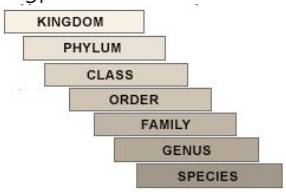
Solution LAQ - 1
The Linnaean system of classification consists of a hierarchy of graded taxonomic (named) ranks that are called as taxa. Any given taxon (singular) may contain several lower taxa, which can be usually distinguished based on certain common characteristics. Such lower ranks may in turn be divided into a succession of progressively smaller ranks. The lower the rank of a group, the more similar are the organisms grouped in it. If any two given organisms can be grouped under the same lower rank or taxon, it implies that the two organisms are structurally, functionally, embryologically similar and that they have had a comparable evolutionary history.
Within the living world as a whole, the biggest taxonomic rank is Kingdom. The next higher rank within a kingdom is the Phylum or Division. It is customary to use the term phylum for major groups in the animal kingdom and the term division for major groups in the plant kingdom. The phylum or division is a broad grouping of more or less closely related organisms, sharing certain common characteristics.
Each phylum or division has the next taxon called Class. The members of each class exhibit certain distinguishing characters that are unique only to them.
In the same way, using comparable criteria of similarities and relationships, each class can be divided into orders, each order into families, each family into genera and each genus into species. Species is normally the basic or fundamental unit of classification. A species is therefore the narrowest taxonomic category and kingdom is the broadest category in the Linnaean hierarchy.
A typical Linnaean hierarchy has seven taxa represented as follows:



Solution LAQ - 2
Importance of classification:
(i) It makes the study of such a wide variety of organisms easy.
(ii) It projects before us a good picture of all life forms at a glance.
(iii) It helps us understand the interrelationship among different groups of organisms.
(iv) It serves as a base for the development of other biological sciences such as biogeography etc.
(v) Various fields of applied biology such as agriculture, public health and environmental biology depends on classification of pests, disease vectors, pathogens and components of an ecosystem.
Solution LAQ - 3
Hierarchy is defined as sequence of categories in a decreasing or increasing order from kingdom to species and vice versa. Kingdom is the highest rank followed by division, class, order, family, genus and species. Species is the lowest rank in the hierarchy. The hierarchy has two categories which are obligate and intermediate. Obligate means they are followed strictly and range from kingdom to species as said above. Intermediate are not followed strictly and

they are added in obligate list such as subdivision, super family, super class, suborder, subspecies etc.;
(i) Species: Group of population which is similar in form, shape and reproductive features so that fertile sibling can be produced. Some siblings can be sterile when a hybrid is produced. A hybrid can be product of female horse and male donkey (Mule). Sexual reproduction is present in eukaryotes. Species is followed by subspecies, varieties and races. These categories are inferior as compared to species.
(ii) Genus: It is defined as group of similar species. But it is not mandatory to have many species. Some genera have only one species known as monotypic. If there are more than one species it is known as polytypic. For example lion, tiger are quite similar species placed under the genus Panthera.
(iii) Family: It is defined as collection of similar genera. It can be separated from genera by reproductive and vegetative features. For example, cats and leopard are included in the family Felidae.
(iv) Order: One or more than one similar families constitute order. Family Felidae are included in the order Carnivora.
(v) Class: One or more than one order makes a class. Class Mammalia includes all mammals which are bats, rodents, kangaroos, whales, great apes and man.
(vi) Phylum: It is a term used for animals while its synonym division is used for plants. It is a collection of similar classes. Phylum chordata of animals has class Mammalia along with birds, reptiles and amphibians.
(vii) Kingdom: The top most taxonomic category. Example all animals are included in Kingdom Animalia. The unit in classification that denotes grouping of organism based on features which are observable is known as Taxon.
Solution LAQ - 4
Kingdom Monera is the first of the five kingdoms of biological classification. It comprised most organisms with a prokaryotic cell organization. For this reason the kingdom was sometimes called Prokaryota or Prokaryotae. Prior to its creation these were treated as two separate divisions of plants: the Schizomycetes (bacteria) were considered fungi, and the Cyanophyta were considered blue-green algae. The latter are now considered a group of bacteria, typically called the cyanobacteria.
Monera has been divided into Archaea and Bacteria, forming the more recent six-kingdom system and three-domain system. All new schemes abandon the Monera and now treat the Bacteria, Archaea and Eukarya as separate domains or kingdoms. To sum up:
(i) Kingdom Monera are one-celled without an organized nucleus. Examples: bacteria and blue-green "algae."
(ii) They have existed on earth longer and are more widely distributed than any other organisms.
(iii) They are found in almost every imaginable habitat; in air, soil, and water and in extreme temperatures and harsh chemical environments.
(iv) Their one distinguishing characteristic is that there are no membrane bound "organelles".
(v) Pre dominant mode of nutrition is absorption but some may be photosynthetic or chemosynthetic.
(Vi) Reproduction by asexual method.
(vii) True mitotic cell division absent.
Solution LAQ - 5
Characteristics of Kingdom Protista:
(i) They include many kinds of unicellular eukaryotic organisms such as unicellular algae, protozoans and unicellular fungi.
(ii) They are found anywhere there is moisture.
(iii) They are single celled, but many live in a colonial setting (more or less independently).
(iv) Many are unicellular, but some are multicellular (Algae and fungus-like protists).

(v) Some can live in very harsh environments.
(vi) Reproduction can be sexual (conjugation), asexual (binary fission), or a combination of both.
(vii)Some of these organisms use appendages, such as hair-like cilia (e.g. Paramecium) or whip-like flagellum (e.g. Euglena).
(viii) Their mode of nutrition can be autotrophic or heterotrophic.
Examples: Paramecium and Amoeba.
Solution LAQ - 6
Characteristics of Kingdom Fungi:
(i) Simple non-green plants which are not photosynthetic. They are heterotrophic and eukaryotic organisms. Some fungi, such as Puccinia, Albugo etc are parasites and draw their nutrients from living cells of their host plants. Some fungi, such as Mucor, Rhizopus etc are decomposers, deriving their nutrition from dead remains of plants and animals.
(ii) They may be unicellular (yeast) or filamentous (most fungi). The body of a multicellular and filamentous fungus is called a mycelium and is composed of several thread like structures termed hyphae.
(iii) Fungi have a cell wall containing a mixture of chitin and cellulose. Chitin is a tough complex sugar.
(iv) Their reserve food material is glycogen.
Solution LAQ - 7
The division Spermatophyta (sperma = seed, phyton = plant), as the name suggests, includes all seed bearing plants. It has been divided into two sub divisions- Gymnosperms and Angiosperms. The sub-division Gymnosperms (gymno = naked, sperma = seed) includes simpler and primitive plants of the division Spermatophyta.
Gymnosperms: The gymnosperms are seed producing land plants. However, the seeds are not enclosed in fruits. Most of them have now become extinct and only about 900 species are known to be surviving. The living gymnosperms are widely distributed in the cold climates where snow, rather than rain, is the source of water. Only one group called cycads thrive in warmer regions. Example: Pinus.
Angiosperms: Angiosperms represent the most advanced group of vascular plants. They are commonly called 'Flowering plants'. They exceed all other major groups of living plants in number and diversity.
Example: Sunflower
Solution LAQ - 8
Any simple vascular plant that produces spores, but not seeds, and has the diploid stage of its life cycle as the dominant form is called a pteridophyte.
Ferns, Lycopodium, and Club mosses are all pteridophytes.
Bryophyta:
(i) Plant body is gametophytic.
(ii) Real stem and leaves are always absent.
(iii) Fixation of plant body is carried out by rhizoids.
(iv) Bryophytes are non-vascular in nature.
Pteridophyta:
(i) Plant body is sporophytic.
(ii) Real stem and leaves are present.
(iii) Fixation of plant body is carried out by roots.
(iv) Pteridophytes are vascular plants.
Solution LAQ - 9
(a) Characteristics of Platyhelminthes:
(i) Bilaterally symmetrical and dorsoventrally flattened animals.
(ii) Body is thin, soft, leaf-like or ribbon-like.
(iii) Digestive cavity (when present) with a single opening, the mouth (anus is absent).
(iv) Suckers and hooks are usually present.
(v) Circulatory and respiratory systems and skeleton are absent
(vi) Hermaphrodite i.e. both male and female reproductive organs occur in the same individual.
Example: Fasciola (liver-fluke) and Taenia solium (pork tape-worm).
(b) Characteristics of Nematoda:

(i) Bilaterally symmetrical, triploblastic, pseudocoelomate and unsegmented animals.
(ii) Body is worm-like, cylindrical or flattened.
(iii) Body is covered with a tough, resistant cuticle; cilia absent.
(iv) Sexes are separate.
(v) Most forms are parasitic but some are free-living in soil or water.
Example: Ascaris (round-worm) and Ancylostoma (hook-worm).
Solution LAQ - 10
Characteristics of Annelida:
(i) Body triploblastic, bilaterally symmetrical, soft, elongated, vermiform and cylindrical or dorsoventrally flattened.
(ii) Exoskeleton absent; body is covered by a thin cuticle.
(iii) Alimentary canal is tube-like, complete and extends straight from mouth to anus.
(iv) Reproduction is by sexual means. Sexes may be united (hermaphroditic) or separate.
(v) True coelomate animals with closed blood vascular system. Coelom allows true organs to be packaged in the body structure.
(vi) They live in a variety of habitats. Mostly aquatic, marine or fresh water. Some are terrestrial, burrowing in tubes while some are free-living forms.
Different classes and examples:
Class I: Polychaeta - Nereis (sand worm)
Class II: Oligochaeta - Pheretima (earthworm)
Class III: Hirudinea: Hirudinaria (Indian cattle leech)
Solution LAQ - 11
Characteristics of Mollusca:
(i) Body is soft, bilaterally symmetrical, with little segmentation and without appendages. The size of body varies from a microscopic to a giant form such as Octopus of upto 50 feet.
(ii) Body cavity is haemocoel. True coelom is reduced and restricted to the pericardial cavity and the lumen of gonads and nephridia.
(iii) Digestive tract has a simple structure.
(iv) Sexes are usually separate.
(v) Respiration through gills, mantle or a "lung" of the mantle.
(vi) Circulatory system is open except in cephalopods.
(vii) Excretion by a pair of metanephridia or kidneys.
Classes and their examples:
(i) Gastropoda: Pila (apple snail)
(ii) Pelecypoda: Unio (fresh water mussel)
(iii) Cephalopoda: Loligo (squid)
Solution LAQ - 12
Characteristics of Arthropoda:
(i) Triploblastic, bilaterally symmetrical and metamerically segmented animals.
(ii) Body segments are grouped into two regions - cephalothorax (head and thorax together) and abdomen, or three regions - head, thorax and abdomen. Anterior part of body forms a distinct head, bearing sense organs and brain.
(iii) Exoskeleton of cuticle, containing protein, lipid, chitin and often calcium carbonate is secreted by underlying epidermis and shed (moulted) at intervals.
(iv) Alimentary canal is complete; mouth and anus lie at opposite ends of the body.
(v) Respiration through general body surface, by gills, air tubes (tracheae) or book-lungs.
(vi) True nephridia absent. Excretion by coelomoducts, malphigian tubules or green or coaxl glands.
(vii) Sexes are usually separate; sexual dimorphism is well marked in several forms.
(viii) Fertilisation is usually internal, oviparous or ovoviviparous and often with metamorphosis.
Classes and their examples:
(i) Crustacea: Palaemon (prawn)
(ii) Myriapoda: Scolopendra (centipede)

(iii) Insecta: Lepisma (Silver fish)
(iv) Arachnida: Limulus (king crab)
Solution LAQ - 13
(1) Phylum Porifera - Sessile, sedentary, and marine except one group that lives in fresh water. These are non-motile animals attached to some solid support.
Example: Sponges
(2) Phylum Coelenterata - Cnidarians or coelenterates are multicellular, diploblastic animals with tissue grade of organisation. A gelatinous layer called mesoglea persists between the ectoderm and endoderm.
Example: Aurelia (jelly-fish)
(3) Phylum Platyhelminthes - Bilaterally symmetrical and dorsoventrally flattened animals with a soft, leaf-like or ribbon-like thin body.
Example: Taenia Solium (pork tape-worm)
(4) Phylum Nematoda - Bilaterally symmetrical, triploblastic, pseudocoelomate and unsegmented animals. Body is worm-like, cylindrical or flattened.
Example: Ascaris (round-worm)
(5) Phylum Annelida - Body triploblastic, bilaterally symmetrical, soft, elongated, vermiform and cylindrical or dorsoventrally flattened, exoskeleton absent; body is covered by a thin cuticle.
Example: Hirudinaria (Indian cattle leech)
(6) Phylum Arthropoda - Body segments are grouped into two regions - cephalothorax (head and thorax together) and abdomen, or three regions - head, thorax and abdomen. Anterior part of body forms a distinct head, bearing sense organs and brain.
Example: Palaemon (prawn)
(7) Phylum Mollusca - Body is soft, bilaterally symmetrical, with little segmentation and without appendages. The size of body varies from a microscopic to a giant form such as Octopus of upto 50 feet.
Example: Octopus (devil fish)
(8) Phylum Echinodermata - Simple animals may be a star like, spherical or elongate with body triploblastic, coelomate, unsegmented and radially symmetrical.
Example: Echinus (sea urchin)
(9) Phylum Chordata - Chordates are characterised by the following three features: (a) a dorsal, hollow, tubular nerve cord; (b) a pliable rod called notochord that occurs ventral to nerve cord and is replaced by a bone or cartilage to form a vertebral column in vertebrates; and (c) paired gill-slits in the pharynx.
Example: Fishes
Solution LAQ - 14
Characters of birds:-
(i) Forelimbs are modified into wings.
(ii) The body is covered with feathers and scales.
(iii) Mammary glands are absent.
(iv) A toothless beak is present.
(v) Skin is dry only, a single preen gland is present.
(vi) A diaphragm is absent.
(vii) Bones of birds are hollow or pneumatic.
(viii) Larynx of birds is non-functional.
(ix) Lungs contain external air sacs.
(x) Birds are oviparous.
Example: Crow and peacock.
Characters of mammals:-
(i) Wings are absent except in bats.
(ii) Feathers and scales are absent. Hair is present.
(iii) Females have mammary glands.
(iv) Teeth are present. Jaws do not form beak.
(v) Skin bears a number of sweat and oil glands.
(vi) Diaphragm is present.
(vii) Bones of mammals do not have air cavities.
(viii) Larynx of mammals is functional.

(ix) Lungs do not have external air sacs.
(x) Mammals are viviparous.
Example: Human beings and monkeys.
Solution LAQ - 15
The subphylum 'Gnathostomata' is divided into six different classes. Out of the six two classes, Chondrichthyes and Osteichthyes combine together to form a super-class, called Pisces.
Chondrichthyes:
(i) Marine fishes with completely cartilaginous endoskeleton. They are generally large in size.
(ii) Streamlined body is either laterally compressed or spindle-shaped or dorsoventrally flattened and disc shaped.
(iii) Mouth is ventral in position.
(iv) Skin is tough and covered with minute placoid scales.
(v) Heart is two chambered.
(vi) Excrete urea (ureotelic animals).
Example: Scoliodon (dog fish) and Torpedo (electric ray)
Osteichthyes:
(i) Marine and fresh water fishes with partly or whole bony endoskeleton.
(ii) Body is generally spindle shaped.
(iii) Mouth is usually terminal in position.
(iv) Skin is either naked or covered with cycloid or ctenoid scales.
(v) Heart is two chambered containing one auricle and one ventricle.
(vi) Excrete ammonia (ammonotelic animals).
Example: Labeo (Rohu) and Synchiropus splendidus (mandarin fish)

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