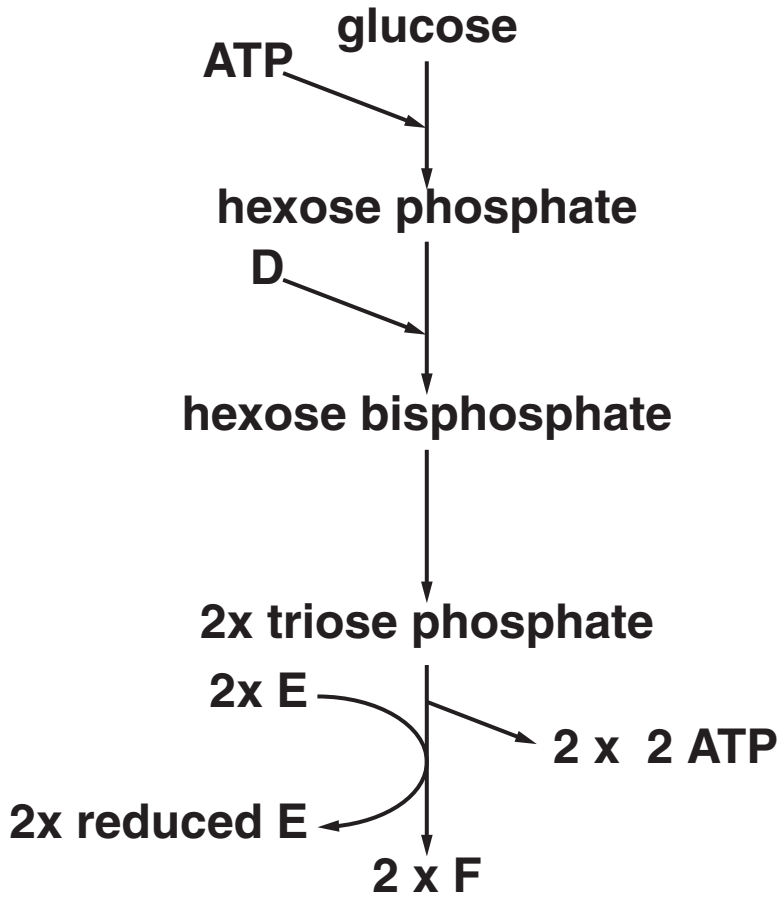

Fig. 2.1

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

_____ [1]

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

_____ [1]

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

D _____

E _____

F _____ [3]

(b) In ANAEROBIC conditions, compound F does not proceed to the link reaction.

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)

(c) The common seal, Phoca vitulina, is an aquatic mammal.

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

Fig. 2.2 shows a seal at the surface of the water and Fig. 2.3 shows the same animal then submerging again.

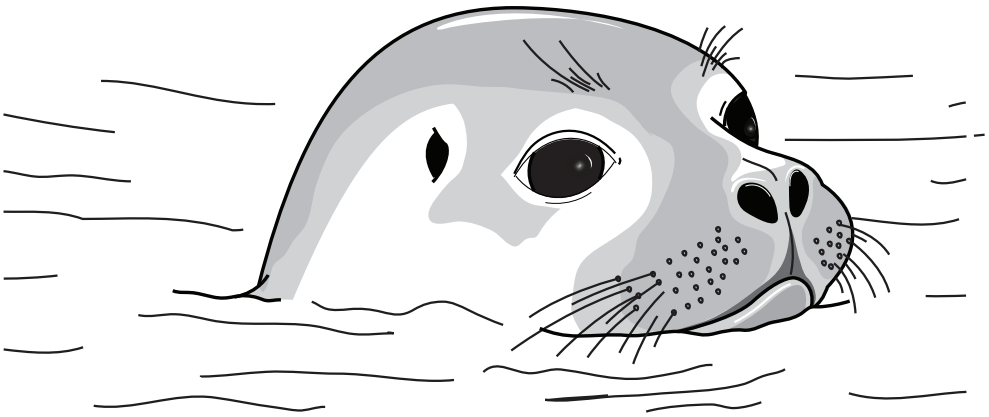
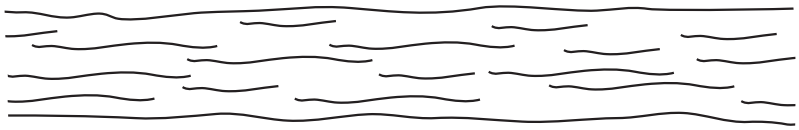


Fig. 2.2



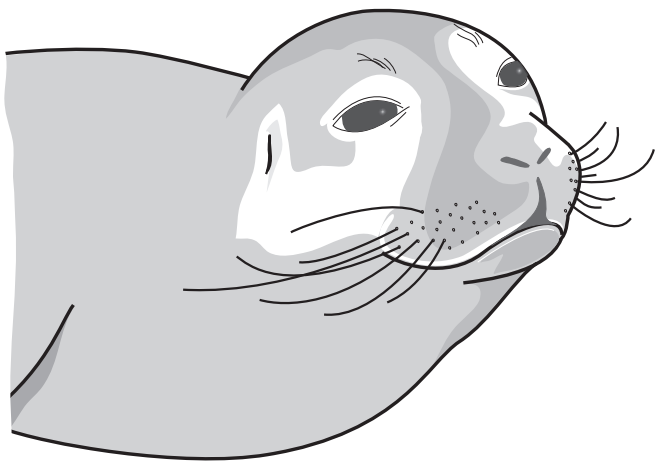


Fig. 2.3

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

_____

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_____

_____ **[3]**

[Total: 13]

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

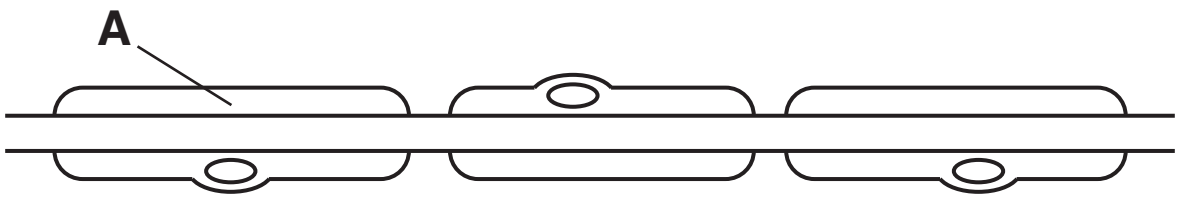


Fig. 3.1

Describe the <u>STRUCTURE</u> of the feature labelled <u>A</u>.

_____

_____

_____

_____ [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 <u>ONLY THE DATA IN TABLE 3.1</u>, describe the effect of each of the following on the speed of conduction:

(i) myelination,

_____

_____

_____

_____

_____ **[2]**

(ii) axon diameter.

_____

_____

_____

_____

_____ **[2]**

(c) The speed of conduction of a nerve impulse is also affected by temperature.

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

_____

_____

_____ **[1]**

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

_____

_____

_____ **[1]**

(d) Outline the 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.

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

[Total: 12]

4 (a) Blood enters the kidneys through the renal arteries and 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 <u>GIVE YOUR ANSWER TO ONE DECIMAL PLACE.</u>

Answer = _____ **% [2]**

(b) Fig. 4.1, <u>ON THE INSERT</u>, 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. These structures increase the surface area of the lining of the proximal convoluted tubule.

_____ **[1]**

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

Some of the changes observed between the glomerular filtrate and the urine are as a result of activity in the proximal convoluted tubule.

With reference to Table 4.1, 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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

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

(c) When the kidneys cease functioning or fail to work effectively, renal dialysis may be necessary.

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

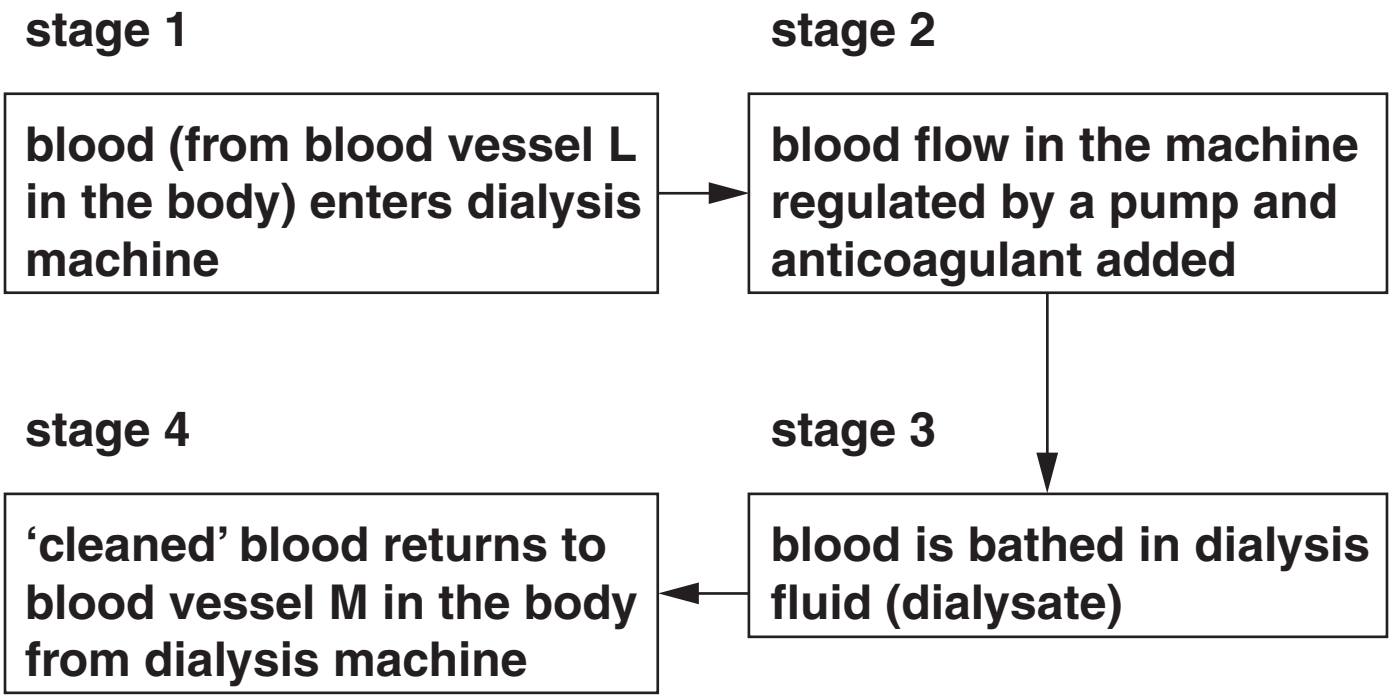


Fig. 4.2

Fig. 4.3 shows further detail of how <u>STAGE 3</u> is achieved.

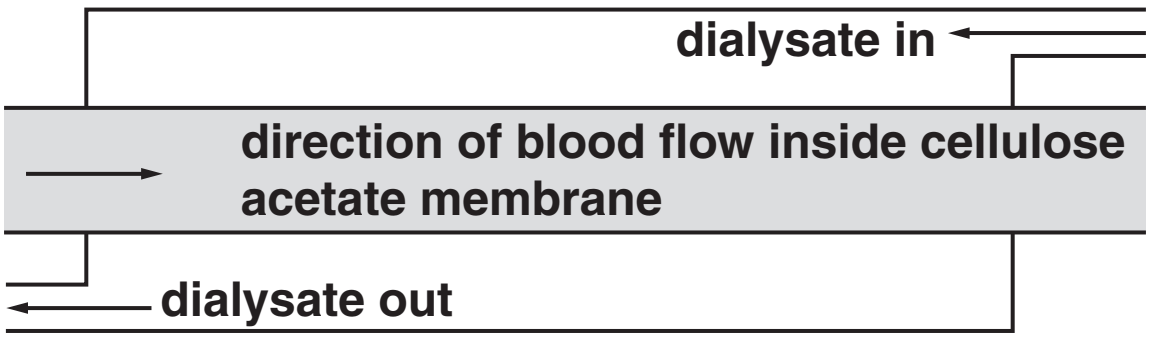


Fig. 4.3

(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]

(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 shown in Fig. 4.3.

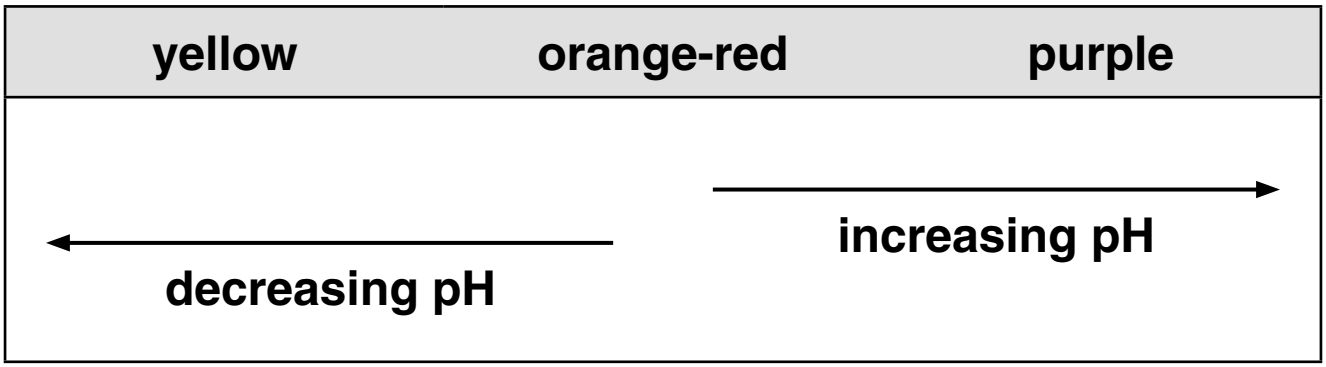
_____

_____ [1]

[Total: 14]

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 containing 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]**

(ii) State <u>TWO</u> precautions that need to be taken when designing and carrying out this experiment in order to obtain results from which valid conclusions can 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]**

(b) In order to maximise production, market gardeners often grow plants in glasshouses.
Light conditions can be controlled along with a number of other factors.

How can factors <u>OTHER THAN LIGHT CONDITIONS</u> 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]

<u>END OF QUESTION PAPER</u>

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