Unit 4 · Ecology

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 50

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

1 Follow the ripple

ANSWER A · 4

i. **Planthoppers increase** (fewer eaten), so **rice decreases** (more eaten). **Frogs decrease** (less food), so **snakes decrease** (less food).

ii. The rice and the snakes. Yes: both decrease, as the spiders did.

MARKING SCHEME

✓ Planthoppers increase.

✓ Rice decreases, through the planthoppers.

✓ Frogs and snakes decrease.

✓ Rice and snakes are two steps away, and decrease like the spiders.

2 Two effects, one bird

ANSWER HA · 3

i. Fewer frogs: less of one food, so egrets decrease. More grasshoppers (fewer eaten by frogs): more of another food, so egrets increase.

ii. The rule works link by link, and here the two links pull against each other. The result depends on which effect is bigger, so the rule alone can't settle it.

iii. By counting the egrets over time.

MARKING SCHEME

✓ Fewer frogs pull egrets down; more grasshoppers pull them up.

✓ The rule can't say which is bigger.

✓ Count them.

3 Litter bags

ANSWER A · 5

(The masses are made up.)

i. A: 18.0 ÷ 50.0 × 100 = **36%**. B: 38.0 ÷ 50.0 × 100 = **76%**. C: 4.0 ÷ 50.0 × 100 = **8%**. D: 9.0 ÷ 50.0 × 100 = **18%**.

ii. Kind of matter: A and B. Moisture: A and C. Oxygen: A and D.

iii. Bean leaves are soft and rich in nitrogen and rot fast, while sal leaves are tough. Dry ground has too little water for bacteria and fungi. Waterlogged mud has little oxygen, so decay there is slow and incomplete.

MARKING SCHEME

✓ 36% and 76%.

✓ 8% and 18%.

✓ The three pairs: A–B, A–C, A–D.

✓ Bean leaves are soft and nitrogen-rich; decomposers need water.

✓ Waterlogged mud has too little oxygen, so decay is slow.

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4 Spot the error

ANSWER U · 3

She swapped immigration and emigration: animals moving **in** (immigration) add, and animals moving **out** (emigration) take away.

$400 + 90 + 15 - 60 - 35 = \mathbf{410}$, so the population grew by **10**.

MARKING SCHEME

- ✓ Immigration adds, and emigration takes away.
- ✓ $400 + 90 + 15 - 60 - 35 = 410$.
- ✓ It grew by 10.

5 Tigers by the numbers

ANSWER A · 4

i. $429 \div 121 \approx$ **3.5 times**.

ii. $429 - 121 = 308$; $308 \div 17 \approx$ **18 tigers a year**.

iii. Deer or wild boar decrease; the grasslands and forests gain.

iv. Young tigers looking for space of their own wander out of the parks, and attacks on cattle and people have risen.

MARKING SCHEME

- ✓ About 3.5 times.
- ✓ About 18 a year.
- ✓ Deer or wild boar down; grasslands or forests up.
- ✓ Young tigers wander out, and attacks on cattle or people rise.

6 Which is it?

ANSWER U · 4

i. **Fungi** (such as white-rot fungi): their hyphae grow into wood and break down lignin.

ii. **Anaerobic bacteria**: mud has no oxygen, and they give out hydrogen sulphide.

iii. **Leaching**: water dissolves the sugars and salts and carries them down.

iv. **Humus, from humification**: it is what is left of the parts that resist decomposers.

MARKING SCHEME

- ✓ Fungi, with lignin.
- ✓ Anaerobic bacteria, from the lack of oxygen or the gas.
- ✓ Leaching.
- ✓ Humus (humification).

7 Correct the misconceptions

ANSWER U · 4

1. A population is one species; several kinds of frog are several populations.
2. Energy flows one way and is lost as heat; materials cycle.
3. A habitat is the place where it lives; its niche is its way of life.
4. An ecosystem with many species is usually more stable, since each animal has more ways to get food.

MARKING SCHEME

- ✓ Population means one species.
- ✓ Energy flows; materials cycle.
- ✓ Habitat is the place; niche is the way of life.
- ✓ Many species make it more stable.

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8 Design a fair test

ANSWER A · 4

i. She changes whether the leaves are chopped or whole, in net bags, and measures the percentage of dried mass lost after some weeks.
ii. Any three: the same kind of leaf; the same starting mass; the same place and soil; the same moisture; the same time.
iii. Fragmentation.
iv. Chopped leaves lose more mass, because they have more surface for the bacteria and fungi to work on.

MARKING SCHEME

✓ Changes chopped or whole; measures mass lost.
✓ Any three things kept the same.
✓ Fragmentation.
✓ Chopped lose more: more surface.

9 Predict, then explain

ANSWER HA · 3

The methane falls. Under water the mud has no oxygen, so microbes break down dead roots and straw anaerobically, which gives methane. With air in the mud, aerobic decomposition can go on, and it gives mostly **carbon dioxide** and water.

MARKING SCHEME

✓ Less methane.
✓ Methane comes from anaerobic decay, without oxygen.
✓ With air, aerobic decay gives carbon dioxide.

10 Is it a wetland?

MARKING SCHEME U · 3

✓ a, b and e are wetlands, whether artificial or temporary.
✓ c is one, at under 6 m at low tide.
✓ d and f are not.

11 Estimate it

ANSWER A · 3

i. $10{,}000 \div 100 \times 12 =$ **1,200 frogs**.
ii. $1{,}200 \times 10 \times 30 =$ **360,000 insects**.
iii. Losing them could mean many more insects on the crop. It rests on a made-up figure, and how much the frogs' loss raised the pests was never measured well.

MARKING SCHEME

✓ 1,200 frogs.
✓ 360,000 insects.
✓ More pests are likely, but the effect wasn't measured well.

12 Put the chain in order

MARKING SCHEME U · 3

✓ The fertilizer and growth come first.
✓ Then decay, lost oxygen and dead fish.
✓ Decomposers use the oxygen.

13 Think

ANSWER

i. The plants die in time. No light means no energy enters, so there is no photosynthesis, and they use up their food and the oxygen by respiring. Energy flows through an ecosystem one way: it can't be reused.

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ii. The dead leaves pile up without rotting, and minerals stay locked in them. The plants slowly run short of minerals, because materials can't cycle without decomposers. HA · 4

MARKING SCHEME

- ✓ In the dark the plants die in time.
- ✓ Energy can't be reused; it must keep coming in as light.
- ✓ Without decomposers dead leaves pile up.
- ✓ Minerals don't return, so the plants run short.

14 Make your own

ANSWER HA · 3

For example, a pond: algae → snail → fish → heron, and algae → zooplankton → fish → heron share the fish. If the fish decrease, the herons decrease (less food), and the snails and zooplankton increase (fewer eaten).

MARKING SCHEME

- ✓ Two real chains that share one living thing.
- ✓ A stated change with one correct effect through a named link.
- ✓ A second correct effect.

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): The guppies here are one population; with the plants and tiny algae they make a community, and with the water and light, an ecosystem.
- **Plant Terrarium** (exhibit): Living plants with non-living soil, air, water and light, all in one glass: an ecosystem small enough to see every part of.
- **Soil Layers** (exhibit): Find the humus layer at the top: fallen leaves and other dead matter, broken down by bacteria and fungi and given back to the soil.
- **The Paludarium** (exhibit): Water below and land above, like a riverbank: mosses grow on the rocks and wood, fed by moisture rising from the water.
- **Water Lily** (garden): Roots in the mud, leaves floating on the surface: a floating plant of a wetland, kept up by air-filled aerenchyma.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	17	20	13	**50**

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