**Chapter I : presentation of the animal kingdom**

* 1. **Definitions:**

**Zoology** (Zoo = animal, logos = study)

Zoology is the science whose object is the knowledge of animals; considered in a general sense, this science deals with everything that concerns these beings, and embraces the study of their classification, anatomy, physiology and history. It is the science that studies the animal kingdom.

**Taxonomy:** Is the science of biological classification and the development of its laws, based on systematic knowledge. It includes classification, nomenclature and specimen identification.

**Systematics** is the arrangement of organisms into groups or taxa based on their similarity or evolutionary relatedness, in a coherent system

**Nomenclature** is the branch of taxonomy that deals with assigning names to taxonomic units according to strict rules (International Code)

**Identification** (or determination) is the practical application of taxonomy to ascertain the identity of a biological sample and recognize its affiliation with a previously described taxon.

**Individual:** It is a functional biological system that can be unicellular or composed of many cells, which can be organized into tissues and organs.

**Species:** is a group of individuals differing from others by a characteristic property called ‘specific difference,’ distinguishing multiple species within the same genus.

**Genus:** is a set composed of collections united by a common property. The elements of the genus are the species.

**1.2 Bases of Classification**

The animal kingdom comprises a multitude of living beings with varying appearances (morphology) and internal constitution (internal anatomy, histology, biochemistry)

In the 16th century, each of these forms was referred to by a long phrase describing its external appearance. The initial foundations of taxonomy were laid by Carl von Linné, a Swedish naturalist, who is also the initiator of binomial nomenclature.

The current classification of the animal kingdom is primarily based on research in embryology and paleontology.

**1.3 zoological nomenclature:**

**A/ zoological unit ( species):**

An species is recognized by 4 criteria:

\_ Internal fertilization (intraspecific) and external sterility (interspecific)

\_ Internal and external morphology

\_ Physiology: biochemistry (odors, secretions,…) and biophysics (response to environmental conditions)

\_ Ecology and distribution

**B/ Higher categories above the species:**

A group of species with common characteristics forms a higher category above the species called a genus.

The collection of genera forms a higher category called a family.

(The phylum is the level that corresponds to different stages of evolution, depending on the degree of complexity within a taxon, intermediate values may exist (subclass, subfamily, etc.).

**1.4. Binomial nomenclature:**

Indeed, the species is denominated using two Latin names: the genus and the species. These two names are typically followed by the name or initials of the author and the date of the nomination. This practice is a part of binomial nomenclature and helps provide a precise and unique identification for each species while also recognizing the scientist who described or named it.

Certainly, here’s an example of a taxonomic classification for the domestic dog:

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Carnivora

Family: Canidae

Genus: Canis

Species: Canis lupus familiaris

In this example, “Canis” is the genus, and “Canis lupus familiaris” represents the species of the domestic dog. This classification system helps scientists categorize and understand the relationships between different organisms.

**1.5. Biology and Phylogeny of the Animal Kingdom:**

The animal kingdom is divided into two subkingdoms :

**I \_ Protozoa** (first or primitive) are unicellular animals whose usually fertilized eggs give birth to two similar individuals. The organelles within these cells perform all the vital functions of these primitive beings, including respiration, feeding, excretion, and reproduction.

**II\_ Metazoans** (multiple or advanced) are multicellular animals whose development typically begins with a fertilized cell. During their embryonic development, this cell divides into a variable number of cells arranged in layers, each with different differentiations (ontogenesis = from the egg to the formation of organ rudiments) linked to various functions (contraction, locomotion, digestion, sensitivity, reproduction…). Each group of cells thus formed specializes to give rise to the formation of organs and systems (organogenesis = organ differentiation). The various phyla of metazoans can be grouped by considering the modalities and degree of complexity in their embryonic development.

**2.1 Diploblastic stage:**

Metazoans typically originate from a fertilized egg cell, and the segmentation process leads to the formation of a solid cell mass (morula), which then becomes hollow and is bounded by a single layer of blastomeres (blastula). The blastula transforms into a hollow germ layer bounded by a double wall (gastrula). The outer layer is called ectoderm (ectoblast), and the inner layer is called endoderm (endoblast). The internal cavity represents the primitive gut, which communicates with the outside through a single opening (blastopore) that serves the dual function of a mouth and anus.

Diploblastic metazoans are more primitive among current metazoans lack of symmetry, absence of defined organs, and the nervous system remains diffuse… examples include sponges and cnidarians

**2.2 Triploblastic stage:**

Ontogenesis is characterized by the appearance of a third layer (mesoderm or mesoblast) situated between the ectoderm and endoderm, replacing the mesoglea.It is possible to divide triploblastic organisms into two groups.

**a/ Acoelomate triploblasts:**

The mesoderm remains compact and never organizes into closed vesicles. This layer only plays a minor role by contributing to the formation of the parenchyma (diffuse tissue that fills the general cavity) and the development of some muscles and reproductive organs. Examples include flatworms and roundworms.

**b/ Coelomate triploblasts**:

mesodermal cells, on either side of the digestive tube, form paired, symmetrical cellular masses that organize into closed vesicles or coelomic cavities. This segmentation of the mesoderm is accompanied by the distribution of muscular masses, nervous structures, excretory, and genital formations. It is also accompanied by a condensation of anterior nervous elements.

**1.5 : A simplified phylogenetic classification:**

