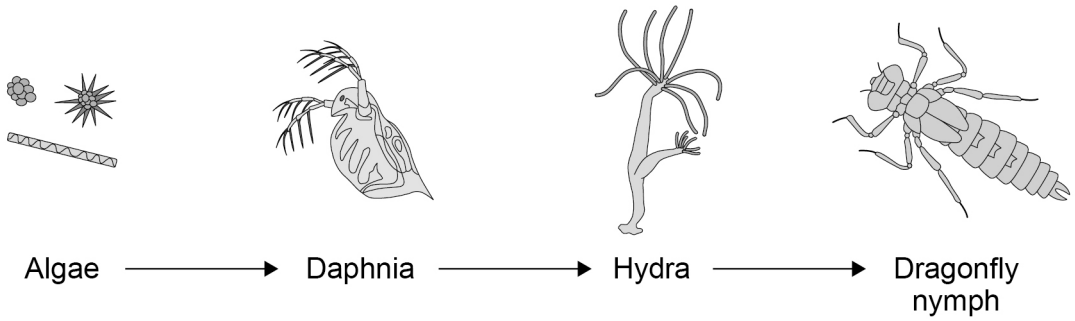
Do not write outside the box

0 7 **Figure 14** shows a food chain in a pond.

Figure 14



0 7 . 1 Which term describes the Daphnia in this food chain?

[1 mark]

Tick (✓) **one** box.

Apex predator ☐

Primary consumer ☐

Producer ☐

Secondary consumer ☐

Do not write outside the box

0 7 . 2 Draw a pyramid of biomass for the food chain.

Label each trophic level.

[2 marks]

0 7 . 3 Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

[1 mark]

Question 7 continues on the next page

Do not write outside the box

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm^3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

Table 3 shows the results.

Table 3

Sample number	Number of Daphnia in 1 dm^3 water
1	5
2	21
3	0
4	16
5	28

0 7 . 4 Calculate the mean number of Daphnia in 1 m^3 of pond water.

1 m^3 = 1000 dm^3

[2 marks]

Mean number of Daphnia in 1 m^3 of pond water = _____

Do not write outside the box

0 7 . 5 The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from Question **07.4**.

Give your answer in standard form.

[4 marks]

Number of Daphnia in the pond = _____

Question 7 continues on the next page

Do not write outside the box

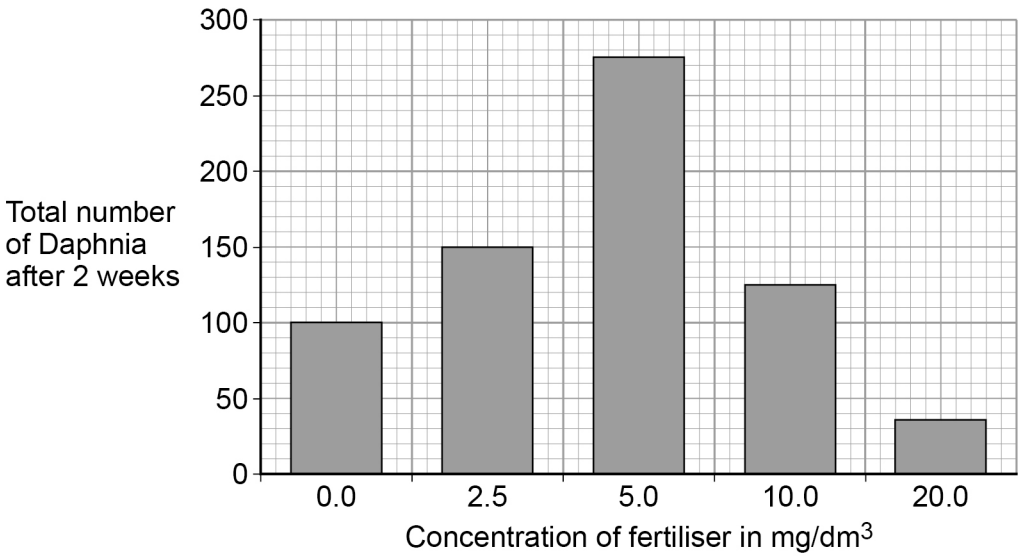
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 15 shows the results.

Figure 15



0 7 . 6 A concentration of 5.0 mg/dm^3 of fertiliser caused a large increase in the population of Daphnia.

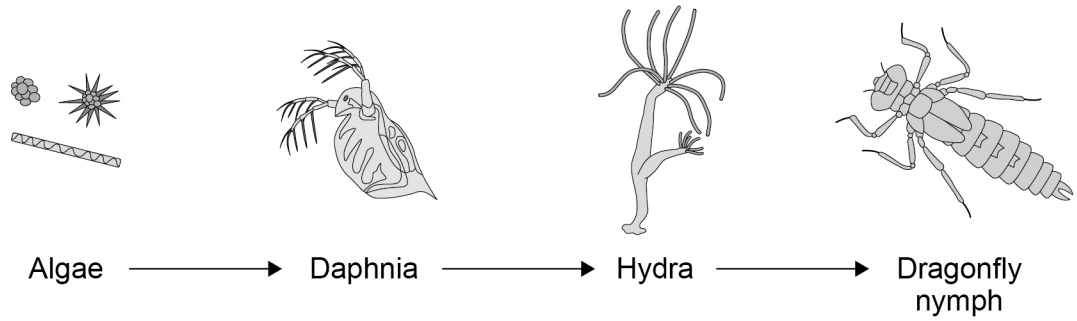
Explain why.

[2 marks]

Do not write outside the box

0 7 . 7 **Figure 14** is repeated below.

Figure 14



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

[2 marks]

14

Turn over for the next question

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	primary consumer		1	AO2 4.7.2.1 4.7.4.1
07.2	correct shape: 4 tiers with largest at bottom and smallest at top correctly labelled: dragonfly / nymph + hydra + daphnia + algae	 in this order **or** allow: 3rd-order **or** tertiary consumer **or** apex / top predator **or** (trophic level) 4 2nd-order **or** secondary consumer **or** (trophic level) 3 1st-order **or** primary consumer **or** herbivore **or** (trophic level) 2 producer **or** (trophic level) 1 allow for **2** marks inverted pyramid if correctly labelled	1 1	AO2 4.7.4.2
07.3	any **one** from: (Daphnia biomass smaller because) • non-digestible parts (of algae) or lost in faeces • not all absorbed • lost in urine / urea • used in respiration **or** lost as carbon dioxide / CO_2 • algae not all eaten **or** eaten by other organisms • some algae decompose	 ignore waste allow excretion allow (to supply energy) for movement / warmth allow used to supply energy	1	AO1 4.7.4.3
07.4	 14 14 000	an answer of 14 000 scores **2** marks allow evidence of an incorrectly calculated mean × 1000 allow 1.4×10^4	 1 1	AO2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5		an answer of 2.625×10^4 **or** 2.63×10^4 **or** 2.6×10^4 scores **4** marks an answer of 26250 scores **3** marks allow ecf from Question **07.4**		AO2 4.7.2.1
	(volume of pond =) 1.875 **or** 2.5 × 1.5 × 0.5	an incorrect answer for one step does **not** prevent allocation of marks for subsequent steps	1	
	14 000 × 1.875	allow ecf from Question **07.4**	1	
	26250		1	
	2.625×10^4	allow 2.63×10^4 **or** 2.6×10^4	1	
07.6	increased (growth / reproduction of) algae		1	AO2 4.7.2.1 4.7.3.2
	(more algae so) more food for Daphnia	allow fertiliser toxic to Hydra (1) (so) fewer Daphnia eaten (1)	1	4.7.4.1
07.7	(Hydra have) less food		1	AO3 4.7.2.1
	because (graph shows) fewer Daphnia (with more fertiliser)	allow other valid suggestions, eg fertiliser toxic to Hydra (1) **or** fertiliser causes growth of algae (on surface) which block light and so die and decay **or** eutrophication (1) (decay / eutrophication) uses up oxygen (so lack of oxygen for Hydra) (1)	1	4.7.3.2
Total			**14**	