The Living World - NCERT Exercise Answer Key

Chapter 1 - Class XI Biology

EXAMSPRINT | Answer Key | The Living World | NCERT Exercises

1. Why are living organisms... non-living objects?

Answer: Living organisms are classified differently because they exhibit unique characteristics that distinguish them from non-living matter:

Distinctive characteristics of living organisms:

- **Growth:** Increase in mass and size from within (intrinsic growth)
- **Reproduction:** Ability to produce offspring and continue species
- **Metabolism:** Sum of chemical reactions maintaining life
- **Cellular organization:** Made of cells as basic units
- **Response to stimuli:** React to environmental changes
- **Homeostasis:** Maintain stable internal conditions
- **Adaptation:** Develop features suited to environment

Non-living objects lack:

- Self-directed growth (any increase is external accumulation)
- Reproductive capability
- Metabolic processes
- Cellular structure

- Purposeful responses to stimuli

Classification necessity: This distinction helps organize biological knowledge and understand life processes systematically.

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2. What is the... for classification?

Answer: The difficulty in defining living organisms stems from exceptions and borderline cases:

Challenges in definition:

Viruses:

- Show some life characteristics (reproduction, genetic material)
- Lack others (metabolism, cellular organization)
- Require host cells to replicate

Dormant seeds:

- Alive but show no metabolic activity
- No growth or reproduction in dormant state
- Can remain viable for years

Worker bees:

- Alive but cannot reproduce
- Exception to reproduction as universal characteristic

Mules:

- Living organisms but sterile
- Cannot fulfill reproduction criterion

Fire analogy:

- Shows growth-like spreading
- Consumes fuel (like metabolism)
- But clearly non-living

Solution approach: Define life by combination of characteristics rather than single defining feature. Most living organisms show most characteristics most of the time.

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3. Metabolic reactions occur... are living?

Answer: Metabolic reactions can occur in non-living systems, but this doesn't make them living:

Metabolism in living vs. non-living:

Living organisms:

- **Self-directed metabolism:** Organisms control their chemical reactions
- **Integrated processes:** All reactions work together for life maintenance
- **Enzyme-catalyzed:** Specific biological catalysts
- **Energy management:** ATP production and utilization
- **Regulatory mechanisms:** Feedback control systems

Non-living systems:

- **External control:** Reactions depend on external conditions
- **Isolated reactions:** Individual chemical processes
- **No integration:** Lack coordinated metabolic pathways
- **No self-regulation:** Cannot control reaction rates

Examples of non-living metabolism:

- Test tube reactions with enzymes
- Industrial catalytic processes
- Chemical reactions in laboratories

Key difference: Living organisms have **integrated, self-regulated metabolic networks** that maintain life, while non-living systems have **isolated, uncontrolled chemical reactions**.

Conclusion: Metabolism alone is insufficient to define life; it must be combined with other characteristics like organization, reproduction, and homeostasis.

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4. Do you think... a living characteristic?

Answer: A virus outside a living cell cannot be considered truly living:

Virus characteristics analysis:

Non-living aspects (outside host):

- **No metabolism:** Cannot carry out chemical reactions
- **No growth:** Cannot increase in size or mass
- **No reproduction:** Cannot replicate independently
- **No response:** Cannot react to stimuli
- **Crystalline structure:** Can be crystallized like minerals

Living aspects (inside host):

- **Reproduction:** Hijacks host machinery to replicate
- **Genetic material:** Contains DNA or RNA

- **Evolution:** Can mutate and evolve
- **Specificity:** Shows host specificity

Scientific consensus: Viruses are considered **"obligate intracellular parasites"** - they exist at the boundary between living and non-living.

Conclusion: Viruses demonstrate that life exists on a continuum rather than as a clear-cut distinction. They are **neither fully living nor completely non-living** but represent a unique biological entity that challenges traditional definitions of life.

Classification: Viruses are studied in biology because they interact with living systems, but they lack the independence characteristic of true life.

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5. What is the... taxonomic categories?

Answer: Taxonomic categories represent hierarchical levels of biological classification:

Complete taxonomic hierarchy (from broad to specific):

1. **Domain** - Largest grouping (Bacteria, Archaea, Eukarya)
2. **Kingdom** - Major life forms (Plantae, Animalia, etc.)
3. **Phylum/Division** - Body plan organization
4. **Class** - General structural similarities
5. **Order** - Lifestyle and habitat similarities
6. **Family** - Close structural relationships
7. **Genus** - Very similar species groups
8. **Species** - Organisms that can interbreed

Significance of hierarchical arrangement:

- **Inclusiveness:** Higher categories include all lower ones
- **Shared characteristics:** Organisms in same category share specific features
- **Evolutionary relationships:** Reflects common ancestry
- **Systematic organization:** Manages biological diversity logically

Example (Human classification):

- Domain: Eukarya
- Kingdom: Animalia
- Phylum: Chordata
- Class: Mammalia
- Order: Primates
- Family: Hominidae
- Genus: *Homo*
- Species: *Homo sapiens*

Memory aid: "Dear King Philip Came Over For Good Soup"

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6. Try to collect... in them?

Answer: This is a practical exercise requiring field observation:

Collection strategy:

- Visit local gardens, parks, or natural areas
- Collect 10 different plant specimens
- Include flowers, leaves, stems, and seeds when possible
- Take photographs for color documentation

Observable differences:

Morphological variations:

- **Leaf shapes:** Broad, narrow, lobed, compound
- **Flower structures:** Petals number, color, arrangement
- **Stem types:** Woody, herbaceous, climbing
- **Root systems:** Fibrous, taproot systems

Size variations:

- **Height:** From small herbs to tall trees
- **Leaf size:** Tiny needles to large broad leaves
- **Flower size:** Small clusters to large single flowers

Texture differences:

- **Surface:** Smooth, rough, waxy, hairy
- **Thickness:** Thin membranous to thick succulent
- **Flexibility:** Rigid to very flexible

Color variations:

- **Leaves:** Various shades of green, red, purple
- **Flowers:** Wide spectrum of colors and patterns
- **Stems:** Green, brown, red, white

Functional adaptations:

- **Water conservation:** Thick waxy leaves
- **Climbing:** Tendrils, twining stems

- **Pollinator attraction:** Bright flowers, scent

This exercise demonstrates: The remarkable diversity within the plant kingdom and the importance of detailed observation in biological study.

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7. Define a taxon... examples of taxa?

Answer: A taxon is a taxonomic group of any ranking used in biological classification:

Definition of Taxon: A **taxon** (plural: taxa) is a group of organisms classified together based on shared characteristics and evolutionary relationships. It can represent any level in the taxonomic hierarchy.

Characteristics of taxa:

- **Monophyletic:** Ideally includes common ancestor and all descendants
- **Shared features:** Members have similar characteristics
- **Ranking level:** Can be at any taxonomic category
- **Named groups:** Each has a specific scientific name

Examples of taxa at different levels:

Kingdom level taxa:

- **Plantae** - All plants
- **Animalia** - All animals
- **Fungi** - All fungi

Phylum level taxa:

- **Chordata** - Animals with backbone/notochord

- **Arthropoda** - Joint-legged animals
- **Angiospermae** - Flowering plants

Class level taxa:

- **Mammalia** - Mammals
- **Aves** - Birds
- **Insecta** - Insects

Order level taxa:

- **Primates** - Apes, monkeys, humans
- **Carnivora** - Meat-eating mammals
- **Rosales** - Rose and related plant families

Family level taxa:

- **Felidae** - Cat family
- **Rosaceae** - Rose family
- **Solanaceae** - Nightshade family

Genus level taxa:

- ***Panthera*** - Big cats (lions, tigers, leopards)
- ***Rosa*** - True roses
- ***Homo*** - Human genus

Species level taxa:

- ***Panthera leo*** - Lion
- ***Rosa indica*** - Indian rose

- ***Homo sapiens*** - Modern humans

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8. Can you identify... shown below?

Answer: Without the actual figures, I'll explain the identification process:

Identification approach:

Observable characteristics to note:

- **Overall body plan:** Symmetry, segmentation
- **Appendages:** Number and type of limbs
- **Body covering:** Skin, scales, fur, feathers
- **Mouth parts:** Feeding adaptations
- **Reproductive structures:** If visible

Classification steps:

1. **Kingdom determination:** Plant vs. Animal vs. other
2. **Phylum identification:** Major body plan features
3. **Class recognition:** Specific structural features
4. **Further classification:** Based on detailed characteristics

Common identification features:

For animals:

- **Vertebrates:** Backbone present/absent
- **Symmetry:** Radial, bilateral, asymmetrical
- **Body segments:** Present or fused

- **Limb number:** None, paired, multiple pairs

For plants:

- **Vascular tissue:** Present/absent
- **Seeds:** Present/absent, naked/enclosed
- **Flower structure:** If present
- **Leaf arrangement:** Alternate, opposite, whorled

Tools needed:

- **Hand lens:** For detailed observation
- **Identification keys:** Step-by-step guides
- **Reference books:** Field guides and taxonomic resources
- **Digital resources:** Online identification tools

Note: Proper identification requires systematic observation of multiple characteristics and comparison with known taxonomic descriptions.

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9. Define biological nomenclature.

Answer: Biological nomenclature is the formal system of naming living organisms:

Definition: Biological nomenclature is the **standardized method of assigning scientific names to organisms** using internationally accepted rules and conventions.

Key features:

Binomial nomenclature system:

- **Two-part names:** Genus + species epithet

- **Universal application:** Same name used worldwide
- **Latin/Latinized:** Scientific universality
- **Example:** *Homo sapiens* (humans), *Rosa indica* (Indian rose)

Naming rules:

- **Genus name:** Always capitalized, noun
- **Species epithet:** Never capitalized, adjective or noun
- **Italics:** In print, underlined in handwriting
- **Author citation:** Original describer's name (often abbreviated)

Governing codes:

- **ICBN:** International Code of Botanical Nomenclature (plants)
- **ICZN:** International Code of Zoological Nomenclature (animals)
- **ICNB:** International Code of Nomenclature of Bacteria

Historical development:

- **Carl Linnaeus:** Established system in 1753 (plants) and 1758 (animals)
- **Species Plantarum:** First consistent application to plants
- **Systema Naturae:** First consistent application to animals

Advantages:

- **Precision:** Eliminates confusion from common names
- **Stability:** Names remain consistent across languages
- **Information:** Reflects taxonomic relationships
- **Communication:** Universal scientific language

Example comparisons:

- Common name: Lion (English), Sher (Hindi), León (Spanish)
- Scientific name: *Panthera leo* (universal)

Priority rule: First validly published name has priority, ensuring nomenclatural stability.

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10. What are the... taxonomic aid?

Answer: Herbarium specimens are dried and preserved plant collections serving multiple taxonomic purposes:

Herbarium definition: A **herbarium** is a collection of preserved plant specimens that are dried, pressed, mounted on paper, and systematically stored for scientific study.

Taxonomic aids provided:

Reference collection:

- **Type specimens:** Original material used for species description
- **Voucher specimens:** Document plant identifications
- **Comparative material:** For identifying unknown plants
- **Regional flora:** Representative local plant diversity

Research applications:

- **Systematic studies:** Understanding evolutionary relationships
- **Morphological analysis:** Detailed structural comparisons
- **Geographic distribution:** Mapping species ranges
- **Temporal studies:** Changes in flora over time

Educational uses:

- **Teaching material:** Hands-on learning resources
- **Student training:** Practice in plant identification
- **Taxonomic workshops:** Professional development
- **Public education:** Museum displays

Documentation purposes:

- **Biodiversity records:** Permanent documentation of plant diversity
- **Conservation:** Tracking rare and endangered species
- **Legal evidence:** For taxonomic and nomenclatural purposes
- **Historical record:** Changes in plant communities

Identification process:

- **Morphological comparison:** Matching unknown specimens
- **Key construction:** Developing identification guides
- **Field guide preparation:** Illustrating species descriptions
- **Digital databases:** Online identification resources

Quality requirements:

- **Complete specimens:** Including flowers, fruits, leaves, stems
- **Proper pressing:** Maintaining structural integrity
- **Detailed labels:** Collection data, location, date, collector
- **Systematic arrangement:** Organized by taxonomic relationships

Major herbaria worldwide:

- **Kew Gardens (K):** London - largest herbarium
- **Paris (P):** Museum National d'Histoire Naturelle
- **New York (NY):** New York Botanical Garden

Modern developments:

- **Digital herbaria:** Online specimen databases
- **DNA sampling:** Genetic material preservation
- **Virtual collections:** Web-based access to specimens

Additional Important Concepts

Key Terminology:

Taxonomy: Science of classification and naming organisms **Systematics:** Study of evolutionary relationships and classification
Phylogeny: Evolutionary history and relationships **Morphology:** Study of form and structure
Biodiversity: Variety of life at all levels

Memory Techniques:

1. **Taxonomic hierarchy:** "Dear King Philip Came Over For Good Soup"
2. **Binomial nomenclature:** Always *Genus species* (genus capitalized)
3. **Life characteristics:** "GR-MARCH" (Growth, Reproduction, Metabolism, Adaptation, Response, Cellular organization, Homeostasis)

Practical Applications:

- **Field identification:** Using taxonomic keys and guides
- **Museum work:** Curation and research

- **Conservation:** Species identification and protection
- **Agriculture:** Crop identification and breeding programs
- **Medicine:** Plant-based drug discovery
