

ADVANCED GCE

HUMAN BIOLOGY

Energy, Reproduction and Populations

F224

Candidates answer on the question paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Monday 24 January 2011

Afternoon

Duration: 1 hour




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- 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. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Answer **all** the questions.
- Do **not** write in the bar codes.

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 **60**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 (a) Oogenesis, the production of female gametes, starts in the ovaries of a baby girl before she is born. By birth, she will have produced over one million primary oocytes.

Fig. 1.1 outlines the sequence of events that occur during oogenesis.

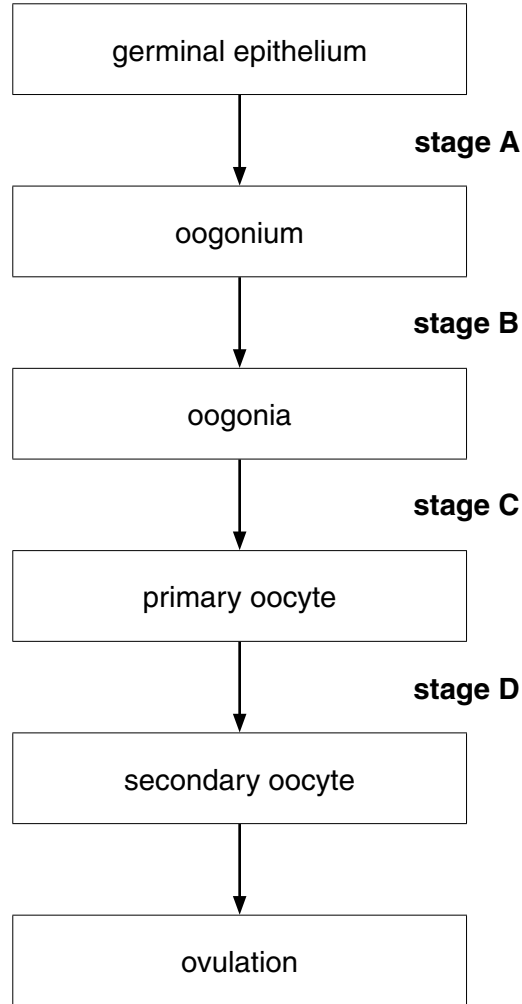


Fig. 1.1

With reference to Fig. 1.1:

- (i) state what is happening to the cells during **stage B** ;
..... [1]
- (ii) state the stage in which cell division by meiosis takes place ;
..... [1]
- (iii) state what is happening to the cells during **stage C**.
..... [1]

(b) Fig. 1.2 shows a section through a mature (Graafian) follicle in a human ovary.

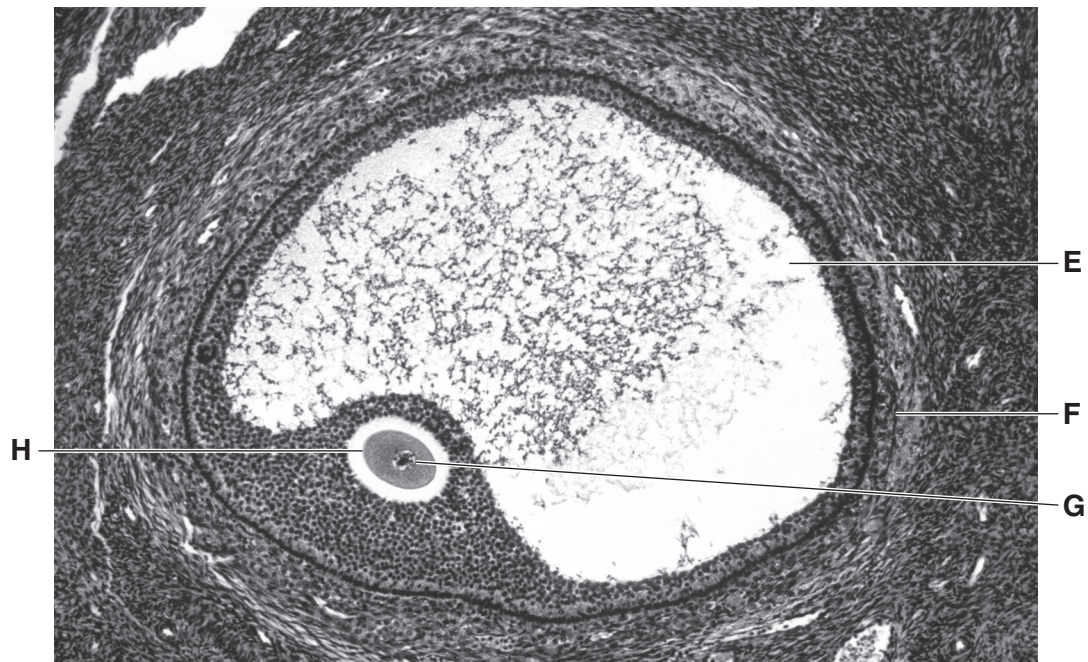


Fig. 1.2

Table 1.1 below lists a number of specific statements about the mature follicle. Each statement refers to one of the structures shown in Fig. 1.2.

Complete the table using the letters **E**, **F**, **G** or **H**.

Table 1.1

statement	structure
contains protective fluid
produces oestrogen
has glycoprotein receptors
contains 23 chromosomes

[4]

[Total: 7]

(b) Prolactin has a specific tertiary structure to allow it to bind to receptors on the cell surface membranes of its target tissues.

Name one target tissue **and** state the function of prolactin in that target tissue.

target tissue

function of prolactin.....

.....

..... [2]

[Total: 6]

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- (b) Most home pregnancy test kits use monoclonal antibodies to detect the presence or absence of HCG in a woman's urine.

An absorbent plastic strip containing three different antibodies is used. The positions of these antibodies are shown in Fig. 3.1.

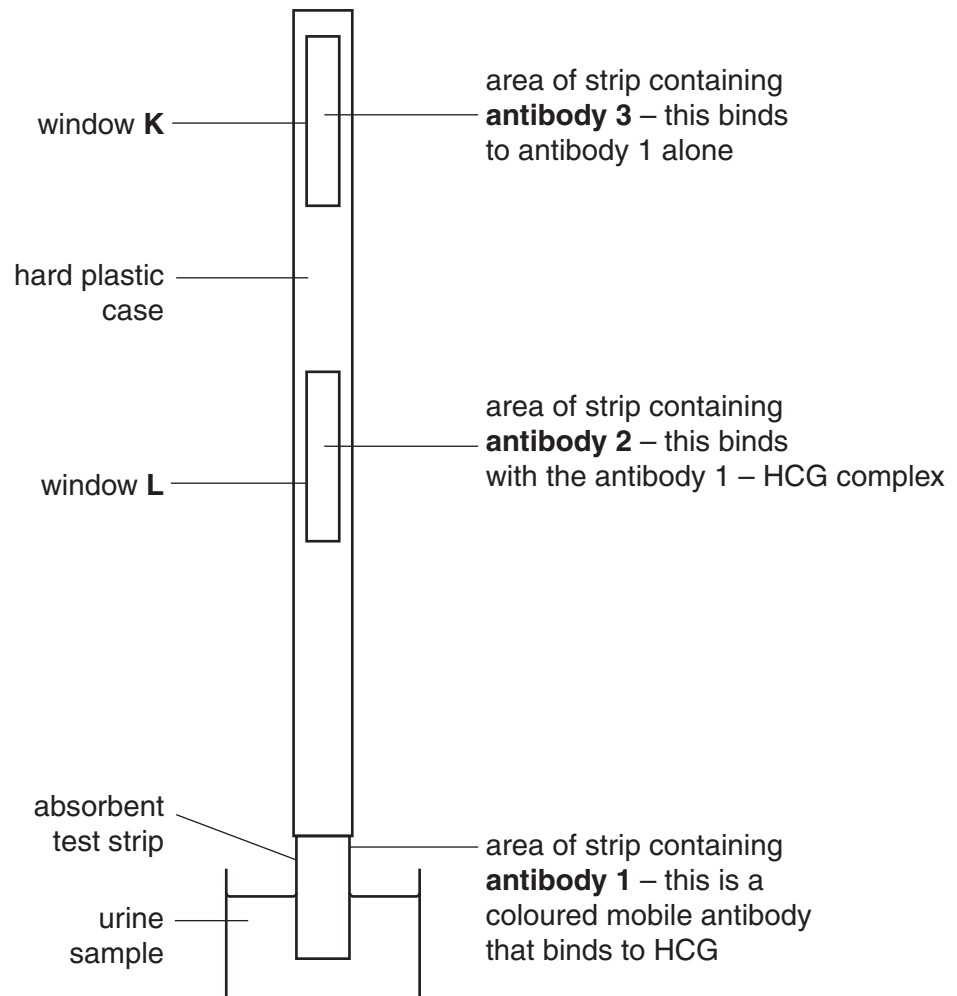


Fig. 3.1

10
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- 4 (a) Endurance athletes, such as marathon runners, rely on their stores of glycogen during training and competition.

Fig. 4.1 summarises the reactions that take place in a cell after it has absorbed glucose from blood plasma.

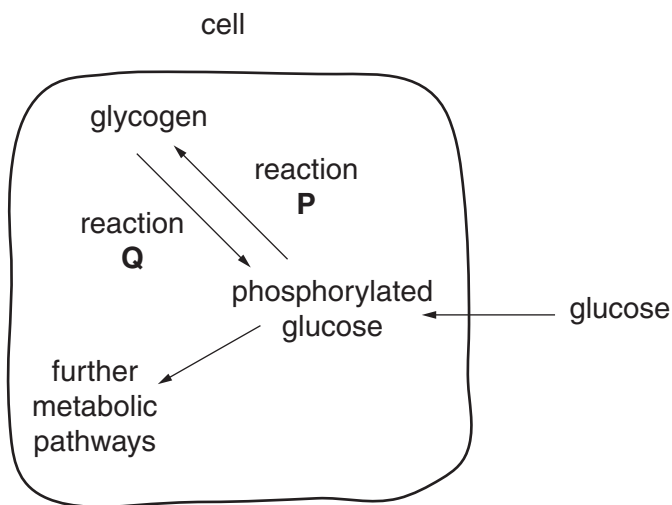


Fig. 4.1

- (i) Name a tissue that contains cells where reactions such as those shown in Fig. 4.1 take place.

..... [1]

- (ii) State the process by which glucose enters the cell.

..... [1]

- (iii) Name the type of reaction occurring at **P** and the type of reaction occurring at **Q**.

P.....

Q..... [2]

- (iv) With reference to Fig. 4.1, suggest **one** example of a 'further metabolic pathway' for glucose.

..... [1]

(ii) Explain the pattern shown by the graph for athlete **S**.

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

(c) Another way to enhance athletic performance is to use synthetic steroids to mimic the action of natural steroids such as the hormone testosterone.

(i) Suggest why steroid molecules are easily taken up by the body's cells.

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

(ii) Explain how the use of synthetic steroids can lead to an improvement in an athlete's performance.

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

(iii) Suggest **two** long-term disadvantages of **male** athletes taking synthetic steroids.

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

[Total: 15]

- 5 (a) In 1978, Peter Mitchell, a British biochemist, won the Nobel Prize for his contribution to the understanding of biological energy transfer through the formulation of the chemiosmotic theory.

Chemiosmosis occurs on the inner mitochondrial membrane (crista) and involves the production of ATP.

Fig. 5.1 shows the structure of part of a crista.

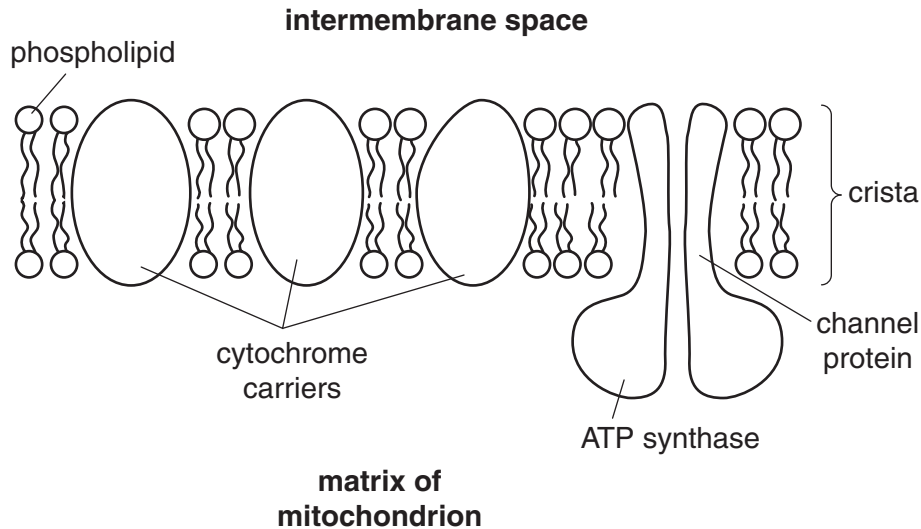


Fig. 5.1

The different stages of chemiosmosis are listed below. They are not listed in the correct order.

stage	description of stage
P	protons diffuse through the channel protein into the matrix
Q	a proton gradient is set up across the crista
R	NAD is reduced during glycolysis
S	hydrogen atoms split into protons and electrons
T	protons combine with electrons and oxygen atoms to form water
U	electrons are passed from carrier to carrier
V	reduced NAD releases hydrogen atoms to cytochrome carriers
W	energy from electron transfer is used to pump protons into the intermembrane space
X	ATP synthase produces ATP

6 (a) The conditions under which animals are reared can impact on human populations. For example, it has been suggested that the intensive farming of animals may have contributed to the swine flu epidemic of 2009.

(i) Outline the main features of intensive farming.

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

(ii) Suggest **two** disadvantages of intensive farming.

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

(b) Most scientists believe that the climate changes that have occurred over the past 50 years have been greatly influenced by human activity. Some scientists disagree.

The following three observations are accepted by most scientists.

Observation 1

2 500 million years ago, 80% of the earth's atmosphere was carbon dioxide. In 1958, the percentage of carbon dioxide in the atmosphere was 0.03% and in 2007 the value was 0.04%.

Observation 2

The decade of 1998 to 2007 was the warmest on record, according to the World Meteorological Organisation.

Observation 3

The mean sea level in 2003 was 75.6mm higher than in 1961.

- (i) Suggest reasons for the decrease in the percentage of carbon dioxide in the atmosphere from 2 500 million years ago until 1958.

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

- (ii) Suggest an explanation for **observation 2**.

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

- (iii) Suggest why an increase in environmental temperature could lead to an increase in crop production.

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

- (iv) Calculate the **average yearly increase** in sea levels between 1961 and 2003.

Give your answer to one decimal place.

Show your working.

Answer = mm [2]

[Total: 14]

END OF QUESTION PAPER

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