Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED GCE

F224

HUMAN BIOLOGY

Energy, Reproduction and Populations

FRIDAY 25 JUNE 2010: Afternoon
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 (KN/JG) MEP60443 30757/3

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. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).**

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.**

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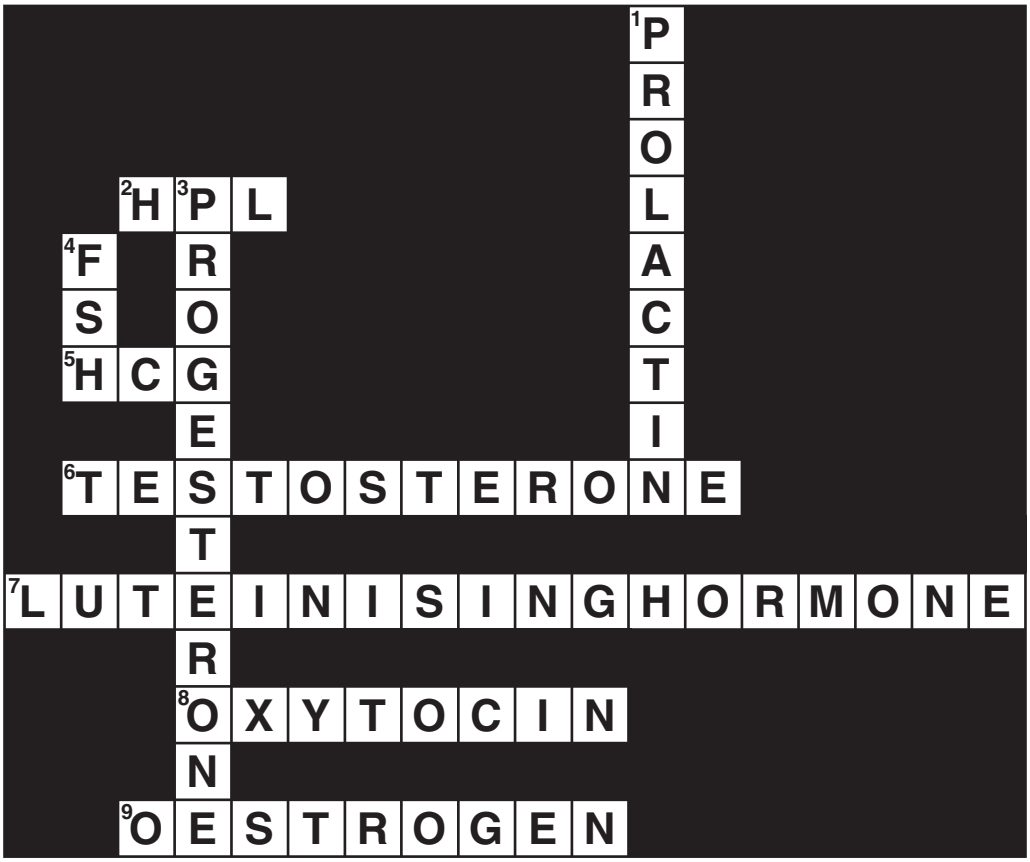
Answer ALL the questions.

1 The theme of the completed crossword below is 'Functions of the Hormones of Human Reproduction'.



(a) Write a clue for each of the following crossword answers:

(i) testosterone (6 across)

_____

_____ **[1]**

(ii) prolactin (1 down).

_____

_____ **[1]**

(b) State which word or term in the crossword matches each of the following clues:

(i) stimulates contraction of uterine muscles

_____ **[1]**

(ii) maintains uterine lining in the early stages of pregnancy.

_____ **[1]**

(c) Which <u>TWO</u> female hormones can be used in the female contraceptive pill?

_____

_____ **[2]**

(d) State <u>ONE</u> other way by which contraceptive hormones can be administered to a woman <u>OTHER THAN BY TAKING A PILL</u>.

_____ **[1]**

[Total: 7]

2 (a) Myoglobin is a respiratory pigment that can combine with oxygen.

Myoglobin is found in muscle cells.

Fig. 2.1 shows a diagram of a molecule of myoglobin.

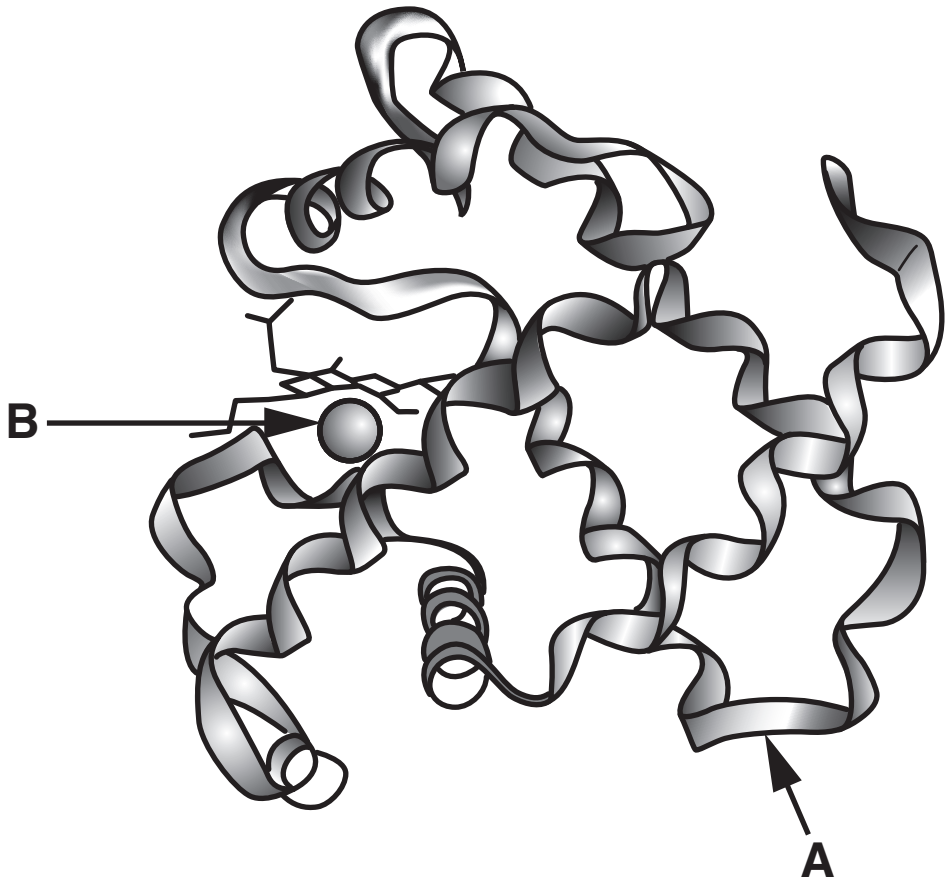


Fig. 2.1

Name structures A and B in Fig. 2.1.

A _____

B _____ **[2]**

(b) Fig. 2.2 shows oxygen dissociation curves for both myoglobin and haemoglobin.

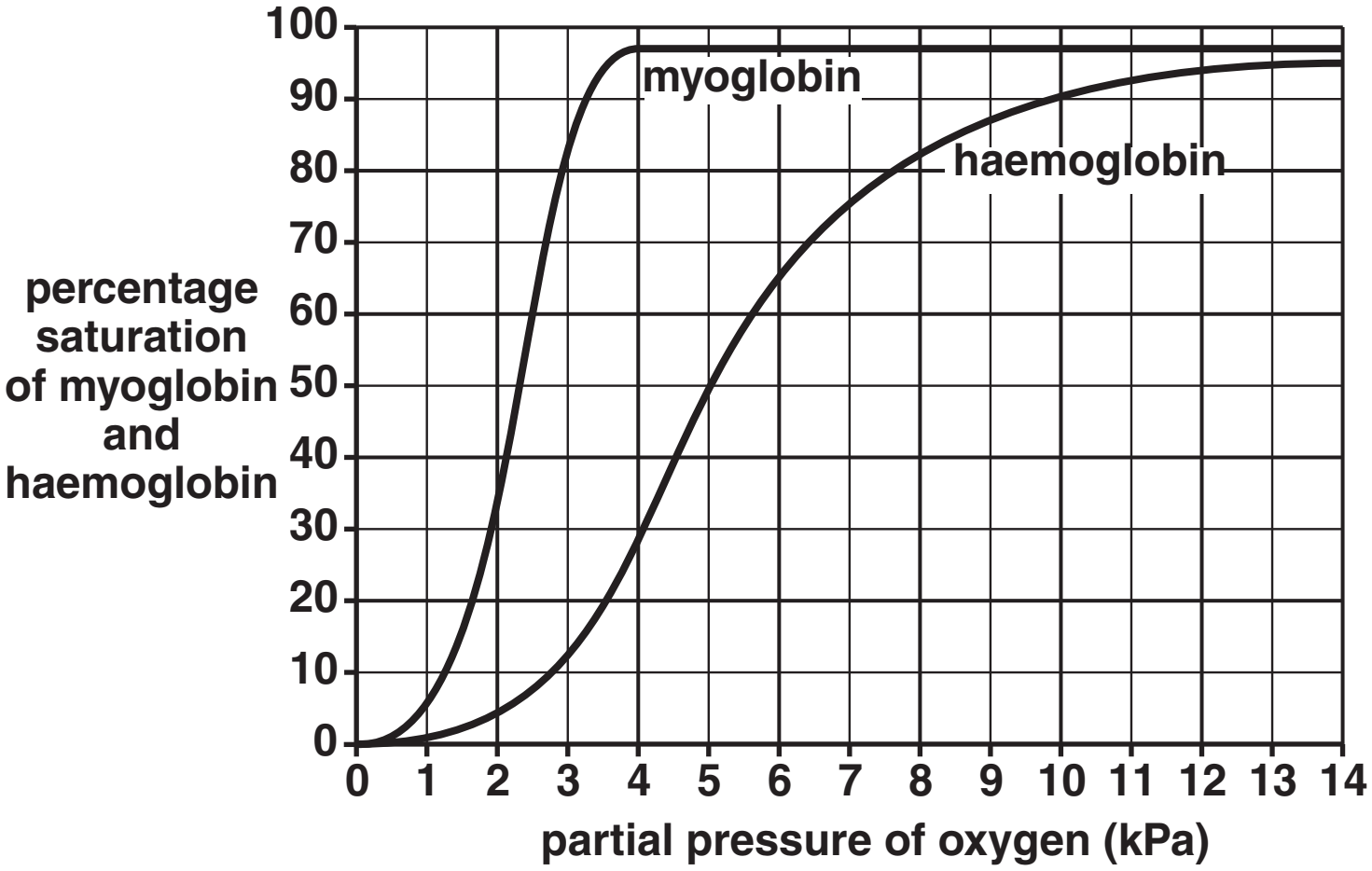


Fig. 2.2

(i) Calculate the decrease in percentage saturation of both myoglobin and haemoglobin between 4 kPa and 2 kPa partial pressure of oxygen.

Answer for myoglobin = _____

Answer for haemoglobin = _____ [1]

(ii) State a location in the human body where the percentage saturation of haemoglobin in the blood will be almost 100%.

_____ [1]

(iii) Describe AND explain the SIGNIFICANCE of the difference in affinity for oxygen between myoglobin and haemoglobin.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(c) Iron is an important element in the structure of both myoglobin and haemoglobin.

A rare disease called haemochromatosis (HC) results in there being an overload of iron in the blood. This build up of iron is toxic to the body and may cause liver, heart or pancreatic disease.

- **One form of HC is hereditary.**
- **Intake of dietary iron does not differ significantly between men and women.**
- **In the 16 to 45 year age range, men show symptoms of HC earlier than women.**

(i) Suggest why men show symptoms of hereditary HC at an earlier age than women.

_____

_____

_____

_____ **[2]**

(ii) A man who is known to have HC decides not to risk having children.

State <u>TWO</u> methods of contraception that he could use.

_____

_____ **[2]**

[Total:11]

3 (a) Erythropoietin (EPO) is a hormone that controls the oxygen carrying capacity of blood in humans by stimulating the production of more red blood cells (erythrocytes).

(i) High altitude can stimulate an increase in the secretion of EPO.

Suggest why a high altitude can lead to increased EPO secretion.

_____

_____

_____ **[1]**

(ii) State the organ responsible for producing and releasing EPO.

_____ **[1]**

(iii) Altitude training is one way of improving athletic performance. A banned substance, recombinant erythropoeitin (RhEPO), is sometimes used to enhance athletic performance.

Outline the <u>BIOLOGICAL</u> <u>DISADVANTAGES</u> of an athlete using RhEPO.

_____

_____

_____

_____

_____ **[2]**

(b) EPO is a protein that acts as a hormone.

Outline how the sequence of codons on a molecule of mRNA is translated into a polypeptide that can form a protein, such as EPO.

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

_____

_____

_____

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_____

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_____

_____ **[6]**

[Total: 10]

4 (a) Hepatocytes (liver cells) detoxify the blood.

Alcohol can be toxic. To prevent this, hepatocytes oxidise the alcohol into a less toxic substance. This process involves the reduction of NAD.

The relationship between the concentration of NAD in the hepatocytes and the concentration of alcohol in the blood is shown in Fig. 4.1.

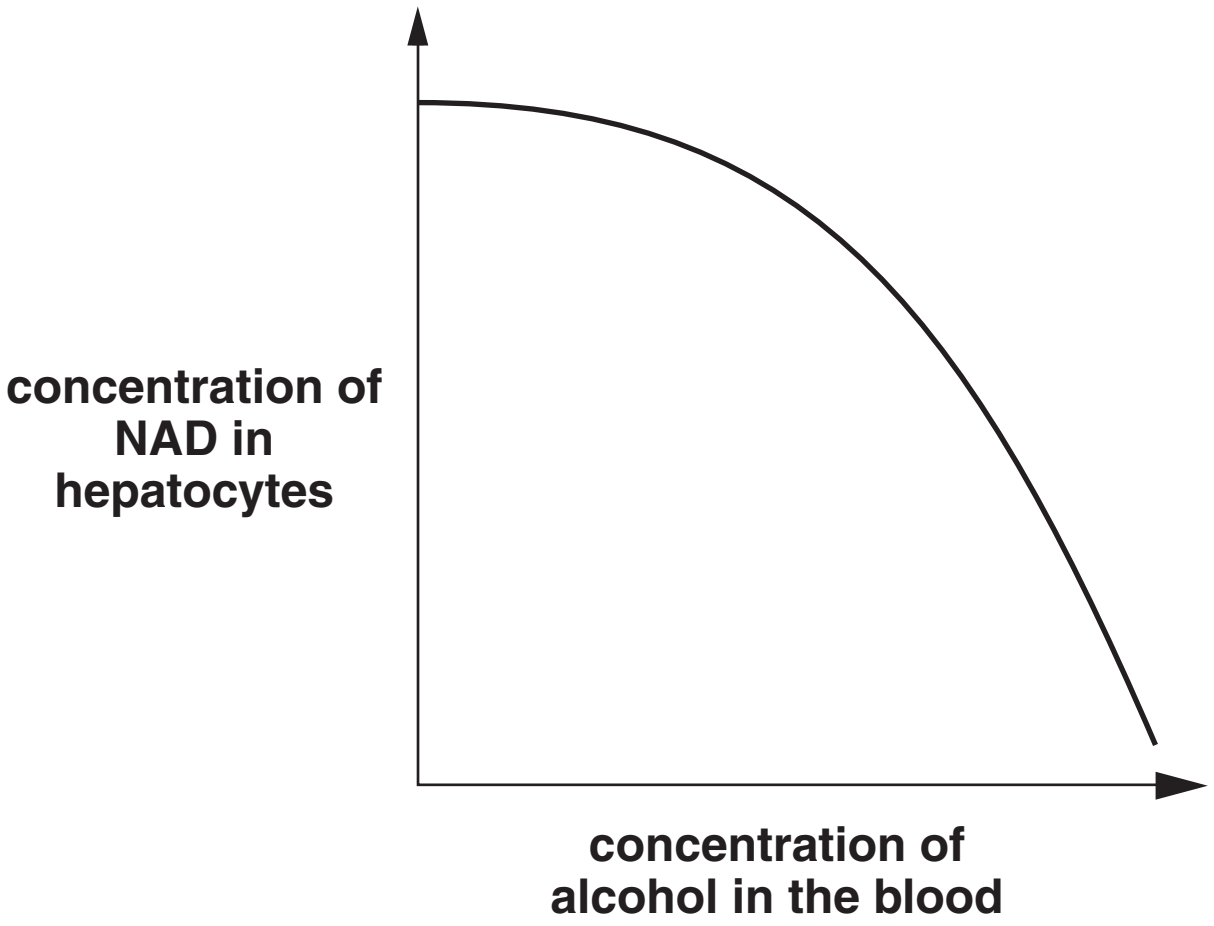

Fig. 4.1

(i) Describe the relationship shown in Fig. 4.1.

_____

_____

_____ **[1]**

(ii) Using Fig. 4.1, suggest <u>TWO</u> respiratory processes that may be affected by an increased concentration of alcohol in the blood.

_____

_____ **[2]**

(b) During a 100 metre race, a sprinter's muscle cells have a high demand for oxygen. The circulatory system is unable to fully meet this demand.

In this situation, both anaerobic and aerobic respiration will occur.

(i) State a substance, <u>OTHER THAN ATP</u>, that is used by muscle cells as a short-term supply of energy.

_____ **[1]**

(ii) Outline the process of <u>ANAEROBIC</u> respiration in muscle cells.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(c) The oxygen uptake for a sprinter will remain high for several minutes after a race.

This is popularly known as the 'oxygen debt'.

Explain the reason for excess post-exercise oxygen consumption (EPOC).

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 10]

5 ***In vitro*** **fertilisation (IVF) is used to treat infertility.**

A survey carried out on several IVF clinics in 2003 investigated the chance of having a multiple birth as a result of IVF treatment.

Fig. 5.1 summarises the results of this survey.

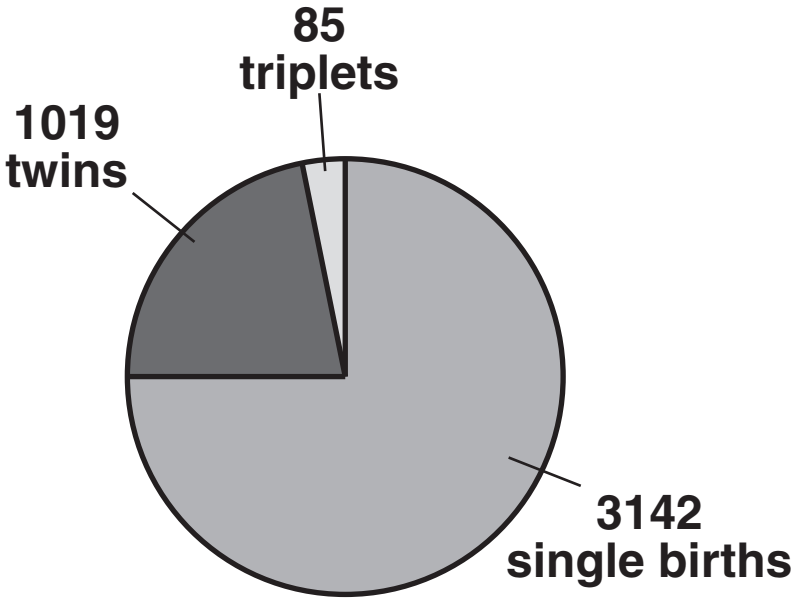

Fig. 5.1

(a) Explain the difference between *multiple pregnancy* and *multiple birth*.

_____

_____

_____

_____

_____ **[2]**

(b) With reference to Fig. 5.1, calculate the percentage of births that resulted in twins.

Show your working and give your answer <u>TO THE NEAREST WHOLE NUMBER</u>.

Answer = _____ % [2]

(c) During a multiple pregnancy, both mother and babies are deemed to be at greater risk of complications.

Outline the increased health risks faced by the <u>MOTHER</u> during a multiple pregnancy.

_____

_____

_____

_____

_____

_____

_____ **[3]**

(d) Fertility treatment may be prescribed for some couples who have been unable to conceive.

Suggest <u>THREE</u> reasons why a man may be infertile.

_____

_____

_____

_____

_____

_____

_____ **[3]**

(e) Some fertility treatments require sperm donation.

Discuss why it is becoming increasingly difficult to recruit sperm donors.

_____

_____

_____

_____

_____ **[2]**

[Total: 12]

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QUESTION 6 STARTS ON PAGE 22

6 Nitrogen is a vital element in the synthesis of amino acids and ultimately proteins, such as insulin and myosin.

Fig. 6.1 outlines some of the ways in which nitrogen is cycled in nature.

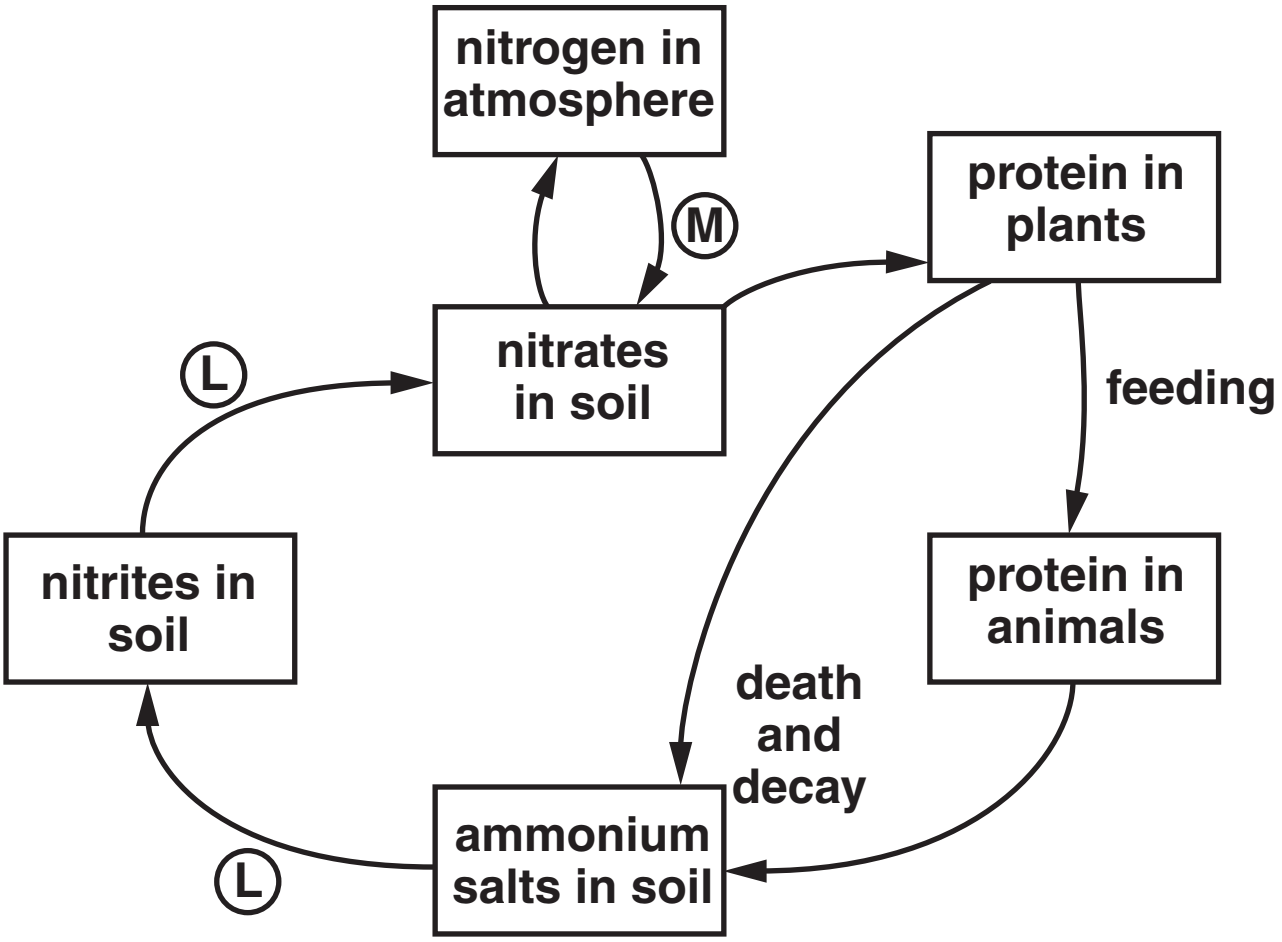

Fig. 6.1

(a) State the <u>TYPES</u> of bacteria that cause the processes L and M.

L _____

M _____ **[2]**

(b) The energy stored in macromolecules in plants is transferred to animals during feeding. Some of this energy is not incorporated into macromolecules in animals.

Explain why some of the energy stored in plant macromolecules does not end up in the macromolecules made by animals.

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

_____

_____

_____

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_____

_____

_____

_____

_____ **[3]**

(c) Fig. 6.2 shows the relationship between annual deforestation rate and annual human population growth for six countries.

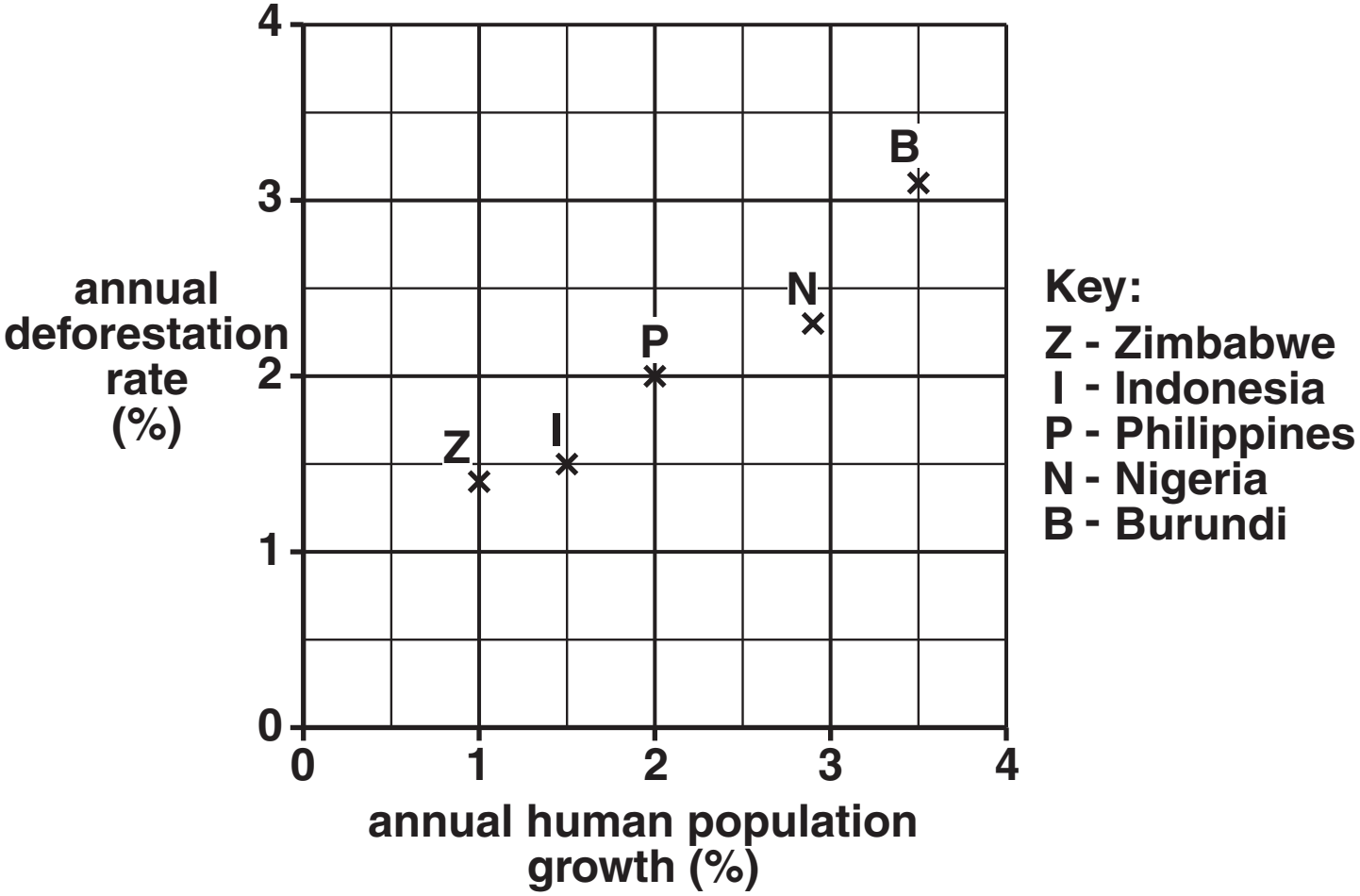

Fig. 6.2

(i) Describe the relationship shown in Fig. 6.2.

_____

_____

_____

_____

_____ **[2]**

(ii) Deforestation is one factor linked to increasing atmospheric carbon dioxide concentration.

Suggest ways by which <u>INDIVIDUALS</u> can reduce their impact on increasing atmospheric carbon dioxide concentration.

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 10]

END OF QUESTION PAPER

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