BIODIVERSITY

Chapter 2 | Complete Exercise Solutions with Explanations

A complete, worked answer key covering every Multiple Choice Question, Short Answer, and Detailed Answer from the Chapter 2 exercise — each MCQ shows the correct option highlighted and ticked, with a clear explanation underneath.

Subject	Biology	**Chapter**	2 — Biodiversity
Reference	scholareye.xyz	**Type**	Exercise Answer Key

A. Select the Correct Answers

1. Which of the following taxonomic ranks represents the broadest rank?

a) Species

b) Genus

c) Kingdom

✓ **d) Domain**

✎ **Explanation**

Taxonomic ranks run from broadest to most specific in this order: Domain → Kingdom → Phylum → Class → Order → Family → Genus → Species. Domain sits above Kingdom, grouping organisms into the three most fundamental categories of life (Archaea, Bacteria, and Eukarya), making it the broadest and most inclusive rank.

2. Which characteristic is unique to organisms in the domain Archaea?

a) Cell walls made of peptidoglycan

b) Presence of a nucleus

✓ **c) Ability to live in extreme environments**

d) Lack of ribosomes

✎ **Explanation**

Archaea are famous for being extremophiles — many species thrive in conditions that would kill most other life forms, such as boiling hot springs, highly acidic or alkaline environments, deep-sea hydrothermal vents, and extremely salty lakes. Unlike bacteria, their cell walls lack peptidoglycan, and like bacteria (and unlike eukaryotes) they have no nucleus, yet they still possess ribosomes.

3. Which of the following is a key characteristic that distinguishes eukaryotic cells from prokaryotic cells?

a) Lack of a cell wall

✓ **b) Presence of a nucleus**

c) Absence of ribosomes

d) Smaller size

✎ **Explanation**

Eukaryotic cells contain a true, membrane-bound nucleus that houses their genetic material, along with other membrane-bound organelles (mitochondria, endoplasmic reticulum, etc.). Prokaryotic cells have no nucleus — their DNA lies free in the cytoplasm — and they are generally smaller, though both cell types have ribosomes and many have cell walls.

4. Why is it impossible to classify viruses within traditional biological kingdoms?

✓ **a) They lack cellular structure and organelles**

b) They cannot perform photosynthesis

c) They are smaller in size than bacteria

d) They are parasites

✎ **Explanation**

The traditional classification system is built around the cell as the basic unit of life. Viruses are acellular — they have no cytoplasm, organelles, or cellular machinery of their own, and cannot grow or reproduce independently; they must hijack a host cell's machinery to replicate. Since they don't meet the basic structural definition of a cell, they fall outside all three domains and every kingdom.

5. Which of the following is the correct way of writing the scientific name of humans?

✓ **a) Homo sapiens (italicized)**

b) Homo sapiens (not italicized)

c) Homo Sapiens

d) homo sapiens

✎ Explanation

Binomial nomenclature rules require the genus name to start with a capital letter and the species name to be entirely lowercase, with the whole name italicized when typed (or underlined when handwritten). "Homo Sapiens" wrongly capitalizes the species name, and "homo sapiens" wrongly lowercases the genus name and is not italicized — only option (a) follows every rule correctly.

B. Write Short Answers

1. What is the term used to describe the variety of organisms in ecosystems?

Answer: This is called biodiversity — it refers to the variety of living organisms (species, genes, and ecosystems) found in a particular habitat or across the entire planet.

2. How is biodiversity crucial for humans and for the planet Earth?

Answer: Biodiversity provides food, medicines, clean air and water, fertile soil, and raw materials, while also maintaining ecological balance, supporting pollination and nutrient cycling, and increasing an ecosystem's resilience to disease and environmental change — making it essential for both human survival and the health of the planet.

3. What are the seven taxonomic ranks used in the Linnaean system?

Answer: From broadest to most specific: Kingdom, Phylum, Class, Order, Family, Genus, and Species.

4. What are the basic differences between archaea and bacteria?

Answer: Archaea have cell walls that lack peptidoglycan and cell membranes with unique branched-chain lipids, and many live in extreme environments; bacteria have peptidoglycan in their cell walls, simpler membrane lipids, and are found in almost every habitat on Earth, including inside the human body.

5. Which kingdom includes organisms that are multicellular, heterotrophic, and lack cell walls?

Answer: The kingdom Animalia — animals are multicellular and heterotrophic (they obtain nutrients by consuming other organisms), and their cells lack a rigid cell wall, unlike plants and fungi.

6. Enlist the distinguishing characteristics of fungi.

Answer: Fungi are eukaryotic, mostly multicellular (with some unicellular exceptions like yeast), have cell walls made of chitin rather than cellulose, are heterotrophic and absorb nutrients from their surroundings, lack chlorophyll, and typically reproduce by producing spores.

7. List the three domains that encompass all living organisms.

Answer: Archaea, Bacteria, and Eukarya.

8. Why can't we classify viruses in any kingdom?

Answer: Because viruses are not made of cells — they have no cytoplasm or organelles and cannot carry out life processes or reproduce on their own. Since every kingdom is defined in terms of cellular organisms, viruses simply don't fit the definition of a living cell-based organism.

9. How does binomial nomenclature facilitate clear communication about organisms across different languages?

Answer: Binomial nomenclature gives every species a unique, standardized two-part Latin name (genus + species) that is recognized by scientists worldwide, regardless of their native language. This avoids the confusion caused by common names, which can differ from region to region or even refer to different species altogether, ensuring everyone is talking about exactly the same organism.

C. Write Answers in Detail

1. Discuss biodiversity and its significance in maintaining the health of ecosystems.

Biodiversity refers to the full variety of life on Earth, spanning three levels: genetic diversity (variation within a species), species diversity (the variety of species within a habitat), and ecosystem diversity (the range of different habitats, communities, and ecological processes).

It is significant to ecosystem health because a wide variety of species creates a stable web of interactions — predators control prey populations, pollinators enable plant reproduction, decomposers recycle nutrients, and producers generate energy for the entire food web. High biodiversity increases an ecosystem's resilience, allowing it to recover from disturbances such as disease, fire, or climate change, since the loss of one species is less likely to collapse the whole system. Biodiversity also underpins the ecosystem services humans depend on: clean air and water, fertile soil, pollination of crops, and natural pest control.

2. Explain the importance of classification in biology and how it helps us understand the relationships between different organisms.

Classification is the systematic grouping of organisms based on shared characteristics. With millions of known species, classification organizes this vast diversity into a manageable, logical framework, making it possible to study, identify, and communicate about organisms accurately.

Beyond simple organization, classification reveals evolutionary relationships. Organisms grouped closely together (for example, within the same genus or family) typically share a more recent common ancestor than organisms placed in different kingdoms or domains. This allows scientists to trace how life has diversified over time, predict characteristics of newly discovered organisms based on their relatives, and understand patterns such as convergent evolution. It also gives every organism a unique scientific name, eliminating the confusion caused by common names that vary between regions and languages.

3. Compare and contrast the domains Archaea and Bacteria, focusing on their key characteristics.

Archaea and Bacteria are both domains of single-celled prokaryotic organisms — they lack a true nucleus and membrane-bound organelles, and both possess ribosomes and a cell wall. Because of these shared features, they were once grouped together, but molecular evidence shows they are biochemically very different.

Differences: Bacterial cell walls contain peptidoglycan, while Archaeal cell walls do not. Archaea have unique membrane lipids with branched hydrocarbon chains linked by ether bonds, whereas bacterial membranes use straight-chain fatty acids linked by ester bonds. Archaea also have RNA polymerase and ribosomal proteins more similar to those of eukaryotes than to bacteria. Ecologically, many archaea are extremophiles found in harsh environments like hot springs, salt flats, and deep-sea vents, while bacteria are far more widespread, living in soil, water, air, and inside the bodies of other organisms, including as both helpful and harmful microbes in humans.

4. Describe the diagnostic characteristics of the four kingdoms within the domain Eukarya.

Protista: Mostly unicellular eukaryotes (some simple multicellular forms exist) that are highly diverse in how they obtain nutrition — some are photosynthetic (like algae), others are heterotrophic (like amoebas), and some are both.

Fungi: Eukaryotic, mostly multicellular organisms with cell walls made of chitin. They are heterotrophic, absorbing nutrients from their environment (often decomposing organic matter), and typically reproduce through spores.

Plantae: Multicellular, eukaryotic, autotrophic organisms with cell walls made of cellulose. They carry out photosynthesis using chlorophyll to produce their own food from sunlight.

Animalia: Multicellular, eukaryotic, heterotrophic organisms that lack cell walls. They obtain energy by consuming other organisms and are generally capable of movement at some stage of their life cycle.

5. Discuss the challenges of classifying viruses within the traditional three domains of life.

Viruses pose a fundamental challenge to classification because the three-domain system (Archaea, Bacteria, Eukarya) is built entirely around the cell as the basic unit of life, and viruses are acellular — they have no cytoplasm, ribosomes, or organelles of their own.

Viruses also cannot carry out independent metabolism or reproduction; they are obligate parasites that must inject their genetic material into a host cell and hijack the host's cellular machinery to replicate. Because they show some properties of living things (they carry genetic material and can evolve) but lack others (independent metabolism, cellular structure, and the ability to reproduce alone), biologists debate whether viruses should even be considered "alive." As a result, they are studied and classified separately, using their own systems based on genome type and structure rather than being placed inside any domain or kingdom.

6. Explain the rules and guidelines for assigning scientific names to organisms.

Scientific names follow the system of binomial nomenclature, developed by Carl Linnaeus, which gives every species a unique two-part Latin (or Latinized) name.

Key rules: The first part is the genus name, always capitalized; the second part is the species name, always written in lowercase. The complete name is always italicized in print (or underlined when handwritten). Names are typically derived from Latin or Greek, or Latinized versions of other words (such as a person's name or the place where the organism was found). No two species can share exactly the same binomial name, ensuring each name is globally unique. This standardized system allows scientists everywhere, regardless of their native language, to refer to the exact same organism without ambiguity.