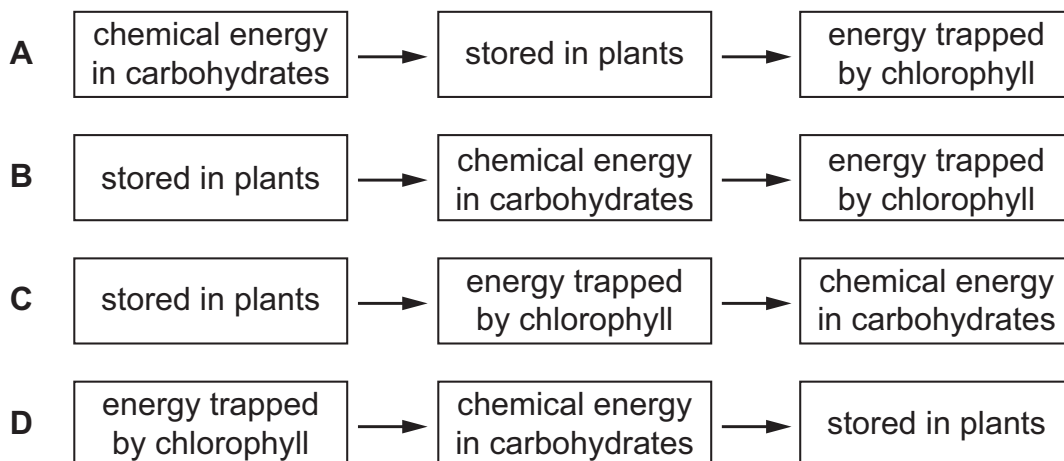


32 Which flowchart shows how energy is transferred from the Sun to an organism?



33 Which statements about a food chain are correct?

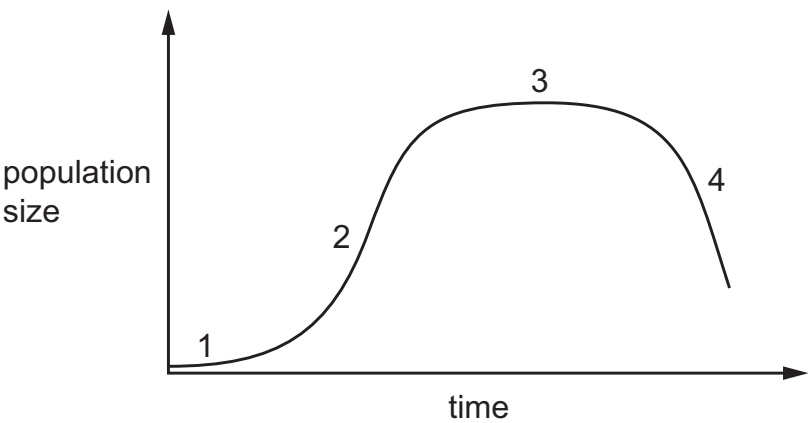
- 1 Between trophic level 1 and trophic level 2, energy is passed from a herbivore to a carnivore.
- 2 Between trophic level 2 and trophic level 3, energy is passed from a primary consumer to a secondary consumer.
- 3 Between trophic level 3 and trophic level 4, energy is passed from a secondary consumer to a tertiary consumer.

A 1 and 3 **B** 1 only **C** 2 and 3 **D** 2 only

34 Which process in the nitrogen cycle is involved in the breakdown of amino acids in living organisms?

- A** deamination
- B** decomposition
- C** denitrification
- D** digestion

36 The graph shows how the size of a population changes over time.



Which row identifies the phases of population growth?

	death phase	exponential phase	lag phase
A	3	1	4
B	3	2	1
C	4	1	3
D	4	2	1

4 Steppe ecosystems are large areas of grasslands found in central Asia.

(a) Fig. 4.1 is a food web from a steppe ecosystem.

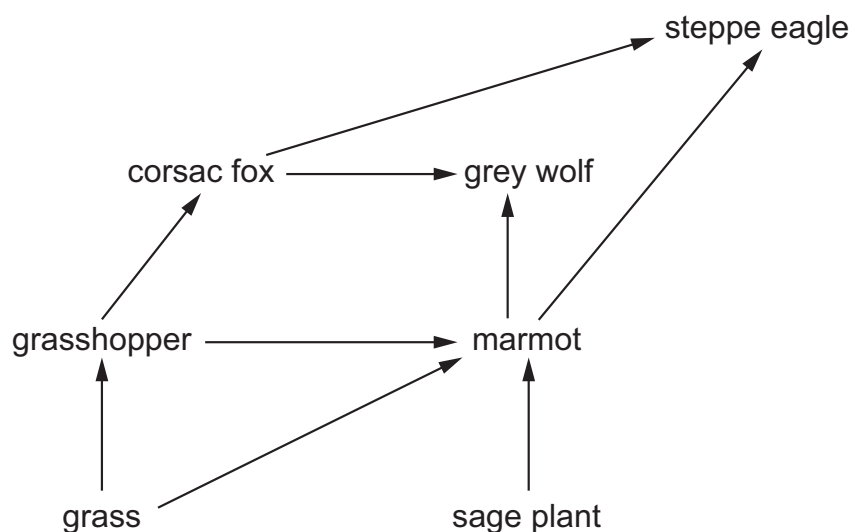


Fig. 4.1

(i) State the name of **one** primary consumer from Fig. 4.1.

..... [1]

(ii) Use the information in Fig. 4.1 to construct **one** food chain with four trophic levels that includes the steppe eagle.

[1]

(iii) There are fewer grey wolves than marmots in this ecosystem.

Explain why the population size of organisms decreases from one trophic level to the next trophic level in this ecosystem.

.....
.....
.....
.....
..... [2]

- (b) Fig. 4.2 is a photograph of a wild horse. Przewalski's horse is a type of wild horse that nearly became extinct.



Fig. 4.2

After a captive breeding programme, they have been successfully reintroduced to the steppe ecosystem.

The captive breeding programme started with 12 wild horses.

- (i) Explain the risks to a species of a captive breeding programme that uses such a small number of individuals.

.....

.....

.....

.....

.....

.....

..... [3]

- (ii) Suggest ways of maintaining a population of Przewalski's horse in the wild after their reintroduction to the steppe ecosystem.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (c) *In vitro* fertilisation (IVF) can be used in captive breeding programmes.

Fig. 4.3 shows some of the stages involved in IVF.

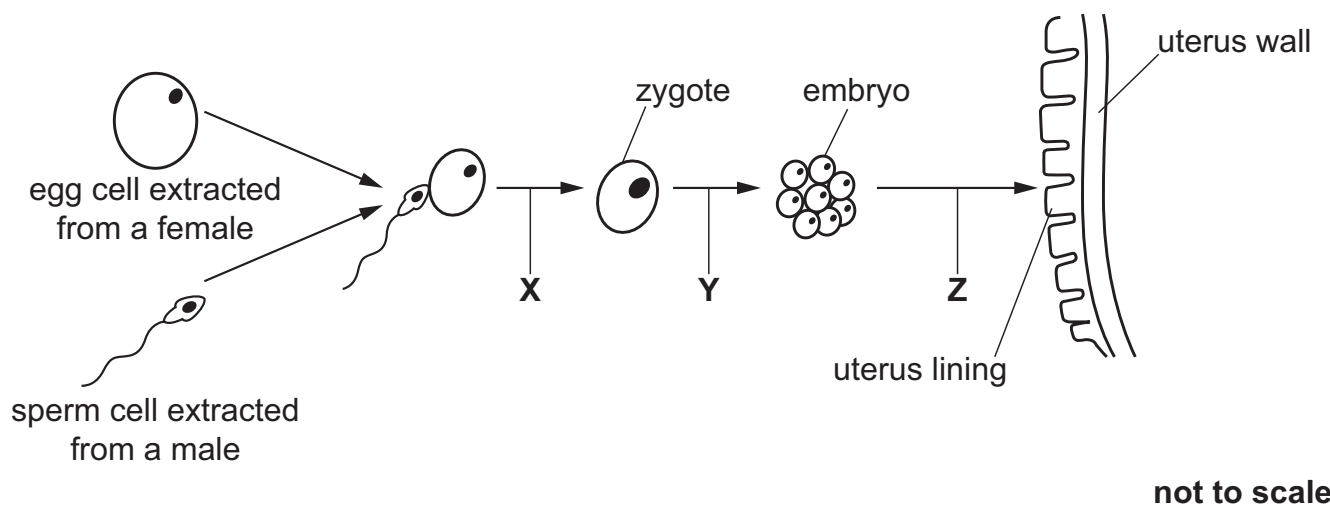


Fig. 4.3

State the names of the processes occurring at X, Y and Z in Fig. 4.3.

X

Y

Z

[3]

[Total: 14]

- 3 (a) Fig. 3.1 is a photograph of a necklace starfish, *Fromia monilis*.

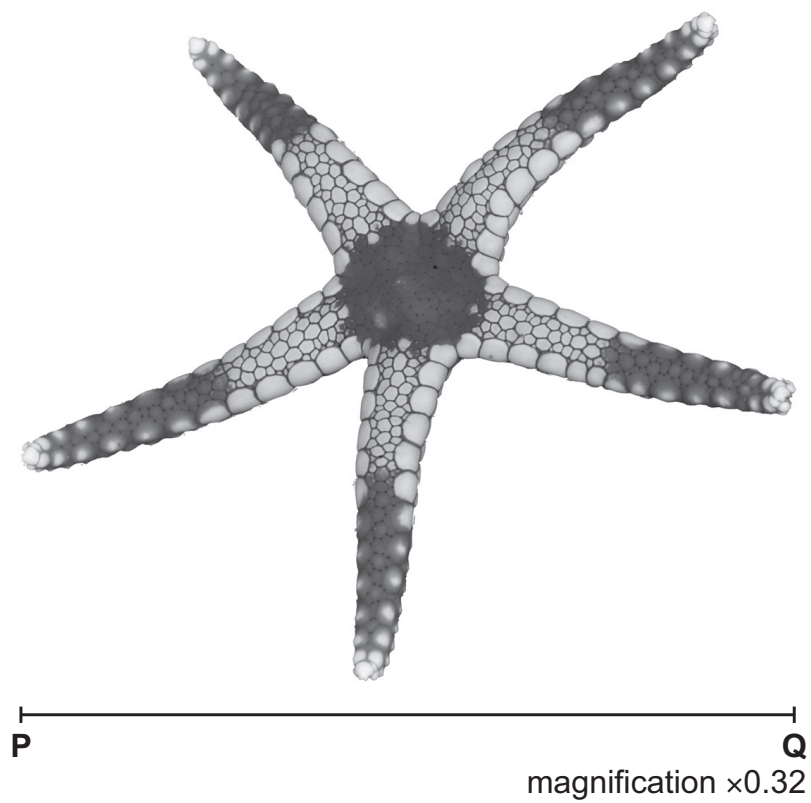


Fig. 3.1

- (i) Draw a large diagram of the necklace starfish shown in Fig. 3.1.

(ii) Line **PQ** in Fig. 3.1 represents the diameter of the necklace starfish.

Measure the length of line **PQ** in Fig. 3.1.

length of line **PQ** mm

Calculate the actual diameter of the necklace starfish using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ in Fig. 3.1}}{\text{actual diameter of the necklace starfish}}$$

Give your answer to **two** significant figures.

Space for working.

..... mm
[3]

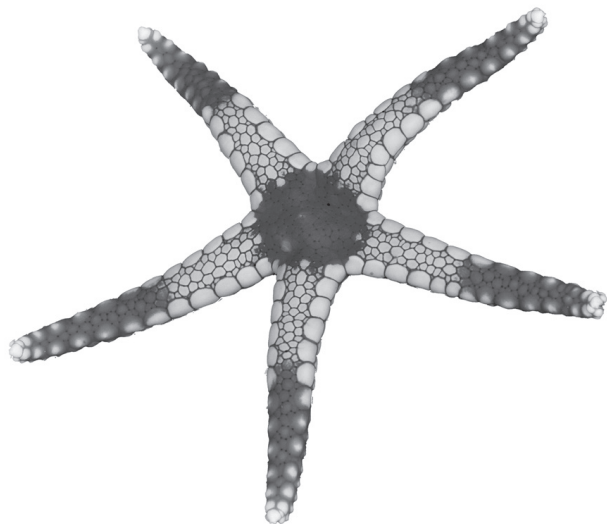
(iii) Fig. 3.2 is a photograph of a spiny starfish, *Marthasterias glacialis*. Fig. 3.3 is a photograph of a necklace starfish.

The magnifications of the photographs are **not** the same.



spiny starfish

Fig. 3.2



necklace starfish

Fig. 3.3

State **two** ways the spiny starfish in Fig. 3.2 differs from the necklace starfish in Fig. 3.3, and **one** way it is similar.

Do **not** include references to size in your answer.

difference 1
.....

difference 2
.....

similarity 1
.....

[3]

(b) Seven-armed starfish live in the sea.

Scientists investigated the distribution of seven-armed starfish, *Luidia ciliaris*, in one region.

- Photographs of 20 m² areas of seabed were taken at different depths.
- The depth of the water in each area was measured when the water was at its highest level (high tide).
- The numbers of seven-armed starfish in each photograph were counted.
- All photographs were taken on the same day in July.

(i) State **two** ways that the method used by the scientists ensured that the numbers of seven-armed starfish counted at different depths could be compared.

- 1
-
- 2
-

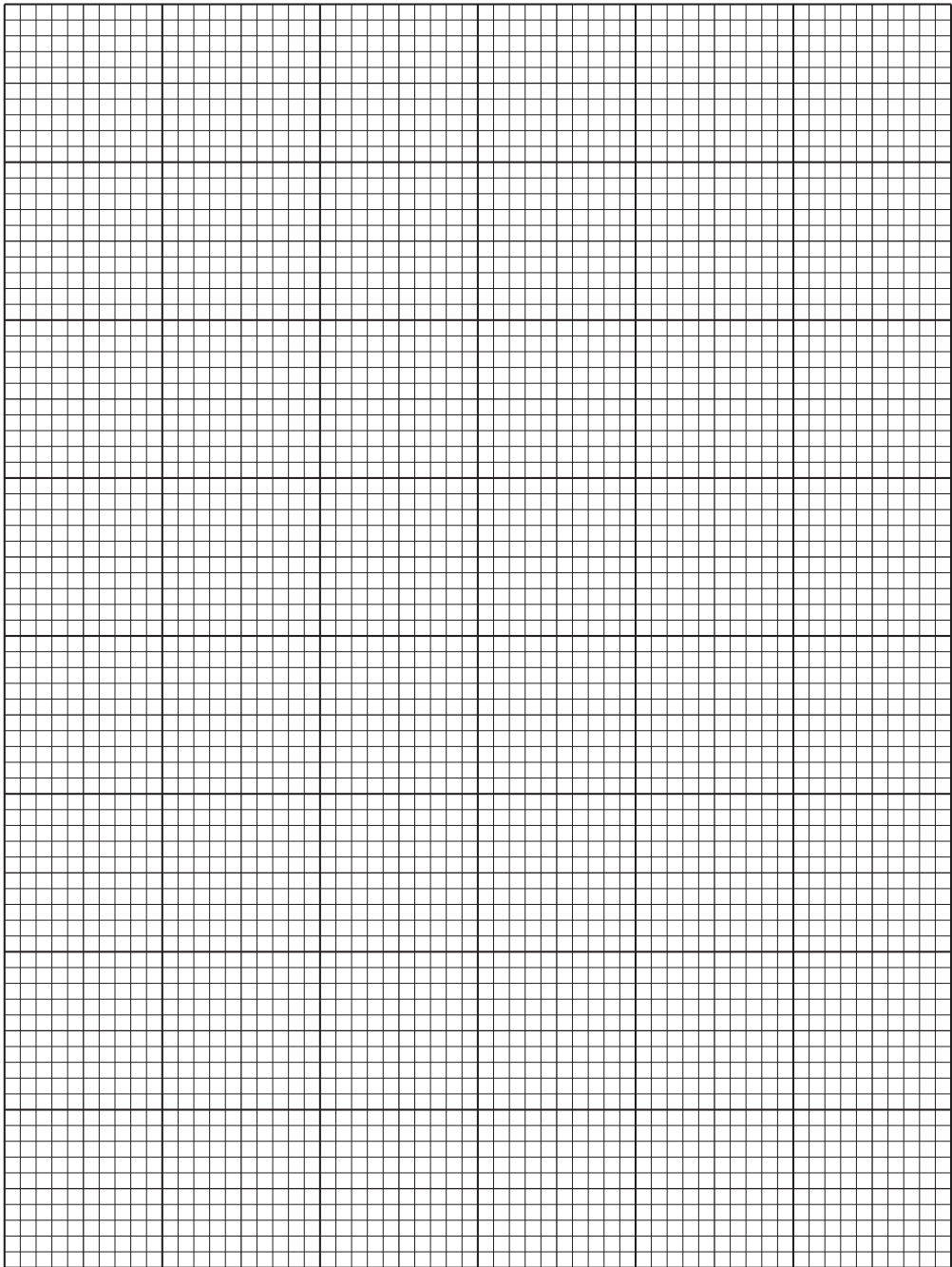
[2]

The results of the investigation are shown in Table 3.1.

Table 3.1

depth / m	number of seven-armed starfish counted
0.0–9.9	337
10.0–19.9	1486
20.0–29.9	1243
30.0–39.9	241
40.0–49.9	121

(ii) Plot a histogram on the grid of the data in Table 3.1.



(iii) State the depth range in Table 3.1 at which most seven-armed starfish were found.

.....m [1]

(iv) Using the information in Table 3.1, calculate the total number of seven-armed starfish that were photographed at all depths, and use this value to calculate the percentage of starfish that were photographed in the 0.0–9.9m range.

Express the percentage as a whole number.

Space for working.

total number of seven-armed starfish photographed

percentage of seven-armed starfish photographed at 0.0–9.9m%
[3]

[Total: 20]

36 A student investigated the effect of high temperature on the production of nitrate ions in soil.

Two samples of soil were taken. One sample was heated to 100 °C.

All the nitrate ions were completely removed from both soil samples.

Ammonium ions were then added to both soil samples.

After two weeks, both soil samples were tested for the presence of nitrate ions.

The results are shown.

soil sample	nitrate ions present or absent
not heated to 100 °C	present
heated to 100 °C	absent

Which statement explains the results?

- A** Heating the soil broke down the nitrate ions.
- B** Heating the soil increased the activity of denitrifying bacteria.
- C** Heating the soil killed nitrifying bacteria.
- D** Heating the soil killed nitrogen-fixing bacteria.