

Chapter (4) Classification of living organisms

Lesson (1) Principles of classification of living organisms



Living organisms are similar in functional and structural unit (Cell) and properties of life (Feeding, growth, reproduction, respiration, movement, sensation, excretion). But they are different in many things (Ex. life way – shape – structure – nutrition – the way of reproduction).

*→ Due to the diversity of living organisms, the need of **classification process** emerged. The science which studies the classification of living organisms is called **Taxonomy***

Taxonomy (Classification): *The science which studies the arrangement of living organisms according to their similarities and differences, which facilitates their study*

→ Greek philosopher Aristotle (lived 2300 years ago) was the first to classify animals into red-blooded and bloodless animals. He classified plants into shrubs, weeds and trees

→ Modern taxonomy depends mainly of the definition of species

Species: *A group of individuals having the same morphological characteristics which interbreed producing similar fertile individuals*

Tigon

*→ When female lion (lioness) and male tiger cross, they produce the so-called **tigons**. Tigons are infertile and cannot reproduce*



Fig. (1) Tigon

Mule

→ When a male donkey and female horse cross, they produce the so-called mules.

→ Mules are also infertile and cannot reproduce



Fig. (2) Mule

→ From the previous examples, we conclude that neither mule nor Tigon can be called species because they cannot interbreed (cross) and produce new fertile individuals.

Naming of living organisms

→ A living organism has different names in different languages, to overcome this problem, scientist **Carl Linnaeus** created a system to name living organisms, this system is called **Binomial system**, which is written in Latin language.

→ In binomial system, every organism has a binomial name, which is composed of two names:-

- 1st name: The name of **genus**, it begins with a capital letter
- 2nd name: The name of **species**, it begins with a small letter

→ Binomial names are written in Latin language in italics or underlined to be differentiated.

→ Linnaeus used Latin language because it is an old language not spoken by people, which protects it from any change or modification

Example:-

The scientific name (binomial name) of cat is *Felis domesticus*

- *Felis* is the name of genus, it means "Cat" in Latin
- *Domesticus* is the name of species, it means "domestic" in Latin

Taxonomic Hierarchy

There are seven classification levels in taxonomy, every level contains less animals with more similarity in characteristics, these levels are:-

- 1- Kingdom:** contains a number of phyla (Singular phylum)
- 2- Phylum (Pl. Phyla):** Represents a number of classes

3- Class: Contains a number of orders

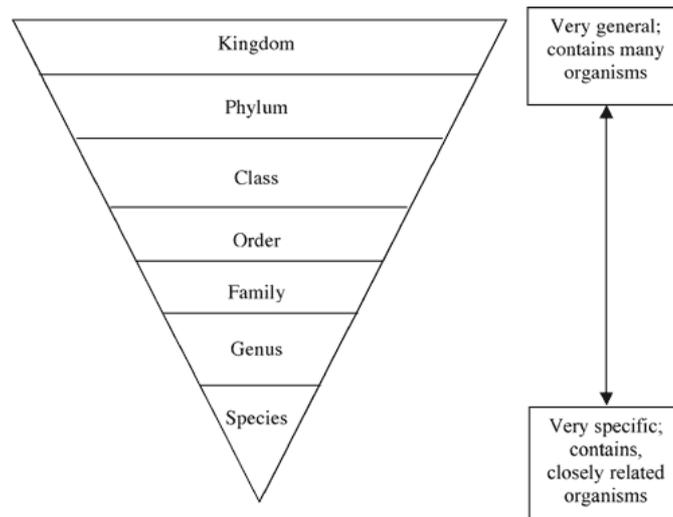
4- Order: Contains a number of families

5- Family: Contains a number of genres

6- Genus: Contains a number of species

7- Species: It contains individuals capable of producing fertile individuals

→ There are other groups between each two successive groups of the previously-mentioned levels (Ex. sub-phylum, sub-order, sub-family, sub-genus)



Dichotomous key

Dichotomous key: A series of characteristics arranged in pairs which helps the user determine the species of an unknown organism.

→ Dichotomous key begins with wide characteristics, and they become less more specific and definite as the level of the key increases. In each step, you can choose between two characteristics on basis of the living organism you search for.

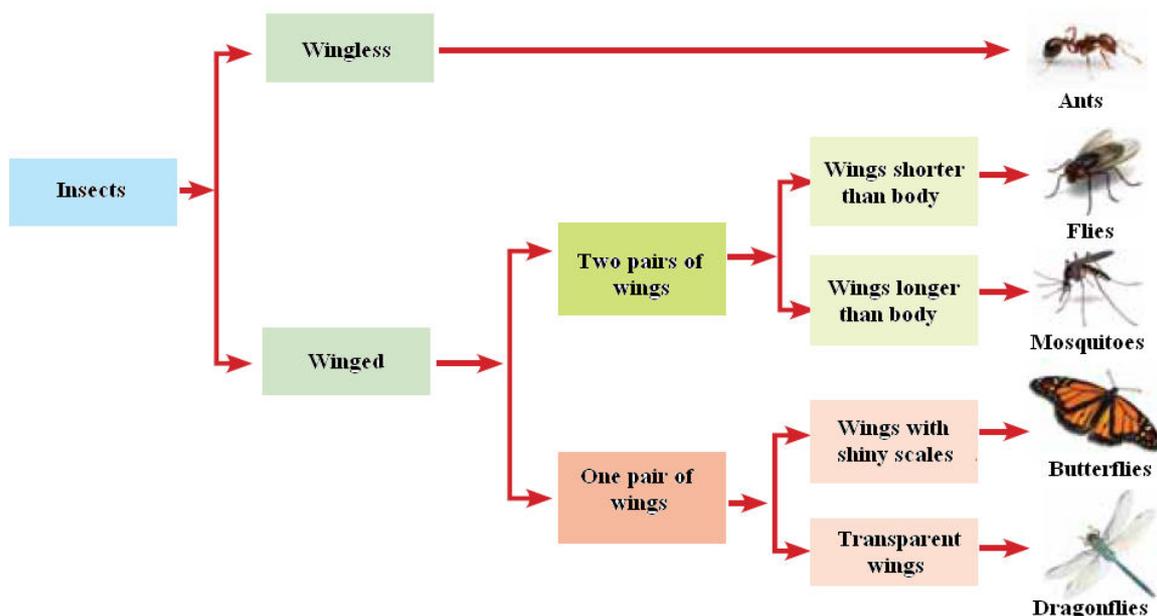


Fig. (3) Dichotomous key of some insects

Definitions of lesson (1)

Taxonomy (Classification): *The science which studies the arrangement of living organisms according to their similarities and differences*

Species: *A group of individuals having the same morphological characteristics which interbreed producing similar fertile individuals*

Dichotomous key: *A series of characteristics arranged in pairs which helps the user determine the species of an unknown species*

Give reasons for

1- The scientific importance of taxonomy (classification)

Because it deals with the arrangement of living organisms according to their differences and similarities, which facilitates their study.

2- The formation of tigers

Due to the interbreed of a female lion and male tiger

3- The formation of mules

Due to the interbreed of a male donkey and female horse

4- Neither tigers nor mules are species

Because both of them are infertile and cannot produce new fertile individuals, as they are resulted from the crossing of organisms of different species

5- The importance of binomial system of naming living organisms

Because it gives each organism a special scientific name, which overcame the problem of the difference of its names in different languages.

6- In binomial system, organisms names are derived from Latin language

Because Latin is an old language not spoken by people, which protects it from change or modification

7- The importance of dichotomous key

Because it helps us determine the species of an unknown organism through its characteristics

What happens when

1- A female lion and male tiger interbreed (cross)

Tigers are formed, which are organisms incapable of reproduction.

2- A female donkey and a male horse cross

Mules are formed, which are organisms incapable of reproduction

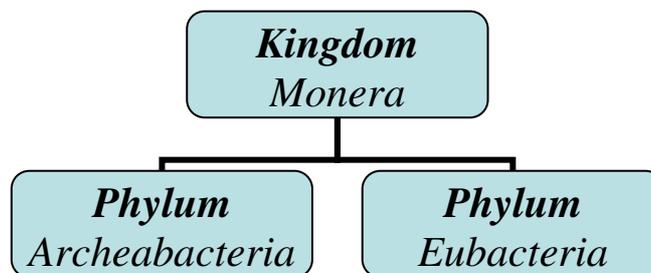
Lesson (2) Modern classification of living organisms



→ In 1700, Carl Linnaeus put the traditional classification system, which has only two kingdoms: Animal kingdom – Plant kingdom

→ On the grounds of the development of scientific techniques used in biology, scientist **Robert H. Whittaker** put a new classification system in 1969, this system was called Modern Classification. Whittaker classified living organisms into 5 kingdoms: Monera – Protista – Fungi – Plantae – Animalia

Kingdom Monera



General characteristics of Monera:-

- 1- Unicellular prokaryotic organisms
- 2- They live alone or in colonies
- 3- Their cell walls are devoid of cellulose or pectin
- 4- Their hereditary material is not surrounded by a nuclear membrane (doesn't have a definite nucleus)
- 5- Cytoplasm doesn't contain some organelles such as mitochondria, endoplasmic reticulum, plastids and Golgi bodies

For reading only The word Monera is derived from Latin language and means "Single", as they are the least developed organisms

Phylum Archeobacteria

Most of them live in extreme environmental conditions such as hot springs, environments empty of oxygen, highly-saline environments.

→ They are different from Eubacteria in the structure of cell wall and plasma membrane

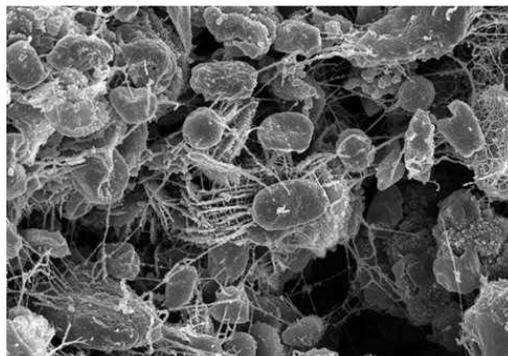


Fig. (4) Halophiles, an example on Archeobacteria

For reading only The word "Archeabacteria" is composed of two words: **Achaea** which means "Ancient", **Bacteria** which means "Rod" – as there are rod-shaped bacteria

Phylum Eubacteria

For reading only the prefix (Eu-) means good – as Eubacteria are more developed bacteria than Archeabacteria

→ They have many species which spread wildly in all the environments of earth, (air, water, ground...etc)

→ There are autotrophic bacteria (Ex. cyanobacteria), and there are heterotrophic bacteria (Ex. nostoc)

Autotrophs: Organisms which produce complex organic compounds from simple substances present in the surrounding – generally by photosynthesis process (Ex. plants)

Heterotrophs: Organisms which use organic carbon for growth from many sources (Ex. animals, humans)



Fig. (5) Cyanobacteria



Fig. (6) Nostoc

→ Bacteria reproduce asexually, they have different shapes (rod-shaped, spiral, spherical)

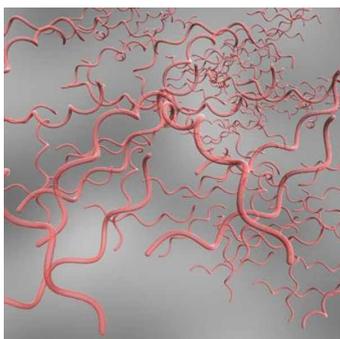


Fig. (7) Spiral

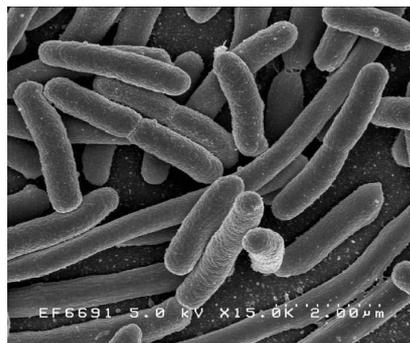


Fig. (8) Rod-shaped

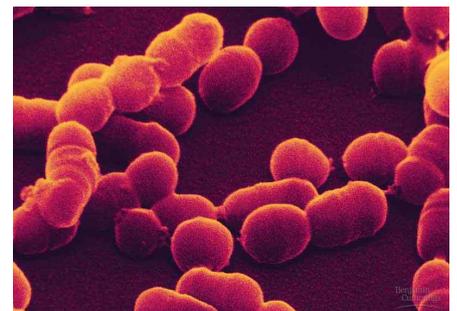
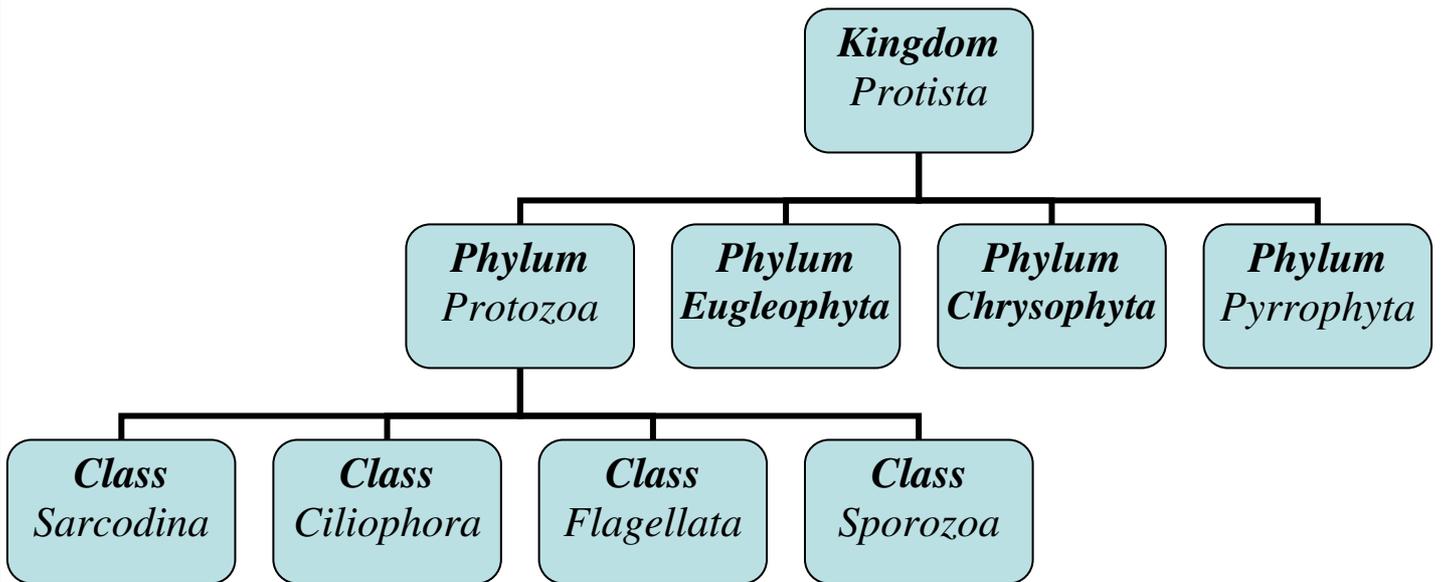


Fig. (9) Spherical bacteria

Kingdom Protista



For reading only The word "Protista" is derived from the Latin word "Proto-" which means "first" – as they are primitive organisms

Properties of Protista:-

- 1- Eukaryotic organisms
- 2- They are different from plants and animals, as they are not complex
- 3- Some of them have cell walls and plastids

Phylum Protozoa

Properties of protozoa:-

- 1- Unicellular microorganisms
- 2- They live in freshwater, salt water or fertile lands
- 3- They live alone or in colonies
- 4- Some of them parasite on animals and plants causing diseases
- 5- They reproduce sexually and asexually

Protozoa are classified according to their movement methods into:-

1- Class: Sarcodina

→ They move using temporary projections from the body called **Pseudopodia** (Ex. Amoeba)



Fig. (10) Amoeba, an example of Sarcodina

For reading only The word "Sarcodina" means "Flesh" – as Sarcodina like amoeba resembles flesh of meat

2- Class: Ciliophora

→ They move using cilia
(Ex. Paramecium)

For reading only Word "Ciliophora" consists of two words: "Cilio" which means "Cilia", and "phora" which means "bearer" – "Ciliophora" means "cilia bearer"
→ "Paramecium" means "oval" – as paramecium is oval-shaped

3- Class: Flagellata

→ They move using flagella
(Ex. Trypanosoma – Which causes sleeping disease)

For reading only Word "Flagellata" has two words, "Flagella" which means "scourge", and "-ata" which means "group"

4- Class: Sporozoa

→ They don't have a method for movement
→ They produce phases called Spores
(Ex. Plasmodium – which parasites on human causing malaria disease)

For reading only Word "Sporozoa" consists of two words: "Sproro" which means "spore" and "Zoa" which means "animal" - as Sporozoa produce spores
→ Plasmodium means "Mould"

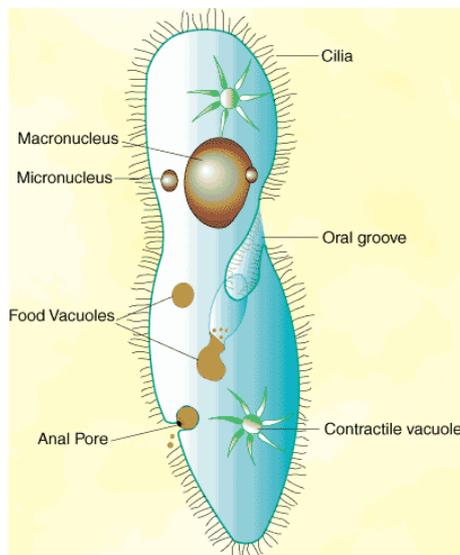


Fig. (10) Paramecium

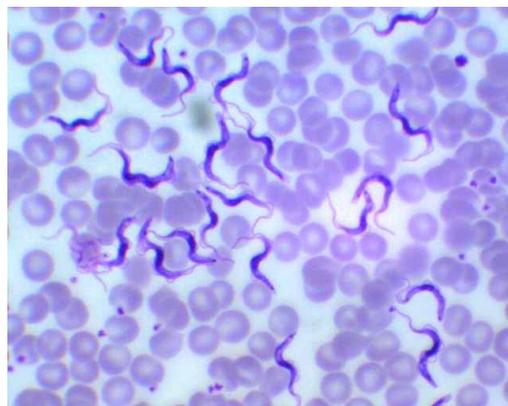


Fig. (11) Trypanosoma

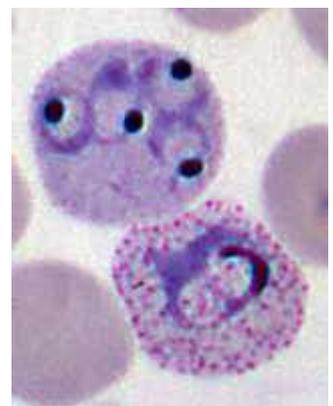


Fig. (12) Plasmodium

Euglenophyta phylum:-

This phylum contains Euglena

Properties of euglena

- 1- Unicellular organisms*
- 2- They contain green plastids (chloroplasts) and perform photosynthesis*
- 3- They move by flagella*



Fig. (13) Euglena

Chrysophyta phylum

- Most of them are unicellular and called **Diatoms***
- Diatoms have semi-glass cell wall containing Silica (Silicon dioxide SiO_2), they are a source of fish food*

For reading only Chrysophyta is composed of two words "Chryso" which means "gold" and "phyta" which means plants (Golden plant)

Pyrrophyta phylum

For reading only "Pyrro" means fire, as Pyrrophyta resemble fire in colour

- These algae form a great part of phytoplanktons which live in seas and oceans.*
- They have red colour due to the existence of red pigment along with chlorophyll*
- **Dinophlagellates** is the greatest group of this phylum, its individuals move by two flagella*



Fig. (14) Diatoms

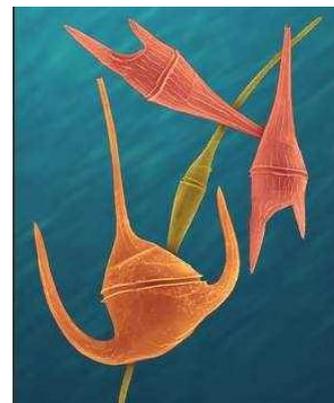
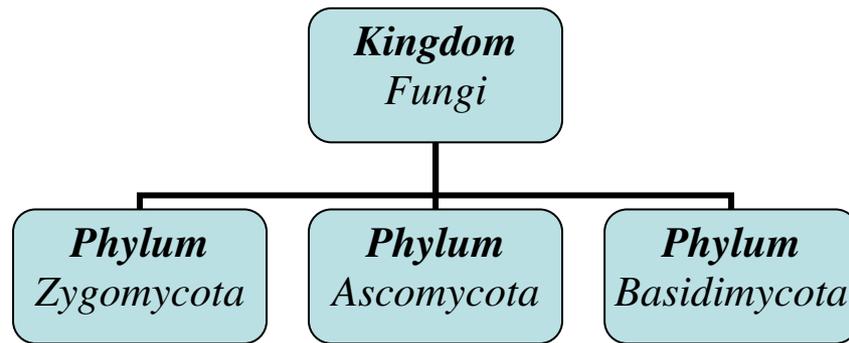


Fig. (15) Pyrrophyta

Kingdom Fungi



Characteristics of fungi:-

- 1- They are eukaryotes, some of them are unicellular and others are multicellular
- 2- They are immobile (cannot move) and their cell walls contain chitin
- 3- They are composed of filaments called **Hyphae**, which accumulate forming **Mycelium**
- 4- They may be autotrophic, heterotrophic or saprophytic
- 5- Most of them reproduce sexually, while the rest reproduce asexually by spores formation

For reading only "Hyphae" means "Web", as they look like spider webs
→ Mycelium means "fungi tissue"

Fungi are classified according to their structure of reproduction methods into:-

Phylum: Zygomycota

→ Their Hyphae are undivided and spores are produced in sporangium
(Ex. *Rhizopus nigricans*, which causes the black mould on bread and produces an enzyme used in cheese industry)

For reading only Zygomycota has two words, "Zygo" which means pairing, "mycota" which means fungi (Pairing fungi)

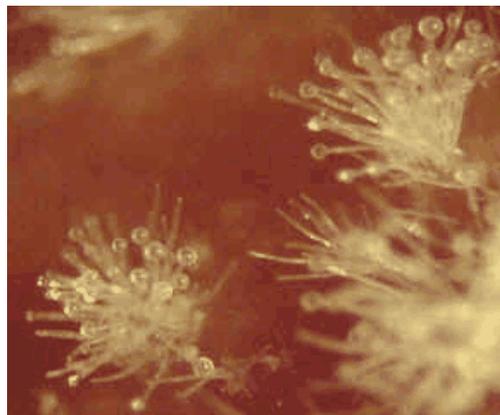


Fig. (16) *Rhizopus nigricans*

Phylum: Ascomycota

- Some of them are unicellular (Ex. yeast fungus)
- Some of them are multicellular and have *Hyphae* which are divided by transverse barriers called **Septa**, they produce spores inside *sporangia*. (Ex. *penicilium* fungus, which produces *penicillin* antibiotic)

For reading only "Asco-" means "sac", so *Ascomycota* means "sac-like fungi"

→ *Septa* means "Separate"

Phylum: Basidimycota

- Its *Hyphae* are divided, its spores may be produced in mace-like structure called **Cap**, some of them are edible (can be eaten by man) (Ex. *Mushroom*)

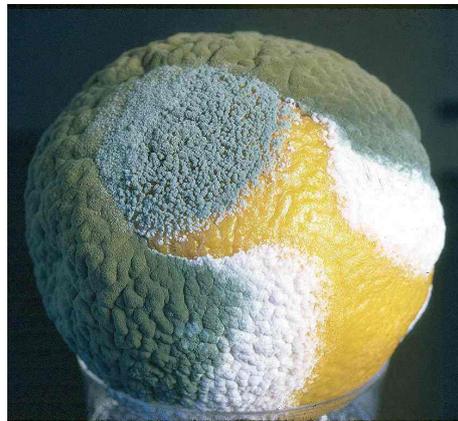


Fig. (17) *Penicilium* fungus

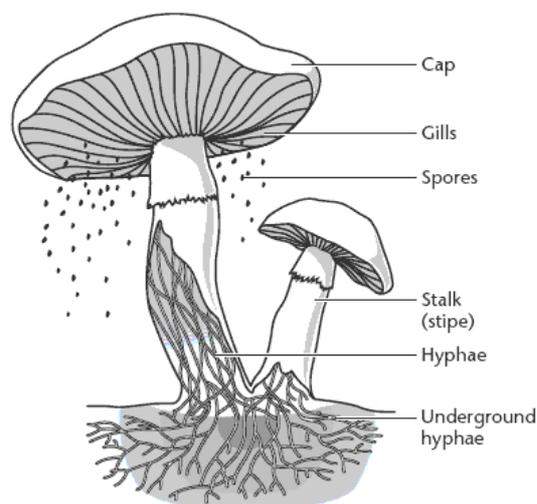
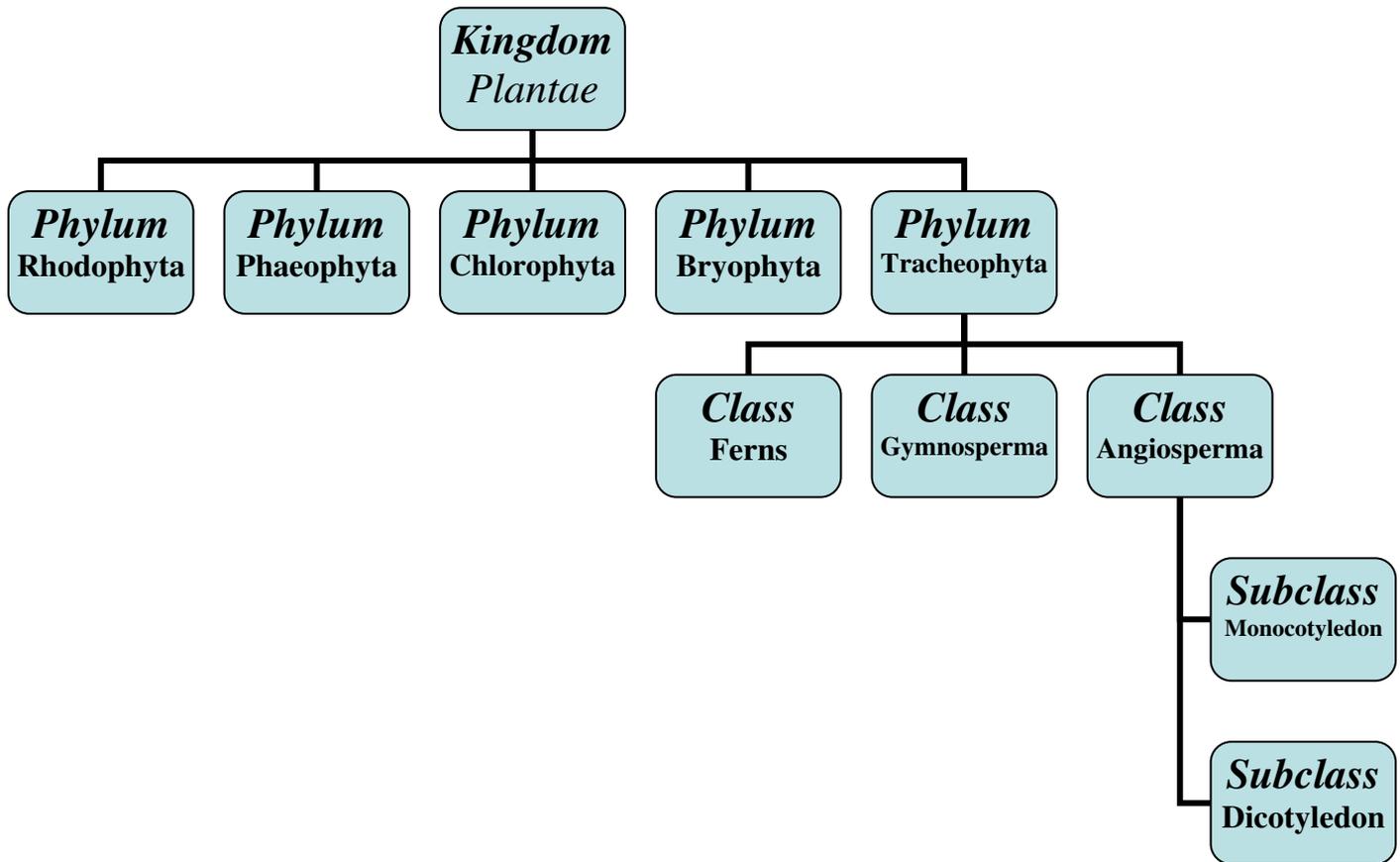


FIGURE 9.3. Parts of a Fungus

Fig. (18) *Mushroom structure*

For reading only "*Basidium*" is a spore-bearing structure which is found in some fungi. *Basidimycota* were called after it

Kingdom Plantae



Characteristics of plants:-

- 1- Eukaryotic organisms
- 2- Their cell walls contain cellulose
- 3- Their cells contain chlorophyll in green plastids
- 4- Most of them reproduce sexually

Most scientists of taxonomy see that kingdom Plantae is divided into:-

- A- High algae (Rhodophyta – Phaeophyta – Chlorophyta)
- B- Non vascular plants
- C- Vascular plants

A- High algae:-

Phylum: Rhodophyta

→ Marine weeds which are composed of filaments held together by a gelatinous (jelly-like) membrane, their cells have plastids carrying red pigments

Example: Polysiphonia algae

Phylum: Phaeophyta

→ Marine weeds which are composed of simple and branched filaments, their cells have plastids carrying brown pigments

Example: Fucus algae



Fig. (18) Polysiphonia algae



Fig. (19) Fucus algae

For reading only Polysiphonia consists of two words: "Poly" which means many, "Siphonia" which means "Sucking tube, blowing liquid"
→ "Fucus" means "sea weed"

Phylum: Chlorophyta

- Their cells have green plastids
- Some of them may be unicellular (Ex. Chlamydomonas)
- Some of them may be multicellular (Ex. Spirogyra)



Fig. (20) Spirogyra

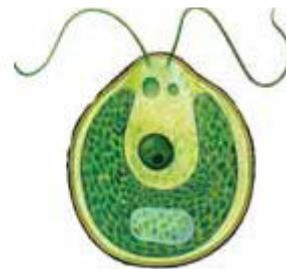


Fig. (21) Chlamydomonas

For reading only "Rhodo-" means **red**, "Phaeo-" means **brown**, "Chloro-" means **green**. And "phyta" means plant

- Chlamydomonas consists of two words: "Chlamyda" which means cloak, "monas" which means "single-celled"
 - Spirogyra consist of two words: "Spiro" which means spiral, "gyra" means round
-

B- Non-vascular plants:-

Phylum: Bryophyta

- This phylum contains plants which don't have vascular tissues specific in transporting water and food, they are called **Non-vascular plants**
- Non vascular plants are terrestrial plants which need high humidity to grow up and reproduce. So, they live in damp and shady places.

→ *Bryophyta* are small green plants which have hairs for anchorage called *rhizoids*, some *Bryophyta* are flat (Ex. *Ricca*) and others are erect (Ex. *Funaria*)



Fig. (22) *Ricca* plant (flat)



Fig. (23) *Funaria* plant (erect)

C- Vascular plants:-

Phylum: Tracheophyta (Vascular plants)

For reading only "Trachea" is a vessel or duct in plant, "Phyta" means plant

→ Vascular plants (*Tracheophyta*) have *Xylem* tissues (which transports light and salt) and *Phloem* tissues (Which transports the organic substances produced from photosynthesis process), this phylum has 3 classes:-

1- Class: Ferns

→ Simple-structured plants, most of them are herbaceous (grass) and the rest are woody (trees). They live in damp and shady lands and exist in abundance on the walls of wells and damp valleys

→ They are differentiated into stems, roots and leaves. They have feather-like leaves, but do not have flowers.

→ They reproduce by spores which exist in special structures in the undersurface of their leaves

Example: *Vougheir*



Fig. (24) Feather-like leaf of *Vougheir*

2- Gymnospermae (Conifers)

→ They are vascular plants which do not form flowers, they have male and female reproductive organs called **cones**

→ Their seeds have no testa (pericarps) and their leaves are needle-shaped

Example: Pinus



Fig. (25) Pinus plant

For reading only Gymnosperms has two words: "Gymno" which means "naked, uncovered" and "Sperm" which means "seed"

3- Angiospermae (Flowering plants)

→ They are terrestrial plants which are differentiated into leaves, roots and stems. They form flowers which turn into fruits carrying seeds inside.

→ This class is divided into two classes: Monocotyledons – Dicotyledons

Subclass: Monocotyledons	Subclass: Dicotyledons
<ul style="list-style-type: none"> - Each seed has only one cotyledon - Leaf veins are parallel - Petals (flower parts) are in multiples of three - Bundles of vascular tissues are scattered through the stem - fibrous roots <p>Examples: Wheat – Corn – Onion – Cactus – Banana – Palm – Lily</p>	<ul style="list-style-type: none"> - Each seed has two cotyledons - Leaf vein are reticulated (branched) - Petals (flower plants) are in multiples of four or five - Bundles of vascular tissues are arranged across the stem in a ring - tap roots <p>Examples: Pea – bean – cotton – flower – orange ... etc</p>

	Seeds	Leaves	Flowers	Stem	Roots
Monocotyledons					
Dicotyledons					

Fig. (26) Comparison between monocotyledons and Dicotyledons

Definitions of lesson (2)

Monera: They are prokaryotic unicellular organisms whose cell walls are free from cellulose or pectin, they are devoid of many membranous cytoplasmic organelles.

Protista: They are eukaryotic organisms whose structure is not complex, some of them have plastids and cell walls, and a small number of them are multicellular

Sarcodina: A class of Protista whose individuals move by using temporary projections from the body called pseudopodia such as Amoeba

Ciliophora: class of Protista whose individuals move by using cilia such as paramecium

Flagellata: Class of Protista whose individuals move by using flagella such as Trypanosoma

Sporozoa: Class of Protista whose individuals do not have methods for movement and produce spores such as Plasmodium

Euglena: Unicellular organisms which belong to protists and move by using flagella, they can perform photosynthesis due to the presence of green plastids

Pyrrophyta: Phylum of Protista whose individuals are algae which form great part of phytoplanktons which live in seas and oceans, their cells have plastids carrying red pigments.

Fungi: Kingdom of immobile eukaryotic living organisms whose cell walls contain chitin, they reproduce sexually and asexually and composed of filaments called Hyphae

Hyphae (sing. Hypha): Group of filaments which forms the mycelium of fungi

Zygomycota: Phylum of fungi whose Hyphae are not divided, they reproduce by the formation of spores inside sporangia

Ascomycota: Phylum of fungi whose Hyphae are divided by transverse barriers called septa, they produce spores inside sporangia

Rhodophyta: Marine weeds which are composed of filaments held together by a gelatinous (jelly-like) membrane, their cells have plastids carrying red pigments such as Polysiphonia

Phaeophyta: Marine weeds which are composed of simple and branched filaments, their cells have plastids carrying brown pigments such as Fucus

Bryophyta: They are terrestrial plants which do not have vascular tissues, they need high humidity for growth and reproduction

Ferns: Simple-structured plants which have vascular tissues, they live in damp lands and reproduce by spores.

Gymnosperms (conifers): They are vascular plants which do not form flowers and have male and female reproductive organs called cones, their seeds have no testa and their leaves are needle-shaped

Angiosperms: They are terrestrial plants which are differentiated into leaves, roots and stems. They form flowers which turn into fruits carrying seeds inside.

Give reasons for

1- Cyanobacteria belong to kingdom Monera

Because:-

- 1- They are unicellular prokaryotic organisms
- 2- They live alone or in colonies
- 3- Their cell walls are devoid of cellulose or pectin
- 4- Their hereditary material is not surrounded by a nuclear membrane (doesn't have a definite nucleus)
- 5- Cytoplasm doesn't contain some organelles such as mitochondria, endoplasmic reticulum, plastids and Golgi bodies

2- Amoeba belongs to phylum Sarcodina in Protista

Because they move by using temporary projections from the body called pseudopodia

3- Trypanosoma is harmful for humans

Because Trypanosoma parasites on humans causing sleeping disease

4- Plasmodium is harmful to humans

Because it causes malaria disease to them

5- Pyrrophyta (Dinophlagellates) are red-coloured

Because their cells have plastids containing red pigments

6- Mushroom is from fungi

Because:-

- 1- They are multicellular eukaryotes
- 2- They are immobile (cannot move) and their cell walls contain chitin
- 3- They are composed of filaments called Hyphae, which accumulate forming Mycelium

7- *Rhizopus nigricans* is from Zygomycota

Because their Hyphae are not divided and they produce spores inside sporangia

8- Mushroom is from Basidimycota

Because its Hyphae are divided and its spores are formed inside a mace-like structure called cap

9- Corn is from plants

Because:-

- 1- It is a eukaryotic organism*
- 2- its cell walls contain cellulose*
- 3- its cells contain chlorophyll in green plastids*
- 4- it reproduces sexually*

9- Polysiphonia algae is from Rhodophyta

Because it is from marine weeds whose filaments are held together by a gelatinous membrane and its cells contain plastids carrying red pigment

10- Ricca is from Bryophyta

Because Ricca doesn't have vascular plants which transport food and water, they are small green plants which have hair for anchorage called Rhizoids

11- Vougheir belongs to ferns

Because it is differentiated into stems, leaves and roots, but doesn't form flowers of seeds. They reproduce by the formation of spores in structures on the undersurface of its leaves

12- Pinus plant belongs to gymnosperms (conifers)

Because it doesn't form flowers and has female or male reproductive organs called cones. Its seeds has not testa and it has needle-shaped leaves

13- Monocotyledons are from angiosperms

Because they are terrestrial plants which have stems, leaves and roots, and they form flowers which turn into fruits carrying seeds.

14- Banana is from monocotyledons

Because its seed has only one cotyledon, its leaves veins are parallel, its petals exist in multiples of 3, bundles of its vascular tissues are scattered through the stems and its roots are fibrous

15- Cotton is from Dicotyledons

Because its seed has two cotyledon, its leaves veins are reticulated, its petals exist in multiples of 4 or 5 , bundles of its vascular tissues are arranged across the in a ring and its roots are taproot

What happens when

1- Trypanosome parasite reaches to human blood

This will cause the infection with sleeping disease

2- Plasmodium parasite phases reach to human blood

This will cause the infection with malaria disease

3- Leaving a wet piece of bread in a damp and warm place for some days

Rhizopus nigricans fungus (bread mould) is formed, which rotten this piece of bread.

Questions

1- Choose the correct answer

1- was the first to classify animals into red-blooded and bloodless animals

A- Socrates B- Aristotle C- Linnaeus D- Leeuwenhoek

2- put the traditional classification system

A- Aristotle B- Leeuwenhoek C- Linnaeus D- Robert Whittaker

3- put modern classification system

A- Robert Brown B- Aristotle C- Charles Darwin D- Robert Whittaker

4- Kingdom individuals are prokaryotes

A- Monera B- Protista C- Animalia D- Plantae

5- are prokaryotes which live in extreme environmental conditions

A- Eubacteria B- Achaeabacteria C- Rhodophyta D- Sporozoa

6- is an example of Eubacteria

A- Amoeba B- Pencilium C- Nostoc D- Euglena

7- are from autotrophic bacteria

A- Nostoc B- Amoeba C- Cyanobacteria D- Paramecium

8- are from heterotrophic bacteria

A- Nostoc B- Amoeba C- Cyanobacteria D- Paramecium

9- moves by using pseudopodia

A- Amoeba B- Trypanosome C- Plasmodium D- Paramecium

10- moves by using cilia

A- Amoeba B- Trypanosome C- Plasmodium D- Paramecium

11- moves by using flagella

A- Amoeba B- Trypanosome C- Plasmodium D- Paramecium

- 12- causes sleeping disease in human
 A- Amoeba B- Trypanosome C- Plasmodium D- Paramecium
- 13- causes malaria in human
 A- Amoeba B- Trypanosome C- Plasmodium D- Paramecium
- 14- belong to Chrysophyta phylum – kingdom Protista
 A- Amoeba B- Diatoms C- Dinophlagellates D- Euglena
- 15- Belong to Pyrrophyta phylum – kingdom Protista
 A- Amoeba B- Diatoms C- Dinophlagellates D- Euglena
- 16- Diatoms cell walls contain Substance
 A- Pectin B- Cellulose C- Silica D- Lignin
- 17- Is from Zygomycota
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 18- is from Ascomycota
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 19- is from unicellular Ascomycota
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 20- is from multicellular Ascomycota
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 21- is from Basidimycota
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 22- secretes enzyme which is used in cheese industry
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 23- is known as bread mould
 A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus
- 24- is an example of Rhodophyta
 A- Polysiphonia B- Fucus C- Chlamydomonas D- Vougeir
- 25- Fucus algae belong to
 A- Rhodophyta B- Chlorophyta C- Phaeophyta D- Bryophyta
- 26- is from unicellular Chlorophyta
 A- Spirogyra B- Fucus C- Chlamydomonas D- Vougeir

- 27- is from multicellular Chlorophyta
 A- Spirogyra B- Fucus C- Chlamydomonas D- Vougheir
- 28- is an example of erect Bryophyta
 A- Funeria plant B- Ricca C- Vougheir D- Pinus
- 29- is an example of flat Bryophyta
 A- Funeria plant B- Ricca C- Vougheir D- Pinus
- 30- Yeast belongs to kingdom
- A- Animalia B- Plantae C- Protista D- Fungi
- 31- is from conifers
 A- Funeria plant B- Ricca C- Vougheir D- Pinus
- 32- Vougheir is from
- A- Gymnosperma B- Bryophyta C- Angiosperma D- Ferns
- 33- is from monocotyledons
 A- Banana B- Pea C- Cotton D- Bean

2- Write the scientific terms

- 1- They are prokaryotic unicellular organisms whose cell walls are free from cellulose or pectin, they are devoid of many membranous cytoplasmic organelles.
- 2- They are eukaryotic organisms whose structure is not complex, some of them have plastids and cell walls, and a small number of them are multicellular
- 3- A class of Protista whose individuals move by using temporary projections form the body called pseudopodia
- 4- class of Protista whose individuals move by using cilia such as paramecium
- 5- Class of Protista whose individuals move by using flagella
- 6- Class of Protista whose individuals do not have methods for movement and produce spores
- 7- Unicellular organisms which belong to protists and move by using flagella, they can perform photosynthesis due to the presence of green plastids
- 8- Phylum of Protista whose individuals are algae which form great part of phytoplanktons which live in seas and oceans, their cells have plastids carrying red pigments.
- 9- Kingdom of immobile eukaryotic living organisms whose cell walls contain chitin, they reproduce sexually and asexually and composed of filaments called Hyphae

10- Group of filaments which forms the mycelium of fungi

11- Phylum of fungi whose Hyphae are not divided, they reproduce by the formation of spores inside sporangia

12- Phylum of fungi whose Hyphae are divided by transverse barriers called septa, they produce spores inside sporangia

13- Marine weeds which are composed of filaments held together by a gelatinous (jelly-like) membrane, their cells have plastids carrying red pigments such as *Polysiphonia*

14- Marine weeds which are composed of simple and branched filaments, their cells have plastids carrying brown pigments

15- They are terrestrial plants which do not have vascular tissues, they need high humidity for growth and reproduction

16- Simple-structured plants which have vascular tissues, they live in damp lands and reproduce by spores.

17- They are vascular plants which do not form flowers and have male and female reproductive organs called cones, their seeds have no testa and their leaves are needle-shaped

18- They are terrestrial plants which are differentiated into leaves, roots and stems. They form flowers which turn into fruits carrying seeds inside

3- Write short notes about

1- Bryophytes

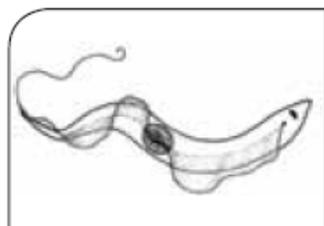
2- Ferns

3- Pyrrophyta

4- Achaeabacteria

5- Eubacteria

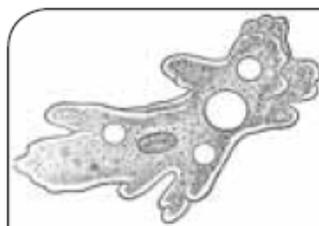
4- The following figures describe some living organisms, answer the questions



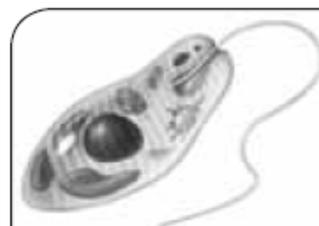
(A)



(B)



(C)



(D)

1- Determine the phyla and classes to which the previous organisms belongs

2- Mention the method of movement of the previous organisms

The Answers

1- Choose the correct answer

- | | |
|-----------------------------|-------------------------------|
| 1- Aristotle | 17- <i>Rhizopus nigricans</i> |
| 2- Linnaeus | 18- Yeast fungus |
| 3- Robert Whittaker | 19- Yeast fungus |
| 4- Monera | 20- <i>Pencilium</i> |
| 5- Archeabacteria | 21- Mushroom |
| 6- <i>Nostoc</i> | 22- <i>Rhizopus nigricans</i> |
| 7- Cyanobacteria | 23- <i>Rhizopus nigricans</i> |
| 8- <i>Nostoc</i> | 24- <i>Polysiphonia</i> |
| 9- <i>Amoeba</i> | 25- <i>Phaeophyta</i> |
| 10- <i>Paramecium</i> | 26- <i>Chlamydomonas</i> |
| 11- Trypanosome | 27- <i>Spirogyra</i> |
| 12- Trypanosome | 28- <i>Ricca</i> |
| 13- <i>Plasmodium</i> | 29- <i>Funeria plant</i> |
| 14- Diatoms | 30- Fungi |
| 15- <i>Dinophlagellates</i> | 31- <i>Pinus</i> |
| 16- Silica | 32- <i>Gymnosperma</i> |
| 33- Banana | |

2- Write the scientific term

- | | |
|----------------------------|--------------------------|
| 1- Monera | 9- Fungi |
| 2- Protista | 10- Hyphae (sing. Hypha) |
| 3- Sarcodina | 11- Zygomycota |
| 4- Ciliophora | 12- Ascomycota |
| 5- Flagellata | 13- Rhodophyta |
| 6- Sporozoa | 14- <i>Phaeophyta</i> |
| 7- <i>Euglena</i> | 15- <i>Bryophyta</i> |
| 8- <i>Pyrrrophyta</i> | 16- Ferns |
| 17- Gymnosperms (conifers) | |
| 18- Angiosperms | |

3- Write short notes about

1- This phylum contains plants which doesn't have vascular tissues specialized in transporting water and food, they are called Non-vascular plants. Non vascular plants are terrestrial plants which needs high humidity to grow up and reproduce. So, they live in damp and shady places

2- Simple-structured plants, most of them are herbaceous (grass) and the rest are woody (trees). They live in damp and shady lands and exist in abundance on the walls of wells and damp valleys. They are differentiated into stems, roots and leaves. They have feather-like leaves, but do not have flowers. They reproduce by spores which exist in special structures in the undersurface of their leaves

3- These algae form a great part of phytoplanktons which live in seas and oceans. They have red colour due to the existence of red pigment along with chlorophyll. Dinophlagellates is the greatest group of this phylum, its individuals move by two flagella

4- They belong to kingdom Monera. Most of them live in extreme environmental conditions such as hot springs, environments empty of oxygen, highly-saline environments. They are different from Eubacteria in the structure of cell wall and plasma membrane

5- They belong to kingdom Monera. They have many species which spread wildly in all the environments of earth, (air, water, ground...etc) There are autotrophic bacteria (Ex. cyanobacteria), and there are heterotrophic bacteria (Ex. nostoc)

4- The following figures describe some living organisms, answer the questions

- 1-
- (A) Trypanosome: (Kingdom Protista – Phylum Protozoa – Class Flagellata)
 - (B) Paramecium: (Kingdom Protista – Phylum Protozoa – Class Ciliophora)
 - (C) Amoeba: (Kingdom Protista – Phylum Protozoa – Class Sarcodina)
 - (D) Euglena: (Kingdom Protista – Phylum Euglenophyta)

- 2-
- (A) Flagella (B) Cilia (C) Pseudopodia (D) Flagella

Lesson (3) Kingdom Animalia



Kingdom Animalia

Characteristics of animals:-

- 1- They are multicellular eukaryotes
- 2- They have the ability to move and transport
- 3- They have the ability to quickly respond to outer environmental stimuli
- 4- Most of the reproduce sexually

→ Kingdom Animalia was divided into 9 phyla according to their structure complexity. Some of these phyla have vertebral column and called Vertebrates, while those which do not have vertebral columns are called invertebrates

1- Phylum Porifera (Sponges)

Sponges: They are simple-structured immobile living organisms which have unsymmetrical bodies containing many pores and canals

Characteristics of sponges:-

- 1- Sponges may be flask-shaped or tube-shaped
- 2- The body of a sponge is hollow and has a wall containing many pores and canals. So, sponges are also known as **Porifera** (*Porifera* means pores bearer)
- 3- They exist alone or in colonies
- 4- Body wall is supported by fibres, spicules or both of them
- 5- Most of them are hermaphrodite and reproduce sexually by fusion of gametes.
- 6- Some of them reproduce asexually by budding and regeneration

Example: Sponge animal



Fig. (27) Sponges

- Sponges are classified as animals though they are immobile because they are multicellular heterotrophic organisms whose cells lack cell walls
- They have few specific cells

2- Phylum Cnidaria

Cnidaria: Aquatic animals whose bodies have radial symmetry and they have cindocytes

Characteristics of Cnidaria:-

- 1- Most Cnidaria are aquatic and live alone or in colonies
- 2- They don't have heads
- 3- Their bodies have a cavity called **vascular digestive cavity**, and the mouth is surrounded by extensions and projections called **tentacles**
- 4- Body cells are arranged in two layers, the outer layers have stinging cells (cindocytes), which protects the animal and helps it in hunting preys. Cindocytes number increases in tentacles

→ During the life cycle of Cnidaria, two forms of individuals appear, which are:-

- **Polyps:** They carry out all life functions except sexual reproduction
- **Medusae:** They are individuals responsible for sexual reproduction, they are usually mobile

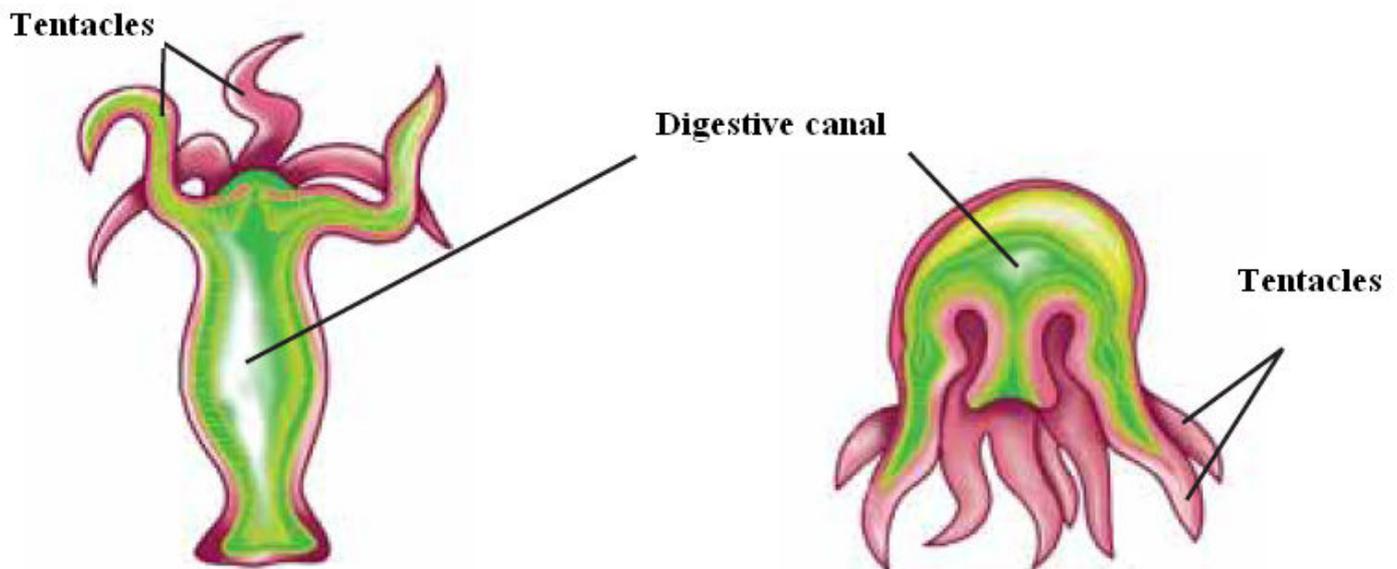


Fig. (28) Polyp and medusa phases of Cnidaria

→ In some Cnidaria, only polyps appear in their lives. In some of them, Medusae dominate over polyps or only both of them appear.

There are 3 classes of Cnidaria, which are:-

A- Class: Hydrozoa

→ Cnidaria in whose life cycles polyps dominate, most of them are aquatic and live in colonies. The rest of them live single in fresh water

Example: Hydra

B- Class: Scyphozoa

→ Cnidaria which spend most of their life in Medusa phase, they are aquatic animals which live in seas and oceans.

Example: Jellyfish

C- Class: Anthozoa

→ Cnidaria which don't have Medusa phase, all of them are aquatic and resemble flowers.

Example: Sea anemone – coral forming coral reefs



Fig. (29) Sea anemone



Fig. (30) Jellyfish

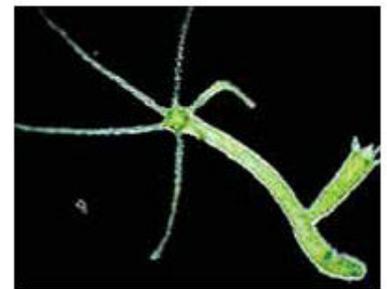


Fig. (31) Hydra

For reading only

→ Cnidaria means "nettle, sting"

→ Hydrozoa is composed of two words "Hydro" which means water, "Zoa" means animal

→ Scyphozoa is composed of two words "Schypho" which means cup, "Zoa" which means animal, as scyphozoa resemble cups

→ Anthozoa is composed of two words "Antho" which means flower, "Zoa" which means animal, as Anthozoa resemble flowers

3- Phylum: Platyhelminthes

→ Platyhelminthes are also called flat worms

Characteristics of Platyhelminthes

- 1- Worms with flat bodies and head
- 2- Their bodies are formed from 3 layers and have lateral symmetry
- 3- Most of them are parasite, and the rest are free-living
- 4- Most of them are hermaphrodite, and the rest are unisexual

Flats worms have three classes, which are:-

1- Class: Turbellaria

→ Free-living worms, most of them live in fresh water and their lengths are few centimeters

Example: Planarian worm

2- Class: Trematoda

→ Worms which parasite on both humans and animals causing dangerous diseases.

Example: Bilharzias worm

3- Class: Cestoda

→ Parasite worms which live in the small intestine of humans and animals causing gastric disorders, anemia and weakness. They have tape-shaped bodies whose length may reach few meters.

Example: Tape worms

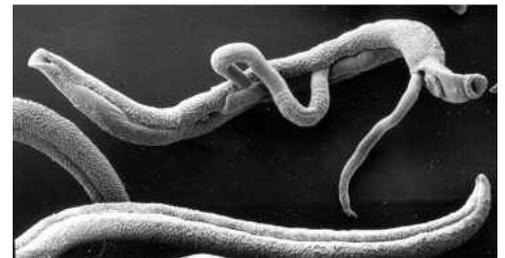
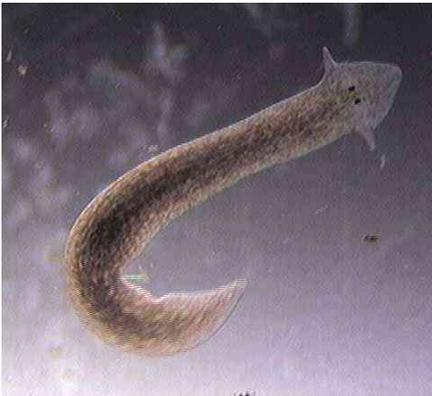


Fig. (31) Planarian Worm Fig. (32) Tape worm Fig. (33) Bilharzias worm

For reading only

- Platyhelminth is composed of two words "Platy" means flat, "helminth" worm
 - Turbellaria is derived from word "turb" which means "disturb", as Turbellaria movement in water disturbs it
 - Trematoda is derived from word "trema" which means hole, as they penetrate living organisms
 - Cestoda means "stitched"
-

3- Phylum: Nematoda (Round worms)

Characteristics of nematoda (round worms)

- 1- They have cylindrical shapes with two ends tapered, their sizes range from microscopic range to few meters
- 2- Their bodies are formed from 3 layers and have lateral symmetry
- 3- They have alimentary canals with two openings: mouth and anus

4- Unisexual organisms

5- They live in all environments, some of them are free-living in water and soil, and the others parasite on animals, plants and humans

Examples: *Ascaris* worm – *Falaria* worm



Fig. (34) *Ascaris* worm

For reading only

→ *Nematoda* means "thread-like"

5- Phylum Annelida (ring worms)

→ They are earth worms which live inside soil in tunnels, they aerate the soil and increase its fertility

→ They are common examples of segmented worms, which have the following characteristics:-

1- They are free-living in salt water, freshwater and soil. Small no. of them are external parasites

2- Their bodies are divided into rings and have thorns in their skins which help them in movement

3- Some of them are unisexual, an a small no. are hermaphrodite

Examples: Earth worms – Medical leech



Fig. (35) Earth worms

6- Phylum Anthropoda

Characteristics of anthropoda:-

- 1- Their bodies are divided into a number of segments, some of these segments have paired identical appendages.
- 2- The segmented body is divided into many parts covered by exoskeleton

Anthropoda have 3 classes, which are:-

A- Class: Crustacea

Characteristics of crustacean:-

- 1- Their bodies consist of two parts (Cephalothorax – abdomen)
- 2- The body is covered with a chitinous cuticle
- 3- They have joint appendages which have different shapes to perform different functions and complex eyes
- 4- They breathe by gills

Examples: Shrimps – Crap – Crayfish



Fig. (36) Crap

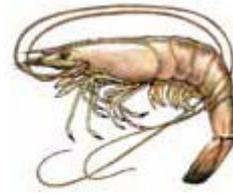


Fig. (37) Shrimps

B- Class: Arachnida

Characteristics of Arachnida:-

- 1- Their bodies are divided into two regions (Cephalothorax - abdomen)
- 2- They have four pairs of legs for movement
- 3- They respire by book lungs or air trachea
- 4- They have simple eyes and they are unisexual

Examples: Spiders – Scorpions



Fig. (38) Scorpion



Fig. (39) Spider

C- Class: Insecta

Characteristics of insecta:-

- 1- Their bodies are divided into head, abdomen and chest (thorax)
- 2- They have a pair of complex eyes and two pairs of wings (which may be absent in some insects such as ants, or be only one pair as in domestic flies)
- 3- They breath by air trachea
- 4- They have three pairs of legs

Examples: Ants – Bees – Cockroaches – Locusts – Butterflies – Mosquito



Fig. (38) Mosquito



Fig. (39) Locust



Fig. (40) Bee



Fig.(41) Fly

D- Class: Myriapods

Characteristics of Myriapods:-

- 1- Their bodies are divided into a group of segments and consist of head and trunk
- 2- They have many legs
- 3- They breathe by air trachea

Examples: Caterpillar, which has 44 legs



Fig. (42) Caterpillar

For reading only

→ Cephalothorax is composed of two terms "Cephal" which means head or brain, "thorax" which means "chest, thorax". Cephalothorax consists of a head and thorax

→ Myriapods consists of two terms, "Myria" which means many, "pods" which means legs

7- Phylum Mollusca

Characteristics of Mollusca:-

- 1- Most of them live in salt water, some of them in freshwater and a small no. on the ground
- 2- They have soft bodies and has a muscular foot for movement
- 3- They have calcareous shells that may be external, internal, absent or unseen
- 4- They have heads (which carry sensation organs) and may be absent
- 5- They have an organ resembling tongue and carries teeth called **Radula**, which is used for feeding
- 6- Most of them are unisexual, and a small no. is hermaphrodite

Mollusca are divided into many classes

A- Class: Gastropoda

→ They move by gliding on the projection (extension) of the foot under their bodies, most of them have spiral shells composed of one piece. Some of them live in water and breathe by gills. And the others live on land and breathe by simple lungs

Example: Snails – Slugs

B- Class: Bivalvia

- The shells of these Mollusca are composed of two hinged parts
- All the individuals of this class are aquatic and breathe by gills

Example: Oyster – Mussel

C- Class: Cephalopoda

→ A part of their feet are modified into tentacles which exist in the head and away from the rest of the body

Examples: Octopus – squid



Fig. (33) Octopus



Fig. (34) Oyster



Fig. (35) Snail

For reading only

- (Gastro-) → Stomach, (Pod) → Foot. So, gastropod means (Stomach foot)
 - (Bivalvia) → Double-valved (have two halves)
 - (Cephal-) → Head, (Pod) → Foot. So, cephalopod means (Head foot)
-

8- Phylum Echinodermata

Characteristics of Echinodermata:-

- 1- The body is not divided (segmented) into parts, it has a solid endoskeleton
- 2- Many of them have prickles and calcareous plates (sheets) on the body wall
- 3- They have structures which resemble suckers called tube feet
- 4- The body may be cylindrical or star-shaped
- 5- They move by arms, prickles or tube feet
- 6- They are unisexual, they reproduce sexually by formation of gametes, and asexually by regeneration
- 7- They don't have anterior (front) or posterior (back) ends, but their bodies have two sides: Oral side (which has the mouth) – aboral side (opposite to oral side)

Echinodermata have 3 classes:-

A- Class: Asteroidea

→ They are animals with five or more arms which extend in a radial system from the central disc

Examples: Star fish

B- Class: Echinoidea

→ They are animals which do not have arms, but their bodies are covered with prickles (for movement and protection). They have five sharp peak-shaped teeth used in fragmentation and chewing of food.

Example: Sea Urchin

C- Class: Holothuroidea

→ They are animals which have soft and long bodies with no arms, their endoskeletons are reduced

Example: Sea cucumber



Fig. (36) Sea cucumber



Fig. (37) Sea urchin



Fig. (38) Starfish

For reading only

- (Echino-) → Hedgehog, (-Dermata) → Skin

- (Aster-) → Star, (-oidea) → Animal

- (Holothuroid) → A genus of animals in Latin, (oidea) → Animal

9- Phylum Chordata

Characteristics of Chordata

- 1- They are the most developed animals
- 2- Their fetuses have skeletal structures in their backs called "**Notochord**", which may stay inside the animal till its death. Notochord turn into vertebral column is most Chordata

(N.B: All the 8 phyla we mentioned before phylum Chordata belong to invertebrates, which do not have vertebral column)

Chordata phylum is divided into sub-phylum, the most important one of them is Sub-phylum vertebrata

Sub-Phylum Vertebrata

Characteristics of vertebrata:-

- 1- Notochord appears in them in embryonic stage. As the fetus grows up, notochord turns into vertebral column, which surrounds and protects the spinal cord.
- 2- They have endoskeletons composed of vertebral column, skull and limbs
- 3- Their hearts have many chambers
- 4- They have blood flowing in blood vessels in a closed cycle, which provides all body parts with oxygen and nutrients

Sub-phylum vertebrata has many classes:-

A- Class: Agnatha

Characteristics of Agnatha:-

- 1- They are fish which have a circular mouth resembling funnel, it has many teeth and no jaws
- 2- They have thin bodies resembling those of snakefish
- 3- They do not have double fins
- 4- They have cartilaginous skeletons
- 5- They are parasites which stick to big fish through their mouths, as they fix themselves to those fish by their teeth. They bite their meat by their rough tongues which resemble files

Example: Lampreys fish



Fig. (39) Lampreys

For reading only

→ Lamprey is derived from Latin verb "Lampere" → which means lick
→ Agnatha is composed of two terms: "A-" which means without, "gnathos" which means jaw. Agnatha means "Without jaws"

B- Class: Chondrichthyes (cartilaginous fish)

Characteristics of Chondrichthyes

- 1- They are aquatic fish with cartilaginous endoskeleton
- 2- Their mouths are located in the abdomen and has two jaws carrying some rows of teeth which help them in predation
- 3- They have double fins
- 4- Their bodies are covered with scales resembling teeth
- 5- They have air bladders in their bodies for floating on the surface of water
- 6- Their gill opening are not covered
- 7- They are unisexual (Sexes are separate), and fertilization is internal

Examples: Shark fish – Whiptail stingray

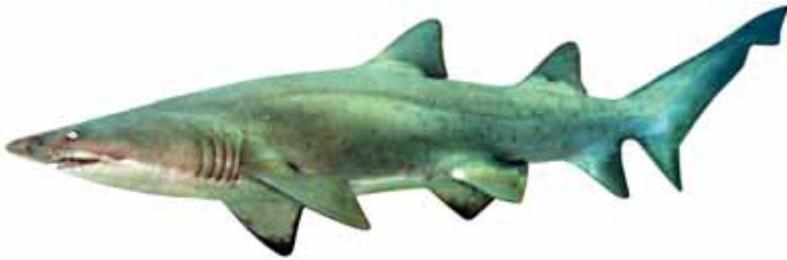


Fig. (40) Shark



Fig. (41) Whiptail stingray.

For reading only

→ Chondrichthyes is composed of two terms: (Chondr-) which means cartilage, (-ichthyes) which means fish. So, Chondrichthyes means "Cartilage fish"

C- Class: Osteichthyes (bony fish)

Characteristics of Osteichthyes

- 1- They are fish which live in both salt water and freshwater
- 2- They have bony endoskeletons, and their mouths are located in the body front
- 3- They have single and double (paired) fins
- 4- Their bodies are covered with bony scales
- 5- Their gill openings are covered with gill cover
- 6- They are unisexual (sexes are separate) and fertilization is external

Example: Bouri fish – Bolty fish



Fig. (41) Bolty fish

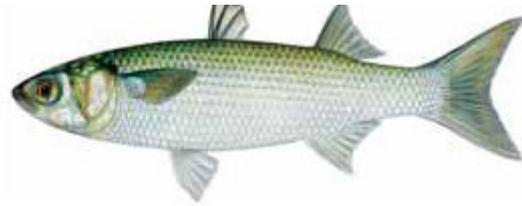


Fig. (42) Bouri fish

D- Class: Amphibia

Characteristics of Amphibia

- 1- They are cold-blooded animals*
- 2- They are have four limbs and have five fingers (pentadactyl)*
- 3- They are unisexual (sexes are separate), and fertilization is external*
- 4- In embryonic stages, they live in water and breathe by gills. The adult stage live on land and breathe air by lungs and skin*

Examples: Salamander – Toads – Frogs



Fig. (43) Frog



Fig. (44) Salamander

E- Class: Reptilia

Characteristics of Reptilia

- 1- Cold-blooded animals (their temp. is equal to that of environment they live in)*
- 2- Body is formed from four regions: Head – Neck – Trunk – Tail*
- 3- They have four limbs (Quadripartite) and weak five fingers (pentadactyl). Each finger ends with a horny claw*
- 4- Some reptile doesn't have limbs and move by creeping (Ex. snakes)*
- 5- They breath air by lungs*
- 6- Sexes are separate (unisexual) and fertilization is internal*
- 7- They lay eggs with skinny or calcareous peels*
- 8- Skins are dry and covered by thick horny scales, which may be horny plates*

Examples: Lizards – Chameleon – Gecko – Tortoise – Crocodile – Snakes



Fig. (45) Snakes



Fig. (46) Lizard



Fig. (47) Crocodile

F- Class Aves (Birds)

Characteristics of birds:-

- 1- Warm-blooded animals (they have constant temp.)
- 2- Their bodies are covered with feather
- 3- They have four limbs, the two forelimbs are modified to wings for flying, and each hind limb has four fingers with horny claws for climbing, movement, predation or swimming
- 4- Their bones are light and hollowed, sternum bone (a bone in the chest) is flat to fix the strong chest muscles which move the wings during flying
- 5- They breathe air by lungs, and their bodies have air sacs which stores additional air quantity during flying
- 6- Sexes are separate (unisexual) and fertilization is internal, they lay eggs

Examples: Pigeons – Swallows – Vultures – eagles – ostriches



Fig. (48) Swallow



Fig. (41) Ostrich



Fig. (42) Vulture

G- Class: Mammalia

Characteristics of Mammalia

- 1- They are hot-blooded animals
- 2- Their bodies have 4 parts: Head – Neck – Chest (Thorax) – Abdomen
- 3- Their skins are covered with hair
- 4- They have four polydactyl (five- fingered) limbs with nails, claws or hooves
- 5- They have differentiated non-similar teeth (Molars – Tusks – Incisors)

6- Sexes are separate (unisexual) and fertilization is internal

7- Most of them give birth, and they have mammary glands which secrete milk for babies

8- They breathe by lungs

Mammalia has three subclasses, which are:-

Subclass: Prototheria	Subclass: Methatheria	Subclass: Eutheria
- They do not give birth, but they lay eggs. Babies feed on milk secreted from mammary glands on the abdomen of mother. They have cloacal opening through which wastes and eggs emerge	- Young born is not fully developed. So mother has to keep it inside a pouch - Young born feeds by suckling milk secreted from nipples inside the pouch until it is fully developed	- They are placental organisms which are born fully developed from mother - They feed on milk secreted by mammary glands of mother
- Duck-billed platypus - Echidna	- Kangaroo	- They have many organisms (Ex. human)



Fig. (43) Duck-billed platypus



Fig. (44) Kangaroo

For reading only

(Proto-) → First (primitive) (-theria-) → Mammals (Meta- Changed)

(Eu-) → Real

→ Subclass Eutheria (real mammals) are divided into many orders:-

A- Order: Edentata (E- → without, Dentata → Teeth, Without teeth)

→ Most of them are without teeth, some of them have only front teeth

→ They have strong curved claws

Example: Armadillo – Sloth



Fig. (45) Armadillo

B- Order: Insectivora (-Vora → Eater, Insects eaters)

→ They feed on insects

→ Their front teeth extend like pincers for predation on two rows

Example: Hedgehog



Fig. (46) Hedgehog

C- Order: Carnivora (Carni- → Meat, Vora → eater, Meat eaters)

→ They have large pointed canines and feed on meat

→ Their front molars are sharp, and back molars are broad and crushing

→ They have sharp, strong and curved claws

Examples: Cat – Dog – Tiger – Fox – Wolf – Seal



Fig. (47) Dog



Fig. (48) Seal



Fig. (49) Tiger

D- Order: Perissodactyla (Perisso → Odd or uneven, Dactyla → Finger)

→ They are herbivorous animals (plant-eaters)

→ They have an odd number (1,3,5...etc) of fingers covered with horny hooves

→ They have large teeth, which are adapted for crushing food

Examples: Horse – Donkey – Zebra - Rhinoceros



Fig. (50) Zebra

E- Order: Artiodactyla (Artio → even, Dactyla → Finger)

→ They are herbivorous animals

→ They have an even number (2,4,6...etc) of fingers covered with horny hooves

Examples: Sheep – Goats – Giraffes – Gazelles – Camels



Fig. (51) Giraffe



Fig. (52) Camel



Fig. (53) Gazelle

F- Order: Cetacea (It means whales in Latin)

- They are huge aquatic animals which live in seas and oceans
- The two forelimbs are modified to paddles, they have no hind-limbs
- They breath atmospheric air by lungs
- Sexes are separate, they give birth their babies suckle milk from mammary glands

Examples: Dolphins – Whales



G-Order: Rodentia (means gnawers in Latin)

- They have a pair of Incisors in bother upper and lower jaws. These incisors are sharp as anvil
- They have long tails and small ears

Examples: Mice – Rats – Squirrel (Chipmunk) – Jerboa



H- Order: Lagomorpha (means rabbit-shaped in Latin)

- They have two pairs of incisors in the upper jaw and one pair in lower jaw
- They have short tails and long ears

Examples: Rabbits – Hares



I- Order: Chiroptera (Chiro → Hand, pteron → Wing, Have wings instead of hand)

- Their forelimbs are modified to wings, where the second and fifth fingers of each forelimb elongated, and skin extended from the body to these fingers
- They become active at night

Examples: Bats



J- Order: Proboscidea (Pro → in front, boscide → to feed)

- They have long muscular trunks
- The front teeth grow forming elephant's fangs



K- Order: Primates

- They are the most developed mammals
- They have two pairs of polydactyl limbs
- Thumb finger is away from the other fingers
- They have developed nervous system and big brains



Examples: Monkeys – Lemurs – Gorillas – Chimpanzee – Apes – Human (most developed living organisms)

→ There are other living organisms which do not subject to Robert Whittaker's classification because they have the characteristics of both living and non living things

Examples: Viruses – Viroids – Prions

Viruses

→ They link between living and non living things:-

Non living things characteristics in viruses :-

- They do not have any cell structures
- They appear in a crystalline form
- They cannot perform any vital processes outside host cell

Living organisms characteristics in viruses:-

- They have DNA or RNA
- They can multiply and reproduce inside host cell

→ Virus consists of:-

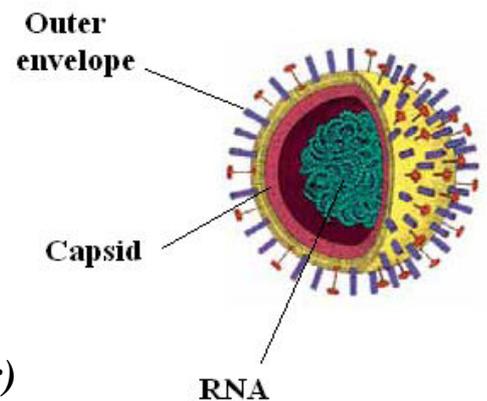
- 1- DNA or RNA
- 2- Protein coat called capsid

→ Viruses have very small sizes (20- 300 nanometer) and cannot be seen

→ Viruses have different shapes: they may be simple (rod-shaped, spiral, spherical, polyhedron) or very complex

→ Viruses are obligatory parasites: as they don't multiply or reproduce unless they are inside a host cell

→ Viruses are highly-specific organisms: Every virus has certain living organisms and cells. Viruses which attack plants cannot attack animals or humans, and those which attack the brain cannot attack the liver



Structure of flu virus

Viroids

- They are non-living organisms (pathogens – disease-causing) which are more simple than viruses
- They consist of small ring-shaped RNA strips in the form of double helix
- They do not have protein coat (capsid)
- Viroids enter the nucleus of the infected cell, and directs metabolism to produce more Viroids. They cause many diseases to plants such as:-
 - Potato spindle tuber disease
 - Cucumber pale fruit disease
- Viroids may spread quickly, but they cannot be determined because they do not destroy host cells like viruses

Prions

- Prions are non living organisms which are more simple than Viroids, as they are composed of only protein and do not have any nucleic acids.
- They spread inside the infected tissues of organisms causing disease which destroy their central nervous system, as they turn brain into a sponge-like mass full of pores like sieves. This may cause death
- Prions infection is common in sheep and livestock, they cause **mad cow disease**. Prions causes the infection of human with two diseases whose symptoms are like those of mad cow.
- Mad cow Prions can transfer to human from meat products of cows suffering from the disease (Hamburgers, sausages, cosmetics and medicine containing substances extracted from cows...etc)
- The transfer of Prions to human wasn't proved till now due to the extent of incubation period of mad cow disease in human

Science, technology and society

A- Modern techniques used in classifying living organisms

- In the past, scientists classified living organisms according to the similarities and differences between them according to shape
- Later (hundreds years ago), Scientists classified living organisms on the basis of determining the degree of similarity and difference between them (evolutionary relation), which depends on their researches on anatomy which:-
 - Determine the anatomic similarities
 - Determine the similarities in natural structures, such as skeletal and glandular structure.

- *The study of embryonic development*

→ *Nowadays, Scientists discovered new techniques by which we can find the similarities and differences of living organisms, this happened due to:-*

- *The invention of electronic microscope, which developed microscopic techniques*

- *The dramatic development of biochemical analysis*

→ *Modern techniques of the classification of living organisms depends on the scientific researches about **DNA sequences** (which we studied in the previous chapter). Scientists discovered that the more similarity is between the sequence of DNA nucleotides of living organisms, the more alike are living organisms*

B- New discoveries in biology

Extract of sponges:-

→ *They play an important role in medicine and chemical industries, as scientists discovered new compounds in some sponges, which can be used as anti-cancer and antibiotics*

Extract of jellyfish

→ *Poisons by which jellyfish hunt their preys have many medical uses*

Definitions of lesson (3)

Porifera (Sponges): *Simple-structured animals which have unsymmetrical bodies with a lot of canals and pores*

Cnidaria: *They are animals with radial symmetry and have stinging cells (cincocytes)*

Polyps: *They are phases of Cnidaria which carry out all vital processes except sexual reproduction*

Medusae: *They are phases of Cnidaria which are responsible for sexual reproduction*

Anthropoda: *Animals whose bodies are divided into a number of segments which carry some pairs of appendages.*

Mollusca: *Animals having soft bodies covered by skin tissue called the mantle, which secretes a protective calcareous shell. It may be internal or external*

Echinodermata: *Animals which have solid endoskeletons and many of them have prickles and calcareous plates in their body walls*

Chordata: A group of animals which have structures in their back called notochords

Viruses: Organisms which have the characteristics of both living and non living things

Give reasons for

1- Sponges are also called Porifera

Because the walls of their bodies have many canals and pores

2- Sponges are classified as animals although they cannot move

Because they are multicellular heterotrophic living organisms whose cells lack cell walls.

3- Cnidaria have cindocytes (stinging cells)

To protect them and help them in predation

4- Jellyfish is from Cnidaria

Because it live in the sea, it doesn't have a head, its body has a digestive cavity, its mouth is surrounded by tentacles and it has cindocytes for protection and predation

5- Hydra belongs to class hydrozoa of Cnidaria

Because in its life cycles, polyps dominate over Medusae

6- Jelly fish belong to class scyphozoa

Because they spend most of their life in medusa stage

7- Sea anemone belongs to class Anthozoa

Because its doesn't have Medusae stage and resembles flowers in shape

8- Planaria worm belongs to phylum Platyhelmenthes

Because it has flat body which have lateral symmetry and composed of 3 layers of tissues

9- Bilharzias worm belongs to Trematoda class

Because they parasite on humans causing dangerous diseases

10- Falaria (or Ascaris) worm belongs to phylum nematoda

Because it has round (cylindrical) shape and its alimentary canal has two openings: mouth – anus.

11- Shrimps belong to Curstacea

Because their bodies are divided into two parts (Cephalothorax – abdomen), their

Bodies are covered with chitinous cuticle and breathe by gills

12- Spiders are from arachnids

Because their bodies are divided into two parts (Cephalothorax – abdomen), they have four pairs of legs for movement and simple eyes

13- Ants are from insects

Because their bodies are divided into three parts (Head – thorax – abdomen), they have complex eyes and three pairs of legs for movement

14- Caterpillar is from Myriapods

Because they have numerous legs (44 legs)

15- Snails are from Mollusca

Because they have soft bodies covered with calcareous shells and muscular feet for movement. They have an organ resembling tongue called Radula

16- Oyster is from Bivalvia class of Mollusca

Because its shell is composed of two hinged parts, it lives in water and breathe by gills

17- Squids are from cephalopods of Mollusca

Because part of their feet are modified to tentacles which exist in the head away from the rest of the body.

18- Starfish is from Echinodermata

Because its body is not segmented and has solid endoskeleton, it is star-shaped, its body has two sides (Oral side – aboral side) and it reproduces asexually by regeneration

19- Sea urchin belongs to class Echinoidea

Because They are animals which do not have arms, but their bodies are covered with prickles (for movement and protection). They have five sharp peak-shaped teeth used in fragmentation and chewing of food.

20- The importance of vertebral column in vertebrata sub-phylum individuals

Because it surrounds and protects the spinal cord

21- Lampreys belong to class Agnatha

Because:-

1- They are fish which have a circular mouth resembling funnel, it has many teeth and no jaws

2- They have thin bodies resembling those of snakefish

3- They do not have double fins

4- They have cartilaginous skeletons

5- They are parasites which stick to big fish through their mouths, as they fix themselves to those fish by their teeth. They bite their meat by their rough tongues which resemble files

22- Shark fish belong to class Chondrichthyes

Because:-

1- They are aquatic fish with cartilaginous endoskeleton

2- Their mouths are located in the abdomen and has two jaws carrying some rows of teeth which help her in predation

3- They have double fins

4- Their bodies are covered with scales resembling teeth

5- They have air bladders in their bodies for floating on the surface of water

6- Their gill opening are not covered

7- They are unisexual (Sexes are separate), and fertilization is internal

23- Bolty fish is from Osterichthyes

Because:-

- They have bony endoskeletons, and their mouths are located in the body front

- They have single and double (paired) fins

- Their bodies are covered with bony scales

- Their gill openings are covered with gill cover

- They are unisexual (sexes are separate) and fertilization is external

24- Salamanders belong to class Amphibia

Because:-

1- They are cold-blooded animals

2- They are have four limbs and have five fingers (pentadactyl)

3- They are unisexual (sexes are separate), and fertilization is external

4- In embryonic stages, they live in water and breathe by gills. The adult stage live on land and breathe air by lungs and skin

25- Chameleons belong to class Reptilia

Because:-

1- They are cold-blooded animals

2- Body is formed from four regions: Head – Neck – Trunk – Tail

3- They have four limbs (Quadripartite) and weak five fingers (pentadactyl). Each finger ends with a horny claw

4- Some reptile doesn't have limbs and move by creeping (Ex. snakes)

5- They breath air by lungs

6- Sexes are separate (unisexual) and fertilization is internal

7- They lay eggs with skinny or calcareous peels

8- Skins are dry and covered by thick horny scales, which may be horny plates

26- Ostriches are from birds (Aves)

Because:-

1- They are warm- blooded animals

2- Their bodies are covered with feather

3- They have four limbs, the two forelimbs are modified to wings for flying, and each hind limb has four fingers with horny claws for climbing, movement, predation or swimming

4- Their bones are light and hollowed, sternum bone (*a bone in the chest*) is flat to fix the strong chest muscles which move the wings during flying

5- They breathe air by lungs, and their bodies have air sacs which stores additional air quantity during flying

6- Sexes are separate (unisexual) and fertilization is internal, they lay eggs

27- Lions are from mammals (belong to class Mammalia)

Because:-

1- They are hot-blooded animals

2- Their bodies have 4 parts: Head – Neck – Chest (Thorax) – Abdomen

3- Their skins are covered with hair

4- They have four polydactyl (five- fingered) limbs with nails, claws or hooves

5- They have differentiated non-similar teeth (Molars – Tusks – Incisors)

6- Sexes are separate (unisexual) and fertilization is internal

7- Most of them give birth, and they have mammary glands which secrete milk for babies

8- They breathe by lungs

28- Duck-billed platypus belongs to subclass Prototheria

Because they do not give birth, but they lay eggs. Babies feed on milk secreted from mammary glands on the abdomen of mother. They have cloacal opening through which wastes and eggs emerge

29- Duck-billed platypus is the intermediate link between birds and mammals

Because it lays eggs and do not give birth (birds characteristics), but its babies feed by suckling the milk secreted from mammary glands on its abdomen (mammals characteristic)

30- Kangaroo belongs to Metatheria

Because it gives birth to not fully-developed babies, so it keeps them inside their pouch, where they suckle the milk secreted from its mammary glands until they become fully developed

31- Kangaroo puts his baby in a pouch

Because young born is not fully developed, so it is kept inside a pouch where its suckle the milk secreted from its mammary gland, until it becomes fully developed

32- Armadillo is a mammal which belongs to order Edentata

Because it doesn't have any teeth and have strong curved claws

33- Hedgehog is a mammal which belongs to order Insectivora

Because it feeds on insects and its front teeth are extended like pincers for predation

34- Dogs are mammals which belong to order Carnivora

Because they feed on meat, their front molars are sharp and back molars are broad and crushing and they have sharp and curved claws

35- Zebras are mammals which belong to order Perissodactyla

Because each limb has an odd number of fingers, which are covered with hooves. They also have large teeth for crushing food

36- Camels are mammals which belong to order Artiodactyls

Because each limb of it has an even number of fingers, which are covered with hooves.

37- Dolphins are mammals although they live in water

Because they feed their babies with milk secreted from mammary glands and they also have lungs for breathing atmospheric air

38- Mice are mammals which belong to order rodentia

Because they have a pair of jaws in each of the upper and lower jaws. They also have short ears and long tails

39- Rabbits are mammals which belong to order lagomorpha

Because they have two pairs of incisors in the upper jaw and one pair in the lower jaw. They also have long ears and short tails

40- Bats are mammals although they can fly

Because they give birth and have mammary glands

41- Viruses has the characteristics of both living and non living things

Non living things characteristics in viruses :-

- They do not have any cell structures
- They appear in a crystalline form
- They cannot perform any vital processes outside host cell

Living organisms characteristics in viruses:-

- They have DNA or RNA
- They can multiply and reproduce inside host cell

42- Viruses are obligatory parasites

Because they cannot reproduce unless they are inside host cell

43- It is hard to detect Viroids in infected cells

Because Viroids do not destroy the cells they parasite like viruses

44- Viroids are harmful to plants

Because some Viroids cause diseases to plants such as pale cucumber

Questions

1- Choose the correct answer

1- animal belongs to phylum Porifera

- A- Lampreys B- Sponges C- Jellyfish D- Bats

2- Animals of phylum has stinging cells

- A- Chordata B- Platyhelminthes C- Cnidaria D- Annelida

3- In the life cycle of, polyps dominate over Medusae

- A- Hydra B- Jellyfish C- Sea anemone D- Coral reef

4- In the life cycle of, Medusae dominate over polyps

- A- Hydra B- Jellyfish C- Sea anemone D- Coral reef

5- Planaria worm belongs to class of phylum Platyhelminthes

- A- Turbellaria B- Trematoda C- Cestoda D- Annelida

6- Ascaris worm belongs to phylum

- A- Nematoda B- Platyhelminthes C- Annelida D- Anthropoda

7- Crabs are from

- A- Crustaceans B- Insects C- Arachnids D- Myriapods

8- Caterpillar is from

- A- Crustaceans B- Insects C- Arachnids D- Myriapods

9- Bees belong to

- A- Crustaceans B- Insects C- Arachnids D- Myriapods

10- Scorpions belong to

- A- Crustaceans B- Insects C- Arachnids D- Myriapods

11- are animals whose shells are composed of two hinged parts

A- Octopus B- Mussel C- Slugs D- Squids

12- Sea urchin belongs to class of Echinodermata

A- Asteroids B- Echinoidea C- Holothuroidea D- Turbellaria

13- is from cartilaginous fish

A- Bouri B- Bolty C- Shark D- Shrimps

14- are from amphibians

A- Frogs B- Geckos C- Jerboa D- Snakes

15- Fetuses of phylum have notochords

A- Chordata B- Porifera C- Mollusca D- Anthropoda

16- is from Eutheria

A- Platypus B- Kangaroo C- Lions D- Chameleons

17- is from Prototheria

A- Human B- Lions C- Platypus D- Kangaroo

18- is an animal which lays eggs and has mammary glands

A- Platypus B- Kangaroo C- Lions D- Chameleons

19- animals have no teeth

A- Lampreys B- Lions C- Vultures D- Armadillo

20- Sloth belongs to order of Mammalia

A- Edentata B- Chiroptera C- Cetacea D- Primates

21- have an even no. of fingers in each limb

A- Rhinoceros B- Horses C- Donkeys D- Sheep

22- Zebras belong to order of Mammalia

A- Artiodactyla B- Chiroptera C- Perissodactyla D- Primates

23- animals belong to Rodentia order

A- Rats B- Rabbits C- Bats D- Flies

24- Elephants belong to Order

A- Edentata B- Chiroptera C- Proboscidea D- Primates

2- Write the scientific term

1- They are animals with radial symmetry and have stinging cells (cincocytes)

- 2- They are phases of Cnidaria which carry out all vital processes except sexual reproduction
- 3- They are phases of Cnidaria which are responsible for sexual reproduction
- 4- Animals whose bodies are divided into a number of segments which carry some pairs of appendages.
- 5- Animals having soft bodies covered by skin tissue called the mantle, which secretes a protective calcareous shell. It may be internal or external
- 6- Animals which have solid endoskeletons and many of them have prickles and calcareous plates in their body walls

3- Compare between

- 1- Cartilaginous and bony fish
- 2- Insects and arachnids
- 3- Annelida and Nematoda
- 4- Birds and reptiles

4- Classify the following living organisms

- 1- Spider
- 2- Jellyfish
- 3- Bilharzias worm
- 4- Octopus
- 5- Bean

The Answers

1- Choose the correct answer

- | | |
|----------------|--------------------|
| 1- Sponges | 13- Shark |
| 2- Cnidaria | 14- Frogs |
| 3- Hydra | 15- Chordata |
| 4- Jellyfish | 16- Lions |
| 5- Turbellaria | 17- Platypus |
| 6- Nematoda | 18- Platypus |
| 7- Crustaceans | 19- Armadillo |
| 8- Myriapods | 20- Edentata |
| 9- Insects | 21- Sheep |
| 10- Arachnids | 22- Perissodactyla |

11- Mussel

23- Rats

12- Echinoidea

24- Proboscidea

3- Compare between

1- Cartilaginous and bony fish

<i>Cartilaginous fish</i>	<i>Bony fish</i>
<ul style="list-style-type: none"> - They have cartilaginous endoskeletons - Their bodies are covered with teeth-like scales - Their gill openings are not covered with gill cover - The fertilization is internal <p>Ex. Whiptail stingray – Shark fish</p>	<ul style="list-style-type: none"> - They have bony endoskeletons - Their bodies are covered with bony scales - Their gill openings are covered with gill covers - The fertilization is external <p>Ex. Bolty fish – Bouri fish</p>

2- Insects and arachnids

<i>Insects</i>	<i>Arachnids</i>
<ul style="list-style-type: none"> - Their bodies are divided into three parts (Head – thorax – Abdomen) - They have 3 pairs of legs - They have complex eyes <p>Ex. Bees – Ants</p>	<ul style="list-style-type: none"> - Their bodies are divided into two parts (Cephalothorax – Abdomen) - They have 4 pairs of legs - They have simple eyes <p>Ex. Spiders – Scorpions</p>

3- Annelida and Nematoda

<i>Annelida</i>	<i>Nematoda</i>
<ul style="list-style-type: none"> - They have round cylindrical shapes - Their bodies are divided into rings - Some of them are unisexual, others are hermaphrodite <p>Ex. Earth worms</p>	<ul style="list-style-type: none"> - They are ring-shaped - Their bodies are formed from 3 layers - They are unisexual <p>Ex. Ascaris worm – Falaria worms</p>

4- Birds and reptiles

<i>Birds</i>	<i>Reptiles</i>
<ul style="list-style-type: none"> - Warm-blooded animals - They have four limbs, forelimbs are modified to wings and hind-limbs have 4 fingers each <p>Ex. Ostriches - Vultures</p>	<ul style="list-style-type: none"> - Cold-blooded animals - they have four limbs with 5 weak fingers, some of them don't have limbs are move by creeping <p>Ex. Snakes - Chameleons</p>

5- Classify the following organisms See classification dictionary page

General test on chapter (4)

Answer four questions only

Question (1)

A- Choose the correct answer

1- put the traditional classification system

A- Aristotle B- Leeuwenhoek C- Linnaeus D- Robert Whittaker

2- Diatoms cell walls contain Substance

A- Pectin B- Cellulose C- Silica D- Lignin

3- Is from Zygomycota

A- Pencilium B- Rhizopus nigricans C- Mushroom D- Yeast fungus3.

4- Ascaris worm belongs to phylum

A- Nematoda B- Platyhelmenthes C- Annelida D- Anthropoda

5- is an animal which lays eggs and has mammary glands

A- Platypus B- Kangaroo C- Lions D- Chameleons

B- Give reasons for

1- Bolty fish is from Osterichthyees

2- Bilharzias worm belongs to Trematoda class

3- Neither tigons nor mules are species

4- The importance of dichotomous key

5- Amoeba belongs to phylum Sarcodina in Protista

Question (2)

A- Write the scientific term

1- They are terrestrial plants which are differentiated into leaves, roots and stems. They form flowers which turn into fruits carrying seeds inside.

2- They are animals with radial symmetry and have stinging cells (cindocytes)

3- Group of filaments which forms the mycelium of fungi

4- Marine weeds which are composed of simple and branched filaments, their cells have plastids carrying brown pigments

5- They are terrestrial plants which do not have vascular tissues, they need high humidity for growth and reproduction

B- What happens when:-

1- A female donkey and a male horse cross

2- Trypanosome parasite reaches to human blood

3- Leaving a wet piece of bread in a damp and warm place for some days

4- *Plasmodium* parasite phases reach to human blood

Question (3)

A- Match

(A)	(B)
1- Eukaryotic heterotrophic organisms whose bodies are composed of filaments forming Mycelium	A- Mammals
2- Plants which reproduce by cones and their seeds have no testa	B- Porifera
3- Warm-blooded animals whose bodies are covered with feather	C- Amphibia
4- Cold-blooded animals whose embryonic stages breathe by gills and adults breath air by lungs	D- Birds
5- Simple-structured animals with pores and canals in their bodies	E- Conifers
	F- Fungi

B- Write short notes about

- 1- Bryophytes
- 2- Ferns
- 3- Pyrrophyta
- 4- Achaeabacteria

Question (4)

A- Correct the underlined words

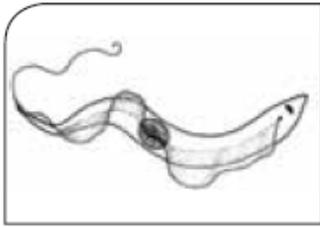
- 1- Carl Linnaeus put the modern classification system in 1969
- 2- Phylum is composed of a group of families
- 3- Amoeba causes sleeping disease
- 4- Jellyfish belongs to Eutheria order of Mammalia
- 5- Gecko is from insects

B- Compare between

- 1- Cartilaginous and bony fish
- 2- Insects and arachnids
- 3- Annelida and Nematoda
- 4- Monocotyledon and Dicotyledons

Question (5)

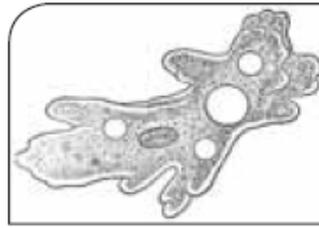
(A) The following figures describe some living organisms, answer the questions



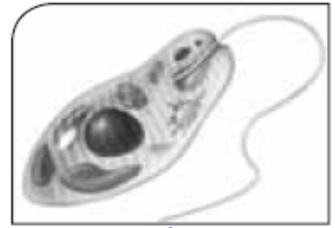
(A)



(B)



(C)



(D)

- 1- Determine the phyla and classes to which the previous organisms belongs
- 2- Mention the method of movement of the previous organisms

(B) classify the following living organisms:-

- 1- Spider
- 2- Human

Living organisms classification dictionary
Including all living organisms of biology curriculum

In alphabetical order

Letter (A)

Amoeba

(Kingdom Protista – Phylum Protozoa – Class Sarcodina)

Ants

(Kingdom Animalia – Phylum Anthropoda – Class insecta)

Apes

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: primates)

Armadillo

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Edentata)

Ascaris

(Kingdom Animalia – Phylum: Nematoda)

Letter (B)

Banana

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Bats

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Chiroptera)

Bean

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Dicotyledon)

Bees

(Kingdom Animalia – Phylum Anthropoda – Class insecta)

Bilharzias worm

(Kingdom Animalia – Phylum: Platyhelmenthes – Class: Trematoda)

Bolty fish

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Osterichthyes)

Bouri fish

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Osterichthyes)

Bread mould

(Kingdom Fungi – Phylum: Zygomycota)

Butterflies

(Kingdom Animalia – Phylum Anthropoda – Class insecta)

Letter (C)**Cactus**

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Camels

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Perissodactyla)

Cat

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Caterpillar

(Kingdom Animalia – Phylum Anthropoda – Class: Myriapoda)

Chameleon

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Reptilia)

Chipmunk

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Rodentia)

Chimpanzee

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: primates)

Chlamydomonas

(Kingdom Plantae – Phylum: Chlorophyta)

Cockroach

(Kingdom Animalia – Phylum Anthropoda – Class insecta)

Corn

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Cotton

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Dicotyledon)

Crabs

(Kingdom Animalia – Phylum Anthropoda – Class Crustacea)

Crayfish

(Kingdom Animalia – Phylum Anthropoda – Class Crustacea)

Crocodiles

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Reptilia)

Cyanobacteria

(Kingdom Monera – Phylum: Eubacteria)

Letter (D)**Diatom**

(Kingdom Protista – Phylum: Chrysophyta)

Dinophlagellates

(Kingdom Protista – Phylum: Pyrrophyta)

Dog

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Dolphin

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Cetacea)

Donkey

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Perissodactyla)

Duck-billed platypus

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Prototheria)

Letter (E)**Eagle**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Aves (birds))

Earthworm

(Kingdom Animalia – Phylum Annelida)

Echidna

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Prototheria)

Elephant

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Proboscidea)

Euglena

(Kingdom Protista – Phylum: Euglenophyta)

Letter (F)**Falaria worm**

(Kingdom Animalia – Phylum: Nematoda)

Fox

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Frog

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Amphibia)

Fucus

(Kingdom Plantae – Phylum: Phaeophyta)

Funeria

(Kingdom Plantae – Phylum: Bryophyta)

Letter (G)**Gazelle**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Artiodactyla)

Gecko

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Reptilia)

Gerbo

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Rodentia)

Giraffes

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Artiodactyla)

Goats

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Artiodactyla)

Gorilla

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: primates)

Letter (H)**Hare**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Lagomorpha)

Hedgehog

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Insectivora)

Horse

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Perissodactyla)

Human

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: primates)

Hydra

(Kingdom Animalia – Phylum Cnidaria – Class: Hydrozoa)

Letter (J)**Jellyfish**

(Kingdom Animalia – Phylum Cnidaria – Class: Scyphozoa)

Jerboa → Gerbo

Letter (K)**Kangaroo**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Metatheria)

Letter (L)**Lampreys**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Agnatha)

Lemurs

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: primates)

Lily

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Lion

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Lizards

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Reptilia)

Locusts

(Kingdom Animalia – Phylum Anthropoda – Class insecta)

Letter (M)**Mice**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Rodentia)

Monkey

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: primates)

Mosquito

(Kingdom Animalia – Phylum Anthropoda – Class insecta)

Mushroom

(Kingdom Fungi – Phylum: Basidimycota)

Mussel

(Kingdom Animalia – Phylum: Mollusca – Class: Bivalvia)

Letter (N)**Nostoc**

(Kingdom Monera – Phylum: Eubacteria)

Letter (O)**Octopus**

(Kingdom Animalia – Phylum: Mollusca – Class: Cephalopoda)

Onion

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Ostrich

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Aves (birds))

Orange

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Dicotyledon)

Oyster

(Kingdom Animalia – Phylum: Mollusca – Class: Bivalvia)

Letter (P)**Palm**

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Paramecium

(Kingdom Protista – Phylum: Protozoa – Class: Ciliophora)

Pea

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Dicotyledon)

Pencilium

(Kingdom Fungi – Phylum Ascomycota)

Pigeons

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Aves (birds))

Pinus

(Kingdom Plantae – Phylum: Tracheophyta – Class: Angiosperma)

Planaria

(Kingdom Animalia – Phylum: Platyhelminthes – Class: Turbellaria)

Plasmodium

(Kingdom Protista – Phylum: Protozoa – Class: Sporozoa)

Platypus → Duck billed platypus

Polysiphonia

(Kingdom Plantae – Phylum: Rhodophyta)

Letter (R)**Rabbit**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Lagomorpha)

Rat

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Rodentia)

Rhinoceros

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Perissodactyla)

Rhizopus nigricans → Bread mould

Ricca

(Kingdom Plantae – Phylum: Bryophyta)

Letter (S)**Salamander**

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Amphibia)

Scorpion

(Kingdom Animalia – Phylum: Anthropoda – Class: Arachnida)

Sea anemone

(Kingdom Animalia – Phylum: Cnidaria – Class: Anthozoa)

Sea cucumber

(Kingdom Animalia – Phylum: Echinodermata – Class: Holothuroidea)

Seal

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Sea Urchin

(Kingdom Animalia – Phylum: Echinodermata – Class: Echinoidea)

Shark

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Chondrichthyes)

Sheep

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Artiodactyla)

Shrimps

(Kingdom Animalia – Phylum Anthropoda – Class Crustacea)

Sloth

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Edentata)

Slug

(Kingdom Animalia – Phylum: Mollusca – Class: Gastropoda)

Snakes

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Reptilia)

Spider

(Kingdom Animalia – Phylum: Arthropoda – Class: Arachnida)

Spirogyra

(Kingdom Plantae – Phylum: Chlorophyta)

Sponge

(Kingdom Animalia – Phylum: Porifera)

Squid

(Kingdom Animalia – Phylum: Mollusca – Class: Cephalopoda)

Squirrel → Chipmunk

Starfish

(Kingdom Animalia – Phylum: Echinodermata – Class: Asteroidea)

Stingray

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Chondrichthyes)

Swallow

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Aves (birds))

Letter (T)**Tape worms**

(Kingdom Animalia – Phylum: Platyhelminthes – Class: Cestoda)

Tiger

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Toads → Frogs

Tortoise

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Amphibia)

Trypanosome

(Kingdom Protista – Phylum: Protozoan – Class: Flagellata)

Turtle

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Amphibia)

Letter (V)

Vougheir

(Kingdom Plantae – Phylum: Tracheophyta – Class: Ferns)

Vultures

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Aves (birds))

Letter (W)

Whales

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Cetacea)

Wheat

(Kingdom Plantae – Phylum Tracheophyta – class: Angiosperma – Subclass: Monocotyledon)

Whiptail stingray → *Stingray*

Wolf

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Carnivora)

Letter (Y)

Yeast

(Kingdom Fungi – Phylum: Ascomycota)

Letter (Z)

Zebra

(Kingdom Animalia – Phylum Chordata – subphylum vertebrata – class: Mammalia – subclass: Eutheria – Order: Perissodactyla)

