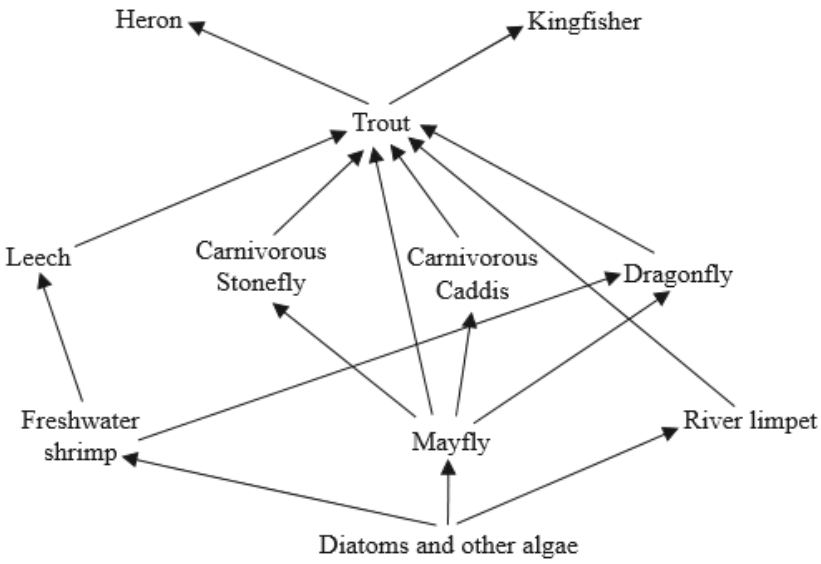
HL Paper 2

The food web below shows some of the feeding relationships found between the organisms living in or near a river in England.



a (i) Identify an organism in the food web that is an autotroph. [1]

a (ii) Identify an organism in the food web that is both a secondary and tertiary consumer. [1]

b. Explain how the flow of energy in the food web differs from the movement of nutrients. [2]

c. Discuss reasons why the levels of a pyramid of energy differ in size. [2]

Markscheme

a (i) diatoms / (other) algae

a (ii) trout

b. nutrients are recycled in a food web and energy enters and leaves/is not recycled;

nutrients are recycled by saprotrophs/returned to environment and reused;

while energy (enters as light and) is dispersed as heat;

c. (the shape of pyramid) shows energy lost from base to top of pyramid/80 to 90 % lost at each trophic level;

(because) energy is used/released through cell respiration/heat/metabolism/ movement (at each trophic level);

not all tissues are eaten *i.e.* bone/hair/cellulose/excretion/undigested/die (so energy is not available for next trophic level);

Examiners report

a (i). Virtually all candidates were able to identify the diatoms/algae as autotrophs in (i)

a (ii) Many identified the trout as both a secondary and tertiary consumer in (ii), although some seemed to think this part of the question asked for two different organisms here, not a single one with two different positions within the food web.

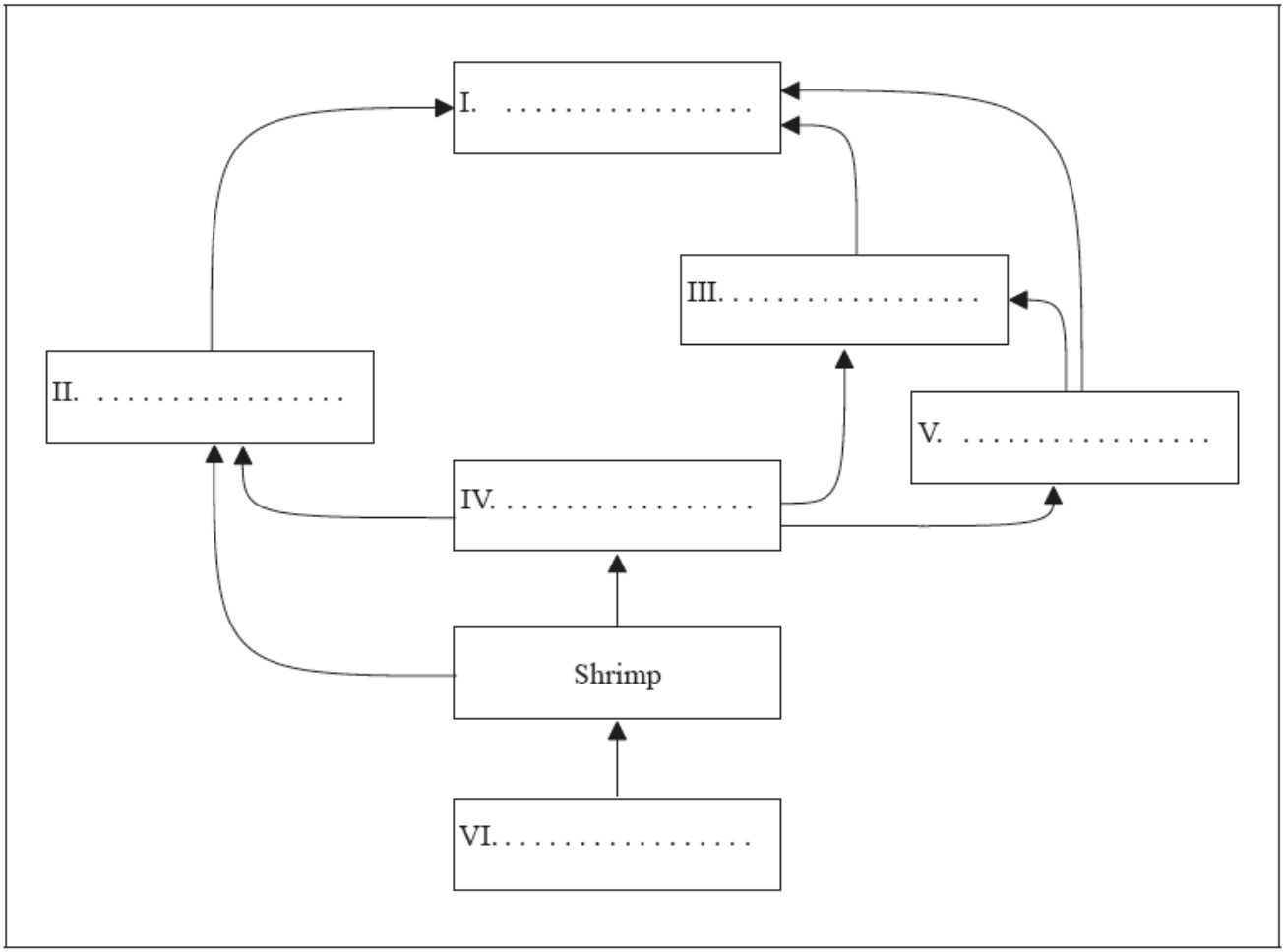
b. Most candidates explained the decrease in energy along a food chain, most referring to the loss of energy due to respiration or heat, but many did not refer to the fact that it cannot be recycled. Many left out reference to nutrients and the fact that they are recycled.

c. In (c) most displayed a general knowledge of the shape of an energy pyramid, but unfortunately, as many had described energy loss in part (b), they did not refer to it again in part (c). However, most mentioned the loss of energy due to respiration, etc. or the fact that some material is not digestion.

The table provides some information about organisms found in an Arctic environment.

Organism	Prey/food	Predators
Arctic cod	Shrimp	Arctic fox, Narwhal, Seal
Arctic fox	Arctic cod, Seal	Polar bear
Narwhal	Arctic cod, Shrimp	Polar bear
Phytoplankton	None	Shrimp
Polar bear	Arctic fox, Narwhal, Seal	None
Seal	Arctic cod	Arctic fox, Polar bear
Shrimp	Phytoplankton	Arctic cod, Narwhal

a. (i) Label the diagram to complete the food web for the organisms in the table above. [3]

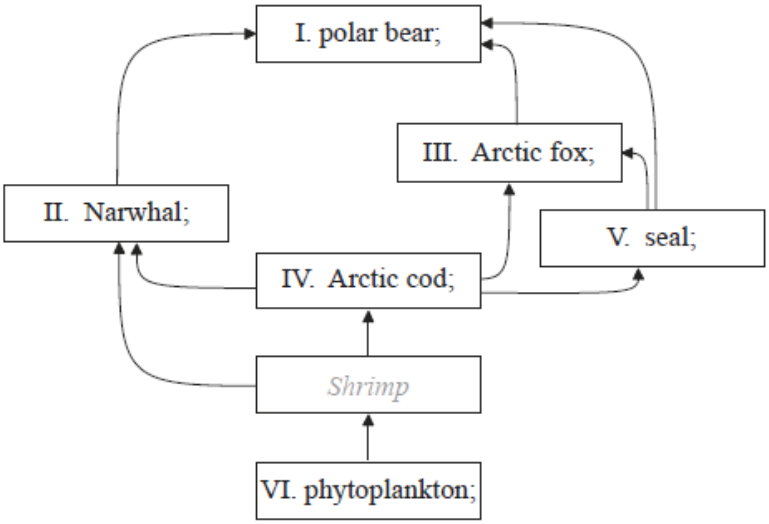


(ii) Deduce the trophic level of Artic cod.

b. Distinguish between the movement of energy and nutrients in an ecosystem. [2]

Markscheme

a. (i) *Award [1] for any three correct answers:*
All 6 = 2 marks
3–5 = 1 mark
0–2 = 0 marks.



[2 max]

(ii) secondary consumer ***[1]***
Do not accept third trophic level.

b. energy moves through/enters and leaves ecosystems / need a constant source of energy;

nutrients cycled between biotic and abiotic environment/in cycles such as C/N;

Examiners report

a. In (a) most were able to gain both marks for the food web, but only about half were able to deduce that the arctic cod was a secondary consumer. In part (b) most knew about the 10% passing to the next trophic level in a food chain, but did not apply this to the ecosystem – i.e. that it has to be continually replaced. The concept of 'nutrients' was poorly understood by many.

b. In (a) most were able to gain both marks for the food web, but only about half were able to deduce that the arctic cod was a secondary consumer. In part (b) most knew about the 10% passing to the next trophic level in a food chain, but did not apply this to the ecosystem – i.e. that it has to be continually replaced. The concept of 'nutrients' was poorly understood by many.