01

The Living World

Quick Revision

Biology is the science, which deals with the study of living organisms and their life processes. The term '**Biology**' was first introduced by **GR Treviranus** and **Jean Baptiste de Lamarck** (1802).

What is Living?

Living organisms show certain key characteristics which distinguish them from non-living things. These are

- **Growth** is shown by living organisms by an increase in mass and an increase in the number of individuals. A multicellular organism grows by cell division.
- **Reproduction** is the process of producing offspring possessing features similar to those of their parents. It takes place by sexual or asexual mode.
- **Metabolism** comprises of both constructive reactions (anabolism) and destructive reactions (catabolism), continuously occurring in the body.
- **Cellular organisation** The cells are the building blocks of all living organisms may it be plants, animals or humans. Thus, organisms can be **unicellular** or **multicellular**.
- **Consciousness** is the ability of living organisms to sense their surroundings or environment and respond to these environmental stimuli, which could be physical, chemical and biological.

Diversity in the Living World

- **Biodiversity** refers to the number and types of organisms present on earth. Our earth possesses a wide range of living organisms. A number of plants and animals have been identified and described. However, a large number of organisms are still unknown to us.
- A rich diversity among organisms or biodiversity in terms of size, colour, habitat, physiological and morphological features can be observed on earth. Therefore, it is necessary to standardise the methods to identify and classify them on the basis of their defining characteristics.
- Certain rules and principles have been formulated for the **identification**, **nomenclature** and **classification** of organisms, which facilitate the study of vast diversity of organisms present on earth.
- **Identification** involves the process of finding the correct name and place of an organism. The morphological and anatomical characters are examined for proper identification.
- **Nomenclature** involves standardising appropriate naming of living organisms, so that they can be recognised and differentiated from others easily across the world.

- To ease the process of studying different organisms, a scientific name is assigned to each organism.
  The principles of naming have been established by **International Code for Botanical Nomenclature** (ICBN) and **International Code for Zoological Nomenclature** (ICZN) for plants and animals, respectively.
- Organisms are identified on the basis of their resemblance and distinct differences from others. They are assigned a correct **scientific/biological** name.
- **Binomial System of Nomenclature** was developed by **Carolus Linnaeus** in 1751 and was published in his book *Species Plantarum* (1753). As per this system, a biological name comprises of two words namely, **generic name** and the **specific epithet**.
- **Nomenclature of organisms** follows certain universal rules, which are as follows
  - Biological names are generally in Latin and are written in Italics. These are latinised or derived from Latin irrespective of their origin.
  - Both the words in a biological name, when handwritten are separately underlined or printed in Italics to indicate their Latin origin.
  - The first letter of the generic name is written in capital letter while that of specific epithet is written in small letter, e.g. *Mangifera indica*.
  - Name of the author appears after the specific epithet at the end of the biological name and is written in an abbreviated form, e.g. *Mangifera indica* Linn, where Linn is for Linnaeus.
- **Classification** is the process by which organisms are grouped into convenient categories based on some easily observable characters. The scientific term used for different categories is **taxa**.
- **Taxonomy** is the branch of science which deals with different aspects of identification, nomenclature and classification of organisms. **Linnaeus** is known as the Father of Taxonomy.
- **Systematics** is the study of systematic arrangement of organisms and the evolutionary relationships amongst them.

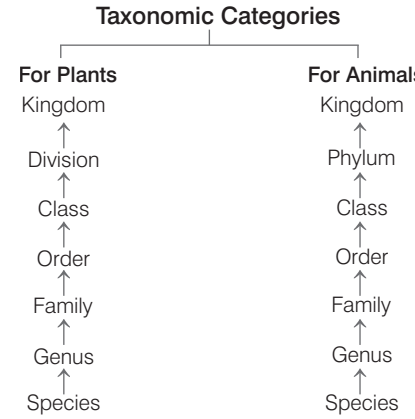
Three Domains of Life

- **Archaea** Archaea domain includes prokaryotic organisms. These are characterised by a monolayer core of lipids in the cell membrane and distinct nucleotides in their **16 S RNA**. It contains a single kingdom called **Archaebacteria**.
- **Bacteria** The bacteria domain consists of typical prokaryotes that lack membrane covered cell organelles. These do not have microchambers for separating various metabolic activities. It also has a single kingdom–**Eubacteria**.
- **Eukarya** The domain eukarya contains all the eukaryotes. The four kingdoms of this domain are Protista, Fungi, Plantae and Animalia.

Taxonomic Categories

- The system of arranging different categories or ranks, which are referred to as **taxonomic categories** in a proper ascending or descending order is called as **taxonomic hierarchy**. Every organism occupies a distinct position in a taxonomic hierarchy.
- Each category in taxonomical hierarchy is commonly called **taxon**. The term 'taxon' was first introduced by ICBN during 1956 and it is the basic unit of classification.
- Taxonomic hierarchy was first proposed by **Linnaeus** and thus it is also called as **Linnaeus hierarchy**. This hierarchy constitutes the following components in an ascending order.
  - **Species** It is the **smallest** unit of taxonomic hierarchy consisting of groups of morphologically similar individuals which can interbreed to produce offspring, e.g. *nigrum* and *melongena* are the two species of genus–*Solanum*.
  - **Genus** It comprises of a group of related species having more characters in common in comparison to species of other genera, e.g. lion, leopard and tiger are all species of the genus–*Panthera*, while cats belong to the genus–*Felis*.

- **Family** It is a group of related genera with a few common features but less number of similarities as compared to genus and species. Plant families are categorised on the basis of both vegetative and reproductive features of species, e.g. family–Solanaceae possesses different genera like *Solanum*, *Petunia* and *Datura*. Similarly, in animals, cats and dogs belong to two different families–Felidae and Canidae, respectively.
- **Order** It is the assemblage of families which exhibit a few similar characters, e.g. order–Polymoniales contains different plant families like Solanaceae and Convolvulaceae. In animals, order–Carnivora includes families Felidae and Canidae.
- **Class** It includes one or more related orders, e.g. class–Mammalia includes order–Primata and Carnivora.
- **Phylum** or **Division** It includes classes with a few similar characters, e.g. phylum–Chordata includes animals possessing notochord and dorsal neural system.
- In plants, classes with few similar characters are placed under higher category called **division**, e.g. the division–Angiospermae includes wheat, onion, etc.
- **Kingdom** It is the **highest** taxonomic category. All animals belong to the kingdom–Animalia, while all plants belong to the kingdom–Plantae.



Objective Questions

Multiple Choice Questions

1. Increase in body mass can be considered a criterion for growth in
(a) living being (b) non-living matter
(c) Both (a) and (b) (d) None of these

2. Choose an appropriate option to complete the given statement.
In plants, growth takes place by .... throughout their lifespan.
(a) cell dedifferentiation
(b) cell differentiation
(c) cell multiplication
(d) None of the above

3. Growth in unicellular organisms can be observed by
(a) counting the mass of cultured cells
(b) analysing the amount of nutrients absorbed by living organism
(c) growth cannot be observed
(d) simply counting the number of cells under microscope during *in vitro* culture

4. In most of the higher animals and plants, reproduction and growth are
(a) synonymous events
(b) mutually exclusive events
(c) Both (a) and (b)
(d) None of the above

5. What kind of growth is exhibited by non-living organisms?
(a) Accumulation of material on surface
(b) Accumulation of material inside
(c) Growth from inside
(d) None of the above

6. Match the following columns.

	Column I		Column II
A.	*Planaria*	1.	Binary fission
B.	Fungi	2.	Asexual spores
C.	*Spirogyra*	3.	Budding
D.	*Hydra*	4.	True regeneration
E.	*Amoeba*	5.	Fragmentation

Codes

	A	B	C	D	E
(a)	1	2	4	5	3
(b)	4	2	5	3	1
(c)	5	2	3	1	4
(d)	4	2	1	3	5

7. Which of the following characteristics is not a defining character of living organisms?
(a) Growth
(b) Growth and reproduction
(c) Reproduction
(d) Growth and metabolism

8. Metabolism can be best defined as
(a) the process in which a chemical is formed inside a body
(b) the process in which a chemical is destroyed inside a body
(c) the sum total of all chemical reactions occurring in a body
(d) a complex construction process only

9. Consciousness is the defining property of living organisms because
(a) photoperiod affects reproduction in seasonal breeders in both plants and animals
(b) plants respond to external factors like temperature and light
(c) human is aware of himself
(d) All of the above

10. Higher level of organisation emerges from interactions among organelles.
(a) True (b) False
(c) Cannot say (d) Partially true or false

11. Which of the following statements are correct regarding the response of living beings to any external stimuli?
I. All organisms from most simple to the most complex, sense and respond to the external stimuli.
II. The external stimuli can be physical, chemical or a biological entity.
III. Responding to an external stimulus is the characteristic feature of living beings.
IV. Living organisms are self-replicating, evolving and self-regulating interactive systems capable of responding to external stimuli.
(a) Only I (b) Only II
(c) I and II (d) I, II, III and IV

12. Biodiversity can be best defined as
(a) occurrence of the number and types of organisms
(b) species and ecosystem of a region
(c) variety of life in an ecosystem
(d) totality of genes, species and ecosystem of a given region

13. Standardising the name of living organism is known as
(a) classification (b) identification
(c) nomenclature (d) Both (a) and (c)

14. ICBN stands for
(a) Indian Congress of Biological Name
(b) International Code for Botanical Nomenclature
(c) International Congress of Biological Name
(d) Indian Code of Botanical Nomenclature

15. The binomial nomenclature system was given by
(a) Carol Linnaeus
(b) Carolus Linnaeus
(c) Aristotle
(d) Whittaker

16. Which of the following is against the rules of ICBN?
(a) Handwritten scientific names should be underlined
(b) Every species should have a generic name and a specific epithet
(c) Scientific names are in Latin and should be italicised
(d) Generic and specific names should be written starting with small letters

17. Which one is the incorrectly written scientific name?
(a) *Panthera tigris* (b) *Mangifera indica*
(c) *Panthera leo* (d) *Columba LIVIA*

18. In binomial nomenclature, the name of author appears after the genus.
(a) True
(b) False
(c) Cannot say
(d) Partially true or false

19. The process by which anything is grouped into convenient categories based on some easily observable characters is
(a) identification (b) classification
(c) sorting (d) grouping

20. The scientific name of mango is written as *Mangifera indica* L. Which of the following statements is correct regarding this ?
(a) Letter L signifies Latin language
(b) The name should be written reverse with *Indica* preceding *Mangifera*
(c) Letter L signifies the author Linnaeus
(d) *Indica* is the generic name

21. Consider the following statements.
I. Classification is not a single step process, but involves hierarchy of steps in which each step represents a rank or category.
II. Taxonomic hierarchy constitute taxonomic categories.
Choose the correct option.
(a) Statement I is correct, but II is incorrect
(b) Statement I is incorrect, but II is correct
(c) Both statements I and II are correct
(d) Both statements I and II are incorrect

22. Taxon refers to a
(a) group of related species
(b) group of related families
(c) type of living organism
(d) taxonomic group of any ranking

23. A 'taxa' is different from 'taxon' because
(a) it is a higher taxonomic category than taxon
(b) it is a lower taxonomic category than taxon
(c) it is a plural of taxon
(d) it is a singular of taxon

24. As we go from species to kingdom in a taxonomic hierarchy, the number of common characteristics
(a) will decrease ***(NCERT Exemplar)***
(b) will increase
(c) remain same
(d) may increase or decrease

25. Species is considered as
(a) the largest taxon of taxonomy/classification
(b) the smallest taxon of taxonomy/classification
(c) Both smallest and the largest unit of taxonomy/classification
(d) None of the above

26. Two different genera are classified in the same taxonomic category family. Which statement is correct about their classification?
(a) The same class, but different species
(b) A different class and different order
(c) The same phylum, but different class
(d) A different kingdom and different phylum

27. Choose the incorrect match.
(a) Order – a group of related families
(b) Genus – a group of related species
(c) Class – a group of related orders
(d) Division – a group of related phyla

28. *Pisum* and *Panthera* are genus and species.
(a) True (b) False
(c) Cannot say (d) Partially true or false

29. Arrange the following in ascending order of similar characteristics.
I. Family II. Genus
III. Class IV. Species

(a) Class < Family < Genus < Species
(b) Family < Class < Genus < Species
(c) Species < Order < Family < Class
(d) Class < Genus < Species < Family

30. Which of the following 'suffixes' used for units of classification in plants indicates a taxonomic category of 'family'?
(NCERT Exemplar)
(a) – ales (b) – onae (c) – aceae (d) – ae

31. Which one of the following animals is correctly matched with its particular named taxonomic category?
(a) Tiger – *tigris*, the species
(b) Cuttle fish –Mollusca, a class
(c) Humans – Primata, the family
(d) Housefly – *Musca*, an order

32. Match the following columns.

	Column I		Column II
A.	Family	1.	*tuberosum*
B.	Kingdom	2.	Polymoniales
C.	Order	3.	*Solanum*
D.	Species	4.	Plantae
E.	Genus	5.	Solanaceae

Codes ***(NCERT Exemplar)***

	A	B	C	D	E
(a)	5	4	2	1	3
(b)	5	4	1	3	2
(c)	1	2	3	5	4
(d)	2	1	3	4	5

Assertion-Reasoning MCQs

Direction *(Q. Nos. 33-42) Each of these questions contains two statements Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.*

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true, but R is not the correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true

33. **Assertion** (A) Non-living organisms exhibit growth, but not cell division.
Reason (R) Cell differentiation occurs exclusively in living organisms.

34. **Assertion** (A) Death is considered as the regulatory process on earth.
Reason (R) It prevents an increase in population caused by continuous reproduction.

35. **Assertion** (A) Consciousness or response to stimuli is a defining property of living organism.
Reason (R) Human being is the only creature to possess self-consciousness.

36. **Assertion** (A) Metabolism is the sum total of anabolism and catabolism.
Reason (R) Diverse types of metabolic reactions occur simultaneously in a living organism.

37. **Assertion** (A) The living organisms are self-replicating, evolving and self-regulating interactive systems capable of responding to external stimuli.
Reason (R) Hierarchy of organisational complexity is shown at all levels.

38. **Assertion** (A) Linnaeus' binomial system of animal classification is essentially an artificial system, yet it has become a natural system.
Reason (R) Similarities forming the basis of Linnaeus system are indicative of genetic relationship.

39. **Assertion** (A) There are seven obligate categories in hierarchy of taxonomy.
Reason (R) Other categories of similar type can be called as intermediate categories.

40. **Assertion** (A) Hierarchical system of classification is useful to reduce volume's description in a catalogue of organisms.

Reason (R) Characters of a larger category (like division) are not repeated for smaller/ lower categories (family and order).

41. **Assertion** (A) Species is a group of individuals with fundamental similarities.

Reason (R) *indica, leo*, *tuberosum* represent such group of individuals.

42. **Assertion** (A) Taxonomic studies require correct classification and identification of organisms.

Reason (R) Taxonomic studies are useful in knowing our bioresources and their diversity.

Case Based MCQs

43. **Direction** *Read the following and answer the questions that follow*

We are surrounded by living and non-living things. All animals and plants are living things and biology is the study of these living things. A cat playing with a ball is obviously living. A pigeon flying from tree to tree is also a living thing. Sometimes it is not as easy to decide. Plants are living things, but they do not play with balls or fly. If something is living it will carry out all of the seven characteristics like movement, breathing or respiration, excretion, growth, sensitivity and reproduction. Some non-living things show one or two of the seven characteristics of living things. Like crystals such as ice crystals forming on a window, grow bigger if the conditions are right. But still they cannot be categorised as living.

(i) Which of the following is a defining characteristic of living organisms? ***(NCERT Exemplar)***

(a) Growth
(b) Ability to make sound
(c) Reproduction
(d) Response to external stimuli

(ii) The most important feature of all living systems is to

(a) utilise oxygen to generate energy
(b) replicate the genetic information
(c) produce gametes
(d) utilise solar energy for metabolic activities

(iii) In which of the following, metabolic reactions take place?

(a) In living organisms
(b) Both in living and non-living organisms
(c) In isolated cell-free systems
(d) Both (a) and (c)

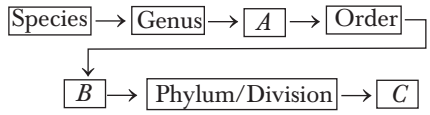
(iv) Why reproduction cannot be considered as an inclusive defining characteristic of all living organisms?

(a) Non-living organisms also reproduce
(b) Many living organisms are sterile
(c) Reproduction is synonym to growth in all organisms
(d) Both (a) and (b)

(v) Which one of the following aspects is an exclusive characteristic of living things?

(a) Isolated metabolic reactions occur *in vitro*
(b) Increase in mass from inside only
(c) Perception of events happening in the environment and their memory
(d) Increase in mass by accumulation of material both on surface as well as internally

44. Study the flowchart given below and answer the questions that follow



(i) Choose the incorrect match.
(a) *A*—Family
(b) *B*—Class
(c) *C*—Kingdom
(d) *A*—includes monocots and dicots

(ii) The taxonomic category '*C*' includes
(a) Fungi (b) Monera
(c) Protista (d) All of these

(iii) Which of the following is not a taxon, but category?
(a) Division
(b) Dicotyledons
(c) Angiosperms
(d) Polypetalae

(iv) Which one of the following has a real existence?
(a) Genus
(b) Species
(c) Family
(d) Order

(v) The suffix phyta indicates
(a) family (b) order (c) class (d) division

ANSWERS

Multiple Choice Questions

1. (c)	2. (c)	3. (d)	4. (b)	5. (a)	6. (b)	7. (b)	8. (c)	9. (d)	10. (a)
11. (d)	12. (a)	13. (c)	14. (b)	15. (b)	16. (d)	17. (d)	18. (b)	19. (b)	20. (c)
21. (a)	22. (d)	23. (c)	24. (a)	25. (b)	26. (a)	27. (d)	28. (d)	29. (a)	30. (c)
31. (a)	32. (a)								

Assertion-Reasoning MCQs

33. (b)	34. (a)	35. (b)	36. (b)	37. (b)	38. (c)	39. (b)	40. (a)	41. (b)	42. (b)

Case Based MCQs

43. (i) *(d),* (ii) *(b),* (iii) *(d),* (iv) *(b)* , *(v) (c)*

44. (i) *(d),* (ii) *(d),* (iii) *(a),* (iv) *(b),* (v) *(d)*

EXPLANATIONS

1. (c) In both living and non-living beings, increase in body mass can be considered as a criterion for growth.

It may occur as the result of accumulation of material on non-living surface or weight increase in livings organisms, e.g. mountains and sand dunes increase due to the accumulation of material on their surface.

2. (c) In plants, growth takes place by cell division or multiplication continuously in all parts throughout their lifespan.

3. (d) Growth occurs in unicellular organisms by cell division. It can be observed in *in vitro* culture by counting the number of cells under the microscope.

4. (b) In most of the higher organisms like plants and animals, reproduction and growth are mutually exclusive events because increase in the body size of living beings does not alter the rate of reproduction or *vice-versa.*

5. (a) Non-living objects like mountains, boulders and sand mounds grow by accumulation of material on their surface. However, in living organisms, growth is from inside (i.e. cell division in the body).

7. (b) Both growth and reproduction are not the defining characteristics of living organisms. Growth is exhibited by non-living matter in terms of increase in mass due to the accumulation of material. Similarly,

reproduction is not exhibited by all living organisms and is not essential for the survival of an individual.

8. (c) Metabolism refers the sum total of all the metabolic activities or chemical reactions in a body, i.e. anabolism and catabolism. Anabolism is a constructive process, while catabolism is a destructive process.

9. (d) Consciousness is the defining property of living organisms because all living organisms show response to external or internal stimuli. For example, photoperiod affects breeding in plants and animals. Plants respond to external factors like light, water, temperature, pollutants, etc. Human being is aware of himself, i.e. show self-consciousness.

12. (a) Biodiversity refers to the variability of life on earth and it represents the number and type of organisms present on the earth.

13. (c) Nomenclature is the process of standardising the name of living organisms such that a particular organism is known by same name all over the world.

14. (b) ICBN stands for International Code for Botanical Nomenclature.

16. (d) Option (d) is against the rules of ICBN and can be corrected as

According to ICBN, the first word denoting the genus (generic name) starts with a capital letter, while the specific epithet starts with a small letter.

Rest other options follow the rules of ICBN.

17. (d) Binomial nomenclature consists of two words, i.e. a generic name and a specific name. The first word denoting the genus starts with capital letter, while specific epithets start with small letter. In the scientific name *Columba LIVIA*, *Columba* is written correctly, while *LIVIA* is incorrect because species names are written in small letters. Thus, the correct form would be *Columba livia.*

18. (b) In binomial nomenclature, the name of author appears after the species.

19. (b) Classification is the process by which anything is grouped into convenient categories based on some easily observable characters. It is important for establishing relationships amongst organisms.

20. (c) The statement in option (c) is correct. Rest statements are incorrect and can be corrected as

Mangifera indica L is the scientific name of mango with 'L' as the name of the author Linnaeus. *Mangifera* represents the genus and *indica* represents the species name.

21. (a) Statement I is correct, but II is incorrect.

Statement II can be corrected as

Taxonomic categories constitute taxonomic hierarchy.

22. (d) Taxon refers to any ranking of taxonomic hierarchy, i.e. any level of grouping of organism based on observable features. According to Simpson, taxon is a group of real organisms recognised at a formal unit at any level in hierarchy.

23. (c) Taxa is just the plural word of taxon.

24. (a) Common characteristics among organisms decrease as we move towards higher taxonomic hierarchy. Thus, on moving from species to kingdom in a taxonomic hierarchy, the number of common characteristics will decrease.

26. (a) Statement in option (a) is correct as

In taxonomic categories, family is placed between class and species and can accomodate different genera. However, different species like dog, jackal, etc., belong to the same genera *Canis* and hence, the same class.

27. (d) Option (d) is incorrect and can be corrected as

Division is a group of related classes (not phyla).

28. (d) *Pisum* is a genus of plants and *Panthera* is a genus of animals.

29. (a) The taxonomic categories in ascending order of similar characteristics are seen as follows

Class < Family < Genus < Species

30. (c) The name of a family in plants always ends with the suffix –aceae, e.g. Solanaceae, Cannaceae and Poaceae.
The suffix–ales is used for taxon 'order' while suffix–ae is used for taxon 'class' and suffix–onae is not used in any of the taxon.

31. (a) Option (a) is correctly matched with its specific taxonomic category as *tigris*, is the species of tiger.

Other options are not correct by matched with their specific taxonomic categories and can be corrected as

Mollusca is a phylum, Primata is an order and *Musca* is a genus.

33. (b) Both A and R are true, but R is not the correct explanation of A.

Both living and non-living organisms increase in mass and thus exhibit growth.

But the characters like cell division, cell differentiation and replication occur in living organisms only.

34. (a) Both A and R are true and R is the correct explanation of A.

Death is considered as the regulatory process on earth. It occurs when there is an increase in entropy and degeneration of body parts of an organism. Reproduction is an important characteristic of living organism in order to continue living on earth but reproduction can cause overcrowding. Thus, to balance reproduction, death checks the population size.

35. (b) Both A and R are true, but R is not the correct explanation of A.

All living organisms have the ability to sense their surroundings or environment and respond to these environmental stimuli which could be physical, chemical or biological. All organisms, therefore are aware of their surroundings. Human beings show self-consciousness. Consciousness therefore becomes the defining property of living organisms.

36. (b) Both A and R are true, but R is not the correct explanation of A.

All living organisms are made up of chemicals. These chemicals, small and big belonging to various classes, sizes, functions, etc., are either constantly being created (i.e. anabolism) or broken down into other/smaller biomolecules (i.e. catabolism). These reactions are collectively called as metabolic reactions or metabolism.

37. (b) Both A and R are true, but R is not the correct explanation of A.

Living organisms are self-replicating, evolving and self-regulating interactive systems capable of responding to external stimuli. Properties of tissues are not present in the constituent cells, but arise as a result of interactions among the constituent cells.

Similarly properties of cellular organelles are not present in the molecular constituents of the organelle, but arise as a result of interactions among the molecular components comprising the organelle.

These interactions result in emergent properties at higher levels of organisation. This phenomenon is true in the hierarchy of organisational complexity at all levels.

38. (c) A is true, but R is false and R can be corrected as

The binomial system of animal classification given by Linnaeus is an artificial system, as it is based on locomotion type and the absence of chlorophyll. Linnaeus system does not show genetic relationship or phylogeny.

39. (b) Both A and R are true, but R is not the correct explanation of A.

The obligate categories used in the classification are species, genus, family, order, class, division/phylum, kingdom. Inspite of these seven major categories, sometimes subcategories like, subspecies or varieties are added for clear distinction. These are called intermediate categories. Generally, intermediate categories are added in classification of plants.

40. (a) Both A and R are true and R is the correct explanation of A.

Hierarchical system of classification helps to reduce description of volume in catalogue of plants and animals. This is because characters for higher categories are not repeated for lower categories. It can be illustrated by an example like *Cannis familiaris* is common dog and belong to family–Canidae. Genus–*Cannis* are applied to wolf, jackal of the same family.

42. (b) Both A and R are true, but R is not the correct explanation of A.

Taxonomic studies of various species of plants, animals and other organisms are useful in various industries like agricultural and forest industry and in general in knowing our bioresources and their diversity. These studies would require correct classification and identification of organisms.

These are fundamental and essential for training in systematics. The information gathered is stored along with the specimens for future studies.

43. (i) (d) Consciousness or response to external stimuli is the defining property of living organisms. All organisms from the prokaryotes to the most complex eukaryotes can sense and respond to various environmental cues.

(ii) (b) The most important feature of all living systems is to replicate the genetic information.

Replication of the genetic information results in the transfer of genetic information from one generation to the next.

(iii) (d) Metabolic reactions take place both in living organisms and can also be performed outside the body in a cell-free system, i.e. an isolated metabolic reaction *in vitro*.

Thus, option (d) is correct.

(iv) (b) Reproduction cannot be considered as an inclusive defining characteristic of life as many living organisms are sterile, i.e. they do not reproduce, e.g. mules, worker bee, etc.

(v) (c) Among the listed options, perception of events happening in the environment and their memory is an exclusive character of living things. This phenomenon is called as consciousness or irritability. Thus, the correct option is (c).

44. (i) (d) The correct matches are *A*-Family, *B*-Class and *C*-Kingdom. Monocot and dicots are classes in plant classfication, not plant families.

(ii) (d) Taxonomic category '*C*' is kingdom. Fungi, Monera, Protista are all kingdoms of classification.

(iii) (a) Division in plant classification is equivalent to phylum in animal classification. It is a taxonomic category (not taxon) between kingdom and class.

(iv) (b) According to biological concept of species (proposed by Mayr), new species is formed from existing species, thus it has real existence.

(v) (d) Division is a category including closely related classes. The name of division ends with phyta (e.g. Spermatophyta).