Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED GCE

F224

HUMAN BIOLOGY

Energy, Reproduction and Populations

WEDNESDAY 22 JUNE 2011: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (SLM/SLM) 11MEP06449 49092/2

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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.**

BLANK PAGE

Answer ALL the questions.

1 (a) Fig. 1.1 is a diagram of the human female reproductive system.

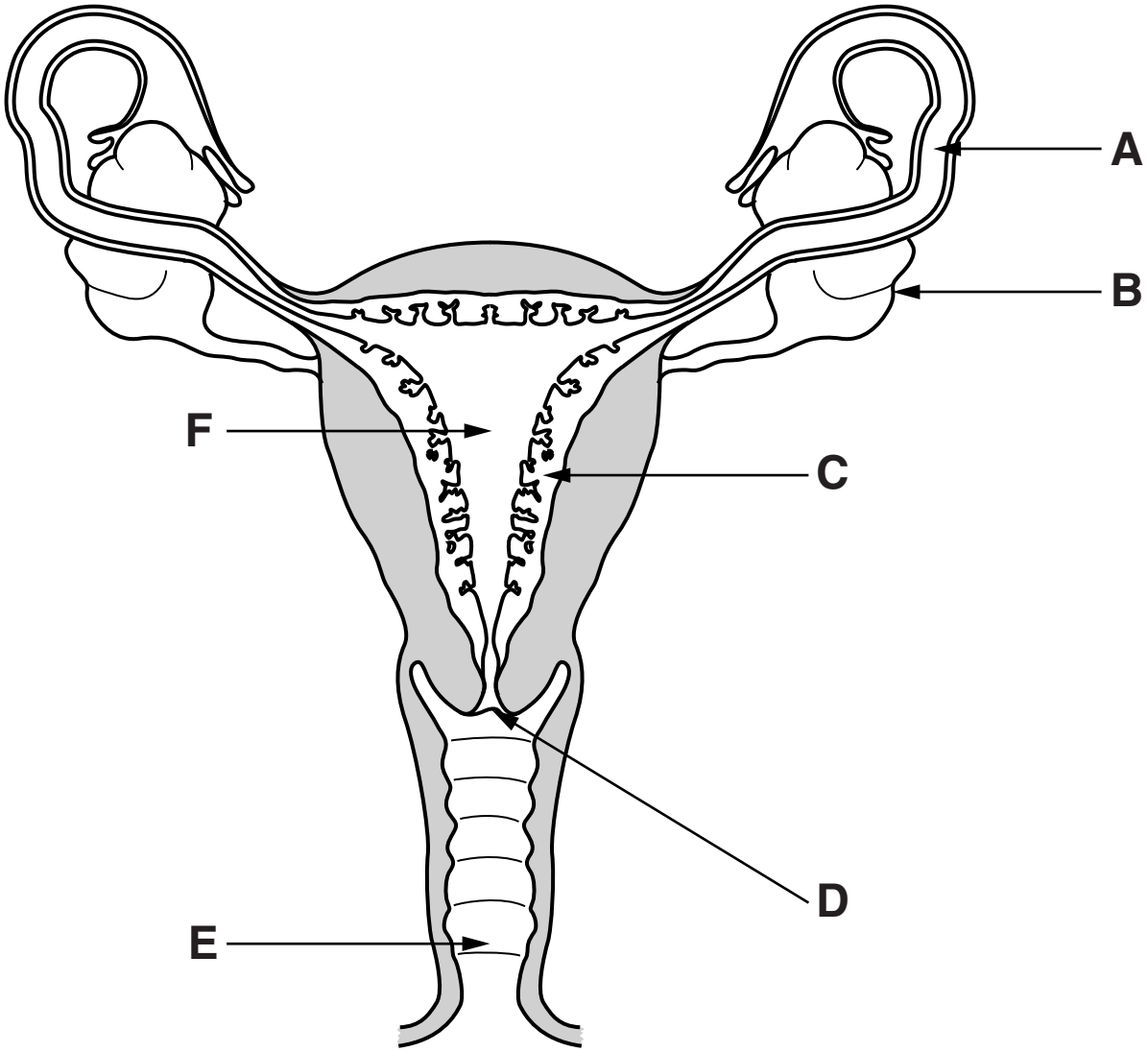


Fig. 1.1

(i) Name structures A and B in Fig. 1.1.

A _____

B _____ **[1]**

(ii) State which letter on Fig. 1.1 indicates the place where fertilisation usually occurs.

_____ **[1]**

(b) The placenta is an organ formed from fetal and maternal tissues. It allows the exchange of substances between the fetus and the mother during pregnancy.

Fig. 1.2 is a diagram of part of the human placenta.

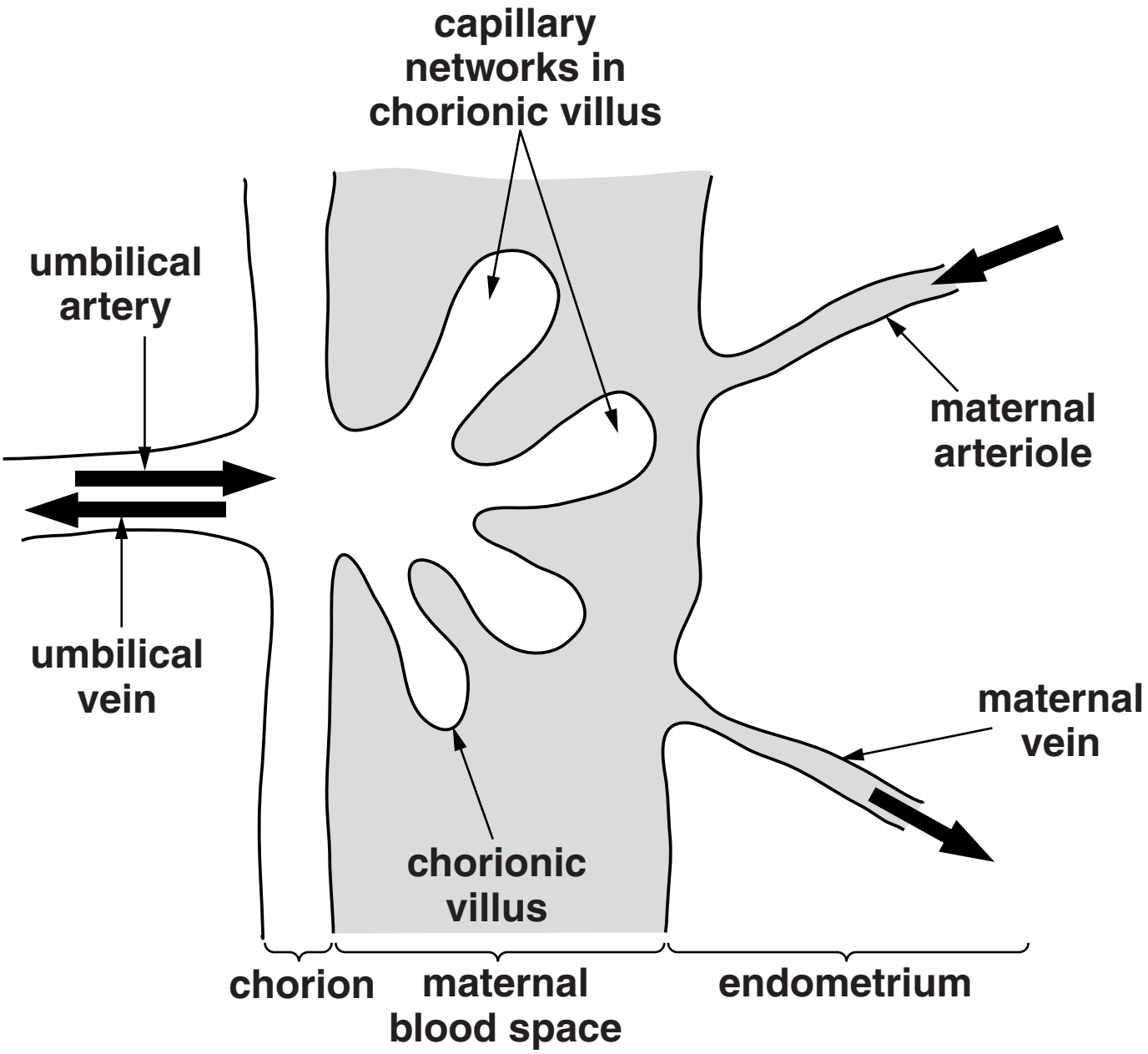


Fig. 1.2

(i) Name ONE substance that passes from mother to fetus and ONE substance that passes from fetus to mother during pregnancy.

mother to fetus _____

fetus to mother _____ **[2]**

(ii) Describe AND explain how the placenta is adapted for the exchange of substances between mother and fetus.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(iii) State TWO STRUCTURAL differences between the umbilical artery and the umbilical vein.

_____

_____

_____

_____ **[2]**

[Total: 10]

BLANK PAGE

QUESTION 2(a) STARTS ON PAGE 10

2 (a) During a sporting event an athlete may have to carry out not only aerobic respiration but also anaerobic respiration to produce sufficient ATP.

Fig. 2.1 (opposite) outlines both these processes in a muscle cell and shows how a liver cell is linked to the processes.

You may refer to Fig. 2.1 in answering questions (i) to (vi).

(i) State ONE use of glucose in the liver cell APART FROM maintaining the blood glucose concentration.

_____

_____ **[1]**

(ii) Anaerobic respiration is less efficient than aerobic respiration.

Explain the meaning of the term less efficient as applied to ANAEROBIC respiration.

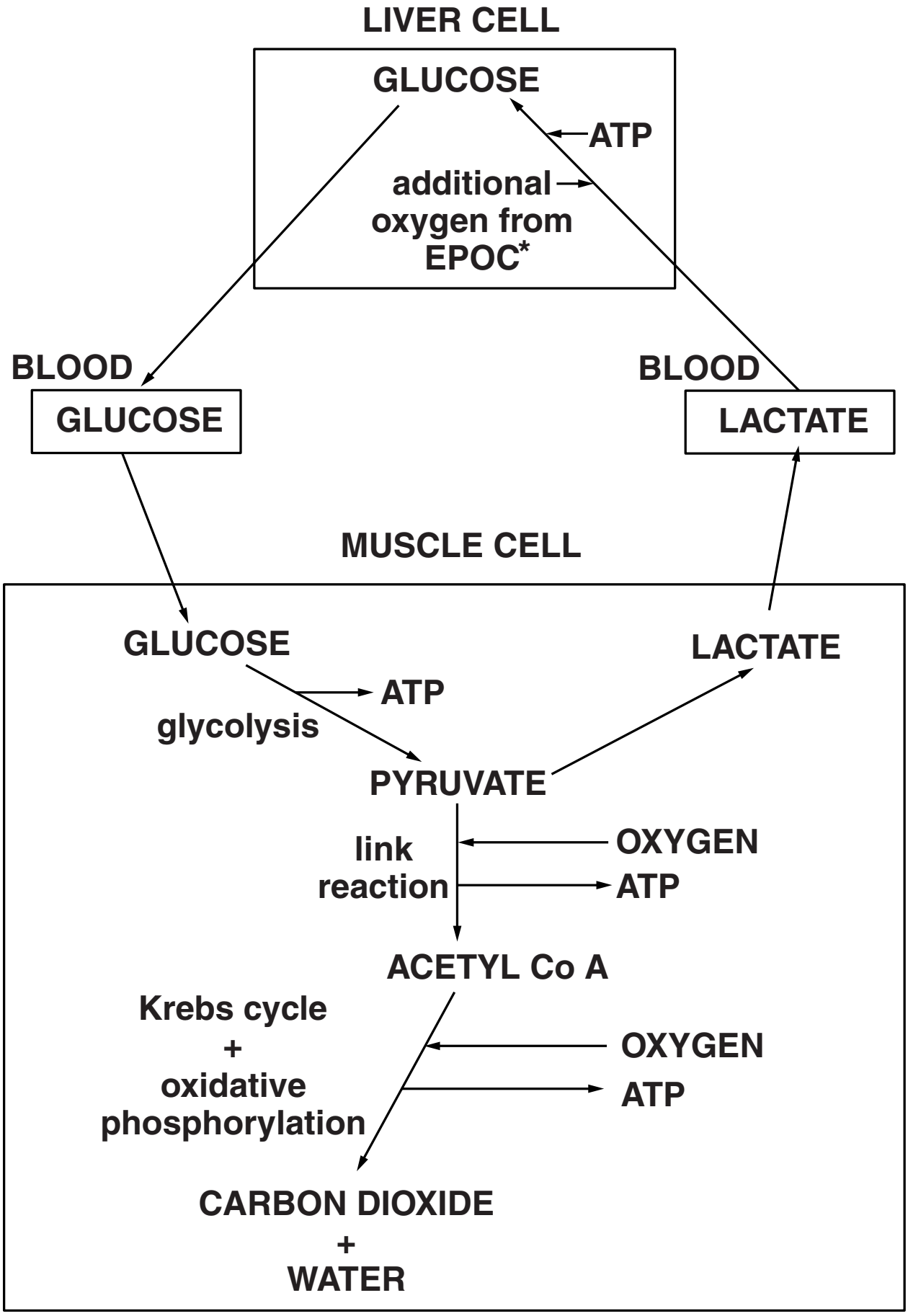
_____

_____

_____

_____

_____ **[2]**



* EPOC = Excessive Post-exercise Oxygen Consumption

Fig. 2.1

(iii) Complete the table below to indicate the precise locations of glycolysis, the link reaction, Krebs cycle and oxidative phosphorylation within the muscle cell.

process	precise location
glycolysis	
link reaction	
Krebs cycle	
oxidative phosphorylation	

[4]

(iv) In the muscle cell, glucose is phosphorylated at the start of glycolysis.

Suggest why this phosphorylated glucose does not diffuse out of the muscle cell into the blood.

_____

_____

_____ **[1]**

(v) State what is meant by Excessive Post-exercise Oxygen Consumption (EPOC).

_____

_____

_____

_____ **[1]**

(vi) Oxygen is required in the metabolic pathways involved in the conversion of lactate to glucose.

Suggest TWO further uses of the additional oxygen from EPOC.

_____

_____

_____

_____

_____ **[2]**

(b) Aerobic exercise, such as regular swimming, can have benefits on the body.

Discuss the LONG-TERM benefits of regular aerobic exercise on the muscles AND on the cardiovascular system.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[5]**

[Total: 16]

3 (a) **The sperm count or sperm density in a sample of semen has been decreasing in men in the UK for the last 70 years.**

Fig. 3.1 shows the mean decrease in sperm density between 1935 and 1995.

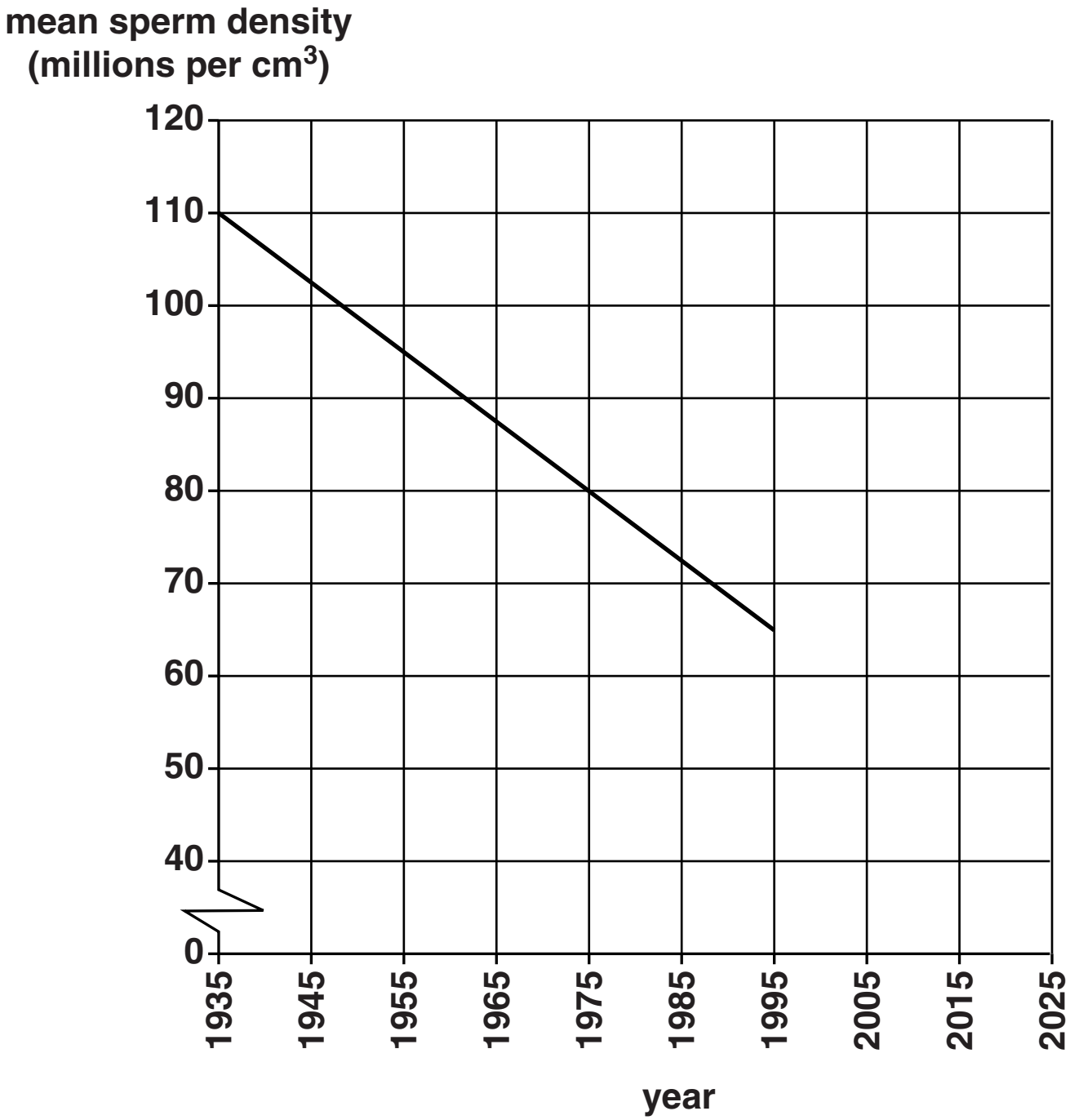


Fig. 3.1

(i) Calculate the mean yearly decrease in sperm density between the years 1935 and 1995.

Show your working.

Answer = _____ millions per cm^3 per year [2]

(ii) Use Fig. 3.1 to estimate the mean sperm count of men in the year 2015.

Answer = _____ millions per cm^3 [1]

(iii) Suggest possible reasons for this decrease in sperm density.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(b) Fertile men can be encouraged to donate sperm to enable childless couples to have children. The sperm from these donors are stored in sperm banks. At various times in the future, the donated sperm may be used in artificial insemination.

(i) Describe how sperm are stored in sperm banks.

_____

_____

_____

_____

_____

_____ **[2]**

(ii) Donor sperm and semen have to be screened before they are stored in sperm banks.

Suggest what the sperm and semen may be screened for.

_____

_____

_____

_____

_____

_____ **[2]**

(iii) Some men have their sperm harvested and stored for future use with their own partners.

Suggest a situation where a man may be offered the option of having his sperm harvested and stored for future use.

_____

_____

_____ **[1]**

[Total: 11]

4 The respiratory quotient (RQ) is used to determine the type of respiratory substrate, such as carbohydrate or lipid, which an organism may use at any one time.

A respirometer can be used to measure the oxygen uptake of yeast in order to calculate the RQ.

Fig. 4.1 is a diagram of a respirometer.

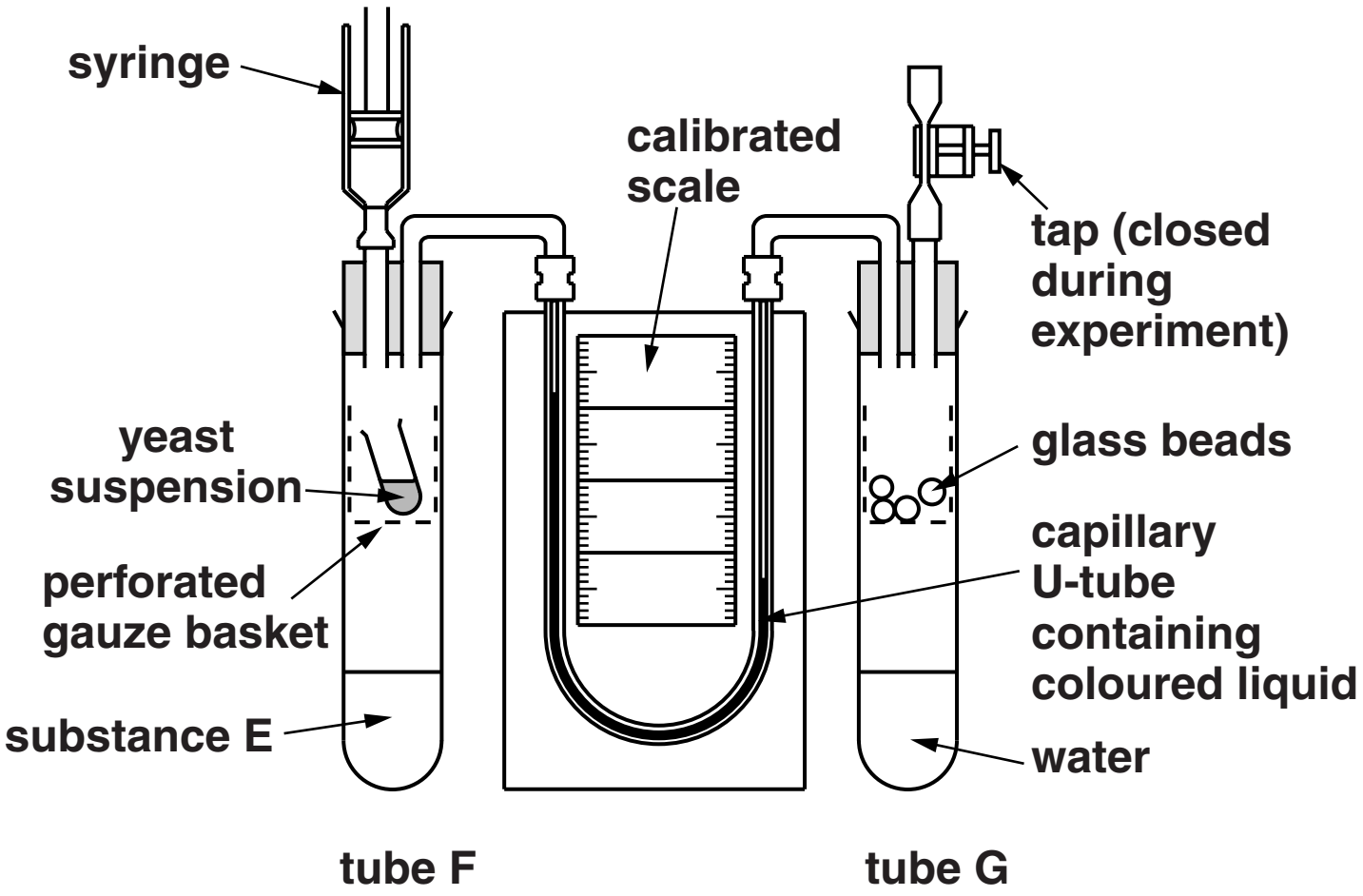


Fig. 4.1

(a) Name substance E and state its function.

_____

_____

_____

_____ **[2]**

QUESTION 4(b) STARTS ON PAGE 22

(b) Describe how the respirometer could be used to measure the RATE of respiration of living tissue such as yeast at different temperatures.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[5]**

[Total: 7]

QUESTION 5 STARTS ON PAGE 24

5 During the last ice age, glaciers destroyed the pre-existing community in areas such as the Lake District leaving bare rock. Over time, primary succession has taken place.

Fig. 5.1 (opposite) shows primary succession in an area such as the Lake District.

(a) Explain what is meant by primary succession.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

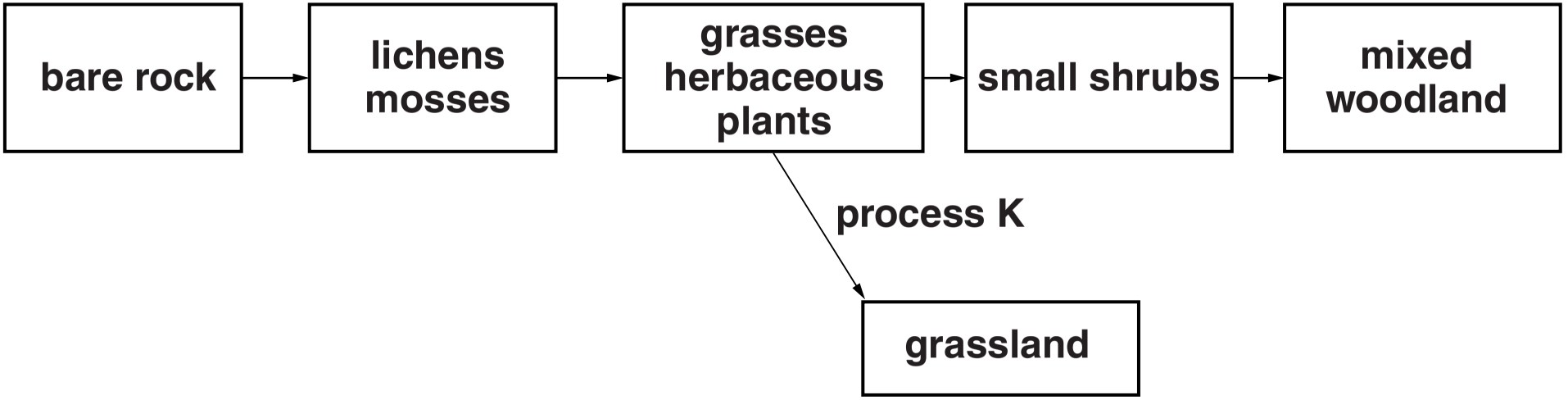

bare rock
lichens
mosses
grasses
herbaceous
plants
small shrubs
mixed
woodland
process K
grassland

Fig. 5.1

(b) Describe the role of the lichens and mosses on the bare rock.

_____

_____

_____

_____

_____

_____ **[2]**

(c) Suggest how process K shown in Fig. 5.1 could be caused.

_____

_____

_____

_____

_____

_____ **[2]**

BLANK PAGE

QUESTION 5(d) STARTS ON PAGE 28

(d) An increase in plant biomass is largely due to photosynthesis.

Fig. 5.2 shows the increase in stored energy in the form of biomass of plants during succession.

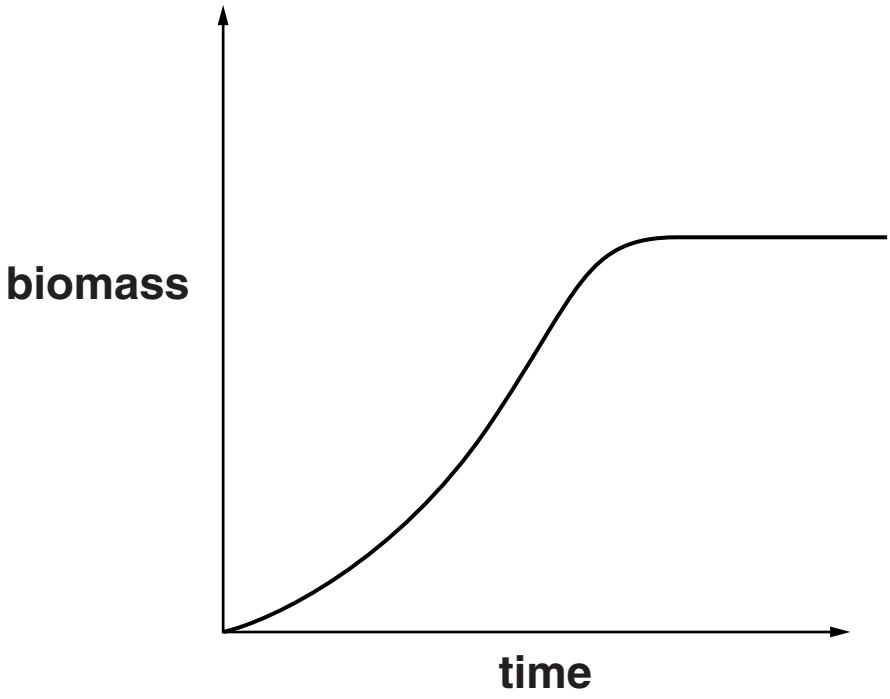


Fig. 5.2

(i) What structure within the chloroplast is responsible for the absorption of light energy?

_____ **[1]**

(ii) Name the TWO products of the light-dependent stage that are used in the LIGHT-INDEPENDENT stage.

_____

_____ **[2]**

(iii) **Suggest why the graph in Fig. 5.2 reaches a plateau.**

_____

_____

_____

_____ **[1]**

[Total: 11]

QUESTION 6 STARTS ON PAGE 30

6 The numbers of different species of animals and plants that are threatened with extinction are recorded in a document known as the Red List.

The Red List shows that 21% of all mammal species and 33% of all amphibian species are under threat of extinction. Unless action is taken to conserve species on the Red List, the end result could be a decrease in global biodiversity.

(a) Explain the meaning of the term biodiversity.

_____

_____

_____

_____

_____ **[2]**

(b) Some species may have uses in the future. Some scientists believe that this is one good reason for maintaining biodiversity.

Outline the ECONOMIC reasons for maintaining biodiversity.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 5]

END OF QUESTION PAPER

ADDITIONAL PAGE

IF ADDITIONAL SPACE IS REQUIRED, YOU SHOULD USE THE LINED PAGES BELOW. THE QUESTION NUMBER(S) MUST BE CLEARLY SHOWN.