

**STUDENT BOOK ANSWERS****Chapter 2 Classifying biodiversity****Question set 2.1**

- 1 First, the diversity of life on Earth is so enormous that classifying organisms is a way of organising information. Organisation of information about organisms allows for patterns and trends to be observed and relationships between organisms to be better understood.  
Second, classification allows biologists to analyse information about organisms.  
Third, classifying organisms allows biologists to communicate with one another. It allows biologists to identify organisms that have already been discovered.
- 2 Classification systems simplify information that would otherwise be too complex to analyse. They are artificial structures and therefore can only be theories.
- 3
  - a This will depend on students' response. Some examples are classifying young people as primary, secondary or tertiary students, classifying types of music and classifying types of books such as fiction or non-fiction.
  - b This will depend on students' response to question 3a. For example, classifying the type of books shows there are broad groups that indicate what the subject matter is about. It will be useful when choosing a book to read as you will already know something about the style before you read the first pages.
- 4
  - a Classification systems are artificial. There may be exceptions to the system and there may be new species not yet discovered that may challenge the existing classification.
  - b This will depend on students' response. Most students will discuss the benefits of classification systems outweighing the limitations.

**Question set 2.2**

- 1 Carl Linnaeus developed the binomial system of naming organisms. Before Linnaeus introduced the binomial system, organisms had descriptive Latin names, which could be very long. His system revolutionised the way that scientists describe and communicate about organisms.
- 2 Animalia, Plantae, Protista and Fungi
- 3 The taxonomic level is the classification of organisms into a series of groups that form a hierarchy or series of nested levels.
- 4 Organisms within a phylum can be grouped according to similar features; these smaller groupings are called classes.
- 5 A binomial name consists of two parts, a generic name and a specific name. The first part (generic name) denotes the genus and is common to all organisms within that genus and the second part is specific to the species; for example, Australia's floral emblem Golden Wattle has the name *Acacia pycnantha*.

### Question set 2.3

- 1 Physical characteristics, reproductive methods and molecular sequences
- 2 Dichotomous keys are tools used to identify organisms. They involve choosing between a series of two options until an organism is identified.
- 3 The more similar the amino acid sequences between organisms are, the more related the organisms are. If amino acid sequences are the same, they are likely to belong to the same classification group.
- 4
  - a *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Neisseria* spp.
  - b *Clostridium difficile*
  - c *Neisseria* spp. In this case, spp. means 'members of the genus *Neisseria*'.

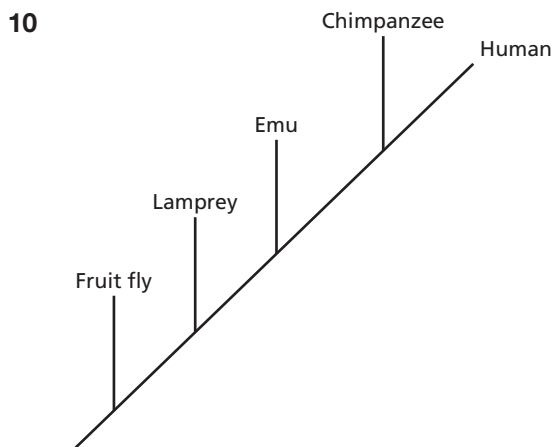
### Question set 2.4

- 1 The construction of cladograms relies on these three assumptions:
  - The more closely related two organisms are, the more characteristics they will share.
  - Some characteristics that are shared by a group will not be present in more distantly related groups.
  - When there are multiple possible ways that organisms can be related, the simplest explanation is the most likely to be correct. This is because if a feature is shared between organisms, it is more likely that this feature evolved once in a common ancestor than independently for each organism.
- 2 Monophyletic refers to a group containing all of the organisms on a branch of a cladogram. The group can also be called a clade.
- 3 It has recently been determined that birds evolved from dinosaurs and share a recent common ancestor with crocodiles and alligators.
- 4 DNA sequencing technology provides evidence of relationships between organisms. The sequencing is used to decide the most accurate cladogram.

### Chapter review questions

- 1 Members of domain Eukarya contain their DNA within a nucleus and have other membrane-bound compartments within their cells.
- 2 Domain, kingdom, phylum, class, order, family, genus and species
- 3 A common ancestor is an organism from which two species evolved.
- 4 The binomial system is the scientific method used to name species. Two names, genus and species, together form the scientific name of each species.
- 5 Organisms are classified into groups to organise their information to observe patterns and trends between them. This can then be analysed and communicated to other scientists.
- 6 The biological classification system is hierarchical in that the higher taxonomic levels are larger groupings and show more diversity between individuals. Further down the hierarchy of classification, the groupings are smaller and less diverse.

- 7 a Paraphyletic
- b The circle will encompass the top half of the cladogram intersecting the line below baboons and above marmosets.
  - c Chimpanzees
- 8 A cladogram is a diagram that shows the evolutionary relationship between organisms. The cladogram demonstrates the most recent common ancestor shared by organisms.
- 9 When organisms inhabit similar niches in different parts of the world, they often evolve similar physical characteristics to suit their surroundings. Because of this, other characteristics are used to determine if their similarity is due to their ancestral relatedness or the environment they live in. In the case of the marsupial mole and African golden mole, their reproductive method is different enough to classify them separately.



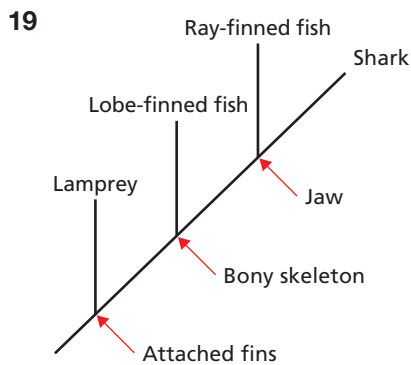
- 11 a Physical characteristics such as size and type of venomous sting; reproductive characteristics and molecular sequences
- b Domain Eukarya, Kingdom Animalia, Genus Carukia
  - c Phylum Cnidaria
- 12 a Presence of a backbone, no fur or feathers, no fins, no scales, colour of skin
- b Amphibia
  - c There may be related species that are very similar to Corroboree frogs and there may be hybrids that are not endangered. It is important to identify the members of the endangered species only so that they can be bred to produce offspring.
- 13 The main advantage of using the binomial system is that it can be understood by scientists all over the world. The same name can be used all over the world, in all languages, avoiding difficulties of translation. Another advantage is that the species name is unique and can't be used to describe any other species. Common names can be confusing. They often differ from one area to another.
- 14 The advancement of technologies has helped refine the biological classification systems. Classification was previously based on external characteristics; new technology has allowed comparisons at cellular and molecular levels. High power electron microscopy and the use of DNA and protein sequencing have shown differences between organisms that were previously undetected.

15	Taxa	Dichotomous Key	Cladogram
<b>Use</b>	Categorise living things into groups	Identify organisms	Interpret evolutionary relationships
<b>Structure</b>	Hierarchy of groups from large (Domains) to very small (Species)	Presented as a list with the pairs of choices numbered	Tree-like with a branching pattern; each branch point represents the most recent ancestor shared by two organisms
<b>Basis of classification</b>	Features that are shared	Choosing between a series of options until an organism is identified	Points at which lineages have diverged
<b>Limitations</b>	Simplistic; new technology allows classification down to more taxa	If the user cannot distinguish between two options, they become 'stuck' and cannot keep going	Unrelated organisms may have evolved similar characteristics independently

16 All cells of members of Eukarya contain DNA within a nucleus and membrane-bound organelles. All cells of Bacteria and Archaea do not contain a nucleus or membrane-bound organelles.

17 This will depend on students' response. A binomial name is useful in describing organisms in the scientific community and common names are beneficial when general populations are describing living things.

18 Birds evolved from dinosaurs. As a taxonomic group, dinosaurs are extinct.



20 Responses will vary.

21 Responses will vary.