SESSION 14: BIODIVERSITY & CLASSIFICATION

KEY CONCEPTS

In this session we will focus on summarising what you need to know about:

- Biodiversity of Earth & SA
- History of Classification
- Taxonomic levels of classification

X-PLANATION

Biodiversity and Classification

Biodiversity refers to the variety of living organisms on earth, which includes species diversity (no. of different species of herbivores), genetic diversity (differences in genes of one species e.g. dog species) and ecosystem diversity (seven highly diverse biomes in SA).

According to the IUCN (International Union for Conservation, SA is ranked as the third most diverse country in the world, in spite of it occupying a surface area of only 1% of the earth’s surface. This is due to it being home of 23 500 plant species, 600 bird species, 2220 fish species, 370 reptile and amphibian species and 80 000 insect species as well as 250 mammal species out of two million known species in the world.

1. Indigenous Species

These are species that occur naturally in a country or area as they are suited to living in that specific climatic conditions or biome. eg. African Elephant is indigenous to Southern Africa, but not just SA because it is found in many countries in Southern Africa and not SA alone.

2. Endemic Species:

These are plants and animals found only in a specific habitat of a country and nowhere else in the country e.g., the Protea and Fynbos in Western Cape. The Cape Floristic region is a hotspot of SA’s biodiversity.

3. Prokaryotes:

Are uni- or multicellular organisms made up of cells that do not have a nuclear envelope (pro-, “before”, karyon, “nucleus”). The genetic material is not bound in a nucleus. They also lack cell organelles such as an endoplasmic reticulum, a Golgi apparatus, lysosomes, and mitochondria. Prokaryotes are divided into two main groups namely the Archaeabacteria (ancient bacteria) and Eubacteria (true bacteria).

4. Eukaryotes:

Are multicellular organisms made up of cells (eu-,”true”, karyon, “nucleus”) that possess a membrane-bound nucleus (that holds genetic material) as well as
membrane-bound cell organelles. Genetic material in eukaryotes is contained within a nucleus. Eukaryotic organisms include organisms such as plants, animals, fungi, and protists.

5. **Prokaryotes and eukaryotes**

Differences between prokaryotes and eukaryotes:

<table>
<thead>
<tr>
<th>Prokaryotes</th>
<th>Eukaryotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small cells</td>
<td>Large cells</td>
</tr>
<tr>
<td>Unicellular or multicellular</td>
<td>Often (but not always) multicellular</td>
</tr>
<tr>
<td>Genetic material is not contained within a nucleus</td>
<td>Genetic material is contained in a membrane-bound nucleus</td>
</tr>
<tr>
<td>Lacks cell organelles such as endoplasmic reticulum, a Golgi apparatus, lysosomes, and mitochondria</td>
<td>Has cell organelles</td>
</tr>
<tr>
<td>Divided into Eubacteria and Archeabacteria</td>
<td>Divided into protists, fungi, plants and animals</td>
</tr>
</tbody>
</table>

**Classification Schemes**

Due to the vast number of organisms that exist on Earth, scientists group organisms according to features/characteristics they have in common. This is just like sorting out cutlery in the kitchen or the clothes in your cupboard.

1. **History of Classification**

Aristotle:
Greek philosopher classified living things into plants or animals according to their appearance.

Carolus Linnaeus:
Swedish scientist introduced the binomial nomenclature system (two name system of classification) using the Genus and species naming system. Capital letter used for genus and small letter for species e.g. *Homo* (genus) and *sapiens* (species) to classify modern humans or *Panthera leo* for a lion and *Panthera pardus* for a leopard.

He further classified organisms using the seven taxonomic levels.

**Example:**
- **KINGDOM:** *Plantae*
- **PHYLUM:** *Angiosperms* (Flowering plants)
- **CLASS:** *Monocotyledonous* (one seeded)
- **ORDER:** *Cyperales* (wind pollinated)
- **FAMILY:** *Poacea* (grasses)
- **GENUS:** *Zea* (leafy stalk)
- **SPECIES:** *Mays* (mealies)
Scientific names are taken Greek or Latin as these do not change. Common names can be confusing as there can be more than one common name for an organism e.g. man, humans, people. Names also differ from one country to the next e.g. the cat is *le chat* in French and *ekat* in isiZulu.

Robert Whittaker introduced the FIVE- KINGDOM CLASSIFICATION according to their mode of nutrition.

Kingdom Monera (Bacteria)  
Kingdom Protista (amoeba)  
Kingdom Fungi (moulds)  
Kingdom Plantae (plants)  
Kingdom Animalia (animals)

**Kingdom Monera**  
- Simple, one-celled  
- Prokaryotes  
- Autotrophic or heterotrophic  
- Reproduction by simple mitosis  
- E.g. Virus & bacteria
Kingdom Protista
• Simple, one-celled
• Eukaryotes
• Autotrophic or heterotrophic
• Reproduction by simple mitosis
• E.g. Amoeba, Spirogyra & Seaweed

Kingdom: Plantae
• Eukaryotes
• COMPLEX Multicellular, WITH cell walls of CELLULOSE
• Autotrophs
• Have chlorophyll and produces nutrition during PHOTOSYNTHESIS
• Reproduce asexually by means of spores
• Sexually by means of gametes
• E.g. Bryophyta(mosses), Pteridiophyta(ferns), conifers, fynbos and angiosperms
Kingdom Fungi
- Eukaryotes
- COMPLEX Multicellular, with cell walls of CHITIN
- Heterotrophs, including saprophytes and parasites
- Reproduce sexually and asexually by means of spores
- E.g. Mushrooms, yeast and bread mould

Kingdom Animalia
- Eukaryotes
- COMPLEX Multicellular, without cell walls
- Heterotrophs
- Asexual, but many sexual reproduction
- E.g. Coral, insects, reptiles, birds and mammals
X-AMPLE QUESTIONS

QUESTION 1

1.1 Which is the scientific name of an organism?
   a. Felidae
   b. domesticus
   c. Felidae domesticus
   d. All of these are correct

1.2 Which scientist is responsible for classifying organisms into plants and animals?
   a. Robert Whittaker
   b. Carolus Linnaeus
   c. Aristotle
   d. Carl Woese

1.3 Which taxonomic level is the highest in the classification scheme?
   a. Kingdom
   b. Domain
   c. Species
   d. Genus

1.4 Which kingdom is mismatched?
   a. Prokaryotes – fungi
   b. Protista – multicellular algae
   c. Plantae – flowers and mosses
   d. Animalia - arthropods and humans

1.5 One major difference between eukaryotes and prokaryotes is that …
   a. they have a cell wall
   b. they have nuclear material
   c. the presence or absence of a nuclear membrane
   d. they are living

QUESTION 2:

2.1 Why is SA regarded as a “biodiversity hotspot”?
2.2 State the significance of a classification system of naming organisms?

QUESTION 3:

3.1 Explain the binomial system of naming organisms.
3.2 What are the seven obligatory classification categories?
3.3 Name the five kingdoms recognised and give examples of each kingdom
3.4 State the characters of each kingdom.