



Unit 2 • Classification of Living Beings

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. taxonomy
2. binomial
3. genus
4. taxon
5. prokaryotes
6. Whittaker
7. hyphae
8. chitin

K • 4

Each carries 0.5 mark.

2 Label the diagram

- | | |
|---|--|
| 1. Amoeba | 4. Paramecium |
| 2. pseudopodia (“false feet”): it flows into them to move | 5. flagellum: a whip that pulls it along |
| 3. Euglena | 6. cilia: tiny hairs that beat like oars |

K • 3

Each carries 0.5 mark.

3 Multiple choice

- | | | |
|--|-----------------------|-------|
| i. | a. Monera | K • 1 |
| Blue-green algae (cyanobacteria) are prokaryotes: their cells have no proper nucleus, so they are Monera, even though they are green. | | |
| ii. | a. Carolus Linnaeus | K • 1 |
| Linnaeus gave every species a two-word name in the 1750s. Whittaker proposed the five kingdoms; Chatton first used the words prokaryote and eukaryote (1925); Koch proved that germs cause diseases. | | |
| iii. | a. it has chlorophyll | U • 1 |
| Euglena has chloroplasts with chlorophyll and makes its own food in light; no animal does. (Amoeba is also unicellular and lives in water, so those don't set Euglena apart.) | | |
| iv. | a. Azotobacter | U • 1 |
| Azotobacter is a bacterium that lives in soil and fixes nitrogen. Euglena and Amoeba are protists, and yeast is a fungus; all three are eukaryotes. | | |
| v. | c. Panthera tigris | A • 1 |
| The genus comes first with a capital letter, and the species second with a small letter, both in italics. Panthera Tigris has a capital on the species, and Tigris panthera has the words the wrong way round. | | |

4 Very short answers

- | | | |
|------------|----------------|-------|
| a. | MARKING SCHEME | K • 1 |
| ✓ Species. | | |
| b. | MARKING SCHEME | K • 1 |
| ✓ Yeast. | | |



- c. MARKING SCHEME U · 1
✓ The alga (by photosynthesis).

5 Short answers

- a. MARKING SCHEME U · 2
✓ The two-kingdom system put prokaryotes with eukaryotes, unicellular with multicellular organisms, and fungi with green plants; some, like *Euglena*, fitted in neither kingdom.
✓ The five-kingdom system sorts organisms by type of cell, number of cells, cell wall, mode of nutrition and role in the ecosystem, so organisms that are really alike are grouped together.
- b. MARKING SCHEME U · 2
✓ Fungi have no chlorophyll, so they can't make their own food.
✓ They absorb their food from dead and decaying matter, and an organism that feeds on dead and decaying matter is a saprophyte.
- c. MARKING SCHEME U · 2
✓ Any one difference, e.g. prokaryotes have no true nucleus (no nuclear membrane round the DNA); eukaryotes have a true nucleus.
✓ Any second difference, e.g. no membrane-bound organelles against mitochondria and other organelles; or always unicellular against unicellular or multicellular; or bacteria against *Amoeba*, plants, animals.
- d. MARKING SCHEME U · 2
✓ Any one difference, e.g. a genus is a group of closely similar species; a species is a group of similar organisms that can breed with each other and have fertile young.
✓ Any second difference, e.g. the genus is a higher taxon and the first word of a scientific name (capital letter); the species is the lowest taxon and the second word (small letter).
- e. MARKING SCHEME A · 2
✓ *Euglena* and *Plasmodium*: Protista.
✓ *Azotobacter*: Monera, and *Mucor*: Fungi.

6 Long answers

- a. ANSWER U · 4
The taxa form a ladder: kingdom → phylum → class → order → family → genus → species. Each taxon is part of the one above it and contains the ones below it. The higher the taxon, the more kinds of organisms it includes and the fewer features they share; the lower the taxon, the fewer kinds, and the more alike they are.
Example (human): kingdom Animalia includes all animals; phylum Chordata only animals with a notochord; class Mammalia only those that feed their young on milk; order Primates only lemurs, monkeys, apes and humans; family Hominidae only the great apes and humans; genus *Homo* only humans; species *sapiens* only us. So organisms that share a lower taxon, like the human and the chimpanzee (same family), are closer relatives than those that share only a higher one, like the human and the cow (same class).
- MARKING SCHEME
✓ The taxa in order: kingdom → phylum → class → order → family → genus → species.
✓ Each taxon is part of the one above it and contains the ones below it.
✓ The higher the taxon, the more kinds of organisms it holds and the fewer features they share; the lower, the fewer kinds and the more alike they are.
✓ The human as an example: Animalia, Chordata, Mammalia, Primates, Hominidae, *Homo*, *sapiens*.



1. They are prokaryotic, unicellular microorganisms.
2. The cell has no definite nucleus; the DNA lies in the cytoplasm.
3. There are no membrane-bound organelles.
4. Many survive in harsh conditions.
5. They may be autotrophic, parasitic, saprophytic or symbiotic.
6. There are three types: archaeobacteria (e.g. Pyrolobus), eubacteria (e.g. Rhizobium, Clostridium) and cyanobacteria (e.g. Nostoc, Anabaena).

MARKING SCHEME

- ✓ Prokaryotic and unicellular: no definite nucleus (the DNA lies free in the cytoplasm) and no membrane-bound organelles.
- ✓ Many survive harsh conditions (heat, cold, drought, salt).
- ✓ They may be autotrophic, parasitic, saprophytic or symbiotic.
- ✓ The three types with an example each: archaeobacteria (Pyrolobus), eubacteria (Rhizobium, Lactobacillus) and cyanobacteria (Nostoc, Anabaena).

7 Think

ANSWER

HA · 2

Because the mule is **sterile**: it can't have young of its own. A species is a group whose members have young that can also breed. Horse and donkey are close enough to mate (the same genus, *Equus*) but not to make a breeding family together, so they are two species: *Equus caballus* and *Equus asinus*.

MARKING SCHEME

- ✓ A species is a group whose members breed together and have young that can also breed.
- ✓ A horse and a donkey can mate, but their young, the mule, is sterile, so they are two species (of the same genus, *Equus*).

8 Activity: Who is the nearest relative?

(not marked)

WHAT STUDENTS SHOULD FIND

Tiger and lion (both big cats, genus *Panthera*); orange and lemon (both citrus fruits); horse and donkey (genus *Equus*). Of these eight, the potato can only be paired with the groundnut, since both form their food underground, but that is a trap: the groundnut is a pod of seeds from the bean family, and the potato a swollen underground stem. Its real close relatives are the tomato and the brinjal, whose flowers and leaves are very like its own (the tomato is even in the same genus, *Solanum*).

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.

- **Tamarillo (Rukh Tamatar)** (garden): Rukh tamatar is *Solanum betaceum*: the same genus as the potato and the tomato.
- **Asparagus Fern** (garden): The "asparagus fern" isn't a fern at all: its scientific name, *Asparagus*, tells the truth.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	15	15	3	2	35

