Year 13 Science: Relationships between species: competition, mutualism, exploitation

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. A tūī drinks flax nectar and carries pollen on its forehead to the next flower. Name the relationship.

2. Possums eat the leaves of kāmahi trees. Name the relationship and the effect on each species.

3. Two species of Paramecium with the same diet are grown together and one dies out. Name the principle.

4. What is the difference between a fundamental and a realised niche?

5. Why is the long-tailed cuckoo's relationship with whiteheads called brood parasitism?

Exam-style question: cuckoo and warbler

The shining cuckoo spends winter in the Solomon Islands and arrives in New Zealand in September or October. The female lays one egg in each grey warbler nest she finds, and the newly hatched cuckoo chick pushes the warbler's eggs out. Grey warblers usually start their first brood in August and a second in late October.

6. Describe the relationship between the shining cuckoo and the grey warbler.

7. Explain the selective advantage of brood parasitism to the cuckoo.

8. Discuss how the timing of the warbler's breeding reduces the cost of the relationship to the warbler.

Fix the mistake

9. Correct this statement: "The bat pollinates the flower to help it."

10. Correct this statement: "Wasps and birds are in a predator–prey relationship over honeydew."

11. Correct this statement: "The realised niche is bigger than the fundamental niche."

12. Correct this statement: "Mistletoe is not a parasite because it photosynthesises."

Answer key (for parents and tutors)

1. A tūī drinks flax nectar and carries pollen on its forehead to the next flower. Name the relationship.
   Mutualism: the tūī gains nectar, the flax is pollinated.

2. Possums eat the leaves of kāmahi trees. Name the relationship and the effect on each species.
   Herbivory, a form of exploitation: the possum gains food (+), the kāmahi loses leaves and photosynthetic area (−).

3. Two species of Paramecium with the same diet are grown together and one dies out. Name the principle.
   The competitive exclusion principle: two species with identical niches cannot coexist.

4. What is the difference between a fundamental and a realised niche?
   The fundamental niche is the full range a species could occupy with no competitors; the realised niche is the smaller part it occupies when competitors are present.

5. Why is the long-tailed cuckoo's relationship with whiteheads called brood parasitism?
   The cuckoo lays its egg in the whitehead's nest and the whiteheads raise the cuckoo chick, losing their own brood: the cuckoo exploits their parental care.

6. Describe the relationship between the shining cuckoo and the grey warbler.
   Brood parasitism, a form of exploitation: the cuckoo gains (+) because the warbler raises its chick, and the warbler loses (−) its own eggs and the energy spent feeding the cuckoo (Achieved).

7. Explain the selective advantage of brood parasitism to the cuckoo.
   The cuckoo spends no energy building nests, incubating or feeding chicks, so a female can lay many eggs, one per nest, spreading the risk across many hosts; more of her energy goes into eggs, so she leaves more offspring than a bird raising one brood itself. Ejecting the warbler eggs means the chick gets all the food (Merit).

8. Discuss how the timing of the warbler's breeding reduces the cost of the relationship to the warbler.
   The warbler's first brood begins in August, before cuckoos arrive, so it is raised unparasitised and the pair still produces young that season; only the second brood is at risk. Warblers that breed early leave more surviving offspring than late breeders, so early breeding is selected for, which limits the cuckoo's impact and lets both species persist; the cuckoo in turn depends on the warbler's second brood being timed with its own arrival (Excellence links both species' timing to reproductive success).

9. Correct this statement: "The bat pollinates the flower to help it."
   The bat is feeding for its own benefit; pollination is a side effect that selection has favoured in the plant.

10. Correct this statement: "Wasps and birds are in a predator–prey relationship over honeydew."
    They compete: both use the same limited honeydew, and each lowers the amount left for the other.

11. Correct this statement: "The realised niche is bigger than the fundamental niche."
    The realised niche is the part of the fundamental niche a species keeps once competitors and predators are present, so it is never larger.

12. Correct this statement: "Mistletoe is not a parasite because it photosynthesises."
    It is a hemiparasite: it makes its own sugars but takes water and minerals from the host's xylem.