

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
June 2012

Human Biology

HBIO2

Unit 2 Humans – their origins and adaptations

Monday 21 May 2012 1.30 pm to 3.00 pm

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You are expected to use a calculator where appropriate.
- You will be marked on your ability to:
 - use good English
 - organise information clearly
 - use accurate scientific terminology.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	



J U N 1 2 H B I O 2 0 1

WMP/Jun12/HBIO2

HBIO2

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



Answer **all** questions in the spaces provided.

- 1 (a)** Glucose, glycogen and triglyceride are energy sources used by muscles. The table shows some features of these energy sources.

Complete the table by putting a tick where the feature is correct.

Energy source	Feature		
	Monosaccharide	Carbohydrate	Lipid
Glucose			
Glycogen			
Triglyceride			

(3 marks)

- 1 (b)** In muscle cells, ATP is used as the immediate energy source. Give **one** advantage of using ATP as the immediate energy source.

.....

.....

.....

(1 mark)

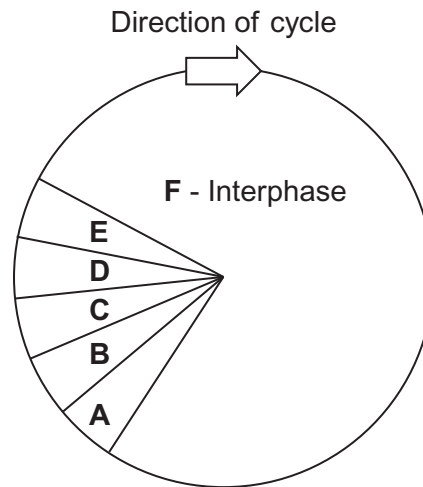
4

Turn over for the next question

Turn over ►



- 2** The diagram shows the events that make up the cell cycle.



- 2 (a)** The letters **A** to **D** represent the stages of mitosis when the nucleus is dividing. Name the stages of mitosis represented by:

A

C

D

(3 marks)

- 2 (b)** Give the letter of the stage in the diagram when the division of cell cytoplasm occurs.

Stage

(1 mark)

- 2 (c)** Explain how the events of the cell cycle help the repair of damaged tissues.

.....

.....

.....

.....

.....

(2 marks)



- 3 There are different types of evidence for the evolutionary relationships between humans and other organisms. Choose the appropriate type of evidence from the list below and complete the table. The type of evidence might be used once, more than once, or not at all.

Type of evidence

- Anatomical
- Behavioural
- Biochemical
- Embryological
- Immunological

Type of evidence	Evidence for evolutionary relationships between humans and other organisms
.....	An antibody from a gorilla binds strongly to a human blood protein.
.....	The sequence of amino acids in the haemoglobin of a chimpanzee is almost identical to the sequence of amino acids in the haemoglobin of a human.
.....	Gorillas and humans both have opposable thumbs.
.....	Chimpanzee babies and human babies are both breastfed by their mothers.
.....	Bony fish, birds and humans all produce a form of the hormone prolactin.

(5 marks)

5

Turn over ►



4 In humans, the nucleus of a skin cell contains 23 pairs of homologous chromosomes.

4 (a) What is meant by *homologous* chromosomes?

.....

.....

.....

(1 mark)

4 (b) Complete the table to show the number of chromosomes and the mass of DNA in some cells produced by humans.

Type of human cell	Number of chromosomes	Mass of DNA / arbitrary units
Skin cell		
Sperm cell (gamete)		
Zygote		12

(2 marks)



4 (c) Damage to DNA can result in the formation of skin tumour cells.

4 (c) (i) Give **two** factors that can damage DNA.

1

2
(2 marks)

4 (c) (ii) Name **one** type of gene that may be damaged to produce a tumour cell.

.....
(1 mark)

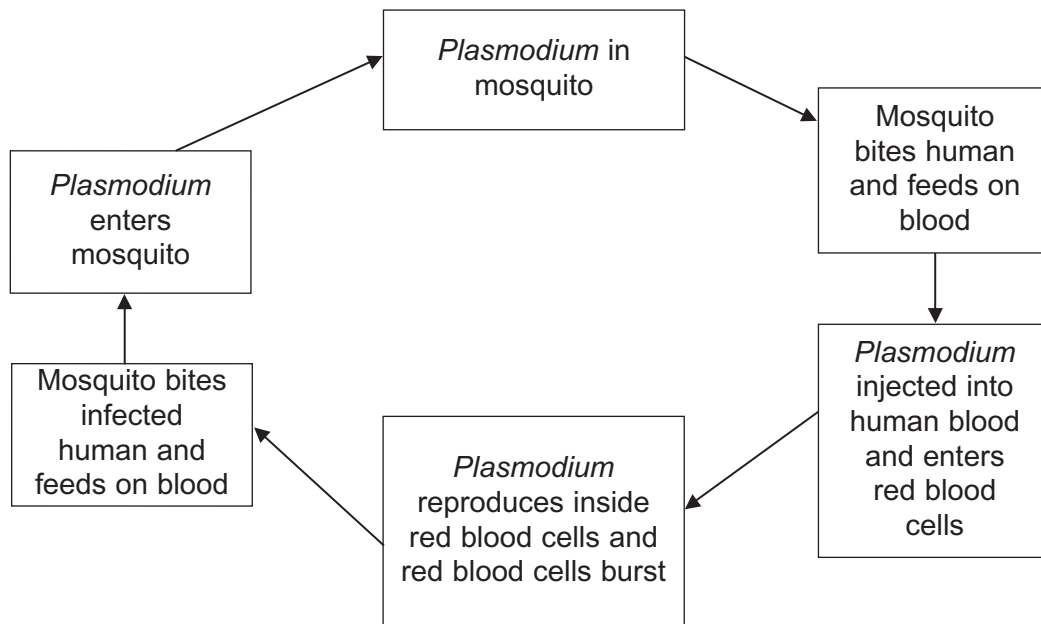
6

Turn over for the next question

Turn over ►



- 5 About 1500 people a year return to the UK from holiday with malaria. Malaria is a disease caused by a parasite called *Plasmodium*. The diagram shows the life cycle of *Plasmodium*.



- 5 (a) Use only information from the diagram to explain why *Plasmodium* is described as a parasite.

.....

.....

.....

.....

.....

(2 marks)



- 5 (b) (i)** *Plasmodium* can survive for long periods of time inside the human body without being attacked by the immune system. Explain why.

.....

.....

.....

.....

.....

(2 marks)

- 5 (b) (ii)** *Plasmodium* reproduces many times inside red blood cells and then the red blood cells burst. Explain how this makes it more likely that *Plasmodium* will complete its life cycle.

.....

.....

.....

.....

.....

(2 marks)

6

Turn over for the next question

Turn over ►



6 *Acetabularia* is a single-celled organism. There are different species of *Acetabularia*.

6 (a) (i) What is a species?

.....

.....

.....

.....

.....

(2 marks)

6 (a) (ii) In the taxonomic hierarchy, to what taxonomic group does *Acetabularia* refer?

.....

(1 mark)

6 (b) Each species of *Acetabularia* can be identified by the shape of a structure called the cap at one end of the cell. The shape of the cap is determined by a protein synthesised in the cytoplasm of the cell.

RNA is involved in the synthesis of the protein that determines the shape of the cap. Describe how RNA is involved in this process.

.....

.....

.....

.....

.....

.....

.....

(3 marks)

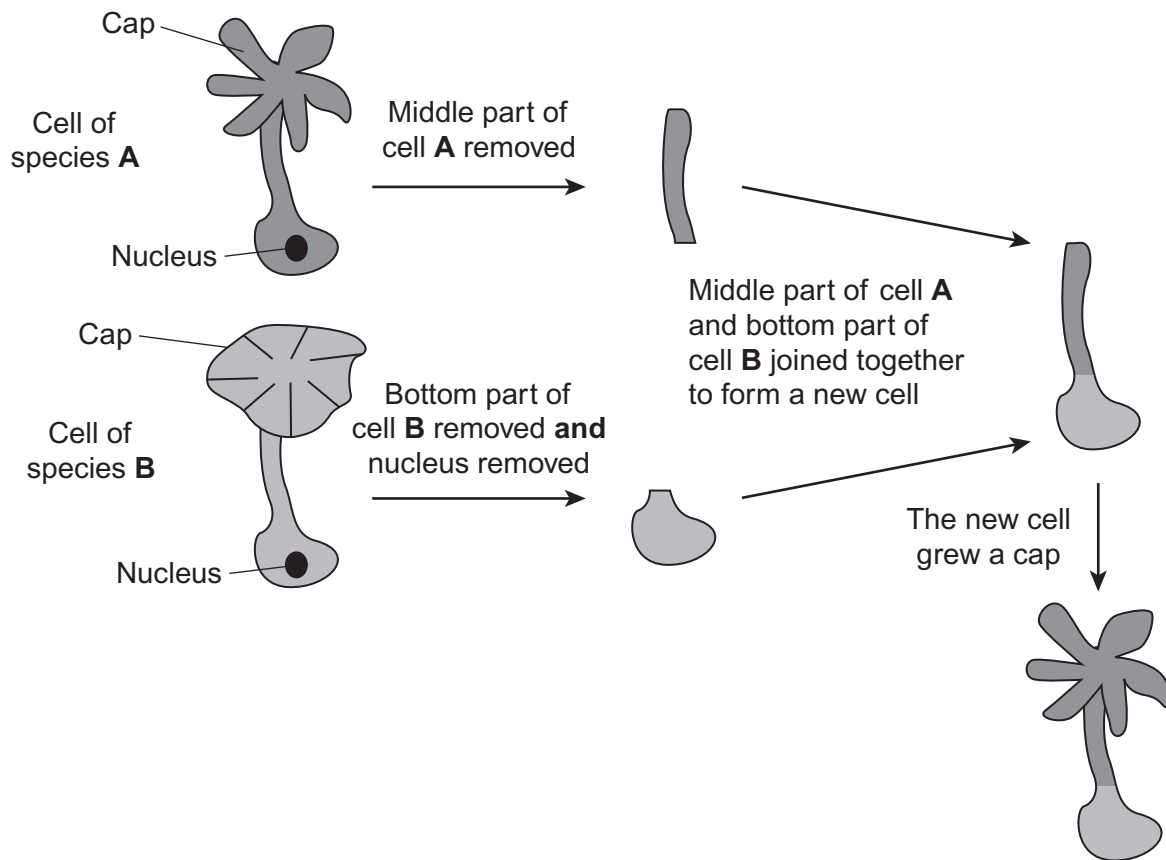
(Extra space)

.....

.....



- 6 (c)** A cell biologist investigated the formation of the cap in *Acetabularia*. She used cells of two species of *Acetabularia*, **A** and **B**. The diagram shows what she did and the result she obtained.



Suggest why the new cell grew the type of cap found in species **A**.

.....

.....

.....

.....

.....

.....

(Extra space)

.....

.....

(3 marks)



7 Evidence from an archaeological site has shown that, about 45 000 years ago, humans ate plants and animals, cooked their food and used stone tools to prepare food.

7 (a) (i) Other than carbon dating, name **one** technique for dating evidence found at an archaeological site.

.....
(1 mark)

7 (a) (ii) Carbon dating can be used to estimate the age of this site from the plant and animal remains found there.
Explain why.

.....
.....
.....
(1 mark)

7 (b) Suggest **two** pieces of evidence from this site that would support the idea that humans cooked their food.

1
.....
2
.....
(2 marks)

7 (c) Suggest **one** piece of evidence that would support the idea that these humans used stone tools to prepare food. Explain your suggestion.

.....
.....
.....
.....
.....
(2 marks)



- 7 (d)** What does the evidence from this archaeological site suggest about the hunter-gatherer way of life?

.....

.....

.....

.....

.....

(2 marks)

8

Turn over for the next question

Turn over ►



8 (a) How is cardiac output calculated?

.....

.....

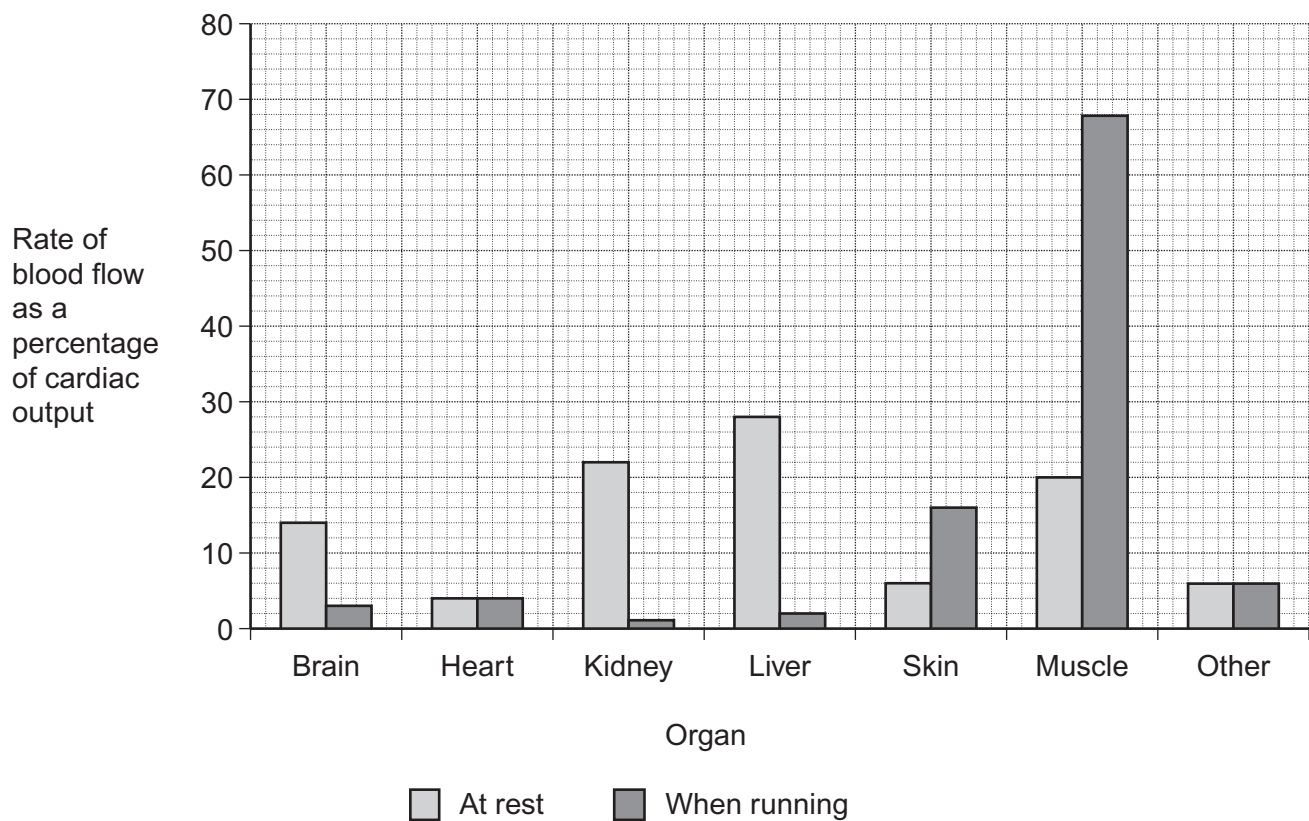
.....

.....

.....

(2 marks)

A sports scientist measured the rate of blood flow to different organs in the body of a long-distance runner. She took measurements when the runner was at rest and when he was running. The graph shows the results.



The cardiac output of the runner:

- at rest was 5 dm³ per minute
- when running was 25 dm³ per minute.



- 8 (b)** Use this information to calculate the volume of blood per minute received by muscle when running. Show your working.

Volume of blood = dm^3 per minute
(2 marks)

- 8 (c)** The sports scientist concluded that the volume of blood reaching the brain of the athlete per minute did not change much when running.
Use information from the graph to explain why she drew this conclusion.

.....

.....

.....

.....

.....

(2 marks)

- 8 (d)** During a long-distance run, the concentration of carbon dioxide in the blood increases. Explain how an increase in the concentration of carbon dioxide causes a change in heart rate.

.....

.....

.....

.....

.....

(2 marks)

8

Turn over ►



9 (a) What is a fossil?

.....

.....

.....

(1 mark)

Scientists can study DNA from Neanderthal fossils. The information they have obtained suggests that some Neanderthals were light-skinned and red-haired.

9 (b) Suggest why studying DNA from fossils allowed the scientists to reach conclusions about skin and hair colour.

.....

.....

.....

.....

.....

(2 marks)

9 (c) Explain **one** possible advantage to the Neanderthals of being light-skinned.

.....

.....

.....

.....

.....

(2 marks)



- 9 (d)** The scientists concluded that red-haired Neanderthals had evolved from dark-haired ancestors.
Suggest how a population of red-haired Neanderthals might have evolved from dark-haired ancestors.

.....

.....

.....

.....

.....

.....

.....

(Extra space) (3 marks)

.....

.....

8

Turn over for the next question

Turn over ►



10 Read the following passage.

Paclitaxel is a drug used to treat tumours. It prevents the formation of a spindle during mitosis.

Until 1993, most paclitaxel was obtained from the bark of Pacific yew trees from wild populations. The trees were usually killed in the process and this caused complaints from conservationists. To provide a sustainable source of the drug, cultivated trees have been used instead. Supplies of paclitaxel extracted from wild and cultivated Pacific yew trees have not been enough for extensive use. 5

Nodulisporium sylviforme is a fungus that is easily grown on agar plates in laboratories. Recently it has been found that this fungus produces a substance that can be used to make paclitaxel and other drugs with a similar chemical structure. 10

Use information from the passage and your own knowledge to answer the questions.

10 (a) Paclitaxel is a drug used to treat tumours. What is a tumour? (line 1).

.....

.....

.....

.....

.....

(2 marks)



- 10 (b)** Paclitaxel prevents the formation of a spindle during mitosis (lines 1 and 2). Describe how the spindle is involved in mitosis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)

(Extra space)

.....

.....

.....

.....

- 10 (c)** Explain how paclitaxel reduces the risk of developing cancer.

.....

.....

.....

.....

.....

(2 marks)

Question 10 continues on the next page

Turn over ►



- 10 (d) (i)** Paclitaxel was first obtained from the bark of Pacific yew trees from wild populations (lines 3 and 4).

Explain what is meant by a '*wild population*' of Pacific yew trees.

.....

.....

.....

.....

.....

(2 marks)

- 10 (d) (ii)** Suggest and explain **one** advantage of using cultivated rather than wild Pacific yew trees as the source of paclitaxel.

.....

.....

.....

.....

.....

(2 marks)

- 10 (d) (iii)** Supplies of paclitaxel extracted from wild and cultivated Pacific yew trees have not been enough for extensive use (lines 6 to 8). Suggest why.

.....

.....

.....

.....

.....

(2 marks)



[illegible]

(5 marks)

[illegible]

20



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Copyright © 2012 AQA and its licensors. All rights reserved.

