Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2017**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages and **2** blank pages.

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1 Fig. 1.1 is a diagram of the human heart. The diagram shows the phase during the heart beat when the atria contract. The blood vessels that carry blood to and from the heart are labelled **A** to **F**.

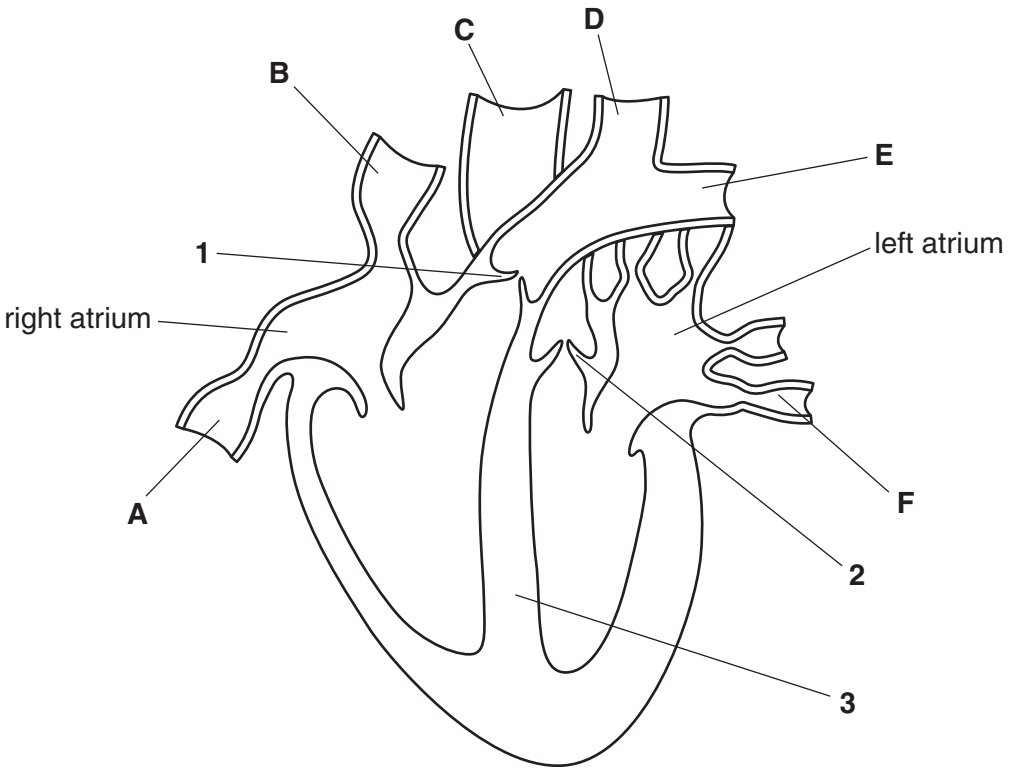

Fig. 1.1

View solution

(a) (i) Draw **one** arrow on Fig. 1.1 to show the pathway taken by blood from a vein into the **right ventricle**. [1]

(ii) Identify the letter of the blood vessel that carries blood at the highest pressure and state its name.

View solution

letter .....

name of the blood vessel .....
[1]

(b) (i) Suggest what causes the valves at **1** and **2** to close during a heart beat.

View solution

.....

.....[1]

(ii) State the function of valves **1** and **2** in the heart.

.....[1]

View solution

(c) Fig. 1.1 shows the phase of the heartbeat when the ventricles are filling with blood.

Using Fig. 1.1, describe **and** explain how the blood travels from the right ventricle to the lungs.

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.....[4]

(d) State the name of the part of the heart labelled **3** and state its role in the mammalian circulation.

name .....

role .....

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[2]

[Total: 10]

View solution

2 Quinoa, *Chenopodium quinoa*, is a dicotyledonous plant that produces seeds that resemble those of cereals, such as rice.

(a) State one feature shown by **all** dicotyledonous plants.

View solution

.....

.....[1]

(b) During seed development, amino acids are converted into storage proteins and proteases.

Protease molecules become active when the seed absorbs water at the start of germination.

Fig. 2.1 shows the formation of a storage protein and a protease in developing quinoa seeds and the action of protease on the storage protein during germination.

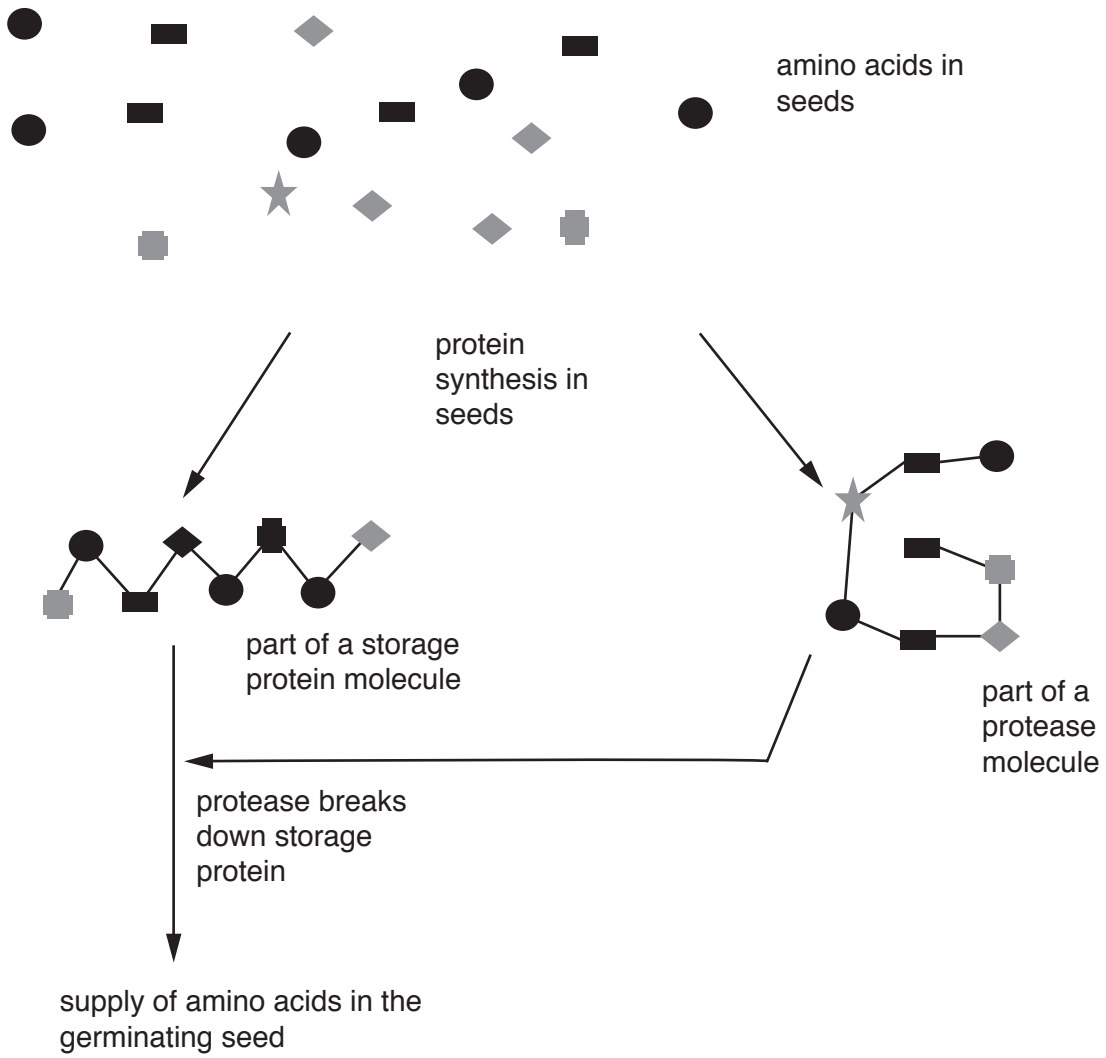

Fig. 2.1

(i) During seed development in quinoa some genes are 'switched on'.

View solution

Define the term *gene*.

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.....[2]

(ii) Describe the differences in structure between the storage protein and the protease shown in Fig. 2.1.

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.....[2]

(c) State the roles of mRNA and ribosomes in protein synthesis.

mRNA .....

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ribosome .....

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[2]

View solution

(d) Researchers investigated the effect of pH on the activity of the protease in quinoa seeds.

View solution

The results are shown in Fig. 2.2.

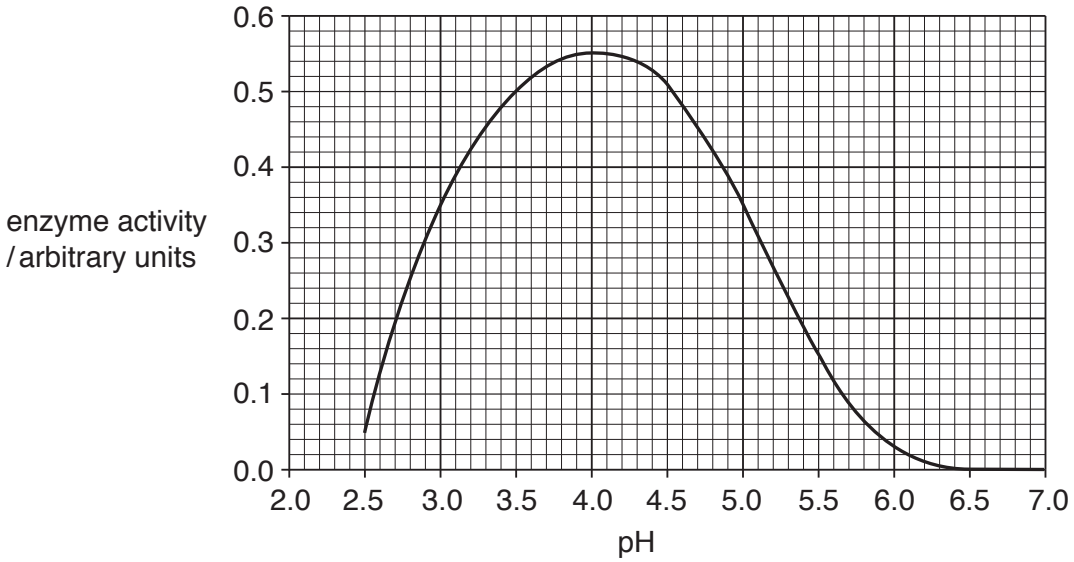

Fig. 2.2

(i) State **two** factors other than pH that would affect enzyme activity.

1 .....

2 .....

[2]

(ii) Describe the effect of increasing pH on the activity of the protease in quinoa seeds.

View solution

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.....[3]

(iii) Explain the activity of protease at pH 4.0 **and** at pH 7.0.

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.....[4]

[Total: 16]

View solution

3 Red blood cells in humans are produced from stem cells.

Fig. 3.1 shows how a red blood cell is produced and becomes specialised.

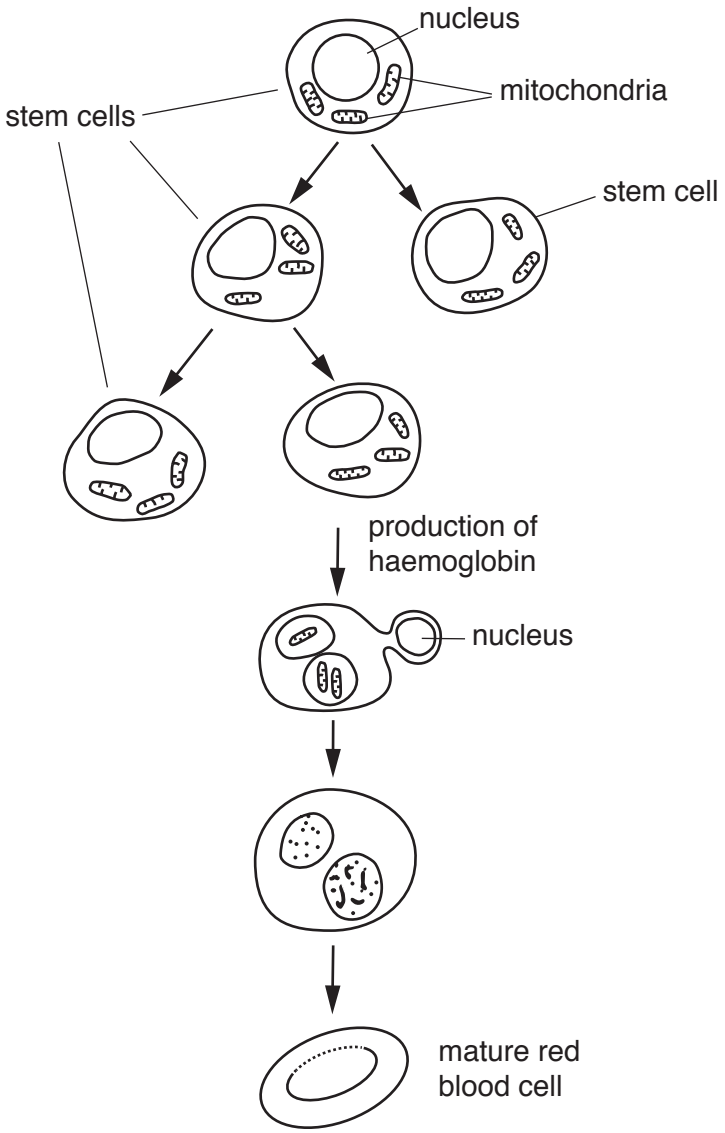

Fig. 3.1

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(a) Use the information in Fig. 3.1 to describe how red blood cells are produced and explain how they are adapted to their function.

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.....[6]

(b) Red blood cells are suspended in the liquid part of the blood.

View solution

State the name of the liquid part of the blood.

.....[1]

(c) Stem cells are also found under the outer layer of the skin.

View solution

Explain why stem cells are found in the skin.

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.....[2]

(d) A type of anaemia is caused by a dietary deficiency.

View solution

(i) State the nutrient that is deficient in the diet when this type of anaemia occurs.

.....[1]

View solution

(ii) State **two** symptoms of anaemia.

1 .....

2 .....

[2]

(e) Some people have sickle cell anaemia.

View solution

Describe the cause of this type of anaemia.

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.....[4]

[Total: 16]

4 Fig. 4.1 is a photograph of a yellow-shouldered Amazon, *Amazona barbadensis*, a species of parrot found along the Venezuelan coast of the Caribbean.



Fig. 4.1

View solution

(a) State the vertebrate group that includes *A. barbadensis* and give **two** features that are used to classify animals into this group.

vertebrate group .....

feature 1 .....

feature 2 .....

[2]

(b) This species is subdivided into several populations on the mainland and on the islands of Margarita and Bonaire. Scientists believe that yellow-shouldered Amazons rarely travel between these places.

Explain what biologists mean when they refer to *populations* of animals, such as *A. barbadensis*.

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.....[3]

View solution

(c) The number of yellow-shouldered Amazons on Margarita Island had decreased to 700 parrots by 1989. The population then increased to 1600 parrots by 2009.

Part of this increase was due to the release of captive-bred parrots on the island. This is one of the few successful release programmes of parrots. A similar release programme in Arizona in the 1980s of a different species of parrot was not successful.

View solution

Suggest why release programmes for captive-bred parrots were **not** successful.

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.....[2]

(d) Some captive breeding programmes involve very small numbers of animals.

View solution

Outline the disadvantages of such programmes.

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.....[3]

(e) Many biologists think that it is better to conserve ecosystems rather than individual species, such as parrots.



Explain the advantages of conserving ecosystems.

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.....[3]

[Total: 13]

5 An investigation studied the effect of fertilisers on grass yield and species diversity in a grassland ecosystem.

Some plots within the grassland were treated with fertilisers containing nitrogen, magnesium and phosphate.

The control plots did not have any added fertiliser.

The average yields were:

- plots with fertiliser 1733 g m^{-2} $year^{-1}$
- plots without fertiliser (control plots) 1009 g m^{-2} $year^{-1}$

(a) (i) Calculate the difference between the average yields of the two plots within the field as a percentage of the average yield of the control plots.

Show your working and give your answer to the nearest whole number.

View solution

..... %
[2]

(ii) Explain why the average yield increased as a result of adding the fertiliser.

View solution

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.....[3]

(iii) State the name of the process that occurs when fertiliser washes off land into rivers and causes an algal bloom.

.....[1]

View solution

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The researchers counted the number of different plant species in each of the plots in the grassland to determine species diversity. Counting started at the beginning of the growing season and was repeated every three weeks.

The average number of plant species in each type of plot is shown in Fig. 5.1.

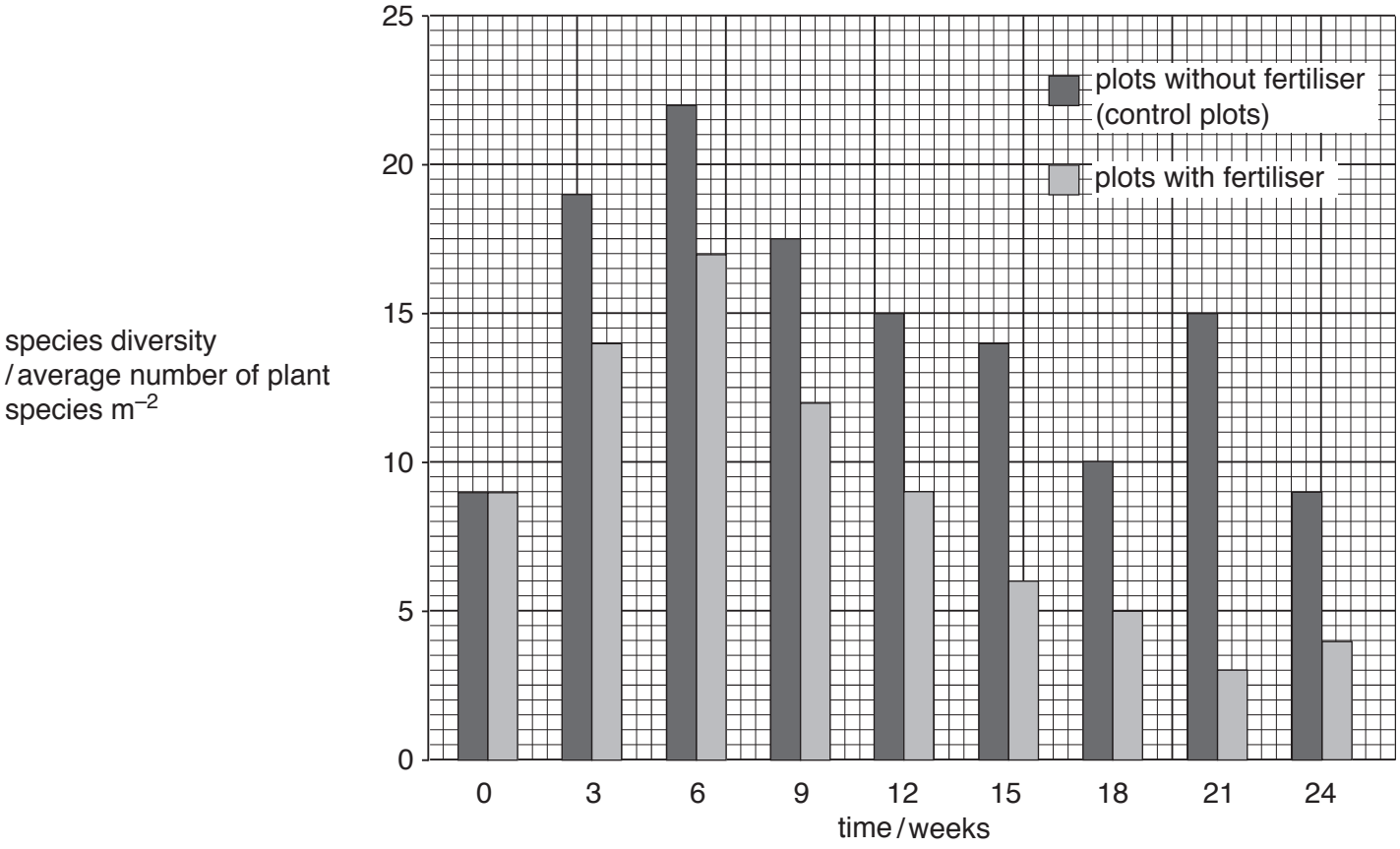

Fig. 5.1

(b) Describe the effect of fertiliser on the plant species diversity shown in Fig. 5.1.

View solution

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.....[3]

(c) Suggest why some species of plants survive in grassland and others do not.

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.....[2]

[Total: 11]

View solution

6 Meningitis is a transmissible disease. One form of the disease is caused by the bacterium *Neisseria meningitidis*.

(a) Define the term *transmissible disease*.

View solution

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.....[2]

(b) One effect of meningitis is a slowing down of nerve impulses.

View solution

State what is meant by a *nerve impulse*.

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.....[2]

(c) The spread of meningitis can be controlled by using vaccines.

View solution

(i) Explain how vaccination provides active immunity.

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.....[4]

(ii) If meningitis disappears from a country, explain why the vaccine should continue to be used in that country.

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.....[2]

(d) People who have meningitis are treated with injections of antibodies to give them passive immunity.

View solution

(i) Suggest why the antibodies must be injected rather than taking them by mouth.

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.....[2]

(ii) Explain why passive immunity does not give long-term protection against diseases, such as meningitis.

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[Total: 14]

View solution

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