



SUBJECT and GRADE	Life Sciences Grade 10
TERM 4	Week 2
TOPIC	Biodiversity and classification: classification schemes
AIMS OF LESSON	At the end of this lesson you should be able to know: • a brief history of classification • the five kingdom system • the naming of things in science • the differences between prokaryotes and eukaryotes • the diagnostic features of main grouping of living organisms
RESOURCES	<i>Paper based resources</i>
	Refer to your textbook section on: • biodiversity and classification
INTRODUCTION	• Revise the topics 'environment and ecosystems' in Grade 10
	<u>Study the following content:</u> <u>Biodiversity</u> • Refers to the variety of life forms that exist on Earth <u>History of classification</u> <u>The two-kingdom system:</u> • Simple classification systems were based on shared physical characteristics • As information increases classification systems became more complex • A Swedish botanist, Carl Linnaeus, classified living organisms into two kingdoms i.e. Plantae (plants) and Animalia (animals) • Linnaeus developed a classification system where seven categories under each kingdom are used: Kingdom → Phylum/Division → Class → Order → Family → Genus → Species

CONCEPTS AND SKILLS

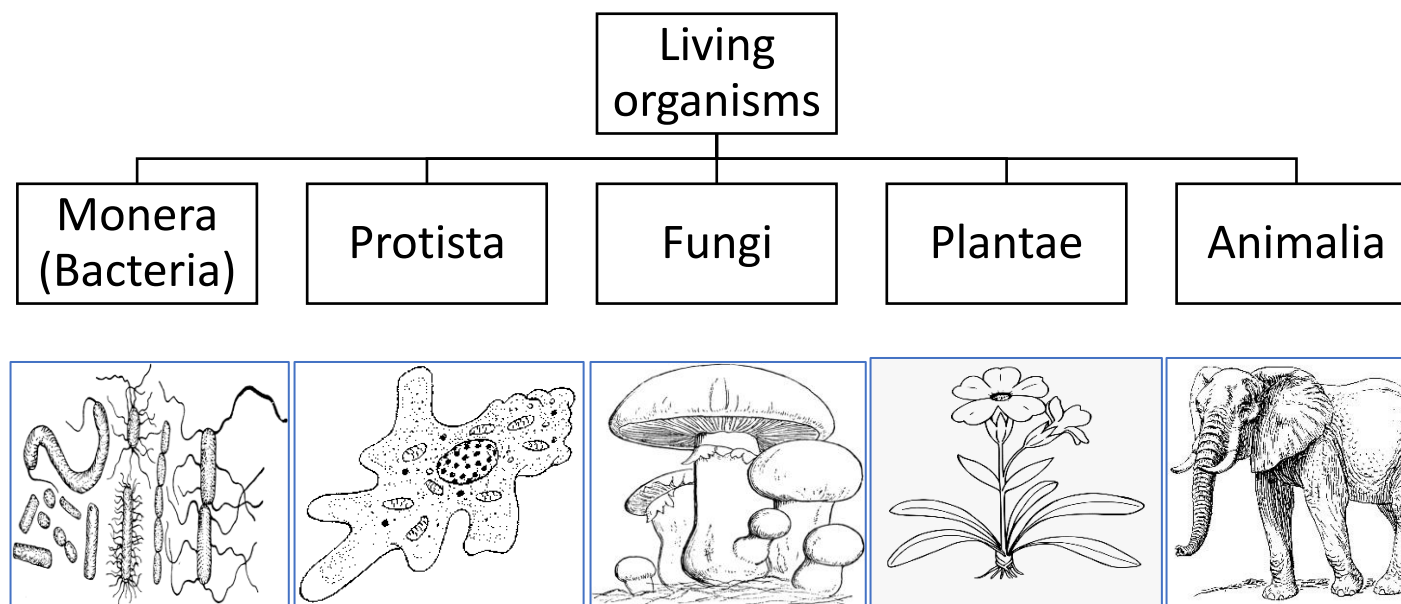
- A kingdom is divided into phyla in animals but divisions in plants
- The above categories are based on shared physical characteristics within each group

Table to show the basic classification of two organisms

Division	Lion	Pine tree
Kingdom	Animalia	Plantae
Phylum/Division	Chordata	Pteridophyta
Class	Mammalia	Gymnospermae
Order	Carnivora	Coniferales
Family	Felidae	Pinaceae
Genus	<i>Panthera</i>	<i>Pinus</i>
Species	<i>leo</i>	<i>ponderosa</i>

The five-kingdom system:

- The most common classification system, the five-kingdom system was proposed by Robert Whitaker in 1969
- The five-kingdom system is currently one of the accepted classification systems



Naming of living organisms:

- Carl Linnaeus designed a **binomial** system for naming of living organisms
- The first word of the name is the **genus** and the second word is the **species**
- The genus name is written with a capital letter and the species with a small letter e.g. *Panthero leo*
- If the name is written by hand, the genus and species names are underlined e.g. Panthero leo
- When typing the name, the whole name is typed in italics e.g. *Panthero leo*

Biological keys:

- A biological key e.g. a **dichotomous key** is an instrument used to classify living organisms
- A dichotomous key always gives two choices at each step.
- At each step two statements are given based on the characteristics of the organism
- If the right option is chosen at each step it will lead to the name of the organism.

Example of a dichotomous key:

1	a. Three pairs of legs present	Insecta
	b. More than three pairs of legs present	Go to 2
2	a. Four pairs of legs present	Arachnida
	b. More than four pairs of legs present	Go to 3
3	a. Two pairs of antennae present	Crustacea
	b. One pair of antennae present	Go to 4
4	a. Antennae branched at tip	Paupoda
	b. Antennae unbranched	Go to 5
5	a. Two pairs of legs on each body segment	Diplopoda
	b. One pair of legs on each body segment	Go to 6
6	a. Twelve pairs of legs present, eyes absent	Symphyla
	b. More than twelve pairs of legs present	Chilopoda

Differences between prokaryotes and eukaryotes:

Prokaryotes	Eukaryotes
Organisms with cells with no true nuclei	Organisms with cells that have true nuclei
Their genetic material /DNA is not enclosed by a nuclear membrane and occurs free in the cytoplasm	Their genetic material /DNA is enclosed by a nuclear membrane and occurs free in the cytoplasm
No true organelles occur in the cytoplasm	True organelles occur in the cytoplasm
Monera are prokaryotes	Protista, Fungi, Plantae and Animalia are eukaryotes

Diagnostic features of main groups of organisms:

	KINGDOM				
	Monera (Bacteria)	Protista	Fungi	Plantae (Plants)	Animalia (animals)
Characteristics	• Prokaryotes • Single-celled (unicellular) • Micro-organisms • Heterotrophic and autotrophic • Asexual reproduction	• Eukaryotes • Most are unicellular but some are multicellular • Heterotrophic or autotrophic • Asexual reproduction, some reproduce sexually	• Eukaryotes • Some are unicellular but most are multicellular • Heterotrophic, most are saprophytes • Asexual reproduction, some reproduce sexually	• Eukaryotes • Multicellular • Most plants are autotrophic • Asexual reproduction by means of spores or sexual reproduction by means of gametes	• Eukaryotes • Multicellular • Do not have cell walls • Animals are heterotrophic • Reproduction is sometimes asexual but mostly sexual by means of gametes
Examples	Bacteria	Protozoa, algae, slime moulds and water moulds	Yeast, mushrooms, moulds	Mosses, ferns, conifers, flowering plants	Sponges, jelly-fish, flatworms, round worms, earthworms, snails, starfish, insects, spiders, fish, mammals etc.

Know the meaning of instructional verbs in test and examination questions e.g.

Instructional verb	Meaning
Name	Give the name of something
Differentiate	Use differences to qualify between two or more categories
Tabulate	Draw a table and indicate the answers as direct pairs.
Describe	State in sentences the main points of a process
Explain	Give your answer in a cause-effect or statement and reason sequence
Compare	Give similarities and differences between concepts

Answer the following questions:

Question 1:

1. Give the correct biological term for each of the following descriptions.

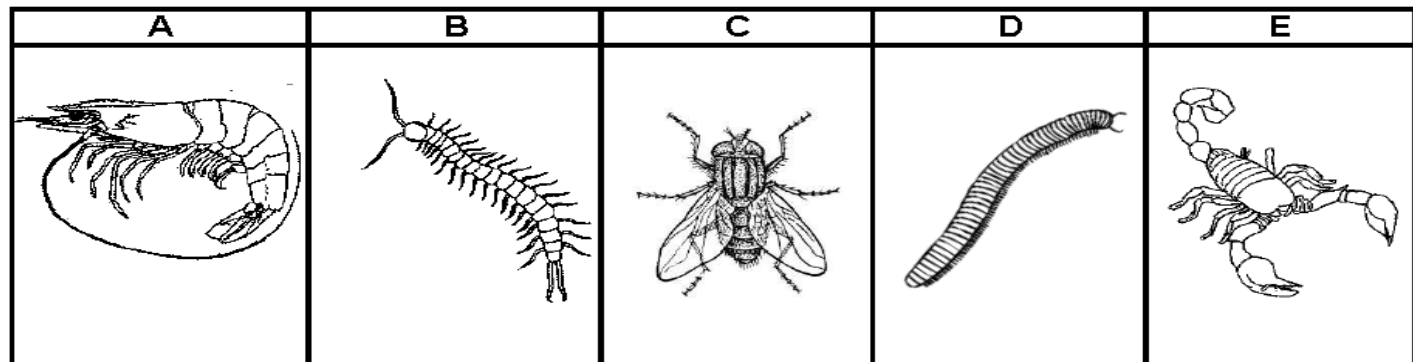
- (a) The variety of living organisms on Earth
- (b) Classification system designed by Charles Linnaeus for the naming of living organisms.
- (c) Organisms with cells that do not have true nuclei
- (d) Organisms with cells that have true nuclei
- (e) The kingdom in the five-kingdom system under which all animal phyla are classified
- (f) The dual name system where each species has its own unique genus and species name.

Question 2:

The table below shows some characteristics of arthropods. Use the information in the table to find the class of the animals labelled **A** to **E**. (Free State P2 Nov 2017)

CLASS	LEGS	WINGS	BODY REGIONS	ANTENNAE
Insecta	Three pairs	Some have	Head, thorax, abdomen	Yes
Arachnida	Four pairs	No	Cephalothorax, abdomen	No
Crustacea	Five to seven pairs	No	Cephalothorax, abdomen	Two pairs
Diplopoda	More than ten pairs, two pair per segment	No	Long worm-like, cylindrical	One pair, short
Chilopoda	More than ten pairs, one pair per segment	No	Long, worm-like, flattened	One pair, long

Match the correct letter of the organisms **A** to **E** to the class described in the table and give reasons why it belongs to that class.



	<u>Question 3:</u> The domestic cat is classified under the genus <i>Felis</i> and belongs to the species <i>domesticus</i>. Write down the genus and species names of the domestic cat according to the rules of the binomial system. Common errors made by learners in examinations: • Not familiar with basic terminology • Not able to use a dichotomous key to classify organisms • Not understanding instructional verb/s in a question e.g. the difference between <i>describe</i> and <i>explain</i>
ACTIVITIES/ASSESSMENT	Complete the activities/questions in your textbook on the section of this lesson.
CONSOLIDATION	• Define all the terminology relevant to the concepts covered in this lesson • Work through questions on this topic in your textbook and other resources.
VALUES	By studying and learning about this section you will develop an awareness of what it means to be a responsible citizen in terms of the environment and the life-style choices that you make.