Trophic levels

4.7.4.1 · Ecology · revision notes

Trophic levels number the feeding positions in a food chain, from producers at level 1 up to apex predators. You also need to describe how decomposers feed. This subtopic is in GCSE Biology only, not Combined Science.

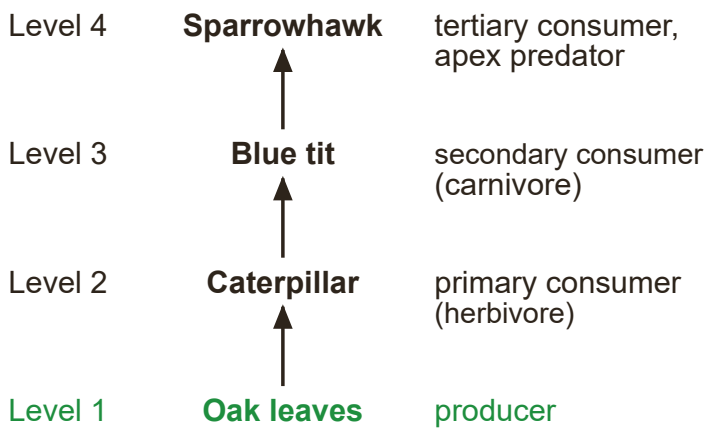
Key facts

- Level 1: producers (plants and algae)
- Level 2: primary consumers (herbivores)
- Level 3: secondary consumers (carnivores that eat herbivores)
- Level 4: tertiary consumers (carnivores that eat other carnivores)
- Apex predator = a carnivore with no predators
- Decomposers secrete enzymes; small soluble food molecules diffuse into them

Notes

Numbering trophic levels

- Each feeding position in a food chain is given a number. Plants and algae are level 1, and the number rises by one for each step further along the chain.
- **Level 1**: **producers**, i.e. plants and algae, which make their own food.
- **Level 2**: **primary consumers**, the **herbivores** that eat plants or algae.
- **Level 3**: **secondary consumers**, the **carnivores** that eat herbivores.
- **Level 4**: **tertiary consumers**, carnivores that eat other carnivores.
- Longer chains continue the numbering (level 5 and so on).
- **Apex predators** are carnivores with no predators.



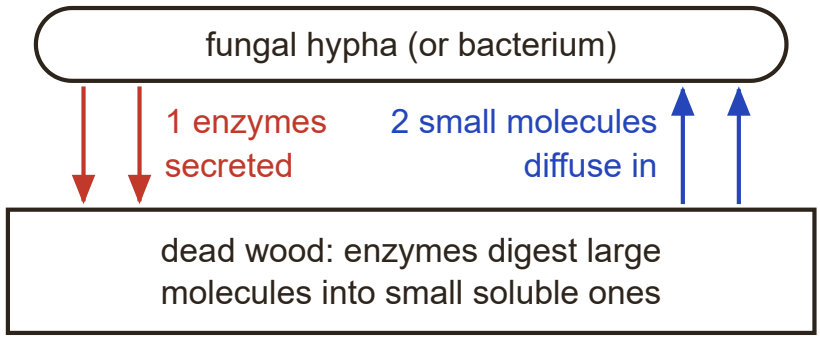
Trophic levels are numbered up the food chain from the producer.

Trophic levels in food webs

- In a food web, an animal can feed at more than one trophic level.
- Example: a mouse that eats seeds is at level 2, but when it eats beetles that feed on leaves it is at level 3.

Decomposers

- Decomposers (bacteria and fungi) break down dead plant and animal matter.
- They **secrete enzymes** into the environment, onto the dead material. The enzymes digest large molecules into small soluble food molecules.
- The small soluble food molecules then **diffuse** into the microorganism.



Decomposers digest their food outside their cells, then absorb the products.

- Decomposers feed on dead material and waste from every trophic level.

How to answer each type of question

Identify trophic levels in a food chain 1 mark each **Grade 3**

1. Start at the producer: level 1.
2. Add 1 for each arrow you follow.
3. Give the matching name if asked: producer, primary, secondary or tertiary consumer.

Example. Here is a food chain from the Southern Ocean:
phytoplankton → krill → penguin → leopard seal → killer whale
(a) What trophic level is the penguin?
(b) Which organism is the apex predator? Give a reason. (3 marks)

Model answer.

(a) Level 3 (1)

(b) Killer whale (1); it is a carnivore with no predators (1)

Describe the differences between trophic levels

2 to 3 marks | Grade 5

1. Say how each gets its food: producers make it by photosynthesis; consumers eat other organisms.
2. Say what each consumer eats: herbivores eat plants or algae; carnivores eat animals.
3. Use the level numbers.

Example. Describe the differences between organisms at trophic level 1 and trophic level 3. (3 marks)

Model answer. Level 1 organisms are producers that make their own food by photosynthesis (1). Level 3 organisms are carnivores / secondary consumers (1) that eat herbivores, which are at level 2 (1).

Describe how decomposers feed

2 to 3 marks | Grade 6

1. Say that they secrete enzymes onto the dead material.
2. Say that the enzymes break down large molecules into small soluble molecules.
3. Say that the small molecules diffuse into the decomposer.

Example. Fungi grow on a fallen tree. Describe how the fungi obtain food from the wood. (3 marks)

Model answer. The fungi secrete enzymes into the wood (1). The enzymes digest large, insoluble molecules into small soluble molecules (1). The small soluble molecules diffuse into the fungus (1).

Identify trophic levels in a food web

2 marks | Grade 7

1. Trace every food chain that the animal is part of.
2. An animal that eats organisms at different levels is at more than one level.

Example. A wood mouse eats seeds. It also eats beetles, which feed on leaves.
Give the two trophic levels of the wood mouse and explain why.

Model answer. Level 2 when it eats seeds, because seeds come from a producer (1). Level 3 when it eats beetles, because beetles are primary consumers (1).

Don’t lose marks

- Starting the count at the first consumer. The producer is level 1.
- Saying decomposers 'eat' dead matter or digest it inside their bodies. They secrete enzymes outside and absorb the products by diffusion.
- Saying an apex predator is 'the biggest animal'. It is a carnivore with no predators.
- Calling a secondary consumer a herbivore.

More tips

Memory tricks

- Trophic level = number of arrows from the producer + 1.
- Decomposers: Secrete, Digest, Diffuse.
- Apex means top: nothing eats an apex predator.

Exam technique

- Give the level number and the name if you are unsure which one is wanted.
- In decomposer questions, use the key words secrete, enzymes, soluble and diffuse.
- In food webs, check every arrow into an animal before deciding its level.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3

Number the trophic levels in a food chain

Level 1 is the producer, level 2 the primary consumer, and so on along the chain.

Grade 4

Describe producers, herbivores and carnivores

Producers make their own food, herbivores eat plants or algae, and carnivores eat other animals.

Grade 5

Define an apex predator

A carnivore with no predators.

Grade 6

Describe how decomposers feed

They secrete enzymes onto dead matter, and the small soluble food molecules produced diffuse into them.

Grade 7

Identify trophic levels in a food web

An animal can be at more than one trophic level if it eats organisms from different levels.

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