Biology Ch 2: Biodiversity - Answer Key

Class 9 Biology (FBISE pattern) | Al Amal Learning Center

Tip: the **boxed** option is correct. Read why, then try the question again yourself.

SECTION A (MCQs)

Q	Question	A	B	C	D
1.	Which statement best defines "biodiversity"?	The study of living organisms and their environment	The grouping of organisms based on similarities	**The variety of living organisms found on Earth**	The identification and naming of organisms

Why C? Biodiversity = **the variety of living organisms on Earth**. (A) describes ecology, (B) is classification, (D) is taxonomy.

2.	The scientific study of the diversity of organisms and their evolutionary relationships is called:	Taxonomy	Ecology	**Systematics**	Classification

Why C? Systematics = scientific study of diversity and evolutionary relationships. Taxonomy = identification, naming and classification; classification = just grouping.

3.	Which of the following is NOT an aim of classification?	To find similarities and differences between organisms	To arrange organisms on the basis of similarities	To study organisms systematically	**To give every organism a different common name in each region**

Why D? Classification aims to find **similarities/differences**, arrange and study organisms systematically. Different common names in each region is the **problem** that scientific names solve.

4.	The third kingdom, Protista, was proposed by:	**Ernst Haeckel**	Carolus Linnaeus	R.H. Whittaker	Carl Woese

Why A? Ernst Haeckel added Protista for Euglena-like unicellular organisms. Linnaeus = binomial nomenclature, Whittaker = five kingdoms (1967), Woese = three domains (1990).

5.	In the five-kingdom system, bacteria and archaea were placed together in Monera because:	**Both have a prokaryotic cell structure**	Both live only in extreme environments	Both have peptidoglycan in their cell walls	Both are autotrophs

Why A? Both are **prokaryotes** (no nucleus), so they shared one kingdom. Archaea have no peptidoglycan and bacteria do not all live in extreme places.

6.	The three-domain system (1990) is based mainly on differences in:	Cell wall colour	Mode of reproduction	Body size	**rRNA nucleotide sequence, membrane lipid structure and antibiotic sensitivity**

Why D? Carl Woese used **rRNA sequence, membrane lipids and antibiotic sensitivity**. Colour, reproduction and size are not the basis.

7.	Which pair is MISMATCHED?	Methanogens - produce methane	Halophiles - live in high salt concentration	Thermoacidophiles - live in high temperature and acidity	**Halophiles - live in high temperature and acidity**

Why D? Halophiles live in **high salt**. High temperature and acidity belongs to **thermoacidophiles**.

8.	The cell wall containing peptidoglycan is a characteristic of domain:	Archaea	Eukarya	**Bacteria**	Archaea and Eukarya

Why C? Only **Bacteria** have peptidoglycan in the cell wall. Archaea and Eukarya have none.

9.	Which kingdom has chitin in its cell wall and is mostly saprotrophic?	Plantae	Protista	Fungi	Animalia

Why C? Fungi have chitin and feed on dead, decaying matter (saprotrophs). Plants have cellulose; animals have no cell wall.

10.	If two organisms belong to the same order, they must also belong to the same:	Family	Genus	Class	Species

Why C? Hierarchy: Domain, Kingdom, Phylum, **Class**, Order, Family, Genus, Species. Same order means same **higher** ranks (class). Family, genus and species are lower.

11.	Which is the correctly written binomial name of pea?	pisum Sativum	Pisum sativum	Pisum Sativum	pisum sativum

Why B? Genus starts with a **capital**, species with a **small** letter, written in italics: Pisum sativum.

12.	A mule (cross of male donkey and female horse) is not regarded as a species because:	It is a hybrid of two genera	It has no chromosomes	It is a plant	It is infertile due to an odd number of chromosomes

Why D? A species must produce **fertile offspring**. A mule has an odd number of chromosomes, so it is infertile.

Scenario: (MCQs 13-16) A student observes three unicellular organisms. Organism X: lives in pond water, has a nucleus and chloroplasts, but feeds heterotrophically in darkness and has no cell wall. Organism Y: has no nucleus, has peptidoglycan in its cell wall and is sensitive to traditional antibiotics. Organism Z: has no nucleus, has no peptidoglycan and lives in a hot spring.

Q	Question	A	B	C	D
13.	Organism X should be placed in kingdom:	Monera	Protista	Fungi	Plantae

Why B? X has a nucleus, chloroplasts and feeds heterotrophically in darkness with no cell wall, like Euglena. This unicellular eukaryote goes in **Protista**.

14.	Organism Y belongs to domain:	Eukarya	Archaea	Bacteria	Not classified in any domain

Why C? No nucleus + peptidoglycan + sensitive to traditional antibiotics = **Bacteria**.

15.	Organism Z belongs to domain:	Bacteria	Eukarya	Archaea	Fungi

Why C? No nucleus, **no peptidoglycan** and lives in a hot spring (extreme environment) = **Archaea**.

16.	Which feature shows that Z is closer to eukaryotes than Y?	It has peptidoglycan	It is sensitive to some antibiotics that affect Eukarya	It lives in hot springs	It is unicellular

Why B? Archaea are sensitive to some antibiotics that affect **Eukarya**. Peptidoglycan is a bacterial feature; hot springs and unicellularity do not link Z to eukaryotes.

Scenario: (MCQs 17-20) The table shows the classification of human and pea. Human: Kingdom Animalia, Phylum Chordata, Class Mammalia, Family Homonidae, Genus Homo. Pea: Kingdom Plantae, Division Magnoliophyta, Class Magnoliopsida, Family Fabaceae, Genus Pisum.

Q	Question	A	B	C	D
17.	The rank "Division" in plants is equivalent to which rank in animals?	Class	Order	Phylum	Genus

Why C? Division (plants and fungi) = **Phylum** (animals). In the table: Chordata is the phylum, Magnoliophyta the division.

18.	The largest taxon shared by human and pea is:	Kingdom	Phylum	Domain	Class

Why C? They are in different kingdoms (Animalia, Plantae) but both are eukaryotes, so the largest shared taxon is **domain Eukarya**.

19.	Which kingdom in the table contains multicellular heterotrophs with an ingestive mode of nutrition?	Plantae	Animalia	Fungi	Protista

Why B? Animalia = multicellular heterotrophs (ingestive). Plantae = autotrophs; Fungi are absorptive (not in the table).

20.	The correct scientific name of pea is:	Pisum sativum	Fabaceae sativum	Magnoliopsida pisum	Pisum Fabaceae

Why A? Binomial name = **Genus + species** = Pisum sativum. Fabaceae is the family and Magnoliopsida the class.

Answer Key at a Glance

1	2	3	4	5	6	7	8	9	10
C	C	D	A	A	D	D	C	C	C
11	12	13	14	15	16	17	18	19	20
B	D	B	C	C	B	C	C	B	A

SECTION B (Short Questions)

Q1 [1+2 marks]

Part	Answer
Definition [1]	**Biodiversity** is the variety of living organisms on Earth (from "biological diversity").
Importance [2] (any two)	1) Gives us oxygen, clean water and air. 2) Helps the carbon cycle and fixes nutrients. 3) Pests are controlled by insects, birds and fungi. 4) Helps pollination and crop production. 5) Gives food, medicines and industrial materials.

OR [1+1+1]

Part	Answer
Classification [1]	Grouping of organisms into classes on the basis of **similarities and differences**.
Taxonomy [1]	Branch of biology concerned with **identification, naming and classification** of organisms.
One advantage [1]	Shows similarities and differences / arranges organisms systematically so they are easy to study / shows evolutionary relationships (any one).

Q2 [3 marks]

Point	Archaea	Bacteria
Peptidoglycan	Absent from the cell wall	Present in the cell wall
rRNA	rRNA not found in Bacteria or Eukarya	rRNA unique to Bacteria
Antibiotics	Insensitive to some antibiotics that affect bacteria; sensitive to some that affect Eukarya	Sensitive to traditional antibiotics; resistant to most that affect Eukarya
Habitat	Often live in extreme environments (methanogens, halophiles, thermoacidophiles)	Generally not restricted to extreme environments

OR [3 marks]

Point	Fungi	Plantae
Cell wall	Made of chitin	Made of cellulose
Nutrition	Saprotrophic (absorptive decomposers)	Autotrophic (photosynthetic)
Chlorophyll	No chloroplasts	Chloroplasts with chlorophyll
Body	Mostly multicellular, some unicellular (yeast)	Multicellular
Examples	Mushroom, black bread mould	Moss, mustard

Q3 [1+2 marks]

Part	Answer
Species [1]	A group of similar organisms capable of **interbreeding** or exchanging genes and producing **fertile offspring**.
Mule [2]	A mule is the cross of a male donkey and a female horse. It has an **odd number of chromosomes**, so it is **infertile** and cannot reproduce. Since a species must produce fertile offspring, the mule is not a species.

OR [1+1+1]

Part	Answer
Binomial nomenclature [1]	Naming system introduced by **Carolus Linnaeus** in which each organism gets two Latin names: first **genus**, second **species**.
Examples [1]	Human: Homo sapiens. Pea: Pisum sativum. (Brinjal: Solanum melongena)
One rule [1]	Genus name starts with a **capital** letter and species name with a **small** letter; the name is written in italics (or underlined when handwritten).

SECTION C (Long Question)

Q4 [2+2+2 marks]

Domain	Characteristics
Archaea [2]	Prokaryotic cells; no peptidoglycan in the cell wall; rRNA not found in Bacteria and Eukarya; not sensitive to some antibiotics that affect bacteria but sensitive to some that affect Eukarya; often live in extreme environments with membranes that withstand higher temperature and stronger acid; examples: methanogens, halophiles, thermoacidophiles.
Bacteria [2]	Prokaryotic cells; cell wall contains peptidoglycan; rRNA unique to Bacteria; sensitive to traditional antibiotics but resistant to most that affect Eukarya.
Eukarya [1]	Eukaryotic cells; not all have a cell wall and it never contains peptidoglycan; rRNA unique to Eukarya; resistant to traditional antibacterial antibiotics; includes four kingdoms: Protista, Fungi, Plantae, Animalia.
Basis [1]	Domains are separated by differences in the **sequence of nucleotides in rRNA**, the **cell membrane lipid structure** and **sensitivity to antibiotics** (Carl Woese, 1990).

OR [3+3 marks]

History [3]	Contribution
Aristotle	First person to classify living organisms.
Abu Usama Aljahiz (700s)	Described 350 species of animals.
Caesalpino (1519-1603)	Divided plants into fifteen groups called genera.
John Ray (1627-1705)	Important works on classification of plants.
Tournefort (1656-1708)	Introduced the taxa of class and species.
Carolus Linnaeus (1707-1778)	Grouped species by similar physical characteristics; gave binomial nomenclature.

Comparison [3]	Two-kingdom	Three-kingdom	Five-kingdom
Kingdoms	Plantae, Animalia	Plantae, Animalia, Protista	Monera, Protista, Fungi, Plantae, Animalia
Proposed by	Oldest system	Ernst Haeckel	R.H. Whittaker (1967)
Key idea	Autotrophs (with bacteria, fungi, algae) in Plantae; dependent organisms in Animalia	Protista added for Euglena-like organisms and to separate unicellular from multicellular	Bacteria and archaea combined in Monera as prokaryotes; Fungi made a separate kingdom

Marks Summary

Section	Marks
Section A (20 MCQs x 0.5)	10
Section B (Q1 + Q2 + Q3)	9
Section C (Q4)	6
Total	**25**