



Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. ecosystem
2. Tansley
3. community
4. biotic
5. abiotic
6. producers
7. trophic level
8. food web

K • 4

Each carries 0.5 mark.

2 Label the diagram

1. sunlight
2. producer green plant
3. herbivores goat, deer, rabbit

4. minerals back to the soil
5. carnivores tiger, fox, eagle
6. decomposers bacteria, fungi

K • 3

Each carries 0.5 mark.

3 Multiple choice

- i. **c. mushroom**

K • 1

A mushroom is a fungus, which breaks down dead matter. Algae and lichens make their own food; an insect is a consumer.

- ii. **a. green plants**

K • 1

Green plants, the producers, are the first trophic level: every food chain starts with them.

- iii. **a. mutualism**

U • 1

In a lichen, an alga and a fungus live together and both gain: the alga makes food, the fungus gives water and shelter.

- iv. **b. the third**

A • 1

Grass is the first level (producer), the grasshopper the second (primary consumer), and the frog, which eats the grasshopper, the third (secondary consumer).

- v. **c. parasitism**

A • 1

Akashbeli benefits and the hedge is harmed, but not killed and eaten all at once: that is parasitism. (It has no green leaves, so it can't make its own food at all.)

4 Very short answers

- a. **MARKING SCHEME**

K • 1

✓ Phytoplankton.

- b. **MARKING SCHEME**

K • 1

✓ About 10 % (one tenth).

- c. **MARKING SCHEME**

U • 1

✓ Commensalism.



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ Decomposers break down dead bodies and wastes into simple minerals that return to the soil and are used again by plants.
- ✓ Without them, dead matter would pile up and the minerals would stay locked in it, so plants would run short of nutrients.

b. MARKING SCHEME

U • 2

- ✓ Only about a tenth of the energy passes on at each step; the rest is used for living and lost as heat.
- ✓ So many producers are needed to supply enough energy for fewer primary consumers, and so on up the chain.

c. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. a food chain is a single line of living things, each eaten by the next; a food web is a network of many chains linked together.
- ✓ Any second difference, e.g. energy flows in one line in a chain, in many directions in a web; or a chain breaks easily if one link is lost, while a web is more stable.

d. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. in mutualism both living things benefit; in commensalism only one benefits and the host is neither helped nor harmed.
- ✓ Any second difference, e.g. mutual partners often depend on each other, a host doesn't; or examples: lichen, sunbird and flower against cattle egret and buffalo, orchid on a tree.

6 Long answers

a. ANSWER

A • 4

The mice were part of a food web, not only rice-eaters. Snakes, owls and other predators that used to eat mice now had to eat other animals instead, such as frogs and insect-eating birds. With fewer frogs and birds, the **insect pests** that they used to eat (grasshoppers, stem borers) multiplied and damaged far more rice than the mice ever did. (If he used poison, it may also have killed the useful predators that ate poisoned mice.) For example: rice → grasshopper → frog → snake, and rice → mouse → snake. Remove the mice, the snakes eat more frogs, the grasshoppers multiply, and the rice suffers. Killing one link upsets the balance of the whole ecosystem. Try it in the food web widget.

MARKING SCHEME

- ✓ The mice were part of a food web: snakes, owls and other predators fed on them.
- ✓ With no mice, these predators ate more of other animals, such as frogs and insect-eating birds.
- ✓ With fewer frogs and birds, the insect pests they used to eat multiplied.
- ✓ The insects ate much more of the rice, so the harvest fell: removing one link upsets the balance of the whole web.

b. MARKING SCHEME

K • 4

- ✓ Mutualism: both benefit, e.g. lichen (alga and fungus), sunbird and flower.
- ✓ Commensalism: one benefits, the other is neither helped nor harmed, e.g. cattle egret and buffalo, orchid on a tree.
- ✓ Parasitism: the parasite benefits and the host is harmed, e.g. tapeworm, mosquito, akashbeli.
- ✓ Competition (both lose, e.g. weeds and rice) or predation (the predator kills and eats the prey, e.g. owl and mouse).



7 Numerical problem

ANSWER

A - 2

Grasshopper: 10 % of 10,000 kJ = 1,000 kJ

Frog: 10 % of 1,000 kJ = 100 kJ

Snake: 10 % of 100 kJ = 10 kJ

MARKING SCHEME

- ✓ 10 % taken at each of the three steps: 1,000 kJ, then 100 kJ.
- ✓ Energy reaching the snake = 10 kJ.

8 Think

ANSWER

HA - 2

Most successful parasites harm their host only slowly or a little, so that the host lives on and the parasite can keep feeding and reproducing (and spread to new hosts). A tapeworm can live in a person's intestine for years. Diseases that kill their host very quickly often burn out, because the host dies before passing them on.

MARKING SCHEME

- ✓ A parasite lives on its host's food and body, so if the host dies, it loses its home and food.
- ✓ So most successful parasites harm their host only slowly or a little, so that the host lives on while the parasite feeds, reproduces and spreads.

9 Activity: Study a grassland (Activity 6.2)

(not marked)

WHAT STUDENTS SHOULD FIND

For example: grass → grasshopper → frog → snake; clover → rabbit → fox → leopard. Decomposers are found in the soil, on dead leaves, logs and dung: mushrooms and molds (fungi) can be seen, while bacteria are too small to see.

See it at Science Playground

Exhibits and plants at the center, Bhaktapur, that go with this unit. Book a class visit at science-playground.com/booking.

- **The Ecosystem Pond** (exhibit): Find the pond's producers, consumers and decomposers, the parts that keep it running.
- **The Paludarium** (exhibit): Water below, land above: find what lives in each part of this tiny riverbank.
- **Foxtail Orchid** (garden): Like the orchid in the book's photo, this one grows on trees but takes nothing from them.
- **Bromeliads and Air Plants** (exhibit): These epiphytes perch on wood; their roots only hold on, the leaves take in water.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	15	10	8	2	35

