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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6761017436

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **February/March 2026**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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1 **(a)** The features of an organism are used to classify them into one of five kingdoms.

One kingdom is the animal kingdom.

(i) State the name of **two** other kingdoms.

1 .....

2 .....

[2]

(ii) Tick (✓) the statements that describe **all** organisms in the animal kingdom.

Their cells have a cell wall.	
They have lungs.	
They are multicellular.	
They are vertebrates.	
They obtain their energy by consuming other organisms.	
They respire.	

[3]

(b) The Felidae are a group of animals commonly known as the cat family. There are 41 species in the cat family. The base sequences in the DNA of these cat species have been compared.

Figure 1.1 is a diagram of part of a DNA molecule.

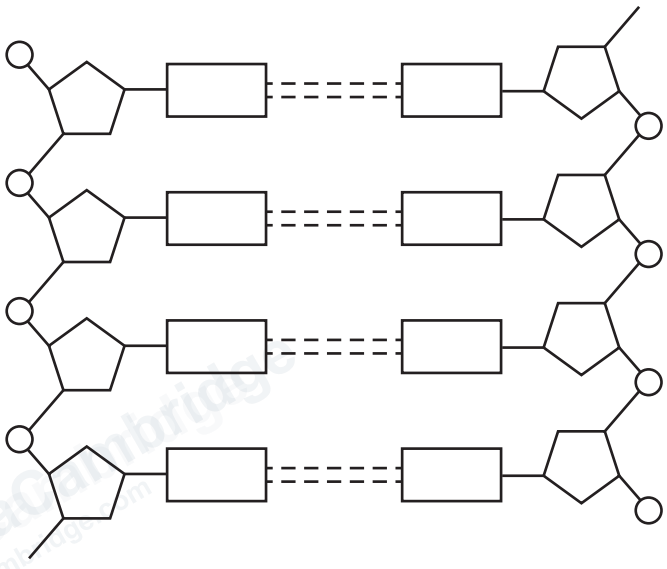

Figure 1.1

(i) On Figure 1.1, draw an **X** to identify a base. [1]

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(ii) DNA is made from four different bases. Base **G** is one of these bases.

State the letters of the **three** other bases **and** state which bases pair together.

.....

.....

..... [2]

(c) Figure 1.2 shows the evolutionary relationships between several species of cat based on their DNA sequences. The diagram should be interpreted from left to right. Each branch shows the point at which a new species was formed.

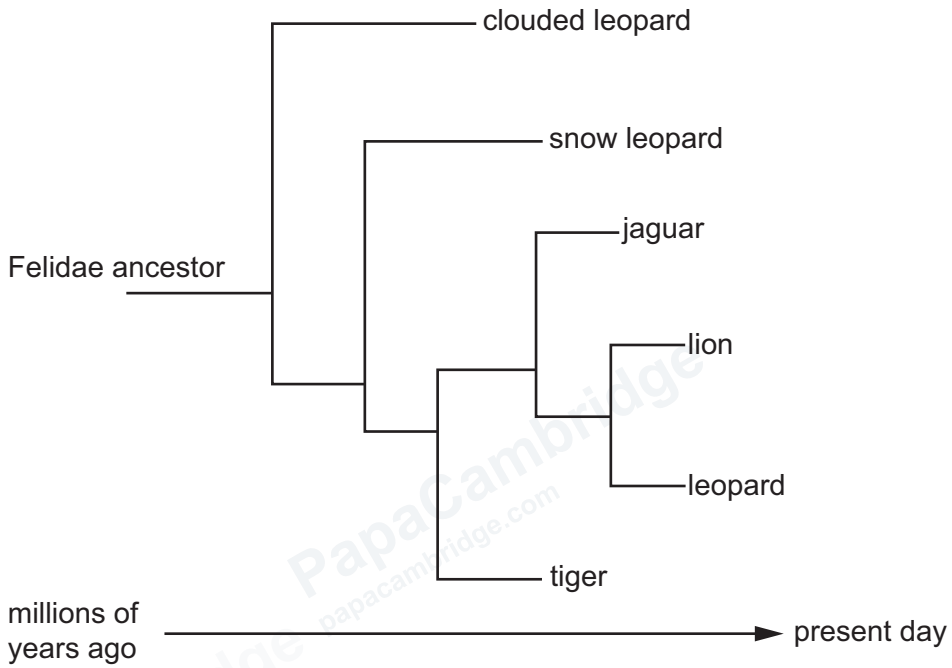

Figure 1.2

(i) Use Figure 1.2 to determine which species has the closest base sequence to the Felidae ancestor.

..... [1]

(ii) Use Figure 1.2 to determine which **two** species are most closely related.

Explain your answer.

.....

.....

.....

..... [2]

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(d) Figure 1.3 shows a photomicrograph of part of an animal cell.

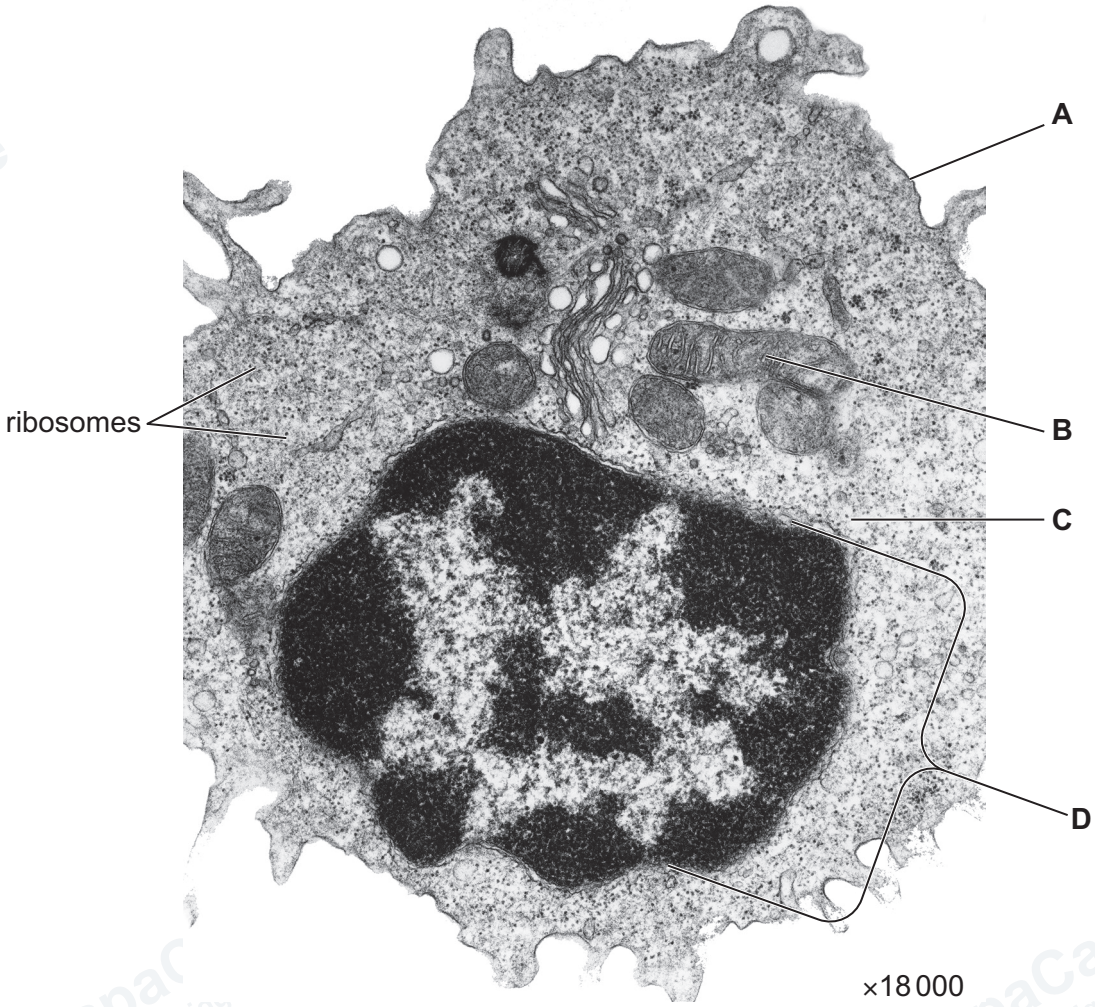

Figure 1.3

(i) State the letters shown in Figure 1.3 that identify the:

cell membrane .....

nucleus. .....

[2]

(ii) State the letter shown in Figure 1.3 that identifies a mitochondrion and describe the functions of mitochondria.

letter .....

functions of mitochondria .....

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.....

.....

[3]

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(iii) The cell shown in Figure 1.3 contains ribosomes.

State the function of ribosomes.

.....

..... [1]

(iv) The magnification of the photomicrograph shown in Figure 1.3 is ×18 000.

State the other measurement needed to calculate the actual size of the cell.

..... [1]

[Total: 18]

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2 **(a)** A scientist investigates the effect of temperature on the rate of photosynthesis in three plant species.

Figure 2.1 shows the results of the investigation.

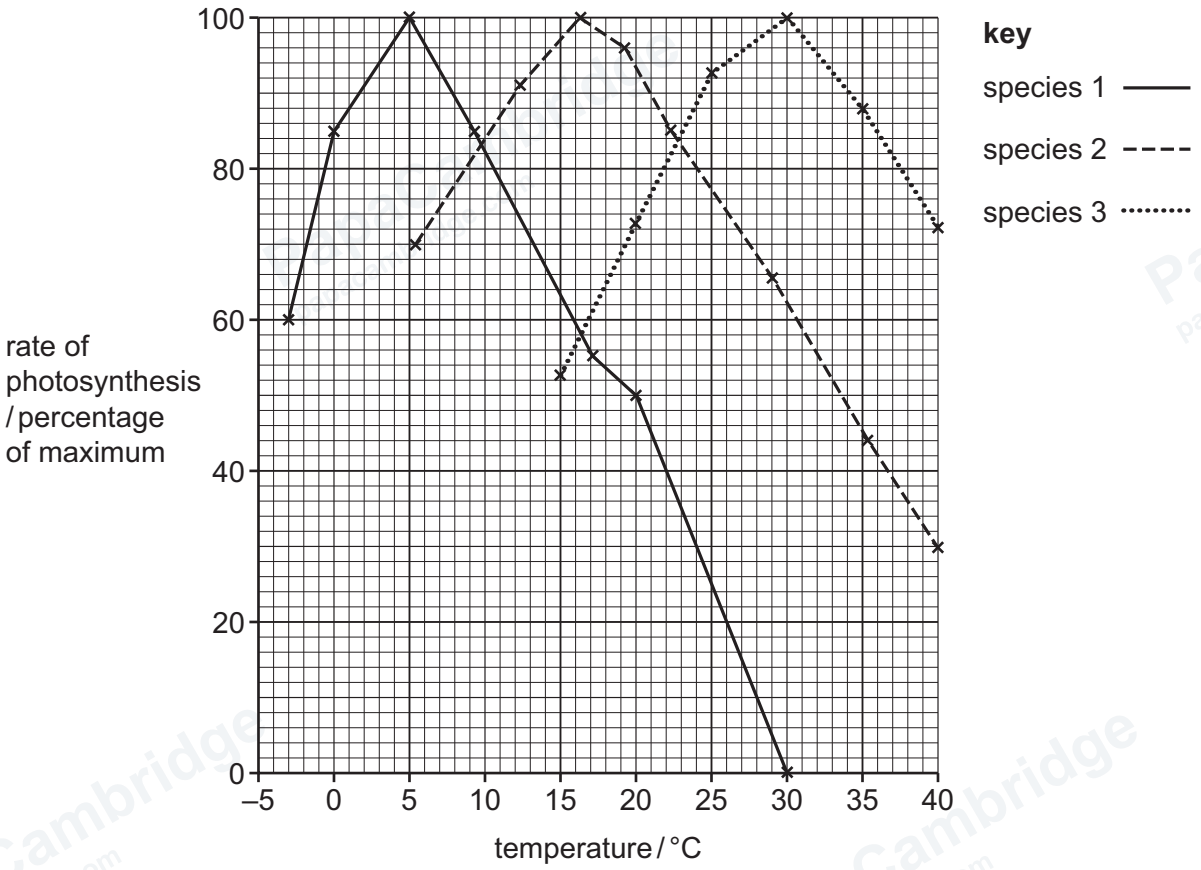

Figure 2.1

(i) At the maximum rate of photosynthesis, species 1 makes 15.0 g of carbohydrate per day.

Use Figure 2.1 to calculate the mass of carbohydrate made by species 1 per day at 0 °C.

Space for working.

..... g
[2]

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(ii) The scientist forms several conclusions.

Tick (✓) **all** the conclusions that are supported by the data in Figure 2.1.

At every temperature, species 3 has a greater rate than species 1.	
Species 1 has a rate of at least 50% of the maximum over a temperature range of 23 °C.	
Species 2 has a greater rate of photosynthesis than species 1.	
Species 3 has a higher optimum temperature than species 1.	

[2]

(iii) Use Figure 2.1 to describe **and** explain the effect of temperature on the rate of photosynthesis for species 1.

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..... [6]

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(b) **(i)** State the balanced chemical equation for photosynthesis.

..... [2]

(ii) Explain why plants need magnesium ions to photosynthesise.

.....

.....

.....

.....

..... [2]

(c) The carbohydrate made during photosynthesis is made into larger carbohydrates with specific functions.

Complete Table 2.1.

Table 2.1

carbohydrate	function in a plant
starch	
cellulose	
	translocated in the phloem

[3]

[Total: 17]

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3 **(a)** Figure 3.1 shows three types of blood vessels in the human body.

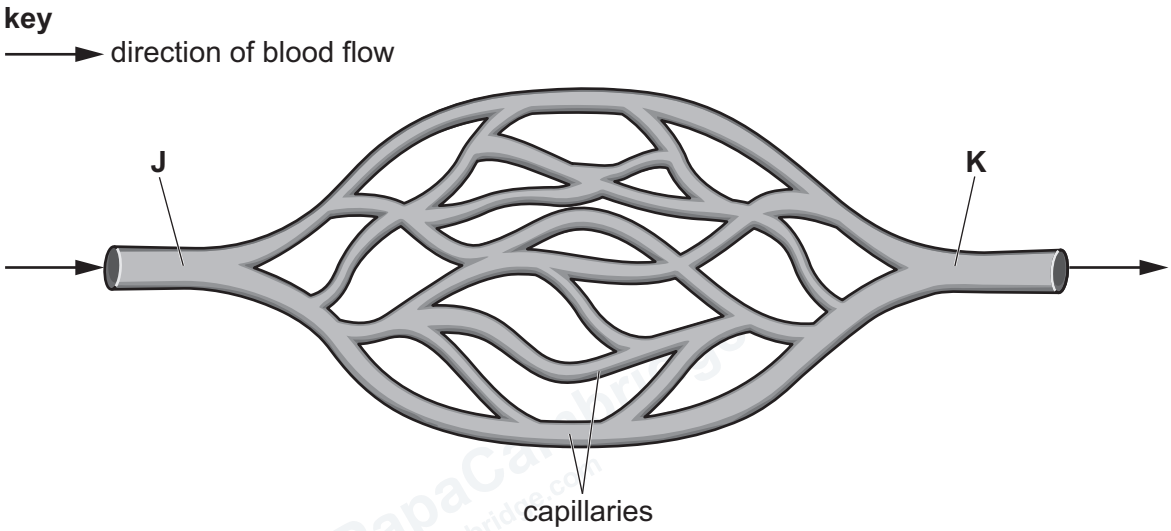

Figure 3.1

(i) Use Figure 3.1 to identify the types of blood vessels labelled **J** and **K**.

J .....

K .....
[1]

(ii) On Figure 3.1, draw a label line and the letter **P** to show where the pressure of blood is at its highest. [1]

(iii) Explain how the structure of capillaries is related to their functions.

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..... [5]

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(b) White blood cells are one component of blood.

(i) Name **two** other components of blood.

1 .....

2 .....

[2]

(ii) Lymphocytes are one type of white blood cell.

Explain how lymphocytes protect the body from infection.

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..... [4]

[Total: 13]

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4 **(a)** Figure 4.1 shows a section through the human eye.

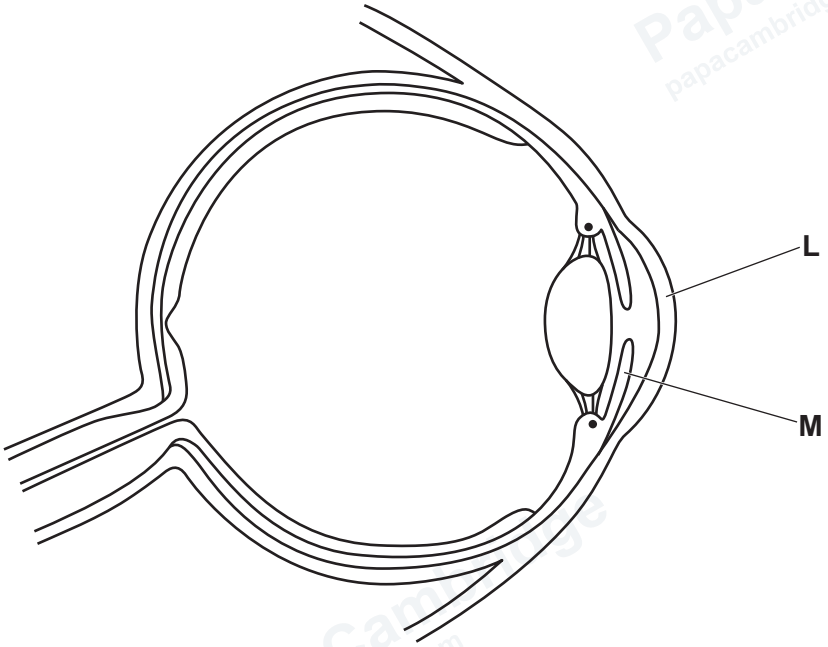

Figure 4.1

(i) Use Figure 4.1 to identify structures **L** and **M**.

L .....

M .....

[2]

(ii) On Figure 4.1, draw a label line and the letter **F** to identify the fovea. [1]

(iii) Describe how the fovea is adapted for its function.

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..... [3]

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(b) Figure 4.2 shows part of the eye from the front and from the side when viewing a near object.

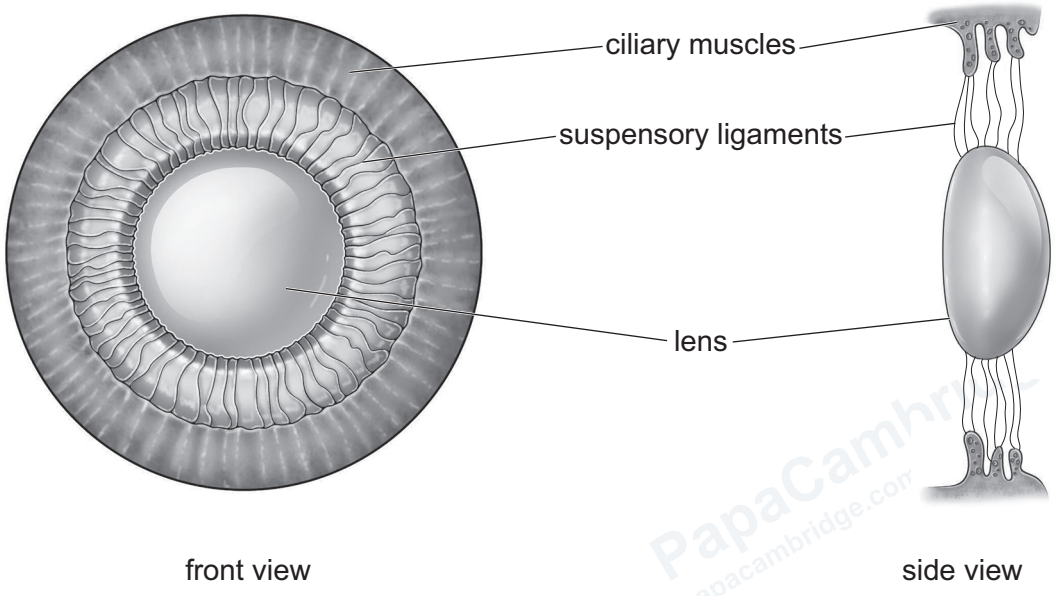

Figure 4.2

(i) Use Figure 4.2 to explain the changes that occur to view a distant object.

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..... [4]

(ii) State the term that describes the ability of the eye to view near and distant objects.

..... [1]

[Total: 11]

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5 **(a)** Eye colour in fruit flies is controlled by a single gene. The alleles for this gene are found on the X chromosome.

Some fruit flies have red eyes and some have white eyes.

The allele for red eye colour is dominant and is represented by the letter **R**.

The allele for white eye colour is recessive and is represented by the letter **r**.

A male fruit fly with the genotype $\mathbf{X^R\ Y}$ and a female fruit fly with the genotype $\mathbf{X^r\ X^r}$ are bred together.

(i) State the eye colour of the male and the female fruit flies.

male eye colour ..... and female eye colour ..... [1]

(ii) State the term used to describe an individual who has two identical alleles of a particular gene.

..... [1]

(iii) Complete the Punnett square to determine the genotypes and phenotypic ratio of the offspring.

		male	
		.....	.....
female	.....	.....	.....
	.....	.....	.....

The phenotypic ratio of the offspring is:

.....
[3]

(iv) State the name of this type of monohybrid inheritance.

..... [1]

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(b) Figure 5.1 shows the chromosomes in a body cell of a fruit fly.



Figure 5.1

Use Figure 5.1 to complete the sentences about the genetic material in fruit flies.

The nucleus in a body cell of a fruit fly contains ..... pairs of chromosomes. A cell with a pair of each type of chromosome is known as a ..... cell.

Before body cells divide by ....., the chromosomes must ..... to maintain the chromosome number in each daughter cell.

[4]

[Total: 10]

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6 **(a)** Figure 6.1 shows a food web from a lake ecosystem.

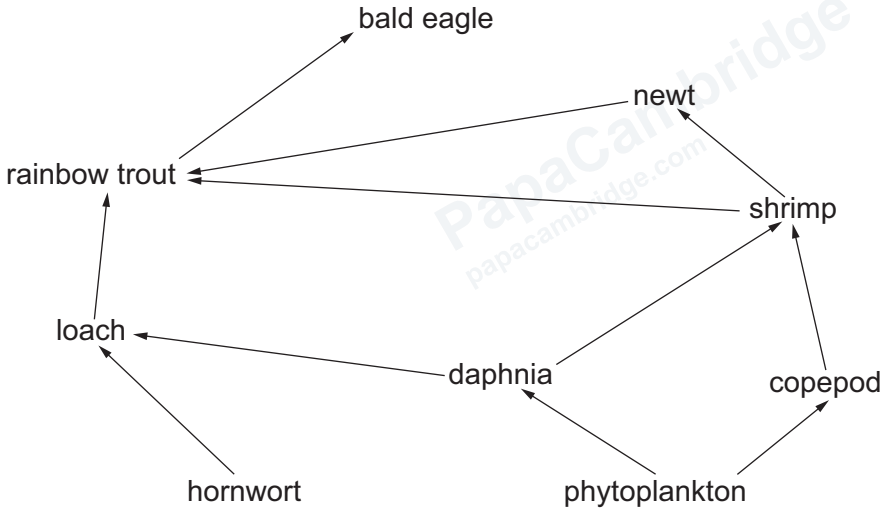

Figure 6.1

(i) Use Figure 6.1 to identify:

all of the producers .....

an organism that **only** feeds as a secondary consumer .....

an organism that consumes at **three** different trophic levels. .....

[3]

(ii) Use Figure 6.1 to construct a food chain containing **six** trophic levels.

[2]

(iii) The newt is an amphibian.

State **one** feature of vertebrates **only** found in amphibians.

..... [1]

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(iv) Humans harvest rainbow trout for food.

Use Figure 6.1 to explain the possible effect of humans harvesting rainbow trout on the population of bald eagles.

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..... [2]

(v) Explain why it is more energy efficient for humans to eat crop plants than it is for humans to eat rainbow trout.

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..... [3]

[Total: 11]

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