

First Variant Question Paper



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

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BIOLOGY

0610/31

Paper 3 Extended

May/June 2009

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

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1	
2	
3	
4	
5	
6	
Total	

This document consists of **17** printed pages and **3** blank pages.



2

Answer **all** the questions.

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- 1 Table 1.1 shows some of the external features of the five classes of vertebrates.

Complete the table by using a tick (✓) to indicate if each class has the feature or a cross (×) if it does not. The first row has been completed for you.

Table 1.1

feature	fish	amphibia	reptiles	birds	mammals
mammary glands	×	×	×	×	✓
fur / hair					
scales / scaly skin					
external ears					
feathers					

[4]

[Total: 4]

- 2 Fig. 2.1 shows the blood supply for the liver of a mammal.

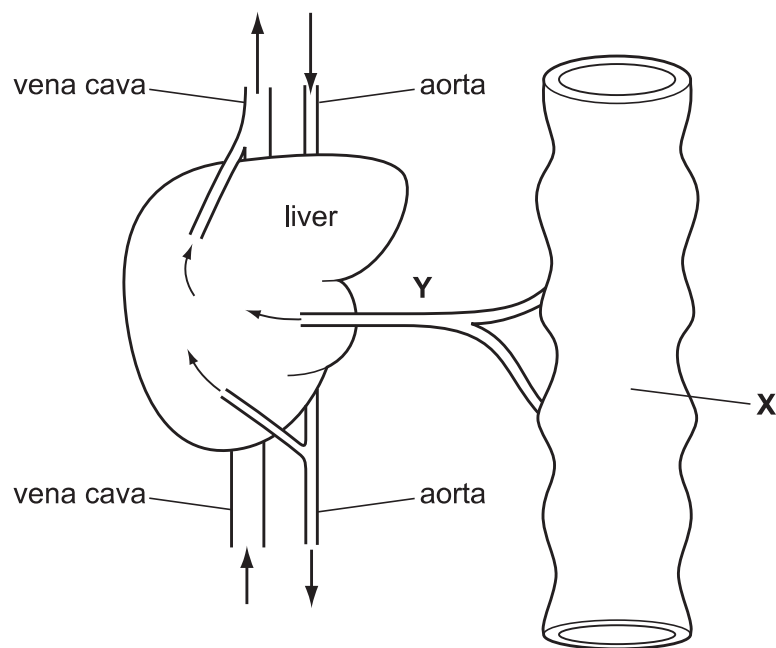


Fig. 2.1

- (a) Blood from organ **X** is carried to the liver by blood vessel **Y**.

Name

- (i) organ **X**,

..... [1]

- (ii) blood vessel **Y**.

..... [1]

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Fig. 2.2 shows some liver cells as seen with a light microscope.

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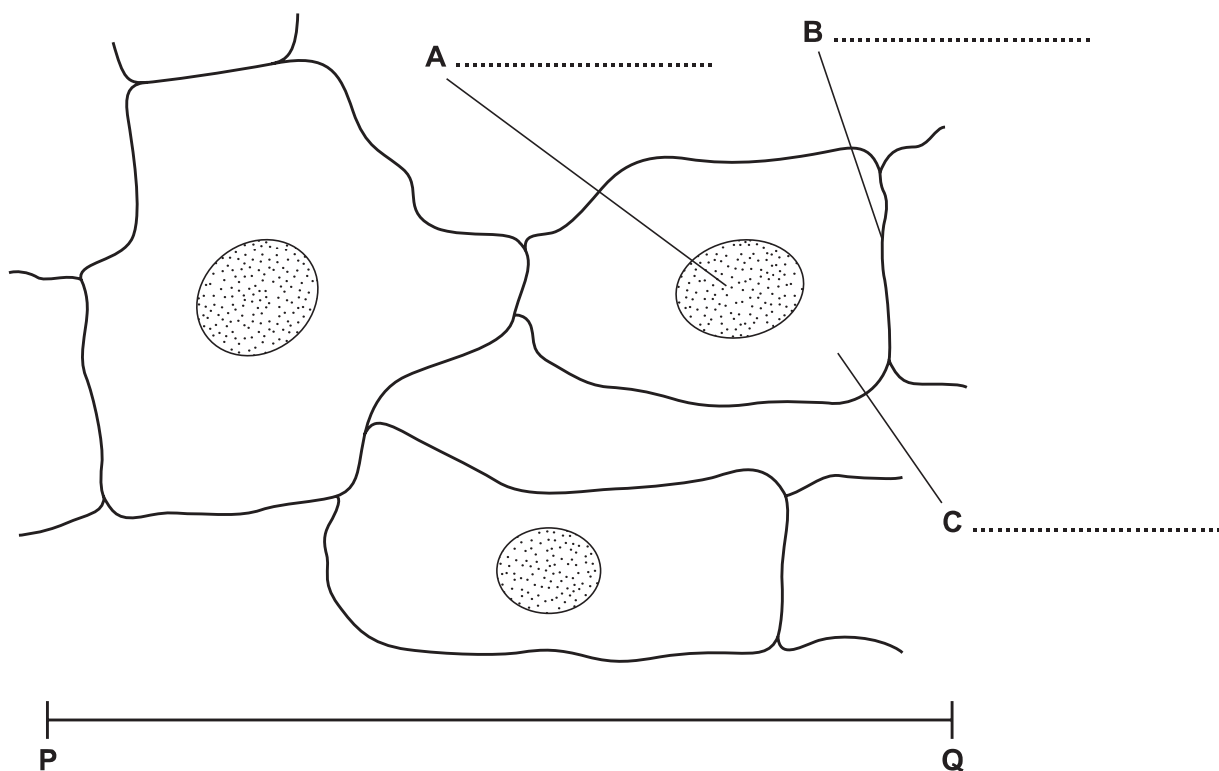


Fig. 2.2

(b) (i) Label, on Fig. 2.2, the structures **A**, **B** and **C**.

[3]

(ii) The distance **P-Q** is 0.06 mm.

Calculate the magnification of Fig. 2.2.

Show your working.

Magnification = x [2]

Liver cells absorb glucose and amino acids from the blood and help to regulate the concentrations of these substances in the blood.

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- (c) Explain how liver cells help to regulate the concentration of glucose in the blood in response to hormones from the pancreas in each of the following situations.

Blood glucose concentration is higher than normal.

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Blood glucose concentration is lower than normal.

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[5]

- (d) Describe what happens to amino acids inside liver cells.

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[3]

[Total: 15]

- 3 (a) Fig. 3.1 shows the activity of an enzyme produced by bacteria that live in very hot water.

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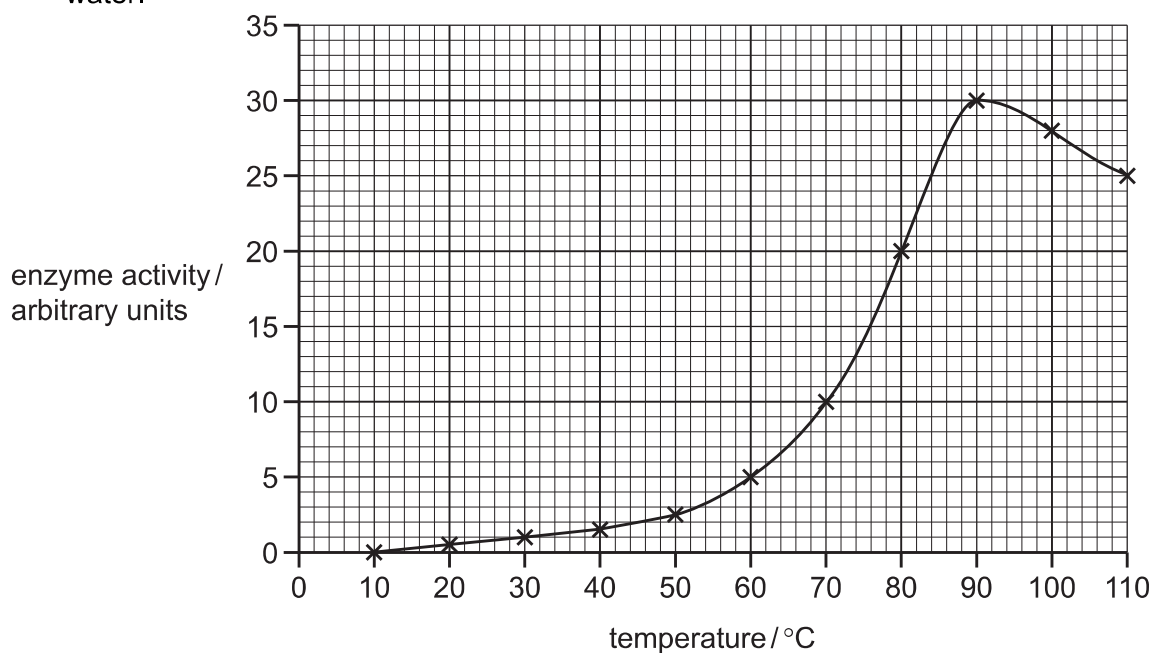


Fig. 3.1

Using the information in Fig. 3.1, describe the effect of increasing temperature on the activity of the enzyme.

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[3]

Enzymes extracted from bacteria are used in biological washing powders.

- (b) Describe how bacteria are used to produce enzymes for biological washing powders.

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[4]

- (c) Food and blood stains on clothes may contain proteins and fats.

Explain how enzymes in biological washing powders act to remove food and blood stains from clothes.

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[4]

- (d) When blood clots, an enzyme is activated to change a protein from one form into another.

Describe the process of blood clotting.

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[3]

[Total: 14]

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- 4 Fig. 4.1 is a photograph of a root of radish covered in many root hairs.

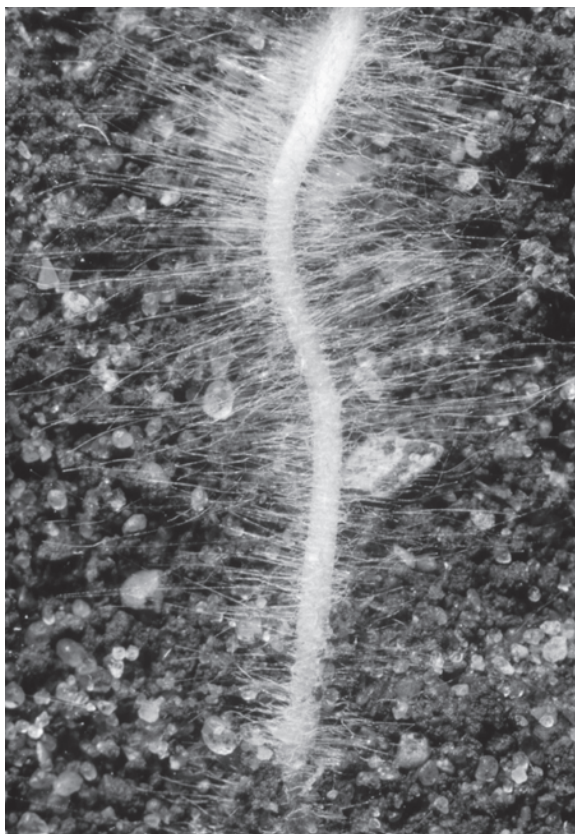


Fig. 4.1

- (a) Using the term *water potential*, explain how water is absorbed into root hairs from the soil.

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[3]

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A potometer is a piece of apparatus that is used to measure water uptake by plants.

Most of the water taken up by plants replaces water lost in transpiration.

A student used a potometer to investigate the effect of wind speed on the rate of water uptake by a leafy shoot. As the shoot absorbs water the air bubble moves upwards.

The student's apparatus is shown in Fig. 4.2.

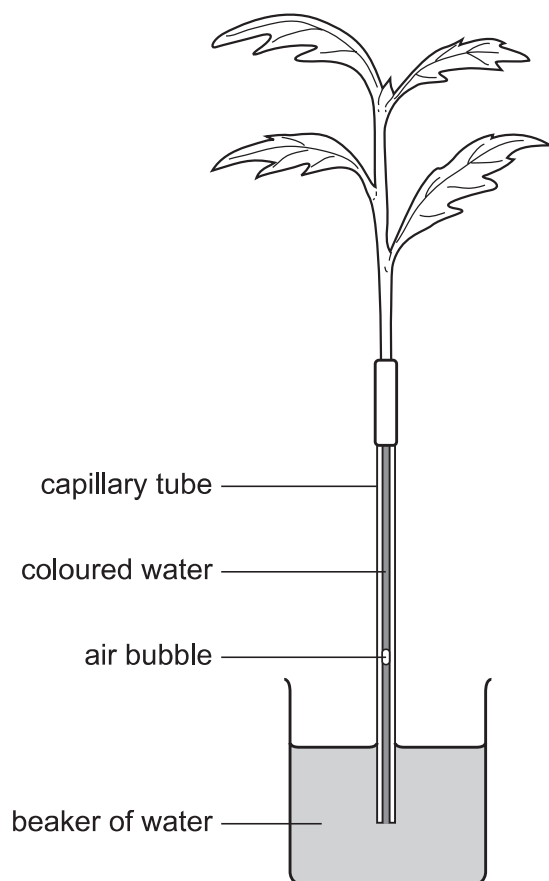


Fig. 4.2

*For
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Use*

The student used a fan with five different settings and measured the wind speed. The results are shown in Table 4.1.

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Table 4.1

wind speed / metres per second	distance travelled by the air bubble / mm	time / minutes	rate of water uptake / mm per minute
0	4	10	0.4
2	12	5	2.4
4	20	5	4.0
6	35	5	7.0
8	40	2

- (b) Calculate the rate of water uptake at the highest wind speed and write your answer in the table.

[1]

- (c) Describe the effect of increasing wind speed on the rate of water uptake. You may use figures from Table 4.1 to support your answer.

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[2]

- (d) State two environmental factors, **other than wind speed**, that the student should keep constant during the investigation.

1.

2.

[2]

- (e) Some of the water absorbed by the plants is **not** lost in transpiration.

State two **other** ways in which water is used.

1.
2. [2]

- (f) Water moves through the xylem to the tops of very tall trees, such as giant redwoods of North America. The movement of water in the xylem is caused by transpiration.

Explain how transpiration is responsible for the movement of water in the xylem.

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- [4]

- (g) Plants that live in hot, dry environments show adaptations for survival.

State three **structural** adaptations of these plants.

1.
2.
3. [3]

[Total: 17]

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- 5 (a) Define the term *gene*.

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

The medical condition sickle cell anaemia is widely distributed in Africa, parts of Asia and the Americas. People with sickle cell anaemia have red blood cells with an abnormal form of haemoglobin.

The gene for haemoglobin exists in two forms:

H^N = allele for normal haemoglobin

H^S = allele for abnormal haemoglobin

- (b) Complete the genetic diagram below to show how two people who are heterozygous for this gene may have a child who has sickle cell anaemia.

Use the symbols H^N and H^S in your answer.

parental phenotypes	normal	x	normal
parental genotypes	x
gametes	+

child's genotype

child's phenotype sickle cell anaemia

[3]

- (c) Describe the effects of sickle cell anaemia on the body.

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..... [4]

- (d) Fig. 5.1 is a map that shows the distribution of the allele for the abnormal form of haemoglobin (H^S) and malaria in Africa.

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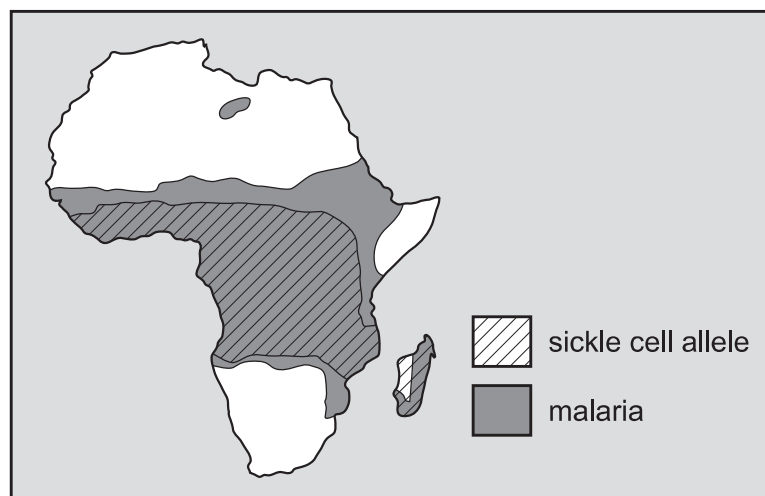


Fig. 5.1

Explain how natural selection is responsible for the distribution of the allele for the abnormal form of haemoglobin (H^S).

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[5]

- (e) Sickle cell anaemia is an example of the variation that exists in the human population. It is a form of discontinuous variation.

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Explain why sickle cell anaemia is a form of discontinuous variation.

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[3]

[Total: 16]

15

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QUESTION 6 STARTS ON PAGE 16

- 6 An agricultural student investigated nutrient cycles on a farm where cattle are kept for milk. The farmer grows grass and clover as food for the cattle. Clover is a plant that has bacteria in nodules in its roots.

For
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Fig. 6.1 shows the flow of nitrogen on the farm as discovered by the student. The figures represent the flow of nitrogen in kg per hectare per year. (A hectare is 10 000 m².)

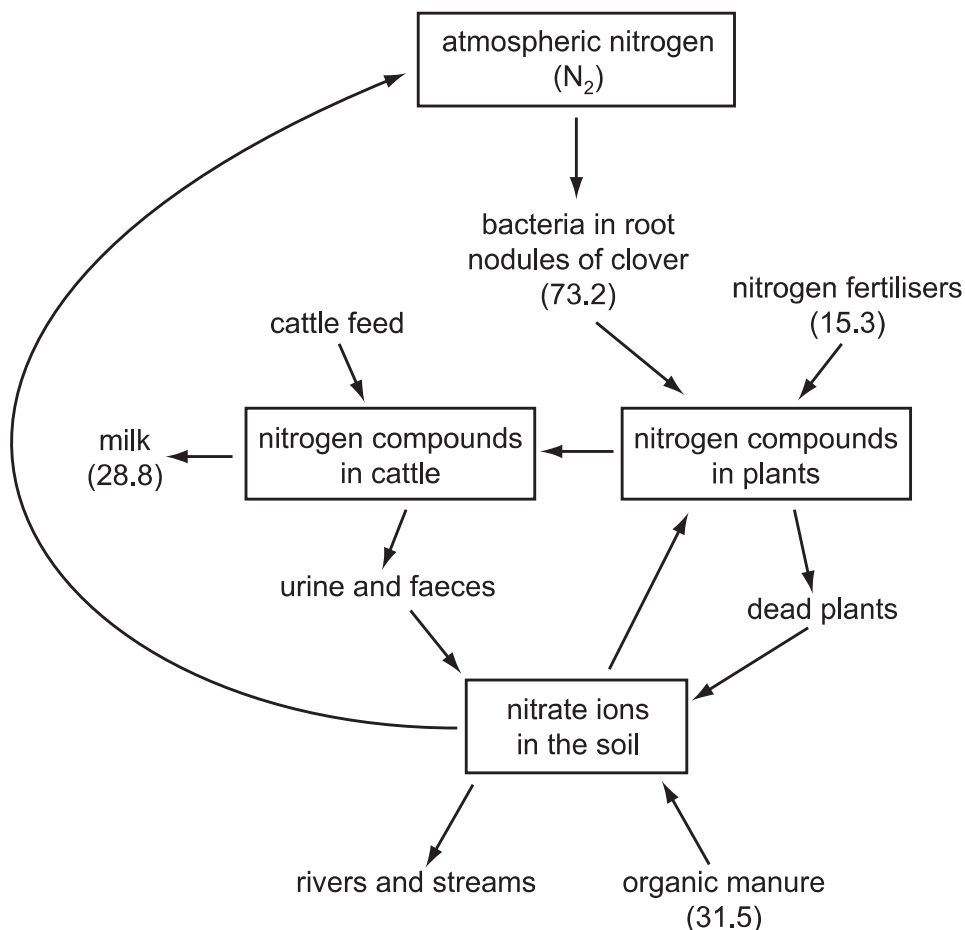


Fig. 6.1

- (a) (i) Name the process in which bacteria convert atmospheric nitrogen into a form that is available to clover plants.

..... [1]

- (ii) Name **two** processes that convert nitrogen compounds in dead plants into nitrate ions that can be absorbed by grass.

..... and [2]

- (b) The total quantity of nitrogen added to the farmer's fields is 120 kg per hectare per year.

Calculate the percentage of this nitrogen that is present in the milk.

Show your working.

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Use

Answer = % [2]

- (c) State two ways in which the nitrogen compounds in the cattle's diet are used by the animals **other than to produce milk**.

1.

2. [2]

- (d) The student found that a large quantity of the nitrogen compounds made available to the farmer's fields was not present in the milk or in the cattle.

Use the information in Fig. 6.1 to suggest what is likely to happen to the nitrogen compounds that are eaten by the cattle, but are **not** present in compounds in the milk or in their bodies.

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..... [5]

- (e) The carbon dioxide concentration in the atmosphere has increased significantly over the past 150 years.

Explain why this has happened.

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[2]

[Total: 14]

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Fig. 4.1

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