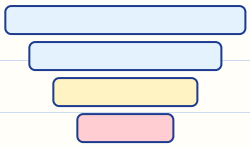
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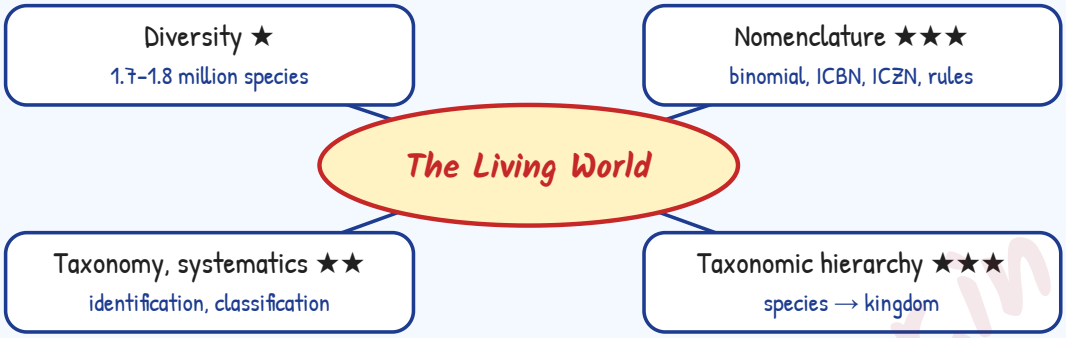
Chapter 1
The Living World



Homo sapiens

NCERT Biology, Reprint 2026-27 · Unit 1: Diversity in the Living World

Chapter map (★ = very often asked in school exams)



What is inside

1. Concept notes with labelled diagram
2. NCERT exercises, fully solved
3. Important exam questions, fully solved
4. Quick-reference sheet; practice A–G, 20 MCQs, 6 A–R, answers, summary

Colour code used

red = key term green = definition

purple = sub-heading black = explanation

★ = high-frequency exam topic

1 = mark the examiner gives for that point

★ **Exam tip:** The rules of binomial nomenclature (with a correctly written name), the meaning of taxon and taxonomic category, the sequence of categories, and the classification of man, housefly, mango and wheat (Table 1.1) are asked in every school exam.

NB **Prepared by Notes Bazar** · Every answer written and checked by hand against NCERT and the CBSE marking schemes. Doubt or mistake? WhatsApp 88240 98091.

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1.1 Diversity in the living world: nomenclature, classification, taxonomy, systematics ★★★

Biodiversity

Each different kind of plant, animal or organism is a **species**. About **1.7–1.8 million** species are known and described: this number and variety of organisms on earth is **biodiversity**. New organisms keep being identified, in new areas and in old ones.

Why scientific names?

Local names vary from place to place, even within a country, and cause confusion. So names must be standardised: the same name all over the world.

- **Identification**: describing an organism correctly so that we know to which organism a name belongs.
- **Nomenclature**: giving the correct (scientific) name to an identified organism.
- Plants are named by the **International Code for Botanical Nomenclature (ICBN)**; animals by the **International Code of Zoological Nomenclature (ICZN)**.
- A scientific name ensures each organism has **only one name**, that people anywhere arrive at the same name from a description, and that the name has not been used for any other organism.

Binomial nomenclature ★★★

Given by **Carolus Linnaeus**: each name has two components, the **generic name** and the **specific epithet**. Mango: *Mangifera indica* (genus *Mangifera*, specific epithet *indica*).

Rules of naming

1. Biological names are generally in **Latin** (Latinised or derived from Latin, whatever their origin) and written in **italics**.
2. The first word is the **genus**, the second the **specific epithet**.
3. Handwritten names: each word is **underlined separately**; printed names are in italics, to show their Latin origin.
4. The genus starts with a **capital letter**, the specific epithet with a **small letter**: *Mangifera indica*.

The **author's name** comes after the specific epithet, abbreviated: *Mangifera indica* **Linn.** means Linnaeus first described it.

Classification and taxa

Classification: grouping organisms into convenient categories based on easily observable characters. 'Dogs', 'cats', 'mammals', 'wheat', 'rice', 'plants', 'animals' are such categories; the scientific term is **taxa** (singular taxon). Taxa exist at very different levels: animals ⊃ mammals ⊃ dogs.

Taxonomy

Taxonomy: the process of classifying organisms into taxa based on their characteristics. Its basis today: external and internal structure, cell structure, development and ecological information. The processes basic to taxonomy are **characterisation, identification, classification and nomenclature**.

The earliest classifications were based on the **uses** of organisms (food, clothing, shelter).

Systematics

The study of the kinds and diversity of organisms and of the **relationships** among them. From Latin *systema* (systematic arrangement); Linnaeus titled his book *Systema Naturae*. Its scope now includes identification, nomenclature and classification, and it takes **evolutionary relationships** into account.

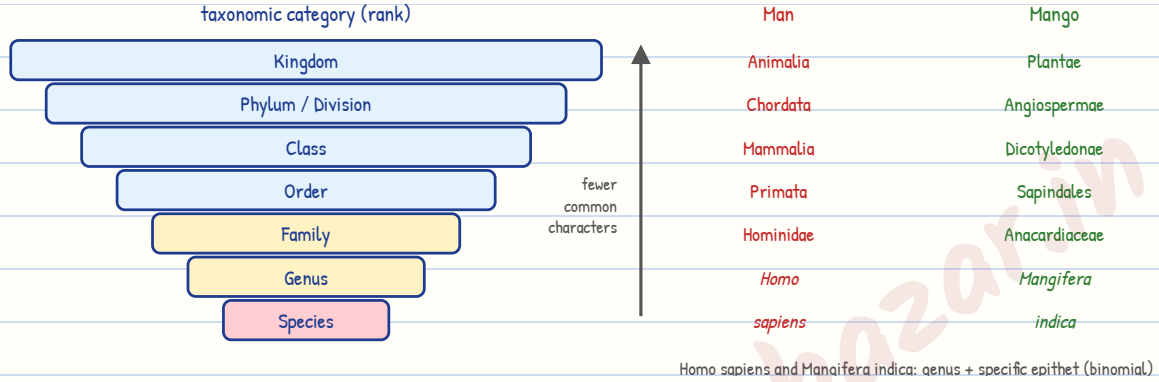
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taxonomy	systematics
classification, identification and naming on the basis of characters	also studies the relationships (including evolutionary) between organisms

✗ **Don't do this:** Write "Mangifera indica", never "Mangifera Indica" or "mangifera indica"; underline the two words separately when handwriting.

✗ **Don't do this:** A taxon is a group (e.g. "mammals"); a category or rank is its level (e.g. "class").

1.2 Taxonomic categories and the taxonomic hierarchy ★★★



The taxonomic hierarchy in ascending order: going up from species to kingdom, the members of a taxon share fewer and fewer characters

Classification is a **hierarchy of steps**, each step a **rank** or **category**; all categories together form the **taxonomic hierarchy**. Each category is a **unit of classification**, a taxon. Taxonomic groups are distinct biological entities, not mere morphological aggregates. Example: insects share three pairs of jointed legs, so they form a recognisable group.

The common categories: **kingdom, phylum (division for plants), class, order, family, genus, species**. Species is the lowest category for all organisms.

1.2.1 Species

A group of individuals with **fundamental similarities**, distinguishable from closely related species by distinct morphological differences. In *Mangifera indica*, *Solanum tuberosum* (potato) and *Panthera leo* (lion), *indica*, *tuberosum* and *leo* are specific epithets. *Panthera* also has *tigris*; *Solanum* has *nigrum* and *melongena*. Humans: *Homo sapiens*.

1.2.2 Genus

A group of **related species** with more characters in common than with species of other genera. Potato and brinjal: genus *Solanum*. Lion (*Panthera leo*), leopard (*P. pardus*) and tiger (*P. tigris*): genus *Panthera*, which differs from the genus *Felis* (cats).

1.2.3 Family

A group of related genera with fewer similarities than genus and species; in plants based on vegetative and reproductive features. *Solanum*, *Petunia*, *Datura*: family **Solanaceae**. *Panthera* and *Felis*: family **Felidae**; dogs are in **Canidae**.

1.2.4 Order to 1.2.7 Kingdom

Order: an assemblage of families with a few similar characters (identified on aggregates of characters). Convolvulaceae and Solanaceae: order **Polymoniales** (floral characters); Felidae and Canidae: order **Carnivora**.

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Class: related orders. Order Primata (monkey, gorilla, gibbon) and order Carnivora (tiger, cat, dog) are in class **Mammalia**.

Phylum: classes such as fishes, amphibians, reptiles, birds and mammals, sharing the **notochord** and **dorsal hollow neural system**, form phylum **Chordata**. In plants the equivalent is **division**.

Kingdom: the highest category. All animals: **Kingdom Animalia**; all plants: **Kingdom Plantae**. Sub-categories are also used for sound placement of taxa.

Going up from species to kingdom, the number of **common characteristics decreases**; the lower the taxon, the more characters its members share; the higher the category, the harder it is to judge relationships, so classification becomes more complex.

name	genus	family	order	class	phylum / division
man *Homo sapiens*	*Homo*	Hominidae	Primata	Mammalia	Chordata
housefly *Musca domestica*	*Musca*	Muscidae	Diptera	Insecta	Arthropoda
mango *Mangifera indica*	*Mangifera*	Anacardiaceae	Sapindales	Dicotyledonae	Angiospermae
wheat *Triticum aestivum*	*Triticum*	Poaceae	Poales	Monocotyledonae	Angiospermae

Table 1.1 (NCERT): organisms with their taxonomic categories.

NCERT exercises, fully solved

NCERT end-of-chapter exercises

1. Why are living organisms classified?

> **Ans.** There are millions of organisms (1.7–1.8 million species known) and it is impossible to study each one separately. Classification groups them into convenient categories on easily observable characters, so that (i) study becomes easy and systematic; (ii) identifying an organism tells us many of its characters at once; (iii) relationships among different groups (including evolutionary ones) become clear; (iv) a sound basis for naming is obtained; and (v) organisms useful in agriculture, forestry, industry and medicine can be recognised.

2. Why are the classification systems changing every now and then?

> **Ans.** Classification depends on our knowledge of organisms. New organisms keep being discovered, and new kinds of information (cell structure, biochemistry, development, ecology, DNA and evolutionary relationships) keep becoming available. As knowledge grows, earlier groupings are found to be artificial or incomplete, so systems are revised to reflect natural and evolutionary relationships better.

3. What different criteria would you choose to classify people that you meet often?

> **Ans.** Possible criteria: sex (male, female); age group (child, teenager, adult, elderly); relation (family, relatives, friends, neighbours); occupation (students, teachers, shopkeepers, doctors); place (school, locality, town); language spoken; physical features such as height or colour of eyes. The criteria chosen depend on the purpose of the classification, just as in biology.

4. What do we learn from identification of individuals and populations?

> **Ans.** Identification tells us the correct name and hence the taxonomic position of an organism, and so its characters and relationship with other organisms. For populations it tells us about their number, distribution, variation and the biodiversity of an area; it helps in conservation of rare and endangered species, in recognising useful (crop, medicinal) and harmful (pest, pathogen) organisms, and in studying evolution.

5. Identify the correctly written name: *Mangifera Indica* / *Mangifera indica*.

> **Ans.** ***Mangifera indica***: the genus begins with a capital letter and the specific epithet with a small letter; both are in italics (or underlined separately when handwritten).

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6. Define a taxon. Give some examples of taxa at different hierarchical levels.

> **Ans.** A **taxon** (plural taxa) is a taxonomic group of any rank, i.e. a unit of classification representing a category in the hierarchy. Examples: kingdom Animalia, phylum Chordata, class Mammalia, order Primata, family Hominidae, genus *Homo*, species *sapiens*; for a plant: kingdom Plantae, division Angiospermae, class Dicotyledonae, order Sapindales, family Anacardiaceae, genus *Mangifera*, species *indica*.

7. Identify the correct sequence: (a) Species → Order → Phylum → Kingdom (b) Genus → Species → Order → Kingdom (c) Species → Genus → Order → Phylum.

> **Ans.** (a) and (c) are both correct ascending sequences (some categories are skipped, but the order is right); (b) is wrong because species is below genus. If one answer is wanted, **(c)** is the most complete correct sequence; (a) is also in correct order.

8. Collect the currently accepted meanings of "species". Discuss the meaning of species for higher plants and animals on one hand, and for bacteria on the other.

> **Ans.** **Morphological (taxonomic) species**: a group of individuals with fundamental similarities in form, distinguishable from related species by distinct morphological differences (NCERT). **Biological species** (Ernst Mayr): a group of actually or potentially interbreeding natural populations, reproductively isolated from other such groups. **Evolutionary species**: a lineage with its own evolutionary role and tendencies.
> In higher plants and animals, which reproduce sexually, the biological species concept works well: members interbreed and produce fertile offspring. In bacteria, which reproduce asexually (and exchange genes only occasionally), interbreeding cannot be used; bacterial species are defined by morphology, physiology, biochemical reactions and DNA (e.g. rRNA sequence) similarity.

9. Define (i) Phylum (ii) Class (iii) Family (iv) Order (v) Genus.

> **Ans.** (i) **Phylum**: a category of related classes sharing a few common features, e.g. Chordata (notochord, dorsal hollow nerve cord); in plants, division. (ii) **Class**: a group of related orders, e.g. Mammalia includes Primata and Carnivora. (iii) **Family**: a group of related genera with fewer similarities than a genus, based on vegetative and reproductive features in plants, e.g. Solanaceae, Felidae. (iv) **Order**: an assemblage of families showing a few similar characters, e.g. Polymoniales, Carnivora. (v) **Genus**: a group of closely related species with more characters in common than with species of other genera, e.g. *Panthera*, *Solanum*.

10. Illustrate the taxonomic hierarchy with suitable examples of a plant and an animal.

> **Ans.** **Animal (man)**: Kingdom Animalia → Phylum Chordata → Class Mammalia → Order Primata → Family Hominidae → Genus *Homo* → Species *sapiens*.
> **Plant (wheat)**: Kingdom Plantae → Division Angiospermae → Class Monocotyledonae → Order Poales → Family Poaceae → Genus *Triticum* → Species *aestivum*.
> Going from species to kingdom, each category includes more organisms that share fewer characters (see the figure in the concept notes).

Quick-reference sheet

Term	Key fact
known species	1.7–1.8 million
identification	correct description → which organism
nomenclature	giving the correct scientific name
ICBN / ICZN	codes for plants / animals
binomial	genus + specific epithet (Linnaeus)

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taxon	a group (unit) of any rank
taxonomy	characterise, identify, classify, name
systematics	+ relationships (evolutionary)
hierarchy	species → genus → family → order → class → phylum → kingdom
man	Hominidae, Primata, Mammalia, Chordata
housefly	Muscidae, Diptera, Insecta, Arthropoda
mango	Anacardiaceae, Sapindales, Dicotyledonae
wheat	Poaceae, Poales, Monocotyledonae

✗ **Don't do this:** Division is used for plants instead of phylum.

Case study (practice): a zoo label. A zoo board reads: "Tiger · panthera tigris · Family: Felidae · Order: Carnivora". (i) What is wrong with the way the scientific name is written? (ii) Name another species in the same genus. (iii) Which family of the same order contains dogs? (iv) Name the class and phylum of the tiger.

Important exam questions, fully solved

Questions of the kind set in school and annual exams, with complete answers and mark steps.

A. MCQs and Assertion–Reason (1 mark each)

Exam-style Binomial nomenclature was given by (A) Darwin (B) Linnaeus (C) Mayr (D) Aristotle [1]

> **Ans.** (B) Carolus Linnaeus.

Exam-style The lowest taxonomic category is (A) genus (B) family (C) species (D) order [1]

> **Ans.** (C).

Exam-style Mango belongs to the family (A) Solanaceae (B) Poaceae (C) Anacardiaceae (D) Muscidae [1]

> **Ans.** (C) (Table 1.1).

Exam-style Which is correctly written? (A) Homo Sapiens (B) *homo sapiens* (C) *Homo sapiens* (D) *Homo Sapiens* [1]

> **Ans.** (C).

Exam-style The order of housefly is (A) Diptera (B) Insecta (C) Primata (D) Poales [1]

> **Ans.** (A).

Exam-style Assertion (A): Lion, tiger and leopard are placed in the same genus. Reason (R): They share several common features. [1]

> **Ans.** Both true; R explains A (genus *Panthera*). (A).

Exam-style Assertion (A): Members of a kingdom share more characters than members of a genus. Reason (R): Going up the hierarchy the number of common characters decreases. [1]

> **Ans.** A false; R true. (D).

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B. Very short and short answer (2 marks)

Exam-style What do ICBN and ICZN stand for? What is their role? [2]

Ans. International Code for Botanical Nomenclature and International Code of Zoological Nomenclature (1); they give the agreed principles and criteria for scientific names of plants and animals, so each organism has one universally accepted name (1).

Exam-style What does "Linn." in *Mangifera indica* Linn. mean? [2]

Ans. It is the abbreviated name of the author (1): the species was first described by Linnaeus (1).

Exam-style Distinguish between taxonomy and systematics. [2]

Ans. Taxonomy: characterisation, identification, classification and naming of organisms on the basis of characters (1). Systematics: also studies the diversity of organisms and their relationships, including evolutionary relationships (1).

C. Short answer (3 marks)

Exam-style State any three rules of binomial nomenclature. [3]

Ans. (i) Names are in Latin (or Latinised) and printed in italics (1). (ii) The first word is the genus, the second the specific epithet; handwritten names are underlined separately (1). (iii) The genus starts with a capital letter and the specific epithet with a small letter (1).

Exam-style Why is a scientific name needed when local names exist? [3]

Ans. Local names vary from place to place even within a country and cause confusion (1). A scientific name is the same all over the world, so scientists can communicate (1); each organism has only one name, not used for any other organism (1).

D. Long answer (5 marks)

Exam-style What is a taxonomic hierarchy? Explain species, genus, family, order and class with one plant and one animal example each. [5]

Ans. The arrangement of taxonomic categories in a definite order from species to kingdom (1). Species: individuals with fundamental similarities, e.g. *indica* (mango), *leo* (lion). Genus: related species, e.g. *Solanum* (potato, brinjal), *Panthera* (lion, tiger) (1). Family: related genera, e.g. Solanaceae (*Solanum*, *Petunia*, *Datura*), Felidae (*Panthera*, *Felis*) (1). Order: related families, e.g. Polymoniales (Solanaceae, Convolvulaceae), Carnivora (Felidae, Canidae) (1). Class: related orders, e.g. Dicotyledonae, Mammalia (Primata, Carnivora) (1).

E. Case study (4 marks)

Case (exam-style): A student found a plant called "aam" in Hindi, "mavinakai" in Kannada and "mango" in English, and noted its scientific name as mangifera Indica.

(a) Why does the plant have so many names? [1] **Ans.** Local names vary from region to region and language to language.

(b) Correct the scientific name the student wrote. [1] **Ans.** *Mangifera indica* (genus capitalised, epithet small, italics).

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(c) Name its family and class, and the code used to name it. [2] **Ans.** Family Anacardiaceae, class Dicotyledonae; named under ICBN.

Practice set: test yourself *Exam-style*

Try every question before looking at the answers at the end of the chapter. 64 or more out of 80 means you are ready for the exam.

A. Fill in the blanks (1 mark each)

1. The number of known species is _____ million.
2. Binomial nomenclature was given by _____.
3. Plants are named under _____.
4. The lowest category is _____.
5. Linnaeus wrote _____.
6. In plants, phylum is called _____.
7. The family of potato is _____.
8. The class of wheat is _____.

B. True or false? (1 mark each)

1. The specific epithet begins with a capital letter.
2. Scientific names are in Latin.
3. Felidae and Canidae are in order Carnivora.
4. Lower taxa share fewer characters.
5. Systematics considers evolutionary relationships.
6. Housefly belongs to class Insecta.
7. Genus is above family.
8. Kingdom is the highest category.

C. Very short answer (1 mark each)

1. Genus of lion.
2. Scientific name of man.
3. Family of mango.
4. Order of man.
5. Phylum of housefly.
6. Division of mango.
7. Order of Solanaceae.
8. What does "Linn." show?
9. Latin word behind "systematics".
10. Two features of Chordata.

D. Short answer I (2 marks each)

1. Define identification and nomenclature.
2. Define taxon with two examples.

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3. Why do classification systems change?
4. Give two rules for writing scientific names.
5. What is a genus? Example.
6. What is a family? Example.
7. Why are the earliest classifications based on uses?
8. Distinguish taxonomy and systematics.

My score (fill in after checking the answers)

Section	A /8	B /8	C /10	D /16	E /18	F /20	G (bonus)	Total /80
My marks								

Rough work

E. Short answer II (3 marks each)

1. Why are living organisms classified?
2. Give the classification of the housefly.
3. Explain order and class with examples.
4. Why does classification become complex at higher categories?
5. State the four processes basic to taxonomy.
6. What do we learn from identifying populations?

F. Long answer (5 marks each)

1. State the rules of binomial nomenclature and explain why it is needed.
2. Illustrate the taxonomic hierarchy with one plant and one animal.

G. HOTS (higher-order thinking)

1. Why can't the biological species concept be applied to bacteria?
2. Potato and brinjal look very different; why are they in one genus?
3. Can two different animals have the same specific epithet? Explain.
4. Why are taxonomic groups not "mere morphological aggregates"?

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20 MCQs

1. Number of known species:
   (a) 1–2 lakh (b) 17–18 million (c) 1.7–1.8 million (d) 10 million
2. Code for naming plants:
   (a) ICBN (b) ICZN (c) IUCN (d) ICNB
3. In *Mangifera indica*, *indica* is the:
   (a) genus (b) author (c) family (d) specific epithet
4. Scientific names are written in:
   (a) Greek (b) Latin (c) English (d) Sanskrit
5. Earliest classifications were based on:
   (a) DNA (b) uses (c) cells (d) evolution
6. "Systema Naturae" was written by:
   (a) Darwin (b) Whittaker (c) Mayr (d) Linnaeus
7. Panthera tigris is the:
   (a) tiger (b) lion (c) leopard (d) cat
8. Genus of potato and brinjal:
   (a) Petunia (b) Datura (c) Solanum (d) Triticum
9. Family of cats and lions:
   (a) Canidae (b) Muscidae (c) Hominidae (d) Felidae
10. Order containing Felidae and Canidae:
    (a) Primata (b) Carnivora (c) Diptera (d) Poales
11. Order Polymoniales includes:
    (a) Poaceae (b) Felidae (c) Solanaceae (d) Anacardiaceae
12. Class of monkey, gorilla and gibbon:
    (a) Mammalia (b) Primata (c) Chordata (d) Hominidae
13. Chordates have:
    (a) jointed legs (b) a notochord (c) wings (d) chlorophyll
14. For plants, phylum is replaced by:
    (a) class (b) order (c) division (d) series
15. Family of man:
    (a) Primata (b) Mammalia (c) Homo (d) Hominidae
16. Order of housefly:
    (a) Diptera (b) Insecta (c) Muscidae (d) Arthropoda
17. Family of wheat:
    (a) Poaceae (b) Poales (c) Monocotyledonae (d) Solanaceae
18. Order of mango:
    (a) Anacardiaceae (b) Polymoniales (c) Poales (d) Sapindales
19. Going up the hierarchy, common characters:
    (a) increase (b) decrease (c) stay the same (d) vanish at genus
20. A unit of classification of any rank is a:
    (a) species (b) code (c) taxon (d) epithet

1 (c) · 2 (a) · 3 (d) · 4 (b) · 5 (b) · 6 (d) · 7 (a) · 8 (c) · 9 (d) · 10 (b) · 11 (c) · 12 (a) · 13 (b) · 14 (c) · 15 (d) · 16 (a) · 17 (a) · 18 (d) · 19 (b) · 20 (c)

Assertion–Reason (6)

(a) Both true, R explains A. (b) Both true, R does not explain A. (c) A true, R false. (d) A false, R true.

1. A: Scientific names are printed in italics. R: It shows their Latin origin.
2. A: Dogs and cats are in different families. R: Both are in order Carnivora.
3. A: Local names are enough for scientists. R: Local names vary from place to place.
4. A: Wheat and mango are in the same division. R: Both are angiosperms.
5. A: Species is the lowest category. R: Members of a species share the most characters.
6. A: Taxonomy and systematics mean exactly the same. R: Systematics includes evolutionary relationships.

Key: 1 (a) · 2 (b) · 3 (d) · 4 (a) · 5 (a) · 6 (d)

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Answers to the practice set

A. 1. 1.7–1.8 2. Linnaeus 3. ICBN 4. species 5. Systema Naturae 6. division 7. Solanaceae 8. Monocotyledonae

B. 1. F 2. T 3. T 4. F 5. T 6. T 7. F 8. T

C. 1. *Panthera* 2. *Homo sapiens* 3. Anacardiaceae 4. Primata 5. Arthropoda 6. Angiospermae 7. Polymoniales 8. first described by Linnaeus 9. *systema* 10. notochord, dorsal hollow neural system

D. 1. correct description to know the organism; giving it the correct scientific name 2. a group of any rank: Mammalia, *Panthera* 3. new organisms and new information on relationships 4. Latin, italics; genus capital, epithet small 5. related species, *Solanum* 6. related genera, Felidae 7. basic needs of food, clothing, shelter 8. classification by characters vs. also relationships

E. 1. see NCERT Q1 2. *Musca domestica*: Muscidae, Diptera, Insecta, Arthropoda, Animalia 3. Order: families with a few similar characters (Carnivora); Class: related orders (Mammalia) 4. fewer common characters, harder to judge relationships 5. characterisation, identification, classification, nomenclature 6. see NCERT Q4

F. 1. the four rules in the concept notes + one name worldwide, no confusion 2. man and wheat (NCERT Q10)

G. 1. bacteria reproduce asexually, so interbreeding cannot define their species 2. they share many fundamental characters, especially floral features 3. yes: an epithet is unique only within its genus (e.g. *indica* occurs in several genera) 4. they are natural groups of related organisms, not just look-alikes

Case. (i) the genus must start with a capital and the epithet with a small letter, in italics: *Panthera tigris* (ii) *Panthera leo* or *P. pardus* (iii) Canidae (iv) Mammalia, Chordata

Last-night summary

- 1.7–1.8 million species known; biodiversity = number and types of organisms.
- Identification, nomenclature (ICBN, ICZN), classification, taxonomy, systematics.
- Binomial nomenclature (Linnaeus): genus + specific epithet, Latin, italics, genus capitalised; author abbreviated at the end.
- Hierarchy: species → genus → family → order → class → phylum (division) → kingdom; common characters decrease upwards.
- Table 1.1: man, housefly, mango, wheat.

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