UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5832627979

BIOLOGY **9700/22**

Paper 2 Structured Questions AS **May/June 2010**

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 in the spaces provided at the top of this page.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, or rough working.
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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

This document consists of **16** printed pages and **4** blank pages.

Answer **all** the questions.

For Examiner's Use

1 Fig. 1.1 is a diagram of an electron micrograph of a plant cell.
Fig. 1.2 is a diagram of an electron micrograph of an animal cell.
Both diagrams are incomplete.

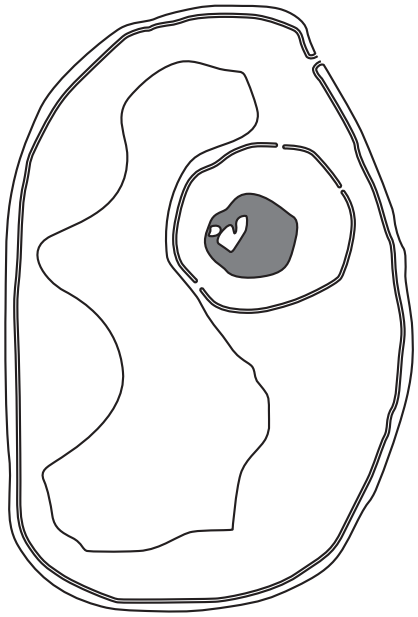

Fig. 1.1

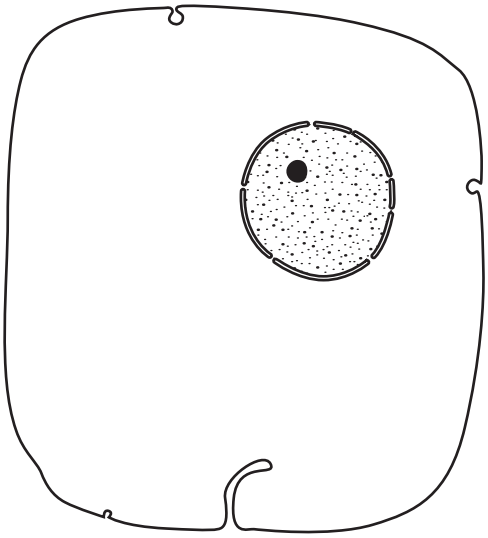

Fig. 1.2

(a) Explain how Fig. 1.1 can be identified as a plant cell.

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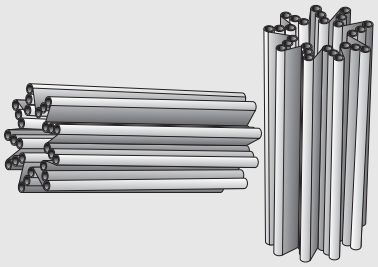
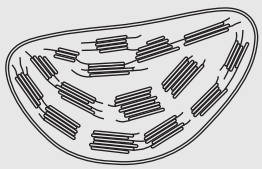
.....[2]

(b) Some organelles are missing from Figs 1.1 and 1.2. Information about these organelles is shown in the shaded boxes in Table 1.1.

For Examiner's Use

Complete the empty boxes in Table 1.1 by adding the correct information below each column heading.

Table 1.1

name of organelle	diagram of organelle(s) as seen under the electron microscope (not to scale)	one function of organelle	cell type(s) in which organelle is located
mitochondrion			animal and plant
		assemble microtubules to produce the mitotic spindle	
rough endoplasmic reticulum		protein synthesis	
Golgi apparatus			animal and plant
		photosynthesis	plant only

[8]

[Total: 10]

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2 Fig. 2.1 is a diagram of a vertical section through a healthy mammalian heart.

For Examiner's Use

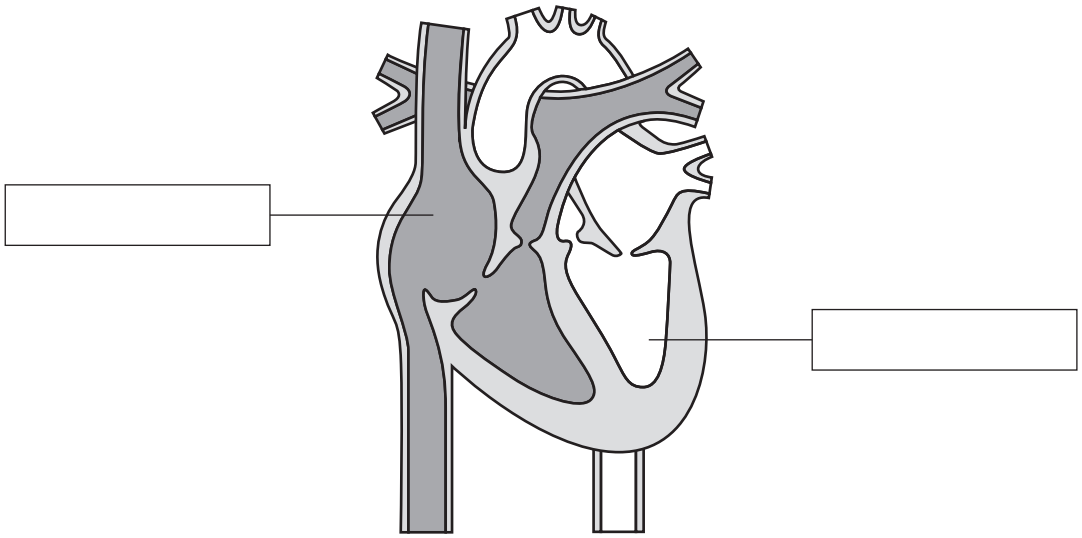

Fig. 2.1

(a) (i) Label the **two** chambers of the heart by writing in the boxes provided on Fig. 2.1. [1]

(ii) State two ways in which the **composition** of blood entering the right atrium is different to blood entering the left atrium.

1. .....

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2. .....

.....[2]

Some people are born with structural defects of the heart and its associated blood vessels. This is known as congenital heart disease. The dotted circles labelled **A** to **G** on Fig. 2.2 show some areas that are affected by different types of congenital heart disease.

For Examiner's Use

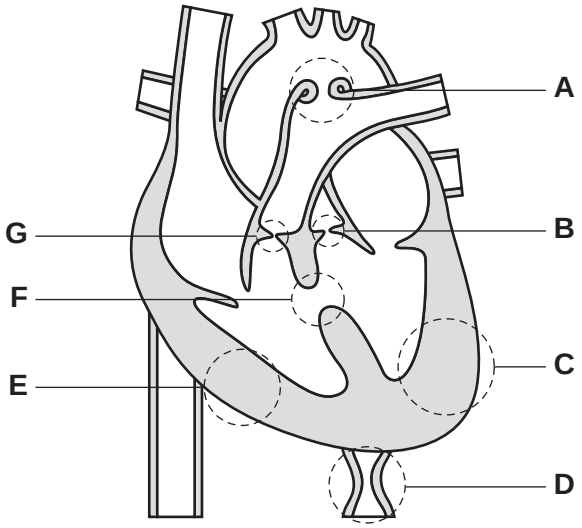

Fig. 2.2

The structural defects causing four types of congenital heart disease are described below:

- **patent ductus arteriosus** – a link between the pulmonary artery and aorta fails to close after birth
- **pulmonary stenosis** – a narrowing of the semilunar valve of the pulmonary artery
- **coarctation of the aorta** – a localised narrowing of the aorta
- **ventricular septal defect** – a hole in the septum between the ventricles.

(b) Match the **one** correct area from **A** to **G** on Fig. 2.2 with each of the congenital heart diseases.

The first one has been completed for you.

patent ductus arteriosus ..... **A** .....

pulmonary stenosis .....

coarctation of the aorta .....

ventricular septal defect ..... [3]

(c) Suggest and explain how the flow of blood in a person with patent ductus arteriosus differs from that of a person with a healthy heart.

For Examiner's Use

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[Total: 9]

3 The HIV/AIDS pandemic has had a very large impact on life expectancy in many African countries.

Table 3.1 shows estimated data for seven African countries for

- the average life expectancy of an individual born in 2002
- the percentage of the population testing positive for HIV in 2002
- the average life expectancy of an individual born in 2002 **if there was no HIV/AIDS pandemic**.

Table 3.1

country	life expectancy / years		percentage of population testing positive for HIV
	without HIV/AIDS	with HIV/AIDS	
Botswana	72.4	33.9	35.8
Côte d'Ivoire	55.6	42.8	10.8
Kenya	65.6	45.5	14.0
Malawi	56.3	38.5	16.0
South Africa	66.3	48.8	19.9
Zambia	55.4	35.3	20.0
Zimbabwe	69.0	40.2	25.1

(a) Using the 'without HIV/AIDS' and 'with HIV/AIDS' data shown in Table 3.1, calculate the percentage decrease in life expectancy for Botswana.

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

Answer = ... % [2]

For Examiner's Use

(b) Suggest two reasons for the differences shown in estimated life expectancy **without** HIV/AIDS between the different African countries.

1. .....

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2. .....

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.....[2]

(c) After studying the data in Table 3.1, a student concluded that:

"There is a correlation between the percentage of the population testing positive for HIV and the decrease in estimated life expectancy with HIV/AIDS."

(i) With reference to Table 3.1, explain why the data do **not** fully support the student's conclusion.

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.....[2]

(ii) List two factors in the prevention and control of HIV/AIDS that would help to improve average life expectancy in the African countries shown in Table 3.1.

1. .....

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2. .....

.....[2]

(d) A person who is confirmed as HIV-positive has tested positive for the presence of antibodies to HIV.

For Examiner's Use

Outline the events that occur in a newly-infected person, which lead to the production of antibodies to HIV.

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[Total: 13]

4 Fig. 4.1 shows the primary structure of a lysozyme molecule, an enzyme found in tears, saliva and in lysosomes.

For Examiner's Use

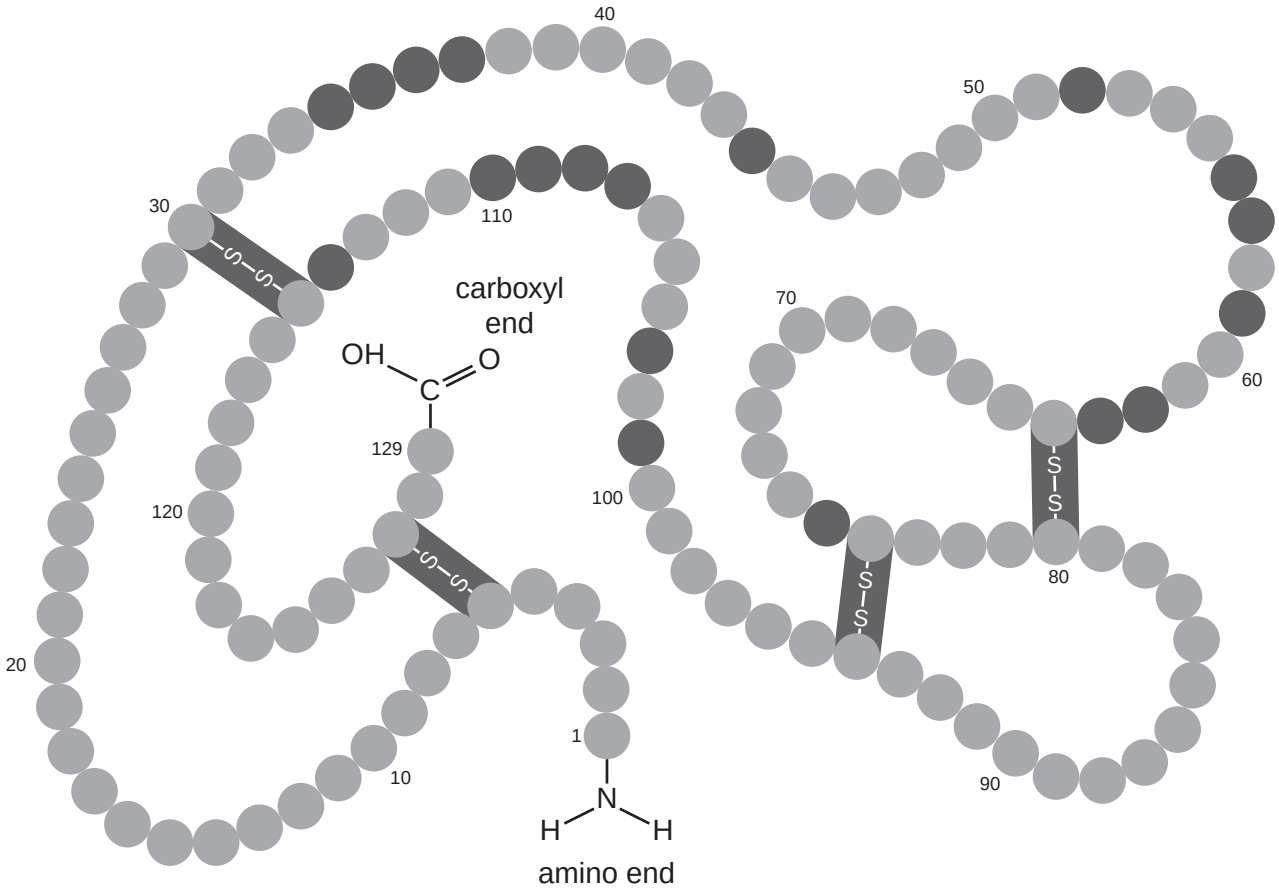

Fig. 4.1

(a) (i) Explain what is meant by the term *primary structure*.

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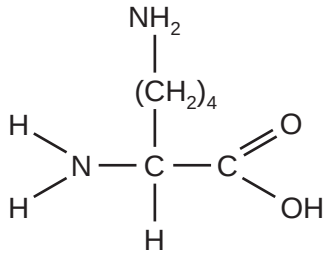
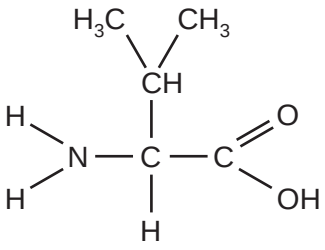
.....[1]

(ii) The molecular structure of the first two amino acids of lysozyme, lysine and valine, is shown below.

Use the space to show how these amino acids become linked in a condensation reaction.



lysine



valine

[3]

(b) Proteins, such as the enzyme lysozyme, have a secondary structure and a tertiary structure.

(i) Describe the secondary and tertiary structure of an enzymatic protein, such as lysozyme.

secondary .....

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tertiary .....

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.....[5]

(ii) State why it is important for enzymes, such as lysozyme, to possess a tertiary structure.

For Examiner's Use

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.....[1]

(c) Some people have a rare disease caused by a single change in the DNA nucleotide sequence of the gene coding for lysozyme. The change leads to the formation of an insoluble protein that has a different structure to the normal soluble lysozyme molecule.

Suggest how a change in the gene can lead to the differences observed between the normal lysozyme and the changed lysozyme.

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.....[3]

[Total: 13]

5 Fig. 5.1 is a diagram of part of the human gas exchange system.

For Examiner's Use

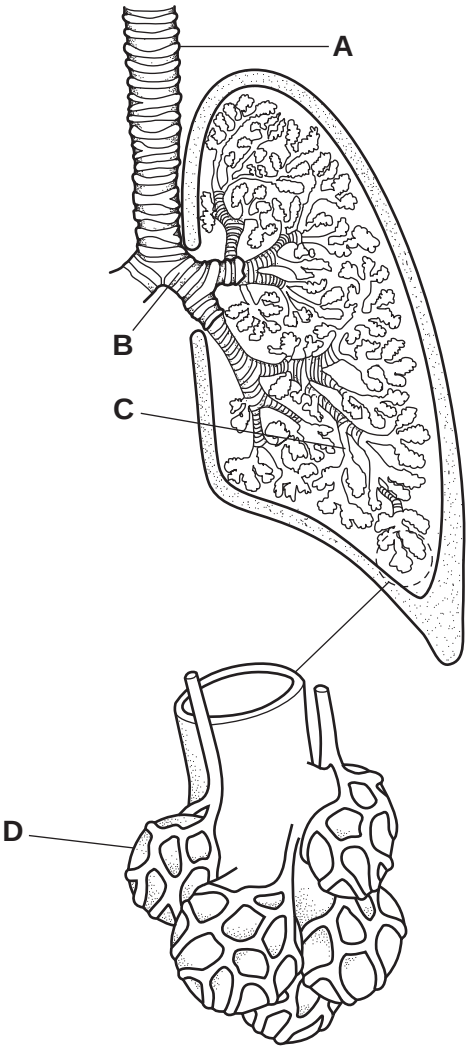

Fig. 5.1

(a) Complete the table to show the distribution of the structural features within the parts of the gas exchange system, **A** to **D**, shown in Fig. 5.1.

Use a tick (✓) if the feature is present and a cross (✗) if the feature is absent. Some of the boxes have been completed for you.

structure	features				
	cartilage	ciliated epithelium	elastic fibres	goblet cells	smooth muscle
A		✓		✓	
B			✓		
C				✓	✓
D	✗				✗

[4]

(b) Explain the role of goblet cells and cilia in the maintenance of a healthy gas exchange system.

goblet cells .....

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cilia .....

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.....[4]

[Total: 8]

6 When investigating ecosystems, food chains and food webs are constructed.

For Examiner's Use

Read the passage below about trophic relationships on one of the Galapagos Islands.

Marine iguanas feed on kelp, which grows attached to rocks in shallow waters. Kelp is a photosynthetic organism. Further inland, xerophytes are grazed upon by land iguanas. A great diversity of herbivorous insects, including many species of short-horned grasshoppers, feed on the xerophytes. An analysis of the gut contents of lava lizards reveals that these insects are prey for the lizards. The lizards are preyed upon by Galapagos snakes. The snakes also hunt grasshoppers and newly hatched iguanas. The Galapagos hawk has a varied diet and catches animals such as Galapagos snakes, short-horned grasshoppers, small lava lizards and newly hatched iguanas.

(a) Complete Fig. 6.1 to make a food web by:

- filling in the blank boxes with the names of the organisms
- adding arrows to show the direction of energy flow between all the different links in the food web. [4]

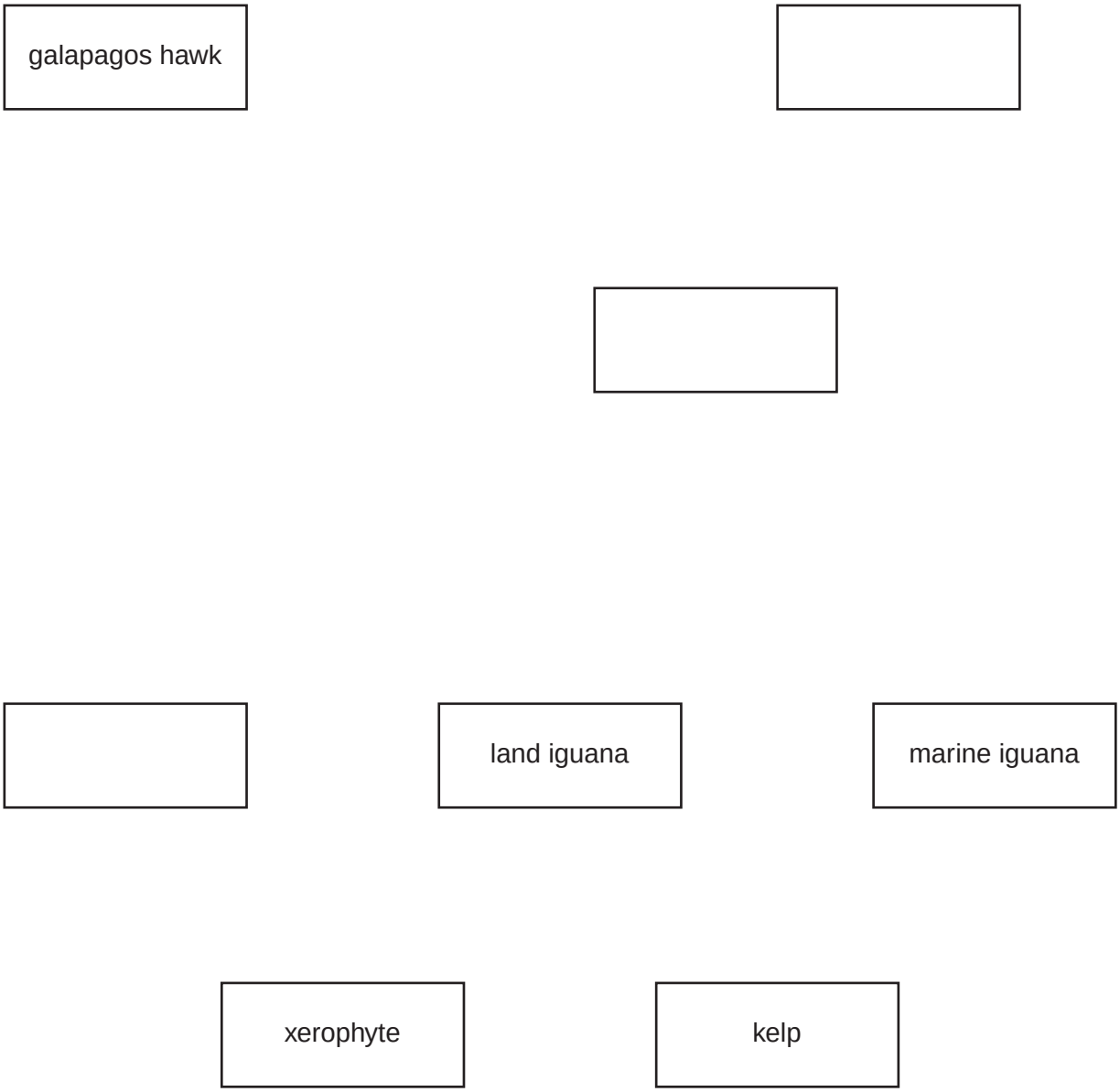

Fig. 6.1

(b) State which of the organisms in Fig. 6.1 are the producers. Explain your choice.

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.....[3]

[Total: 7]

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