Surname	Centre Number	Candidate Number
Other Names		2

GCE A level

1074/02

HUMAN BIOLOGY – HB4

P.M. FRIDAY, 10 January 2014

1 hour 45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**14**	
2.	**10**	
3.	**13**	
4.	**15**	
5.	**11**	
6.	**7**	
7.	**10**	
Total	**80**	

1074
020001

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.
The quality of written communication will affect the awarding of marks.

Examiner only

1. *(a)* Kidneys can become damaged by injury or disease.

(i) Give **four** possible effects of kidney failure. [4]

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Suggest why heart disease or the loss of a large volume of blood can lead to kidney failure. [2]

.....

.....

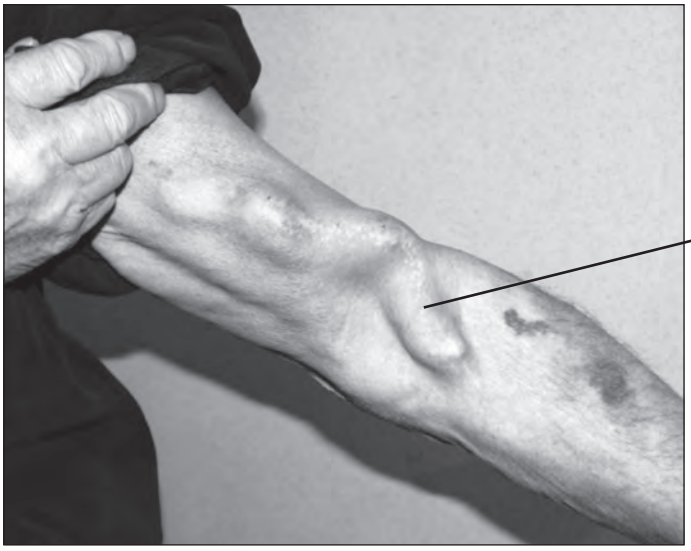
.....

.....

Examiner only

Patients with kidney failure can be treated using dialysis.

During dialysis blood can be taken from an artery, large vein or a fistula which is created by surgically connecting an artery directly to a vein. The picture below shows the appearance of such a fistula.



(b) Explain the appearance of the vein shown in the photograph above which forms the fistula. [2]

.....

.....

.....

.....

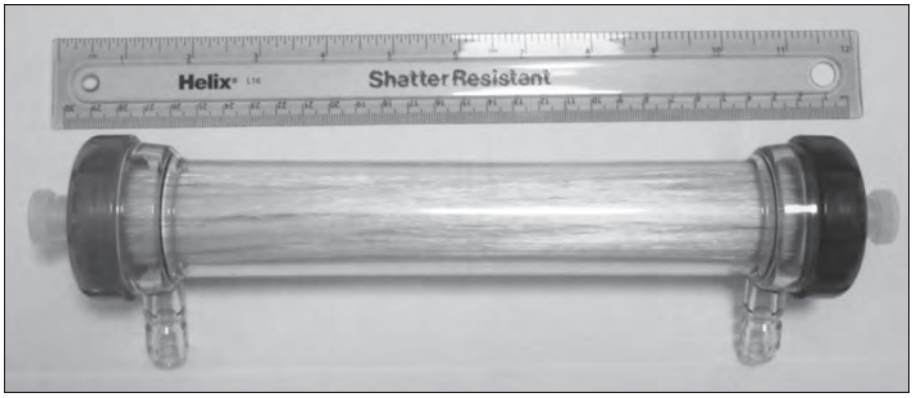
1074 020003

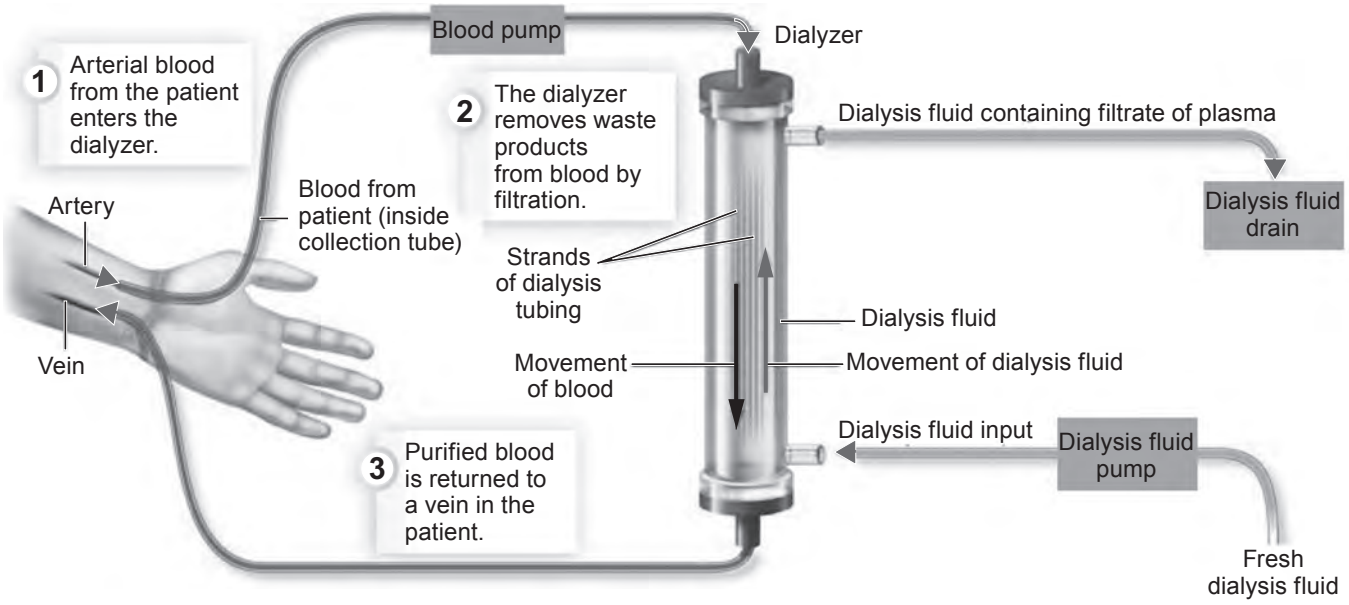
Turn over.

Examiner only

(c) The blood from the patient is passed through a haemodialysis tube. The tube is made from thousands of very small hollow fibres each made from a partially permeable membrane with pores of various sizes. The partially permeable membrane blocks the passage of cells, platelets and large proteins but will allow solute molecules through. The dialysis fluid lacks substances such as urea, contains the same concentration of ions such as potassium and calcium and has the same water potential as blood from a person who has functional kidneys.

The following show a picture of a haemodialysis tube and a diagram representing how it is used.





(i) State why the dialysis fluid has to be constantly replaced. [1]

.....

.....

Examiner only

(ii) Explain why the dialysis fluid moves in the opposite direction to the flow of blood. [1]

.....

.....

(iii) Explain why during some dialysis treatments calcium ions diffuse from the patient's blood into the dialysis fluid but during others they diffuse from the dialysis fluid into the patient's blood. [1]

.....

.....

(d) Transplanted kidneys are more efficient than dialysis but there are some issues concerning the technique.

Suggest **two** reasons against the use of kidney transplants. [2]

.....

.....

.....

.....

.....

.....

(e) The kidney also acts as an endocrine organ. What is meant by the term *endocrine organ*? [1]

.....

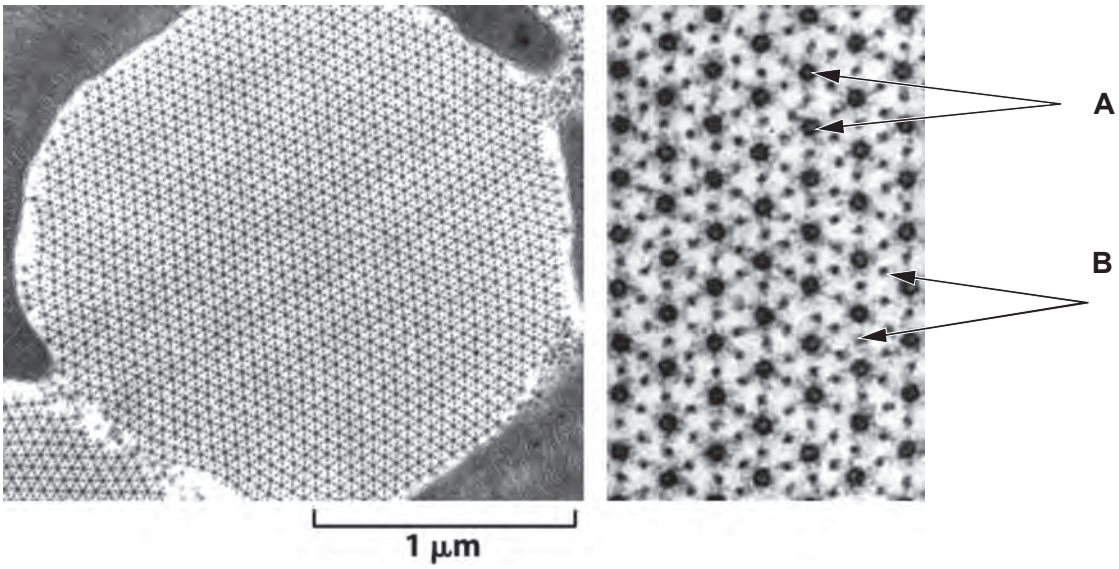
14

1074 020005

Turn over.

Examiner only

2. The electron micrograph shows a cross section of muscle.



(a) Name the molecules labelled **A** and **B** in the micrograph above. [2]

A .....

B .....

(b) Draw a labelled diagram in the space below showing the structure of **one** sarcomere. [4]

Examiner only

(c) Describe the function of calcium ions in

(i) the transmission of a nerve impulse across a neuro muscular synapse; [2]

.....

.....

.....

(ii) the contraction of the muscle. [2]

.....

.....

.....

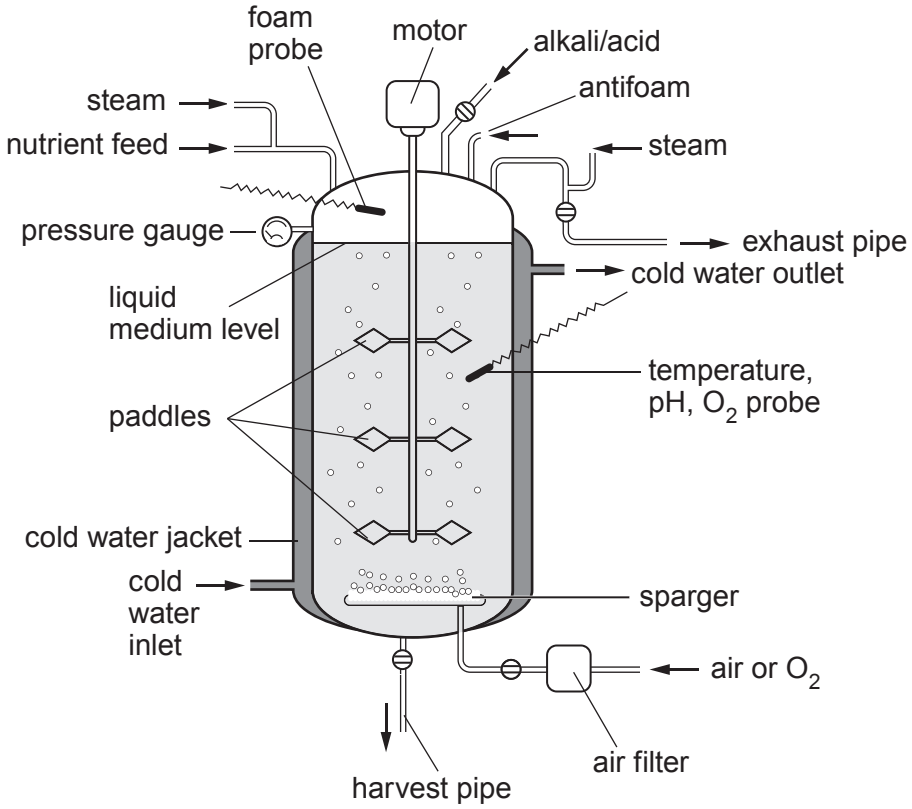
10

1074
020007

Turn over.

Examiner only

3. *(a)* The diagram below shows an aerobic fermenter used for the production of the antibiotic Penicillin.



(i) Give **two** advantages of using microorganisms in industrial fermentation. [2]

.....

.....

(ii) At the end of the fermentation process the penicillin is extracted, the fermenter emptied and the procedure is repeated. What is the general name given to this method of fermentation? [1]

.....

(iii) State **three** ways by which the risk of contamination of the culture is reduced. [2]

.....

.....

.....

.....

Examiner only

(iv) Suggest **two** reasons why it is necessary to reduce contamination. [2]

.....

.....

(v) Explain why it is necessary to circulate cold water through the outer jacket. [2]

.....

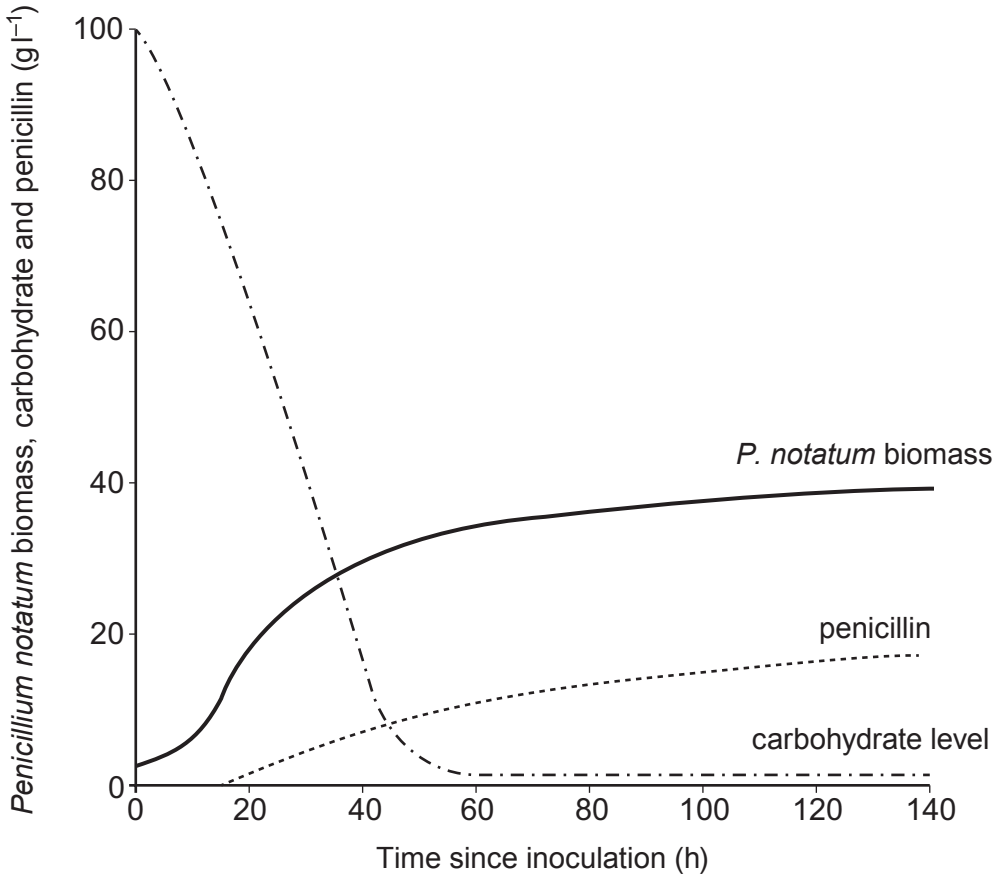
.....

.....

Turn over.

Examiner only

(b) The graph below shows the penicillin production, carbohydrate levels and the biomass of the fungus *Penicillium notatum.*



(i) Describe the relationship between the *P. notatum* biomass, carbohydrate levels and production of penicillin. [2]

.....

.....

.....

(ii) Suggest the benefit to the fungus *P. notatum* of producing an antibiotic. [2]

.....

.....

.....

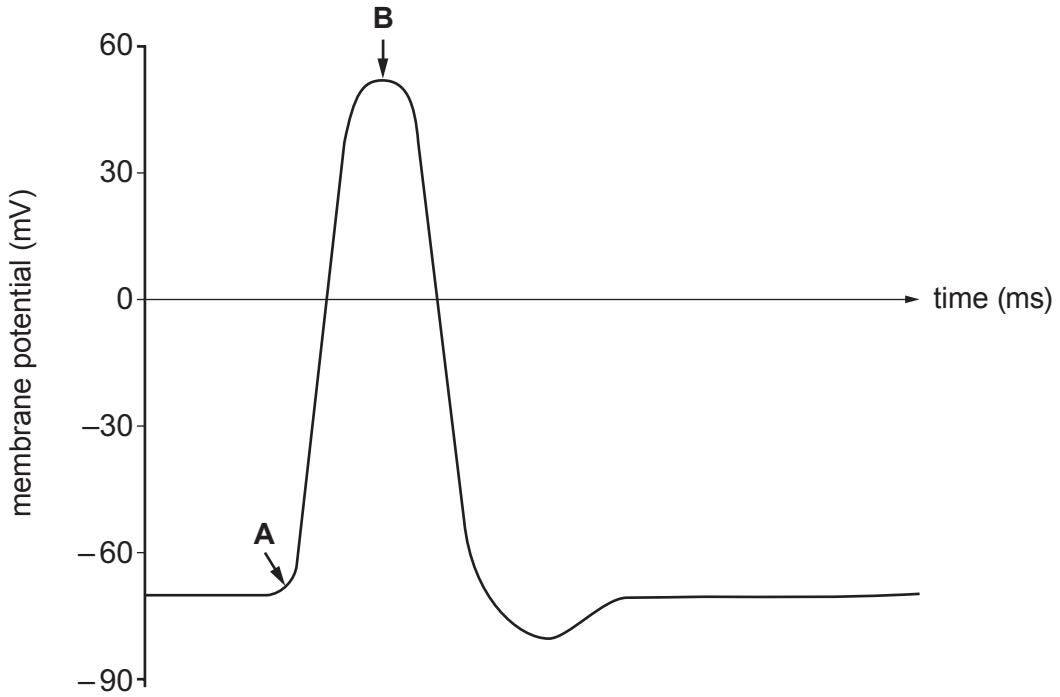
.....

13

BLANK PAGE

Examiner only

4. The diagram shows the changes in the potential difference across the membrane of a neurone during the passage of an action potential.



(a) Describe how the resting potential is maintained in the neurone. [3]

.....

.....

.....

.....

.....

.....

Examiner only

(b) Describe the changes which are taking place in the membrane at points **A** and **B**. [5]

A .....

.....

.....

.....

B .....

.....

.....

.....

(c) Multiple sclerosis is caused by the immune system destroying the myelin sheath of neurones. Explain why this condition leads to a slowing down of the transmission of a nerve impulse. [3]

.....

.....

.....

.....

.....

.....

Examiner only

(d) Some chemicals such as organophosphorous insecticides increase the activity of the nervous system and others such as Beta-blockers reduce the activity of the nervous system.
Suggest **two** ways in which the chemicals could **increase** the activity of the nervous system and **two** ways in which the activity could be **decreased**. [4]

(i) Increase in activity.

I .....

.....

II .....

.....

(ii) Decrease in activity.

I .....

.....

II .....

.....

15

Examiner only

5. For **each** stage of the respiratory cycle shown in the table below use ticks (✓) to indicate which statements are correct. [11]

	Stage of Respiratory Cycle			
Statement	Glycolysis	Link reaction	Krebs cycle	Oxidative phosphorylation
Substrate level phosphorylation takes place				
NAD is reduced				
FAD is reduced				
Dehydrogenation takes place				
Decarboxylation takes place				
Oxygen is used				
ATP is produced				
Takes place in the cytoplasm				
Takes place in the mitochondrial matrix				
Takes place in the inner mitochondrial membrane				
Coenzyme A is used as an acceptor				

11

Examiner only

6. It has been estimated that in the UK every year 150 000 people suffer from cerebrovascular accident (CVA), commonly known as a stroke.

(a) Describe what causes a CVA and suggest factors which could increase the risk of suffering a CVA. [3]

.....

.....

.....

.....

(b) Give **two** common symptoms which can result from CVA. [2]

.....

.....

.....

(c) Suggest **two** ways of treating a patient suffering from a CVA. [2]

.....

.....

.....

.....

7

Examiner only

7. Answer **one** of the following questions.

Any diagrams included in your answer must be fully annotated.

Either, *(a)* Describe the photolysis of water and the light independent stage of photosynthesis. Explain the importance of these processes for the continued life of humans. [10]

Or *(b)* Describe the role of bacteria in the nitrogen cycle. Explain why humans need a supply of organic nitrogen molecules and suggest how humans can improve the recycling of nitrogen. [10]

Examiner only

Examiner only

END OF PAPER

10