

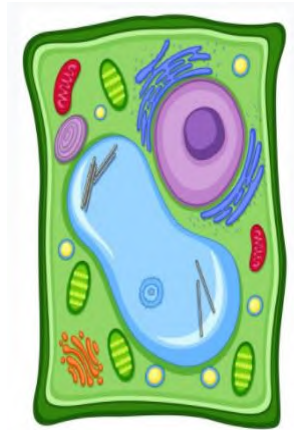


LIFE SCIENCES

GRADE 10

REMOTE LEARNING WORKBOOK





TERM 1





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WEEK 1: TOPIC: Orientation to Life Sciences

SUB-TOPIC: How science works

NOTES & EXAM TIPS

GRAPHS

Graphs are a way of recording the relationship between two things / factors that can change in picture form. These factors that change in relation to each other are called **variables**.

Graphs are therefore a way of recording large amounts of information in a simple form that can easily be understood. Graphs make it easier to interpret trends.

Depending on the information we want to record, we can use different types of graphs. The most common graph is the (**jagged**) **line graph**; we will also deal with **bar graphs, histograms and pie graphs**.

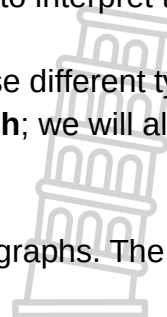
Before we start, we need to learn the terminology linked to graphs. The following terms are common to most graphs:

Axis (pl. axes):

The vertical axis is the y-axis
The horizontal axis is the x-axis

Origin:

The point where the x- and y-axis cross meet.
THERE MUST BE A ZERO AT THE ORIGIN.





Independent variable:	always goes on the x-axis. This is the variable that we can control / change so that we can see what happens.
Dependent variable:	always goes on the y-axis. This is the variable that depends on the independent variable i.e. it changes as we change the independent variable / the variable that is measured .
Scale:	This is the way we determine how to plot the information on the graph and we have to take readings from the graph and carefully consider it before we start the graph. We need to make sure that our scale covers all the figures that we have to plot. The scale starts at 0 and must be kept constant e.g. 5, 10, 15, 20 or 10, 20, 30 etc. The scale must also be clearly marked on the axes.
Heading:	All graphs must have a heading that includes the information on both axes i.e. both variables. The question will guide you to write the heading. The heading must say what type of graph it is. The heading must not have the units. The heading must be underlined.
Labels:	Each axis must be correctly labelled – always include units (if there are any)
Plotting points:	Plot the points and clearly mark them on the graph with a dot. Use a ruler to join the plotted points.

2. BAR GRAPHS:

Bar graphs are used when one of the variables is given in numbers.

Remember:

- Bar graphs have separate bars like the bars in a prison
- Bars are always the same size (width) – measure and draw with a ruler
- Spaces between the bars are always the same size
- Do not draw bars against the y-axis
- Scale must be clearly marked and the number written next to the mark
- It is strongly advised that a key be used. e.g. A, B, C or 1, 2, 3.

- Do not write in the bars.

3. HISTOGRAMS:

Histograms are used when information is presented in continuous groups.

These are similar

to bar graphs BUT THERE ARE NO SPACES BETWEEN THE BARS.

Remember:

- Bars are always the same size (width) – measure and draw with a ruler
- Scale must be clearly marked and the number written next to the mark
- It is strongly advised that a key be used. e.g. A, B, C or 1, 2, 3.
- Do not write in the bars.

4. PIE CHARTS:

How to draw a pie chart:

- | | | |
|------------------------------------|-----------|---|
| 1. Add the numbers to get a total. | OR | 1. Add the numbers to get a total |
| 2. Convert to %. | | 2. Divide the value of the portion by the total |
| 3. Convert % to degrees. | | 3. Multiply the answer with 360° |

Example.

Convert the following table to a pie chart.

Different food types	No. of portions
Lipids	10
Proteins	20
carbohydrates	40

Step 1 – Add number of portions together to get a total

$$10 + 20 + 40 = 70$$

Step 2 – Convert each food type to %.

$$\text{Lipids: } \frac{10}{70} \times 100 = 14\%$$

$$\text{Proteins: } \frac{20}{70} \times 100 = 29\%$$

Carbohydrates: $\frac{40 \times 100}{70} = 57\%$

$14 + 29 + 57 = 100\%$

Make sure you round off correctly till you get 100% then proceed to the next step.

Step 3 - Convert the % to degrees by multiplying by 3.6 OR 360/100.

Lipids - $14\% \times 3.6 = 50^\circ$

Proteins – $29\% \times 3.6 = 105^\circ$

Carbohydrates – $57 \times 3.6 = 205^\circ$

$50 + 105 + 205 = 360^\circ$

Add all degrees and once you have 360 degrees then you may proceed to draw the circle.

Remember to use a key for the pie chart.

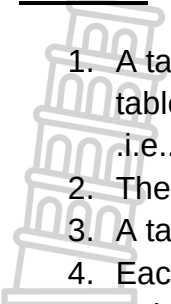
Do not write any numbers in the pie chart.

SCIENTIFIC DIAGRAMS:

Remember:

1. Diagrams must be drawn with a pencil.
2. Draw sharp, clear and solid lines.
3. No shading or colour.
4. Diagrams must be **10 lines big or a third of the page big.**
5. Labels should be printed in lowercase unless a structure is the name of a person e.g. Golgi apparatus.
6. Labels must be one below each other.
7. Label lines should be drawn with a ruler and should be parallel.
8. Heading should include: Drawing of what it is which view i.e. L/S or a C/S fresh material / seen under a microscope with magnification e.g. A line diagram of a cross section of a dicot root as seen under a microscope X200. (Section of diagram and magnification must be include only if relevant to diagram)
9. Heading must be underlined.
10. You may be asked to draw **annotated diagrams**. These are diagrams with labels and functions or labels and descriptions of the structures.

TABLES

- 
1. A table must have a heading which includes the variables that are in the table
i.e.. A table of
 2. The heading must be underlined.
 3. A table must have columns and rows. (Horizontal and vertical lines)
 4. Each column must have a heading and units. (if applicable).
 5. Table must have a frame or border (**drawn in pencil and with a ruler**)

THE SCIENTIFIC METHOD

Steps of the scientific method

Ask a question: The scientific method starts with a question about something that you observe:

How, Why, When, What or Where?

Construct a hypothesis: A hypothesis is an educated guess about the outcome of the experiment:

If _____ (I do this) _____, then _____ (this) _____ will happen.

You must state your hypothesis in a way that you can easily measure or test. Include both the dependent and independent variable and the relationship between the variables in the hypothesis.

Test your hypothesis by doing an experiment: your experiment tests whether your hypothesis is true or false. It is important for your experiment to be a fair test. You conduct a fair test by making sure that you change only one factor at a time while keeping all the other conditions the same.

You should also repeat your experiments several times to make sure that the first results were not just an accident (if possible).

Variables

Independent variable: a variable/factor that you choose to control in the experiment.

Dependent variable: a variable/factor that you measure in an experiment.

Fixed variables: Variables/factors that stay the same throughout the experiment.

Begin with the word same...

Aim

To determine / To investigate The aim must include the 2 variables.

Apparatus

List all apparatus/ chemicals/equipment you will use in the experiment. You may be asked to draw the apparatus as it should be set up.

Method

The method is written in steps and is numbered. It is short and simple and written in third person, as a set of instructions.

Results/Observation

A table is best used to record results. The observation can include what you have seen, heard or smelt. You may be asked to draw a graph in the results.

Discussion

State the results. Discuss the results. Why it happened and what caused it to occur? Was the hypothesis true or false? Was it a fair test? How could you have improved the experiment?

Conclusion

Refer back to aim. It is a short statement.

RELIABILITY

- Repeat the investigation.
- Increase the sample size.

VALIDITY

Validity questions how the investigation or experiment or method was carried out. It is important to be sure that all the factors or variables have been controlled except the one variable that is being tested.

To ensure validity the samples must be chosen randomly.

CALCULATIONS

(1) AVERAGES

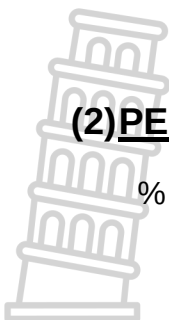
To calculate the average: Add together the set of quantities and then divide by the number of

quantities that were added.

Example.

The average of 2, 4, 6 and 8

$$2+4+6+8 = 20$$
$$20 \div 4 = 5 \text{ is the average.}$$



(2) PERCENTAGE INCREASE AND DECREASE

$$\% \text{ increase or decrease} = \frac{\text{difference}}{\text{first}} \times 100$$

You must know and write the formula in any problem.

(3) RATIOS

Simplify the numbers to its simplest form.
Remember the order of the ratio is given in the question.

1. MAGNIFICATION: Using a microscope

Total magnification = eyepiece magnification x objective lens magnification

$$= 10 \times 40$$

$$= 400X$$

Actual length of specimen = $\frac{\text{measured length of specimen} \times \text{length on scale}}{\text{measured length on scale}}$

ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

- 1.1. Draw two graphs on the same set of axes showing the changes in heart rate of two boys, John and Thabo, as they run over a certain distance.

Distance run (m)	John's heart rate (beats per minute)	Thabo's heart rate (beats per minute)
0	60	70
100	75	80
200	85	90



400	100	110
800	120	115
1500	120	130

1.2. What is the relationship between exercise (running further and further) and heart rate (heart beats per minute)?

2.1. Translate the information in the table below showing the number of learners in a class of 35 who like different types of sports, into a bar graph.

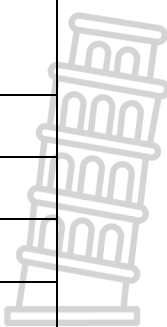
Types of sports	Number of learners who like the sport
Soccer	8
Rugby	5
Basketball	6
Netball	10
Volleyball	2
Cricket	4

2.2. Which sport is liked the least?

2.3. Which sport is liked the most?

3.1. Translate the information showing the number of learners who like different type of fruits into a pie graph. Show all workings.

Types of fruits	No. of learners who like the fruits
Kiwi	10
Apples	5
Pears	15
Oranges	10





WEEK 2: TOPIC: Biosphere to ecosystems

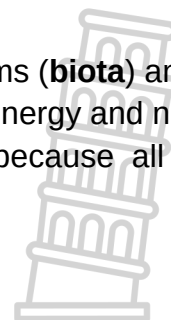
SUB-TOPIC: Biosphere & Biomes

NOTES & EXAM TIPS

BIOSPHERE

Biosphere : bio=life sphere=ball

- Is a global ecosystem composed of living organisms (**biota**) and the nonliving factors (abiotic) from which they derive energy and nutrients.
- Therefore its referred to as a **global ecosystem** because all living organisms on Earth live in it.
- The biosphere is made up of three components
- **Atmosphere**
- **Lithosphere**
- **Hydrosphere**



THE ATMOSPHERE:

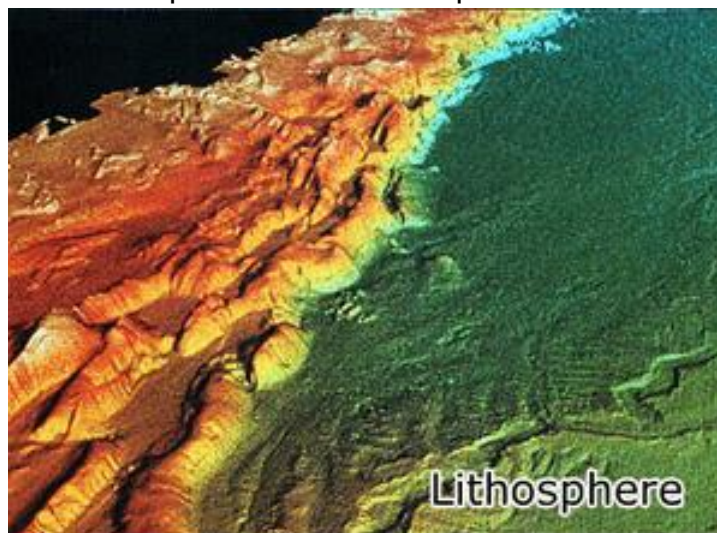
- Is the layer of gases surrounding the earth.

- The atmosphere's ability to absorb the ultraviolet rays of the sun is what allows life on earth to survive.



THE LITHOSPHERE:

- Is the rocky outer part of the Earth. It is made up of the brittle crust and the top part of the upper mantle. The **lithosphere** is the coolest and most rigid part of the Earth.
- The lithosphere shields living organisms from the heat of the Earth's core .
- It also contains ionic compounds which allow plant and animal life to exist.

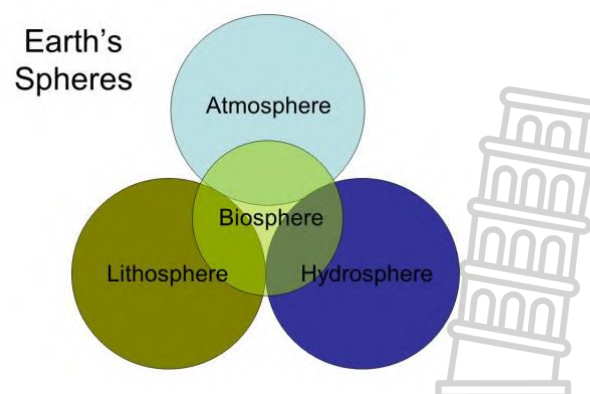


THE HYDROSPHERE:

- Is the combined mass of water found on, under and above the surface of the earth.
- Example: lakes, rivers and springs, oceans (freshwater and salt water).
- It is a home to a wide diversity of aquatic, plant and animal life.

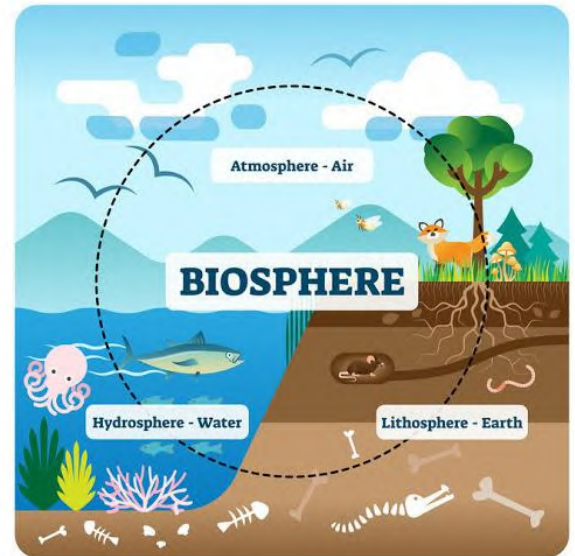
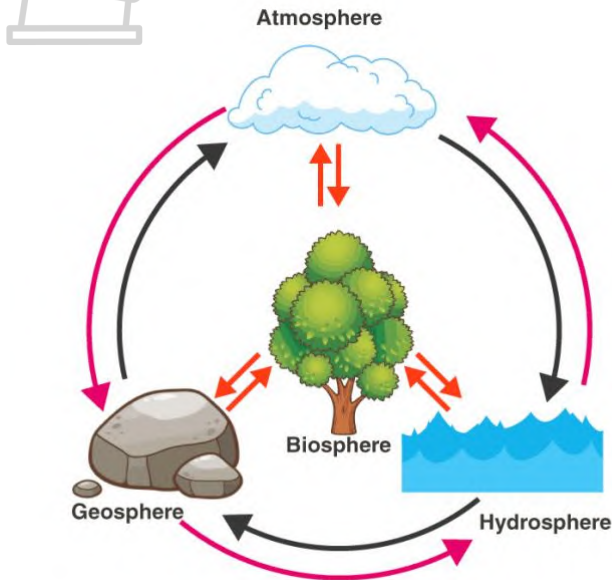


How does the biosphere interact with other spheres?



- The disturbances in one sphere affects the other spheres.
- Example, deforestation (biosphere) results in increased erosion of soil (the upper layer of the lithosphere) into rivers (hydrosphere).
- Deforestation also results in an increase in atmospheric carbon dioxide (atmosphere).
- This is an example of how disturbances in one sphere produces effects in other spheres eg hydrosphere, upper lithosphere and the atmosphere.

- These **spheres** are closely connected.
- For example, many birds (biosphere) fly through the air (atmosphere), while water (hydrosphere) often flows through the soil (lithosphere).
- This means a change in the atmosphere can cause a change in the hydrosphere, and vice versa as seen below.



BIOMES

- The **biosphere** is divided up into a number of **biomes**.
- A **biome** is a collection of plants and animals that have common characteristics for the environment they exist in.
- These biomes have distinct biological communities that have formed in response to a shared physical climate.
- Temperature range, soil type, and the amount of light and water are **unique** to a particular place. This is what is used to define a biome.

TYPES OF BIOMES.

Biomes are grouped into two categories (types)

1. TERRESTRIAL BIOMES

- is an area of **land** with a similar climate that includes similar communities of plants as trees, shrubs, grasses and animals.

2. AQUATIC BIOMES

- is divided into freshwater and marine regions.



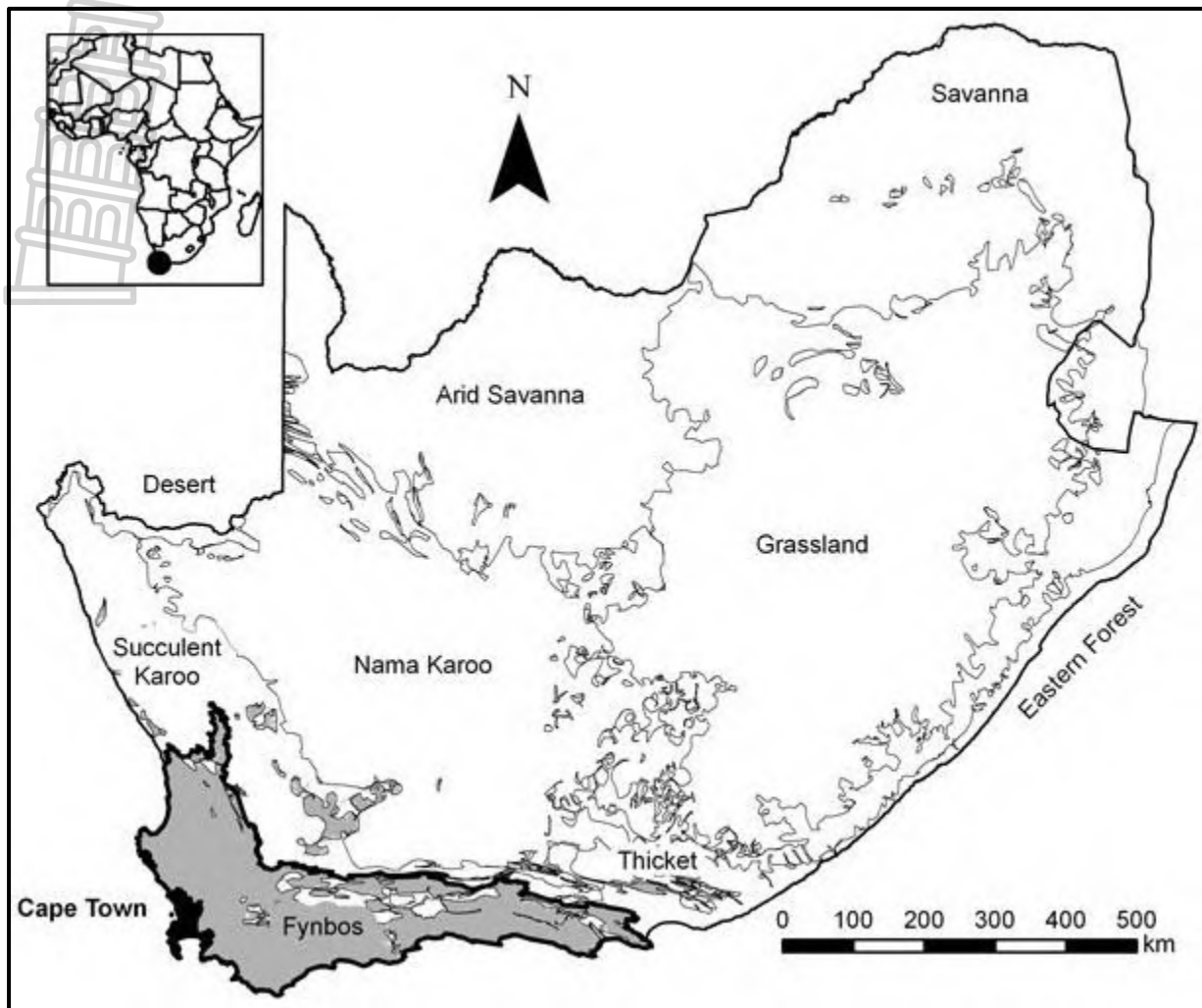
SOUTH AFRICAN TERRESTRIAL BIOMES

South Africa has **nine biomes**, based on vegetation types that share similar ecological characteristics.

Each biome has a characteristic climate envelope, or a range and pattern of temperature and rainfall patterns, within which it occurs.

- 1) **Grassland.**
- 2) **Savannah.**
- 3) **Arid Savannah**
- 4) **Succulent Karoo.**
- 5) **Nama Karoo.**
- 6) **Forest.**
- 7) **Fynbos.**
- 8) **Desert.**
- 9) **Thicket.**





Nama Karoo



Savannah



Succulent Karoo





How Climate, Soils and vegetation influence organisms?

- The key factors determining climate are average annual precipitation (rainfall) and temperature.
- The specific conditions of biomes determine the communities of plants, animals and soil organisms in a particular biome.
- The climate affects the soil. Example soil can be dried out and rearranged during droughty or windy weather.
- As the soil dries out, plant growth is reduced, which reduces the stability of the surface layer and causes more erosion.
- Vegetation can affect climate and weather patterns due to the release of water vapour during photosynthesis. The release of vapour into the air alters the surface energy fluxes and leads to potential cloud formation/rain.

AQUATIC BIOMES

Water covers a major portion of the Earth's surface, so aquatic biomes contain a rich diversity of plants and animals.

ITS DIVIDED INTO TWO SUB BIOMES

Freshwater (low salt content), example ponds, lakes, streams, rivers and wetlands.



And

Marine (high salt content), example oceans, coral reefs and estuaries.



ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

QUESTION 1

1.1 Various options are provided as possible answers to the following questions.

Choose the correct answer and write ONLY the letter (A to D) next to the question number (1.1.1 to 1.1.7) in your answer book, for example 1.1.8 B.

1.1.1 All parts of the Earth where life exists is called the ...

- A biomass.
- B biosphere.
- C biotic factors.
- D abiotic factors.

1.1.2 The layer of air that surrounds the Earth is called the ...

- A lithosphere.
- B hydrosphere.
- C atmosphere.
- D biosphere.

1.1.3 The Biosphere consists of . . .

- A the lithosphere.
- B the atmosphere.
- C the hydrosphere.
- D all the above.

1.1.4 Which component of the biosphere is related to soil?

- A Lithosphere
- B Hydrosphere
- C Atmosphere
- D Hemisphere

1.1.5 Which two spheres are represented in the image?



A. The biosphere and the lithosphere

- B. The atmosphere and the biosphere
- C. The hydrosphere and the atmosphere
- D. The lithosphere and the hydrosphere

1.1.6 Which sequence of events shows the hydrosphere effecting the biosphere, then the biosphere effecting another part of the biosphere?



A

- A: a tornado forms
- B: the tornado rips up trees
- C: trees are in the air

B

- A: people breathe in oxygen
- B: people breathe out carbon dioxide
- C: the air is full of carbon dioxide

C

- A: rain clouds form
- B: rain washes trash into the sewers
- C: people have to clean it up

D

- A: it rains
- B: animals drink water
- C: animals get eaten by people

1.1.7 Ponds and rivers are two types of:

- A. Marine biomes
- B. Rain forest biomes
- C. Freshwater biomes
- D. Estuary biomes

(14)

1.2 Give the **biological term** for each of the following descriptions.

Write ONLY the term next to the question number (1.2.1 to 1.2.5) in your answer book.

1.2.1. A biome that is characterised by having large trees and shade - loving shrubs in the undergrowth.

1.2.2. Part of the earth water and atmosphere which inhabits living organisms.

1.2.3. The upper, rigid layer of the Earth.

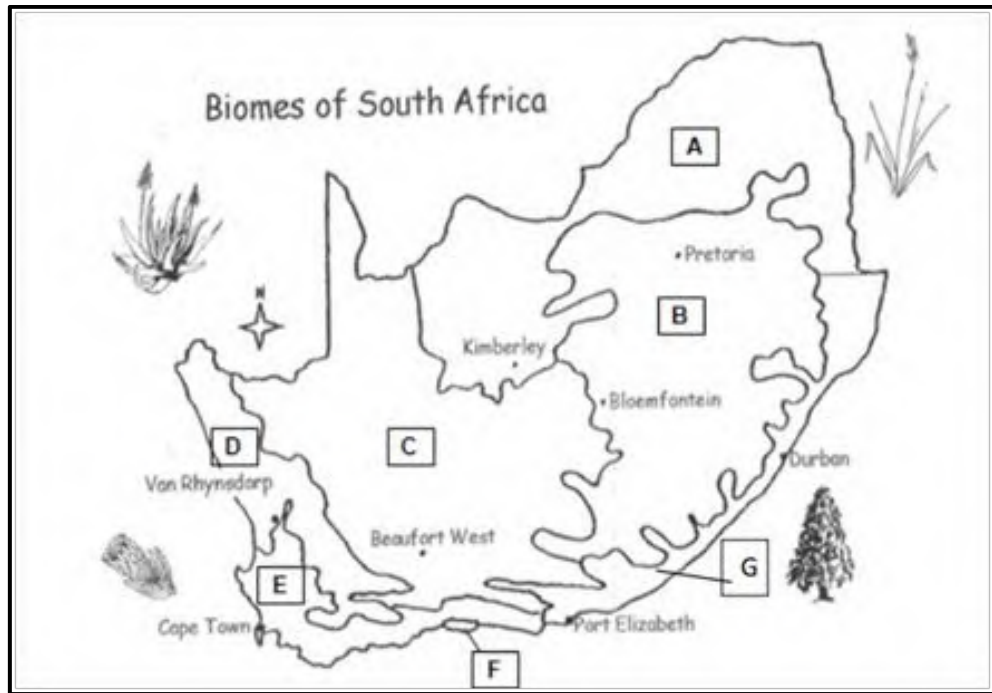
1.2.4. Region of the earth that encompasses all living organisms: plants,

animals and bacteria.

- 1.2.5. The major climatic regions of the world, classified according to their predominant vegetation and characterised by adaptations of organisms to that particular environment. (5)

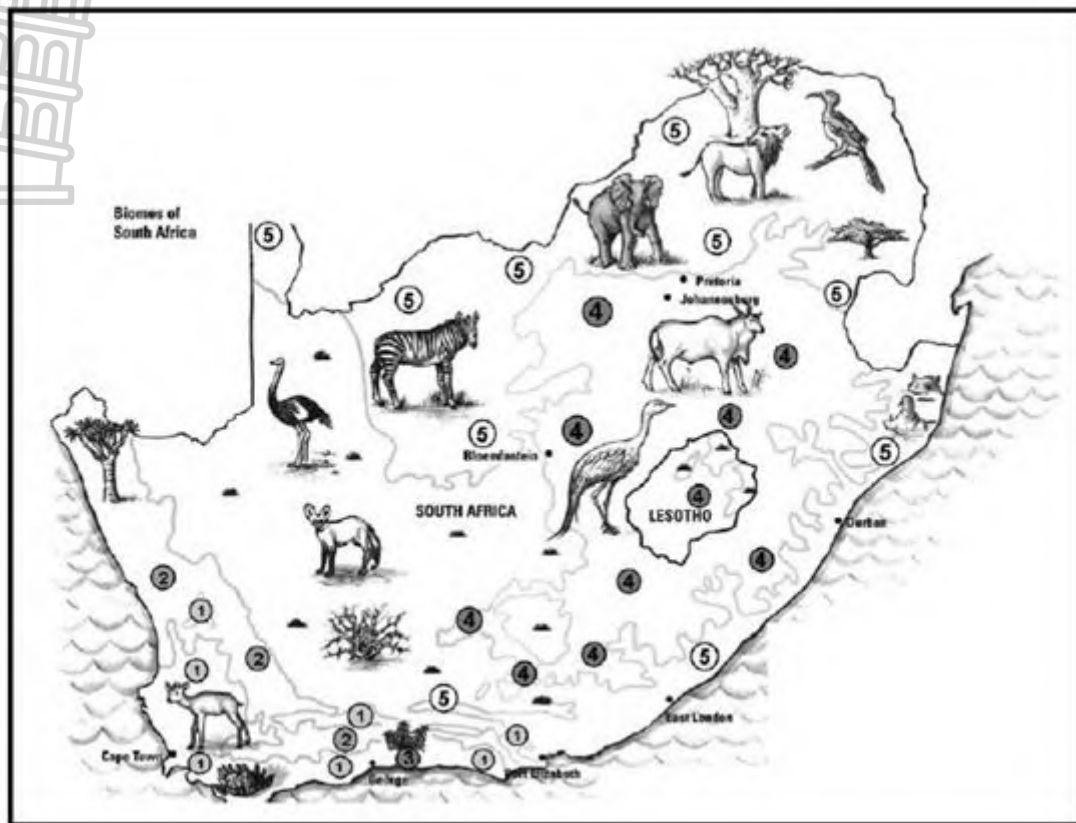
QUESTION 2

- 2.1 Study the map below where South Africa's terrestrial biomes are indicated with the letters A to G and answer the questions that follow.



- 2.1.1 Define the term biome. (2)
- 2.1.2 Name the TWO main types of biomes. (2)
- 2.1.3 Identify the biomes A - G. (7)
2. 1.4 Name the biome which is a main tourist attraction during spring, when the whole area is covered with flowers? (1)
- 2.1.5
- a) Name the biome that includes one of the world's richest floral kingdoms. (3)
- b) Give the biome that attracts tourists to its many game farms.
- c) State the largest biome.

2.2 Study the map below and answer the questions that follow.



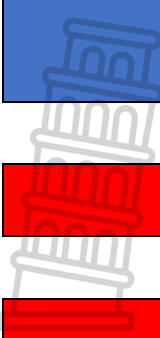
2.2.1 Name the biomes 1 to 5 on the map. (5)

2.2.2 Write down the number ONLY of the biome that:

a) Has the greatest number of succulent plant species in the world

b) Is made up of indigenous forest (2)

Total =40marks



WEEK 3: TOPIC: Biosphere to ecosystems

SUB-TOPIC: Environment and Ecosystems

NOTES & EXAM TIPS

Environment

The **environment** is the natural world, encompassing the interaction of all living species, climate, weather and natural resources that affect human survival and economic activity.

Over the years, humans have been both detrimental and beneficial to the environment. Humans have for the most part tried to preserve and look after our natural resources which are important to us. Human activities have been detrimental to our environment in the forms of atmospheric pollution, global warming and destruction of biodiversity. There are currently many uncertainties regarding the future of our environment. These complex problems will need complex solutions and will need the participation of all.

Ecosystem

An **ecosystem** is a community of biotic (living) and abiotic (non-living) factors in an area that interact with each other. Some examples of ecosystems are a river, a grassland or even a fallen rock.

Biotic factors are living organisms such as plants, animals and microorganisms.

Abiotic factors are non-living such as soil, water, temperature and sunlight.

Biotic and abiotic factors interact amongst themselves and with each other in a way that helps to balance the energy flow of the ecosystem.

The study of all the relationships in an ecosystem is called **ecology**.

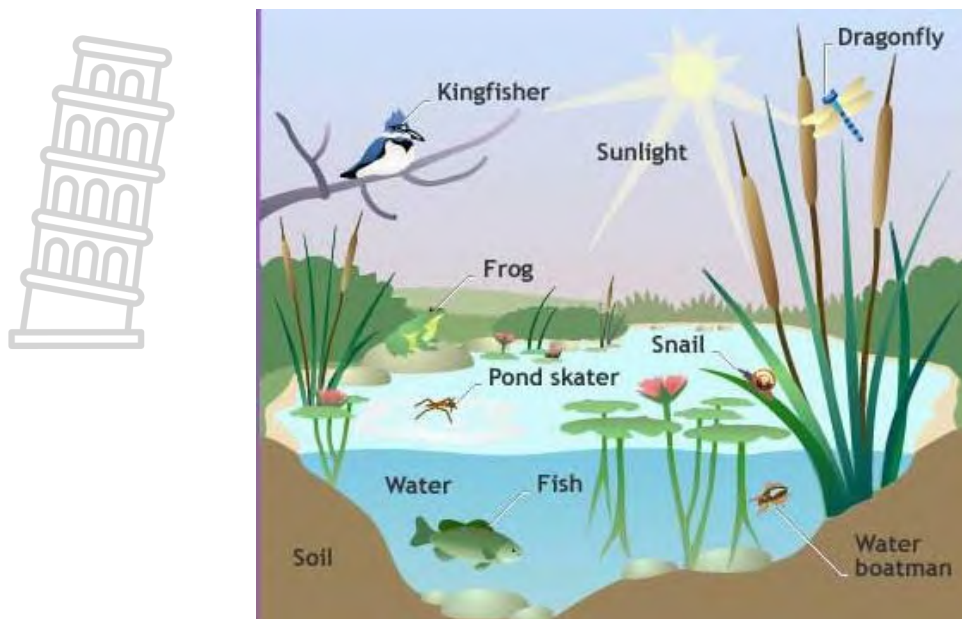


Fig. 1 An example of an ecosystem

ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

QUESTION 1

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.2) in your ANSWER BOOK, for example 1.3 D.

- 1.1 In an ecosystem, the producers get their energy from the...
- A consumers.
 - B decomposers.
 - C rotting leaves.
 - D sunlight.
- 1.2 Which of the following is not an abiotic factor in an ecosystem?
- A Light
 - B Micro-organisms
 - C pH
 - D Temperature

2 x 2 (4)

QUESTION 2

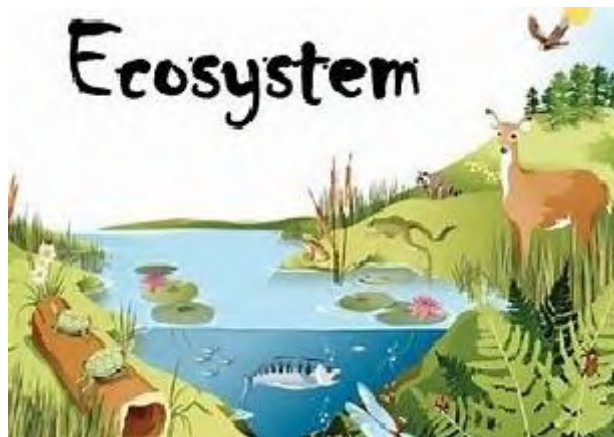
Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.3) in your ANSWER BOOK.

- 2.1 The study of the interaction between different living organisms, and between them and their environment.
- 2.2 The non-living factors in an ecosystem.
- 2.3 An area in which there exists relationships between biotic and abiotic factors.

(3)

QUESTION 3

Study the diagram of an ecosystem and answer the questions.



- 3.1 Label TWO abiotic factors and THREE biotic factors in the diagram.

(5)



WEEK 4: TOPIC: Biosphere to ecosystems

SUB-TOPIC: Biotic and Abiotic factors

NOTES & EXAM TIPS

ABIOTIC FACTORS

PHYSIOGRAPHIC FACTORS

Physiographic factors are the physical geography of an area, including aspect, slope and altitude.

Aspect

Aspect is the direction in which an area faces in relation to the direction of the sun. In south africa, the sun shines from the north. This means that **north-facing slopes** are exposed to the **direct rays of the sun for longer periods** than south-facing slopes. **North-facing** slopes will be **hotter and drier**. **South-facing** slopes will be **moist and cooler** and will have lush vegetation.

Slope

The slope of the land is **how steep or gentle the gradient** is. Water flows faster on steep slopes, which means that more erosion takes place. The soil on steep slopes tends to be thin and infertile, and can only support smaller plants. There is less erosion on more gradual slopes.

Altitude

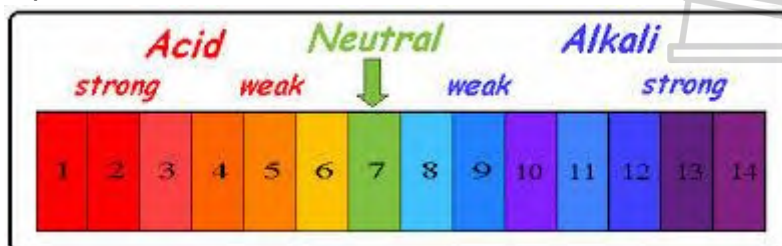
Altitude is the height above sea level. At higher altitudes, there is a decrease in atmospheric pressure, oxygen content and temperature. Rainfall and wind speeds are greater and frost and snow occur.

SOIL (EDAPHIC) FACTORS

Soil is important for plant growth as it provides water and minerals, and holds plants firmly in the ground. The type of soil in an area will determine the kinds of plants that will grow there.

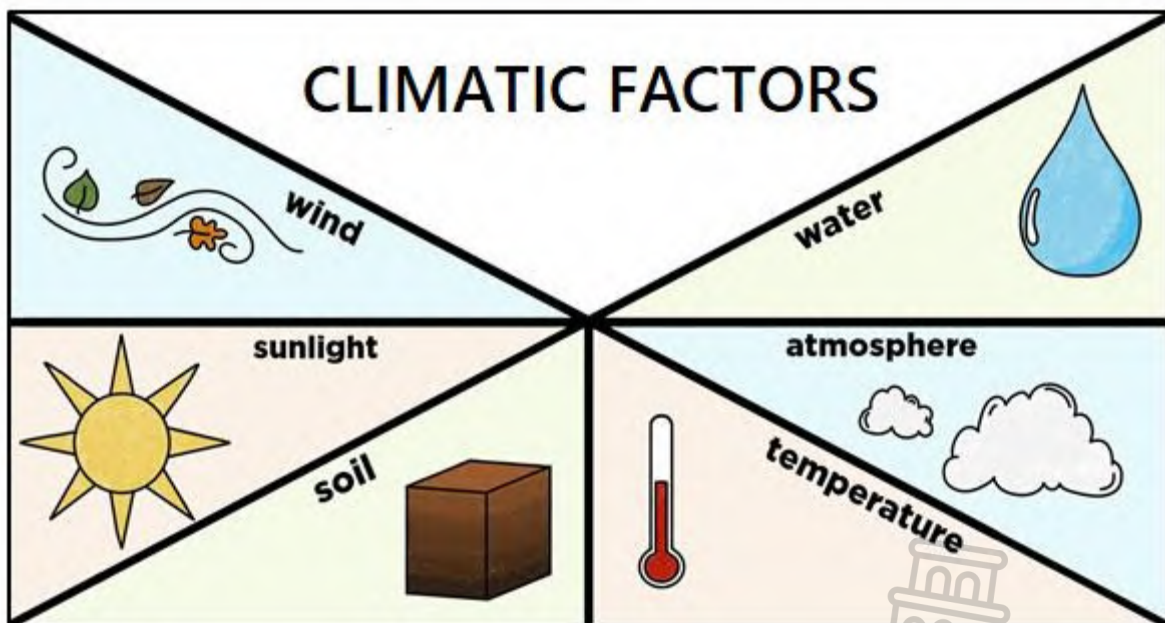
Characteristics of soil:

- pH: Soil pH is a measure of how acidic or alkaline the water in the soil is.



Most plants grow best in neutral pH conditions.

- Humus content: Humus is the organic component of soils formed by the breakdown of dead plants and animals in the soil by bacteria and fungi. These nutrients can be taken up by plants and separates the soil particles, allowing air and water to enter. High humus content = fertile soil.
- Texture: The texture of the soil is determined by the size of the soil particles.
- Sand: Large particles. Feels coarse even when wet.
- Loam: Mixture of sand and clay. Particles stick together when wet. High humus content.
- Clay: Small particles. Soft, smooth and sticky when wet.
- Air content: Air is found in the spaces between the soil particles. Plant roots need oxygen for healthy growth.
- Sand: Big airspaces
- Loam: Mixture of big and small air spaces.
- Clay: Small airspaces.
- Water retention capacity: The amount of water the soil can hold. Water and dissolved mineral salts are found between the spaces in the soil particles.
- Sandy soil: Low water retention
- Loamy soils: Water retention is moderate
- Clay soils: Water retention is high.



Light

Plants grow only where there is enough light for photosynthesis. Some plants are adapted to grow in full sun (sun plants) and others prefer less light and grow best in the shade (shade plants).

Temperature

Temperature is a measure of how hot or cold an area is. The distribution of types changes from the equator to the poles. This is due to the decrease in temperature and rainfall further away from the equator.

Water

Water makes up about 70% by weight of most living things, therefore, they cannot survive without it. Many chemical reactions essential for life occur in water. Water transports various dissolved substances inside and between cells and it maintains a stable body temperature.

Wetlands: Is an area of land that is mostly covered with water. Wetlands are essential ecosystems because:

- They act as natural filters trapping nutrients, soil, disease-causing bacteria and pollutants.
- They slow down floodwaters, as they act like a sponge and store water. This reduces erosion and flood damage. It also maintains a steady flow of water during the year.
- Wetlands are rich in plant life and provide food and shelter for many organisms.

Atmospheric gases

Composition of the atmosphere: 78% Nitrogen, 21% Oxygen, 0,04% Carbon dioxide and some water vapour.

Oxygen is needed by plants and animals for respiration. Carbon dioxide is needed for photosynthesis.

The atmosphere traps some of the sun's heat, preventing it from escaping back into space. This is called the greenhouse effect. Water vapour, carbon dioxide and methane are the main greenhouse gases. These gases allow the sun's energy to pass through the atmosphere and warm the Earth's surface. The earth radiates some of the heat energy back into space. Some of the heat energy is absorbed by the greenhouse gases. This warms up the air to keep the atmosphere at a temperature that allows life to exist.

Wind

Moving air is called wind. Wind is greater at high altitudes and this can effect the growth of trees.

BIOTIC FACTORS

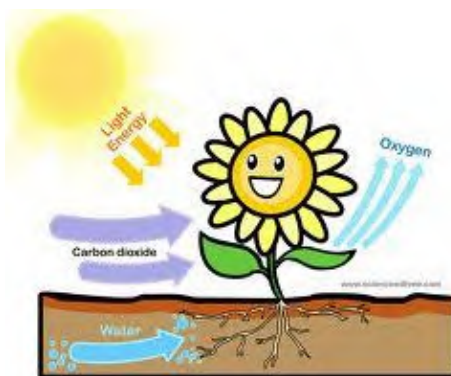
- The biotic components are the plants and animals.
- It also includes organisms such as the fungi and lichens as well as the very small organisms like bacteria.
- The bacteria are so small that it can be seen only with a microscope.
- Such organisms that are invisible to the naked eye are called micro-organisms.
- Some algae and fungi are also examples of micro-organisms.

Producers:

These are biotic factors that have the ability to **make their own food**.

They are able to do this by **absorbing energy** from the **sun**.

The process by which they are able to manufacture their **own food** by using the **radiant energy** is called **photosynthesis**



Consumers:

These are organisms that are **unable to manufacture their own food**.
There are **3 categories of consumers**.



Carnivores: these are the organisms that **feed on animal matter only**.

Herbivores: these are organisms that obtain their **food from plant matter**.

Omnivores: these are organisms that **feed on both plant and animal matter**.

Decomposers:

- These are **organisms** that **feed on dead organic matter**.
- They are usually **micro-organisms**.
- But some decomposers can be **macroscopic e.g. worms**.
- As they break down the bodies of the dead organic matter they **release important substances** back into the environment.
- These substances then can be used by **green plants**.
- **Water, carbon dioxide, mineral salts and energy in the form of heat** are **some of the substances** that are released by decomposers.

ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

Question 1

An investigation was carried out using 50 g of each of three soil types: sand, loam and clay placed on filter paper in a funnel. 80 ml of water was run through each soil. A measuring cylinder was placed below each set of apparatus to collect the water.

An incomplete set of results for the investigation is given in the table below:

	Soil A	Soil B	Soil C
Amount of water drained through each soil (ml)	40		25
Amount of water retained by each soil (ml)		15	

- 1.1 How much of water was retained by soil **C**? (1)
- 1.2 Which soil type (**A**, **B** or **C**) was sand? Give a reason for your answer. (2)
- 1.3 Identify TWO factors that should be kept constant in this investigation. (2)
- (5)**

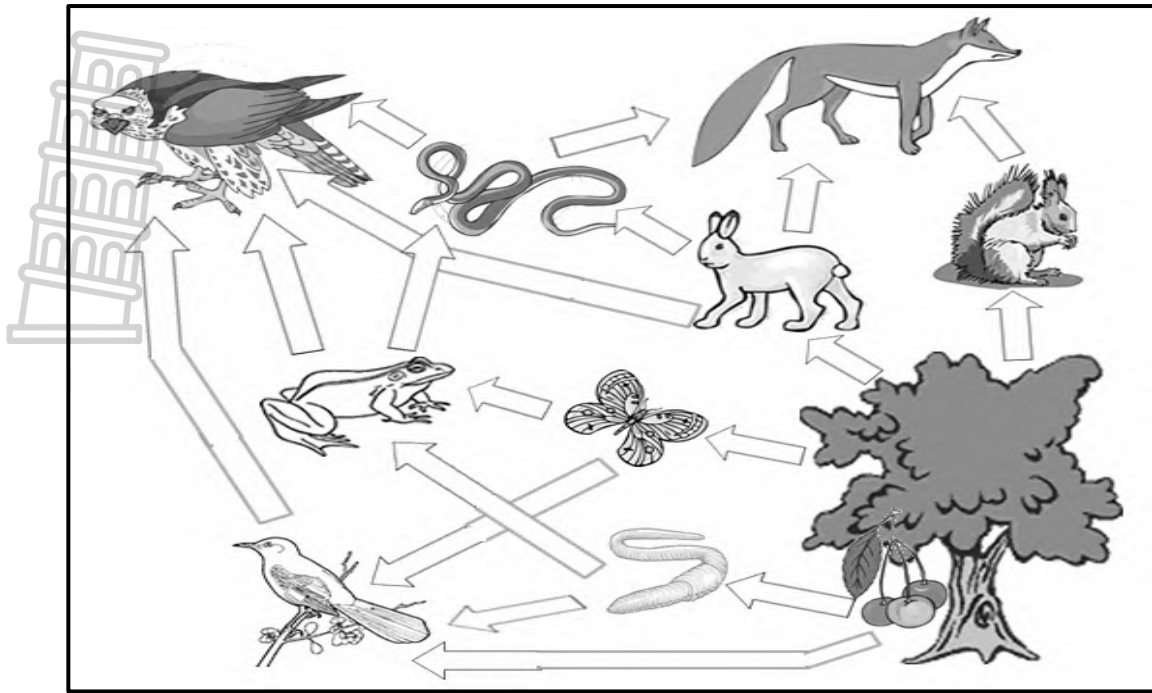
Question 2

The table below shows the results of a study that investigated the effect of temperature and light on the yield of tomatoes in two greenhouses on a farm.

TEMPERATURE (°C)	AVERAGE YIELD OF TOMATOES PER PLANT (kg)	
	LOW LIGHT LEVELS	HIGH LIGHT LEVELS
5	0,5	0,5
10	1,5	2,5
15	3,0	5,0
20	3,6	8,5
25	3,5	7,8
30	2,5	6,2

- 2.1 State TWO steps the investigator may have taken into consideration during the planning stage of the investigation. (2)
- 2.2 Identify the: (2)
- (a) Independent variables (2)
- (b) Dependent variable (1)
- 2.3 Plot bar graphs on the same system of axes showing the results of the average yield of the tomatoes from 200°C to 300°C for both light levels. (6)
- 2.4 State ONE way in which the scientists could have improved the reliability of the investigation. (1)
- (12)**

Question 3



3.1 For the food web, label each organism: (Some may have more than one label)

P = producer

1 = Primary Consumer

2 = Secondary Consumer

3 = Tertiary Consumer

4 = Quaternary Consumer

3.2 Now label each animal as either a:

H = herbivore

C = carnivore

O = omnivore





WEEK 5: BIOSPHERE TO ECOSYSTEMS

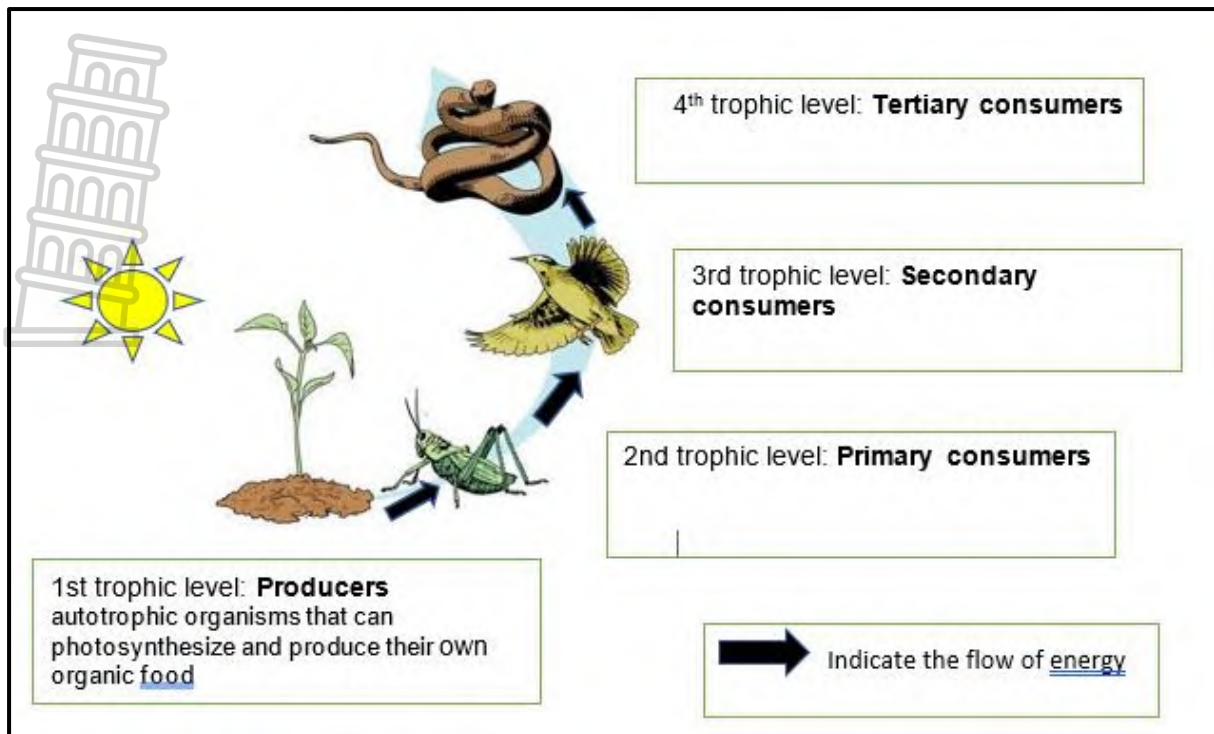
SUB-TOPIC: ENERGY FLOW

NOTES & EXAM TIPS

Energy Flow in Ecosystems

The flow of energy in ecosystems is important to the life on Earth.





Nearly all of the energy in Earth's ecosystems originates from the **Sun**.

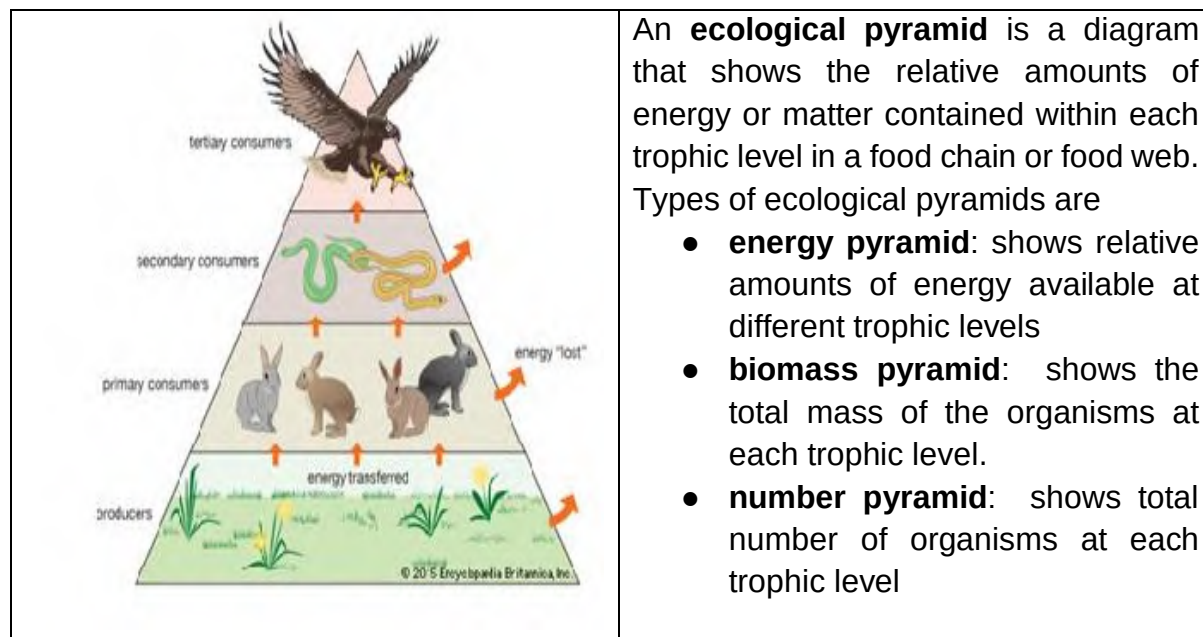
The energy is distributed in the ecosystem through the **food chains** and **food webs**.

Living organisms occur at different feeding levels in an ecosystem (food chains or food webs). These feeding levels are called **trophic levels**.

Producers (Autotrophs)	Living organisms that (green plants) produce their own food and form the first trophic level. They have the greatest amount of energy.
Consumers (Heterotrophs)	Living organisms that cannot produce their own food, they feed on other organisms Primary consumers: Herbivores, occupy the 2 nd trophic level Secondary consumers: Carnivores or omnivores, occupy the 3 rd trophic level Tertiary consumers: Carnivores or Omnivores, occupy the 4 th trophic level Herbivores: Animals that feed on plants only Carnivores: Animals that feed on other animals(meat) only Omnivores: Animals that feed on both plants and animals

Decomposers (Saprophytes)	Organisms that break down dead organic material and wastes Bacteria and fungi are decomposers
-------------------------------------	--

Energy is used by the organisms at each trophic level. These organisms use some of the energy for growth or some of the energy is lost as heat energy through respiration or some of the energy is lost in urine and faeces. This energy is therefore not available for the next trophic level.



ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

QUESTION 1 (Questions taken from various sources)

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.5 in your ANSWER BOOK, for example 1.6 D.

1.1.1 In a food web, what do the arrows represent?

- A Flow of carbon.
- B Flow of energy.
- C Flow of nitrogen.
- D Flow of water.



1.1.2 Organisms that make their own food:

- A Herbivores
- B Carnivores
- C Autotrophs
- D Heterotrophs

1.1.3 As part of an ecological study, the biomass of organisms in community was estimated. The table below shows the biomass

ORGANISM	BIOMASS (kg)
R	50
S	10
T	250
U	200
V	3000
W	75

From the data above, which of the following would be the most probable food chain?

- A $S \rightarrow W \rightarrow U \rightarrow V$
- B $T \rightarrow V \rightarrow R \rightarrow S$
- C $U \rightarrow T \rightarrow W \rightarrow R$
- D $V \rightarrow T \rightarrow W \rightarrow S$

1.1.4 Which of the following organisms are likely to be found in the third trophic level of a food chain?



- A Algae
- B Frog
- C Grasshopper
- D Hawk

1.1.5 In a food pyramid:



- A as the trophic level decreases, the number of organisms supported by the ecosystem decreases
- B as the trophic level increases, the number of organisms supported by the ecosystem increases
- C as the trophic level increases, the number of organisms supported by the ecosystem decreases as the trophic
- D level decreases, the number of organisms supported by the ecosystem increases

5x2
(10)

1.2 Give the correct **biological term** for each of the following descriptions.
Write only the term next to the question number (1.1 to 1.5) in your ANSWER BOOK.

- 1.2.1 They capture the sunlight and produce food through the process of photosynthesis.
- 1.2.2 A series of linked food chains in an ecosystem.
- 1.2.3 Different feeding levels in the in the food chain.
- 1.2.4 It shows the relative amounts of energy available at the trophic levels of a food chain or food web.
- 1.2.5 Organisms that break down dead organisms in the environment

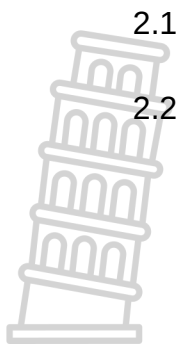
(5)

QUESTION 2

The paragraph below is about an interaction of organisms in an ecosystem. Read the paragraph and answer the questions that follow

A group of learners studied an ecosystem of a local environment next to the dam. It has a grass field with many grasshoppers. In the long grass field lived some birds called finches. The finches fed on the grass seeds. There were other birds called shrikes that preyed on the grasshoppers and any young finches they could catch. A family of mongoose lived in the field and they preyed on all the other animals.

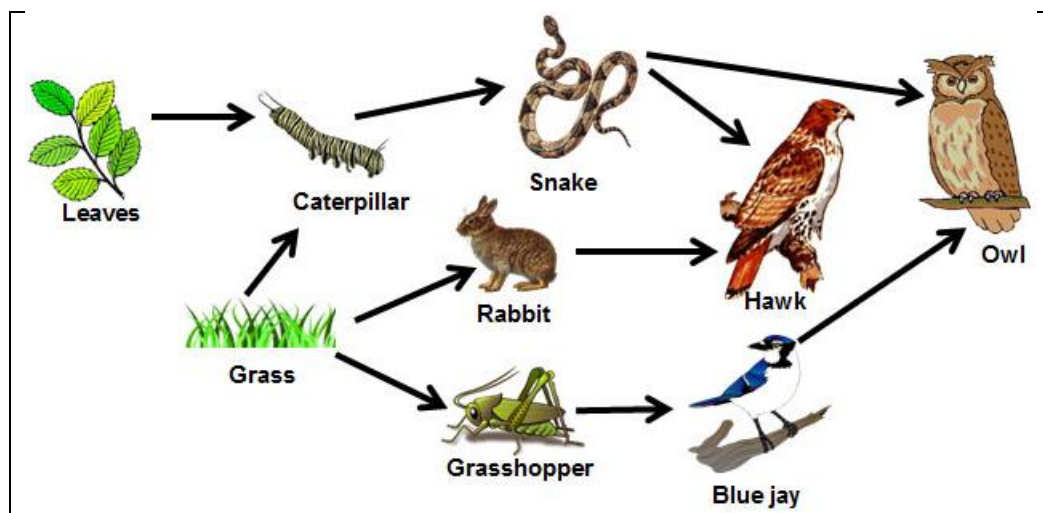
(Adapted from: Top Class Grade 8)



- 2.1 What is the main source of energy for the ecosystem above? (1)
- 2.2 From the paragraph above, give ONE example of the following
 (a) Producer
 (b) Primary consumer
 (c) Secondary consumer (3)
- 2.3 Draw a food chain to show the interaction of four organisms mentioned in the paragraph. (3)
 (7)

QUESTION 3

Study the diagram below which represents a food web in an ecosystem and answer the questions.



- 3.1 What do the arrows in the food web indicate? (1)
- 3.2 Identify the tertiary consumer in this food web. (1)
- 3.3 Explain what would happen if all the blue jays were removed from the ecosystem? (3)
- 3.4 Describe the role that decomposers play in any ecosystem. (2)
- 3.5 Consider the energy flow in the food chain shown below

Grass □ grasshopper □ blue jay □ owl
 97 000kJ 7000kJ 600kJ 50kJ



3.6

Calculate the percentage of the energy that is passed on from the grasshopper to the blue jay. Show ALL working

(3)

Draw the energy pyramid of the food chain shown in QUESTION 3.5 above.

(5)

(15)
)

WEEK 6: TOPIC: Biosphere to ecosystems

SUB-TOPIC: CYCLES (Water and Oxygen)

NOTES & EXAM TIPS

The water and oxygen cycle

The following is a list of terms provided to help you understand cycles. Both water and oxygen cycles are available for re-use over and over again.

Terminology

Term	Definition
Condensation	The change of water from gaseous into liquid form.
Precipitation	Water moves from the atmosphere to earth in the form of rain, mist, hail, dew, and snow.
Infiltration	Water infiltrates deep into the soil and comes to rest on solid rock formation to create the water-table
Evaporation	The process of turning from liquid into vapor.
Transpiration	Loss of water vapor through the stomata of the leaves.
Atmosphere	The air surrounding the earth's surface.
Respiration	The chemical process whereby energy-rich molecules, example, glucose, is chemically broken down to release energy.
Photosynthesis	The process whereby plants absorb CO ₂ and in turn release O ₂ in the atmosphere as a by-product.
Combustion	Reaction of a substance with oxygen as in burning.

The water-cycle

Water is an inorganic compound with two hydrogen atoms and one oxygen atom. It can exist in three phases in the environment, i.e. **solid, liquid and phase**.

The water-cycle plays an important role in moving water through the organisms and in the environment. The water-cycle may be studied in two broad steps:

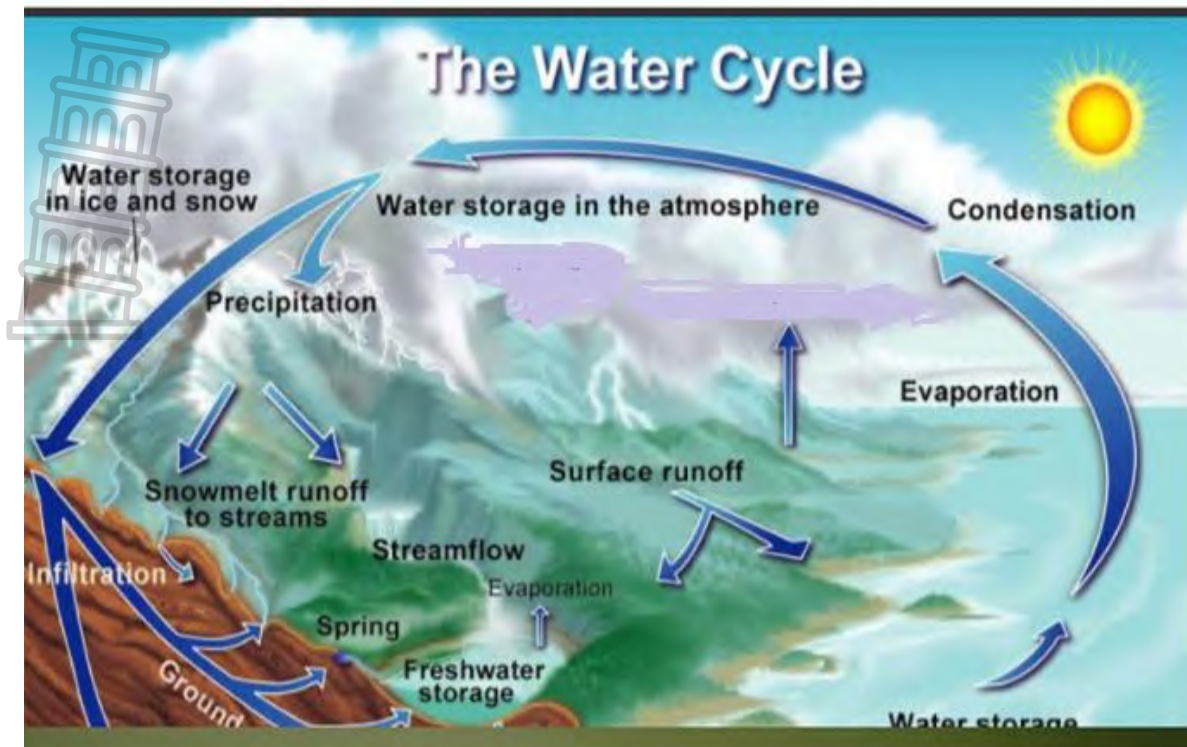
Firstly, the **precipitation, distribution, and absorption**.

Secondly, **evaporation and condensation**.

The water cycle shows the continuous movement of water within the Earth and atmosphere. It is a complex system that includes many different processes. Liquid water evaporates into water vapor, condenses to form clouds, and precipitates back to earth in the form of rain and snow.

Below is an example of the water cycle.



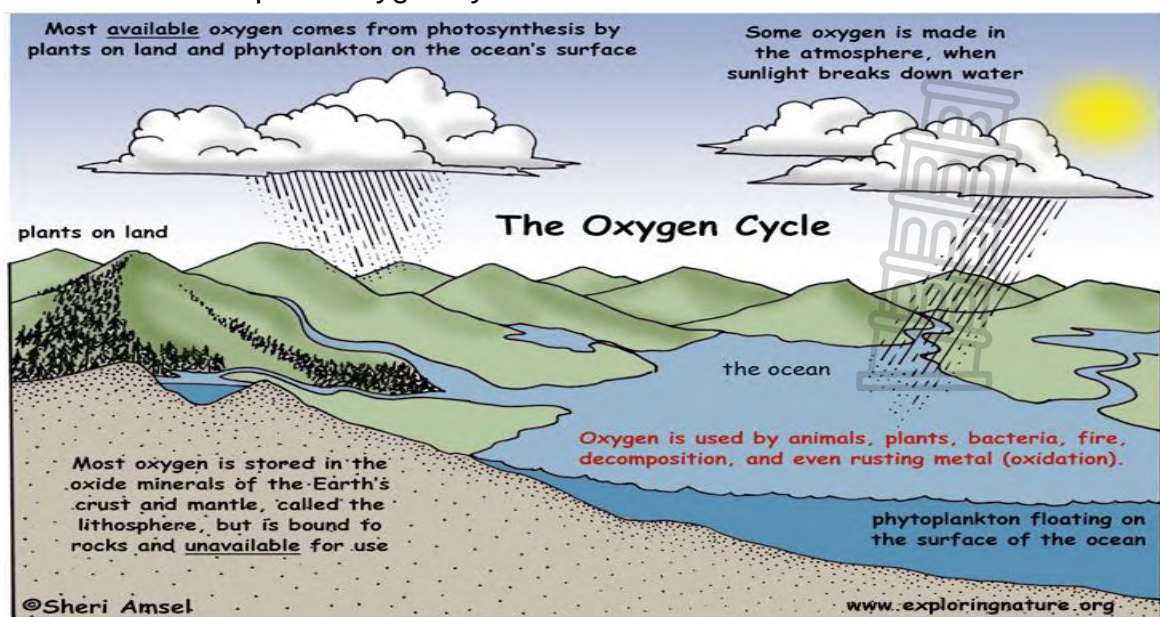


The Oxygen-cycle

Oxygen is essential for cellular respiration. It is used in the breakdown of glucose to release energy. Energy is required for growth and metabolic activities in living organisms.

The normal concentration of O_2 in the atmosphere is approximately 21%. Some of this O_2 dissolves in the waters of ponds, lakes, dams, rivers and the oceans.

Below is an example of oxygen cycle:



ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

QUESTION 1 (Questions taken from various sources)

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.3) in your ANSWER BOOK, for example 1.4 D.

- 1.1 Organisms that live in water are called...
- A terrestrial.
 - B xerophytes.
 - C buoyant.
 - D aquatic.
- 1.3 During cellular respiration plants and animals use . . . from the atmosphere or from the water.
- A oxygen
 - B energy
 - C carbon dioxide
 - D water
- 1.3 Which of the following processes removes water from the atmosphere?
- A Evaporation
 - B Precipitation
 - C Respiration
 - D Photosynthesis
- (2x3) = (6)**

QUESTION 2 (Questions taken from various sources)

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.3) in your ANSWER BOOK.

- 2.1 The process that causes the precipitation of water vapor into the atmosphere.
- 2.2 The release of water vapor from the aerial parts of a plant mainly through the stomata of the leaves.
- 2.3 A gas that is released during combustion. **(3)**

QUESTION 3 (Questions taken from various sources)

Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	The gas that is released in the atmosphere as the by-product of photosynthesis	A B	Oxygen Carbon dioxide
3.2	The process that increases oxygen in the atmosphere	A B	Respiration Photosynthesis
3.3	It is a process where water vapor falls from the atmosphere to the ground as rain, hail, dew.	A B	Precipitation Condensation

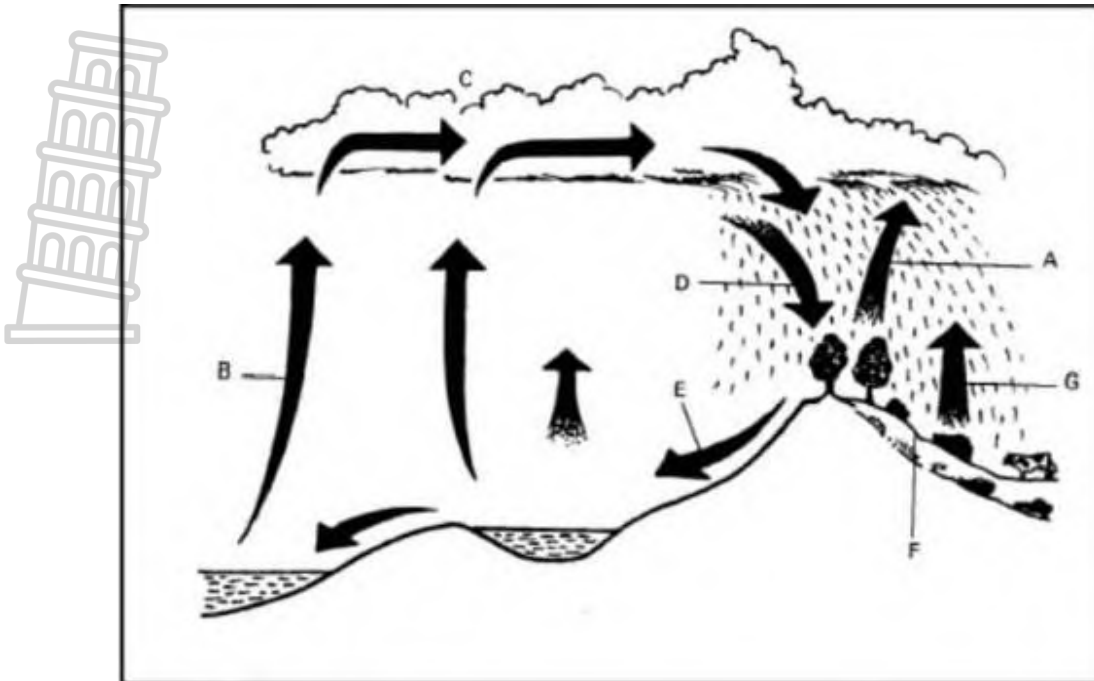
(3 x 2)

(
6
)

QUESTION 4

Study the following diagram and answer the questions that follows:





- 4.1 Name the process labeled **A – D**. (4)
- 4.2 Name one human activity which can affect the water cycle. (1)
- 4.3 What is the most important factor that affects the rate of the process labelled **B**? (1)
- (6)**

QUESTION 5

Read the following paragraph and answer the questions that follows:

Although water is a sustainable resource, we must take care not to use it in an unsustainable way. Most water on earth is not suitable for human or animal consumption, as it occurs in the ocean (96,5%) or in the form of snow or ice (2,95). It is only a small % that remains available for domestic use, agriculture, industries, etc.

- 5.1 What % of water on earth is unavailable for human and animal consumption? (1)
- 5.2 What % of water on earth is available for use in homes, mines, factories and on farms? (1)

- 5.3 Use the table below to construct two pie charts which show domestic and total use of water in S.A. respectively.

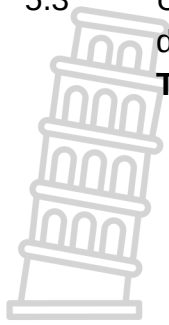


Table 1

DOMESTIC use in litres	
	Out of 100 litres
Washing	10
Sewerage	30
Drink/ food preparation	5
Personal hygiene	15
Gardens	40

Table 2

TOTAL use in litres	
	Out of 100 litres
Nature conservation	8
Manucipal/domestic	200
Factories	100
Mining	35
Hydroelectricity	45
Irrigation	600
Drinking water for livestock	12

(12)
(14)





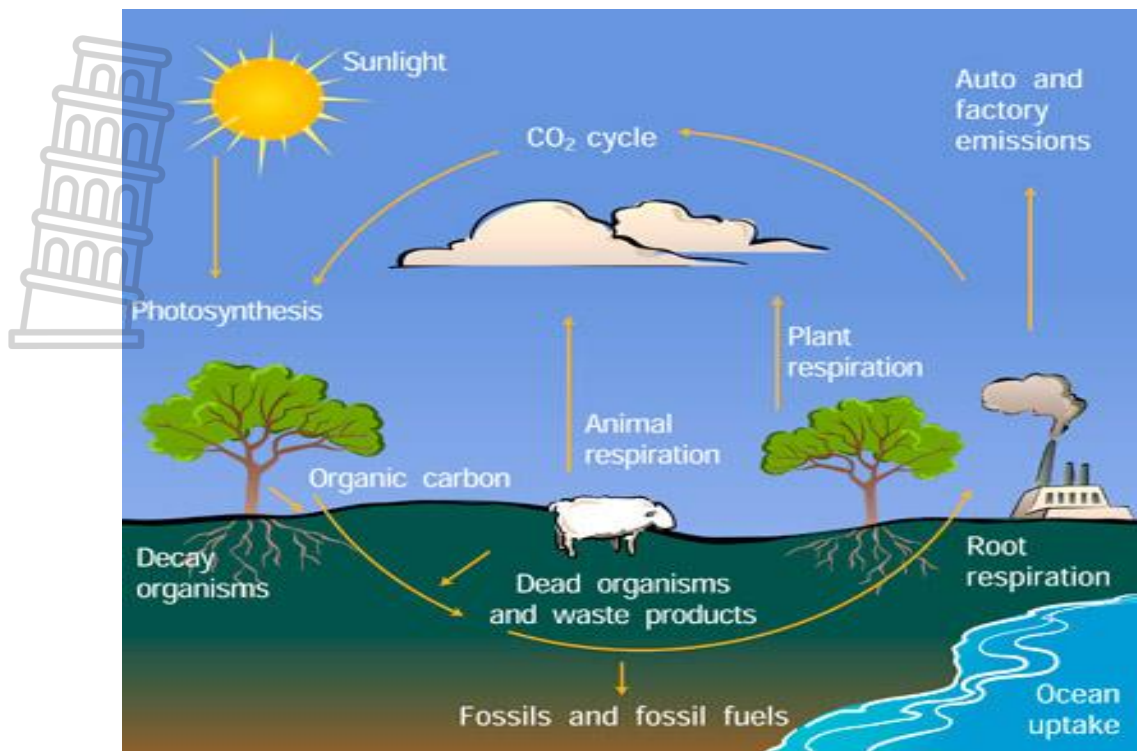
WEEK 7: TOPIC: Biosphere to ecosystems

SUB-TOPIC: CYCLES (Carbon and Nitrogen)

NOTES & EXAM TIPS

CARBON CYCLE

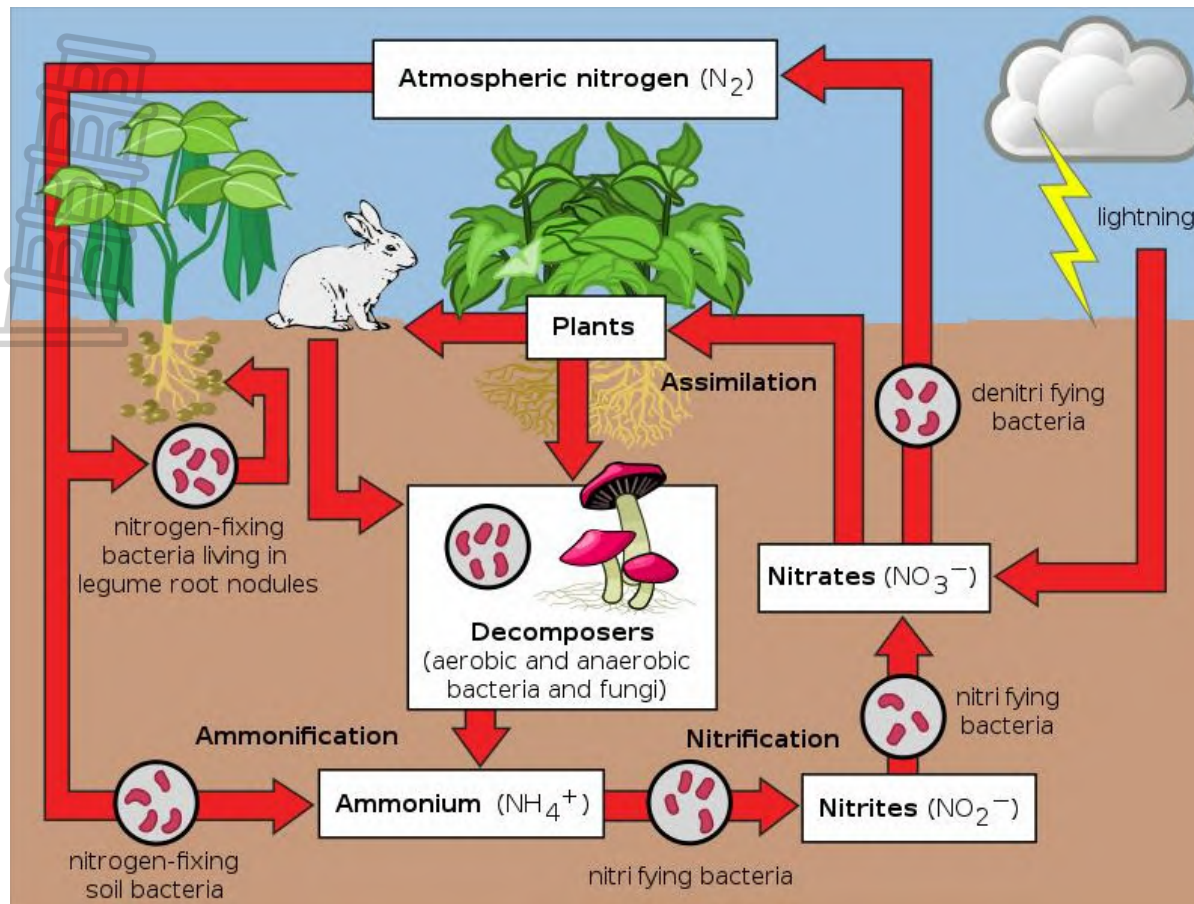




The carbon cycle involves the following processes:

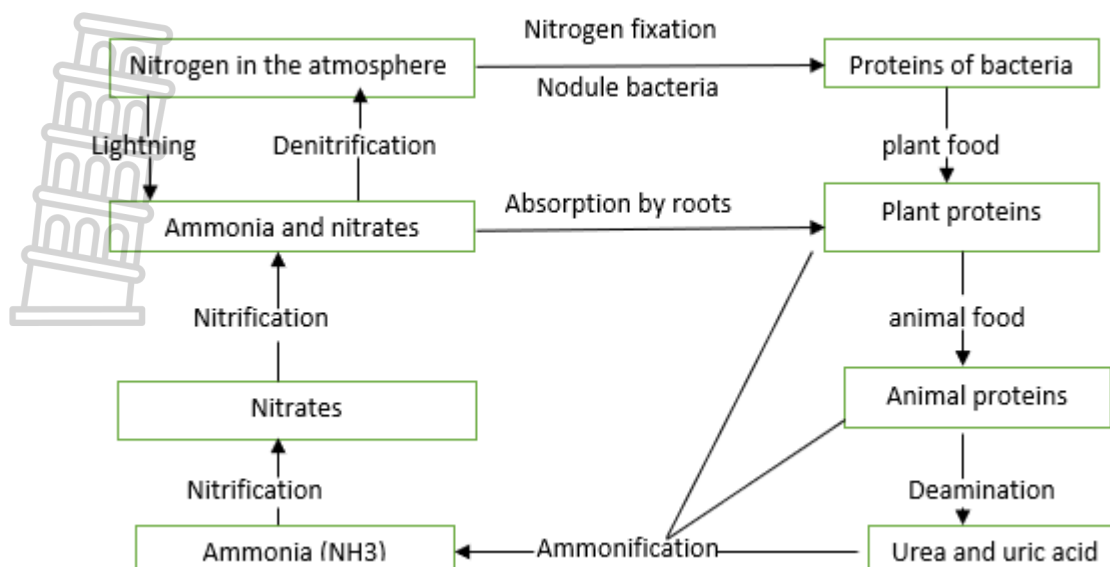
1. **Photosynthesis:** Carbon is absorbed by plants and turned into carbohydrates, proteins and fats.
2. **Feeding:** Carbon passes from plants to animals during feeding, and is turned into carbohydrates, proteins and fats in the animal's body.
3. **Death and decay:** Carbon passes from plants and animals to decompose organisms and turn the carbon into decomposer carbohydrates, proteins and fats.
4. **Respiration:** when plants and animals die, the decomposers breakdown these bodies and release carbon in the form of carbon dioxide back into the atmosphere, water or soil.
5. **Compaction:** sometimes the dead plants and animals do not break down and the carbon becomes locked in for long period.

NITROGEN CYCLE



Schematic representation of the flow of nitrogen through the ecosystem. The importance of bacteria in the cycle is immediately recognized as being a key element in the cycle, providing different forms of nitrogen compounds able to be assimilated by higher organisms.

Nitrogen cycle, circulation of [nitrogen](#) in various forms through nature. Nitrogen, a component of [proteins](#) and [nucleic acids](#), is essential to [life](#) on [Earth](#). Although 78 percent by volume of the [atmosphere](#) is nitrogen [gas](#), this abundant reservoir exists in a form unusable by most organisms. Through a series of microbial transformations, however, nitrogen is made available to [plants](#), which in turn ultimately sustain all [animal](#) life. The steps, which are not altogether sequential, fall into the following classifications: [nitrogen fixation](#), nitrogen assimilation, ammonification, nitrification, and [denitrification](#).



ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

QUESTION 1

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.5) in your ANSWER BOOK, for example 1.6 D.

1.1 Which of the following processes absorb carbon?

- | | |
|------------------|-----------------|
| A Photosynthesis | B Respiration |
| C Combustion | D Decomposition |

1.2 In which process do plants and animals return CO₂ to the atmosphere?

- | | |
|---------------|------------------|
| A Combustion | C Photosynthesis |
| B Respiration | D Decomposition |

1.3 One of the main ways CO₂ is removed from the atmosphere is:

- | | |
|------------------|-----------------|
| A Photosynthesis | C Combustion |
| B Respiration | D Decomposition |

1.4 The source of carbon to plants in the carbon cycle is . . .

- | | |
|------------------|--------------------|
| A fossil fuels. | C carbonate rocks |
| B carbon dioxide | D all of the above |

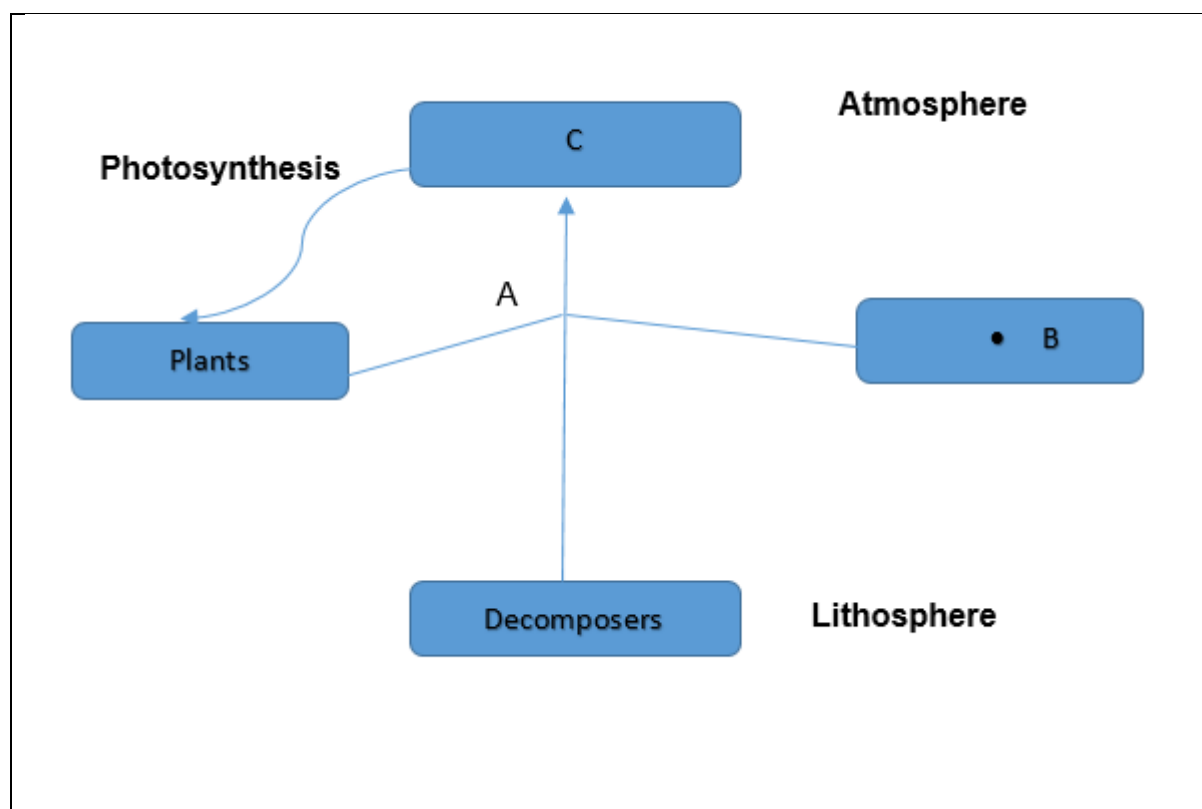
1.5 The role of bacteria in the carbon cycle is:

- | | |
|--------------------------------------|------------------|
| A Breakdown of organic compounds | C Photosynthesis |
| B Assimilation of nitrogen compounds | D Chemosynthesis |

(10)

QUESTION 2

Study the diagram and answer the questions.



2.1. Name the above nutrient cycle.

(1)

2.2. What is the name of the process labelled **A**?

(1)

2.3. What type of organism is represented by **B**?

(1)

2.4. Describe how fossil fuels are formed.

(3)

2.5. What is the form in which this element is found in the atmosphere as indicated by **C**?

(1)

(7)

QUESTION 3

Give the correct biological terminology for each of the following statements:

3.1 The process in which ammonia is converted into nitrates.

3.2 Bacteria that convert free nitrogen into nitrates.

3.3 A decomposition process by which certain bacteria breakdown urea and uric acid into ammonia.

3.4 The process in which nitrogen gas is returned back to the atmospheric nitrogen pool. (4)

QUESTION 4

4.1 Why do living organisms need nitrogen? (2)

4.2 In what form do plants absorb nitrogen? (2)

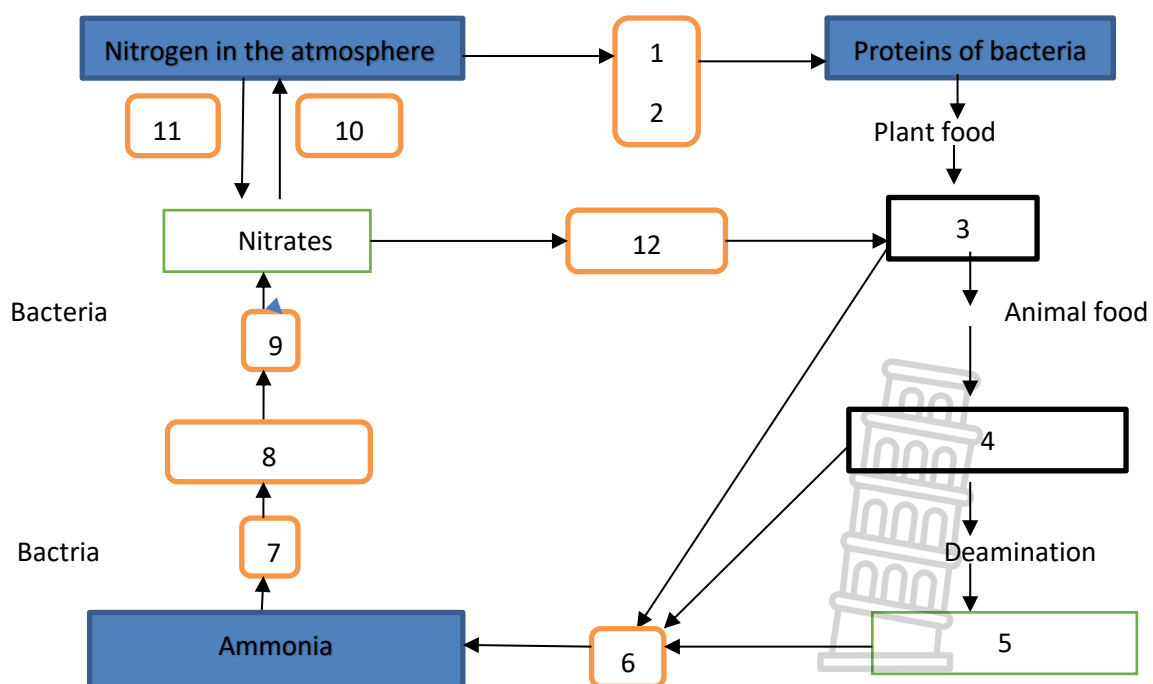
4.3 How do animals get nitrogen? (2)

4.4 Describe the role of the following types of bacteria in the nitrogen cycle:

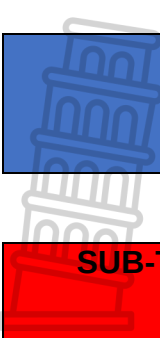
- I. Nitrogen- fixing bacteria
 - II. Nitrifying bacteria
 - III. Denitrifying bacteria
- (6)
(12)

QUESTION 5

Complete the following diagram of the nitrogen cycle in nature by writing down the missing word(s) next the corresponding numbers.



(12)



WEEK 8 & 9: TOPIC: Biodiversity and classification

SUB-TOPIC: Classification schemes: a way of organizing biodiversity Main groupings

NOTES & EXAM TIPS

- There are a great variety of organisms which co-inhabit the earth. These organisms occur in many different forms and sizes. Some of them are invisible to the naked eye. These different species can live in a variety of different habitats.
- Classification refers to the grouping and sorting of things according to similarities and differences.
- Life forms are put into groups as a result of classification. This makes it easier for the scientist to study these life forms.
- Taxonomy refers to the science of naming and classifying a wide range of living things.

Living things were classified into two groups: plants and animals.

This became known as the two-kingdom system.

The following characteristics are used to classify organisms as plant or animals:

The more scientists came to know about life the more advanced the classification systems became:

The Five Kingdom system

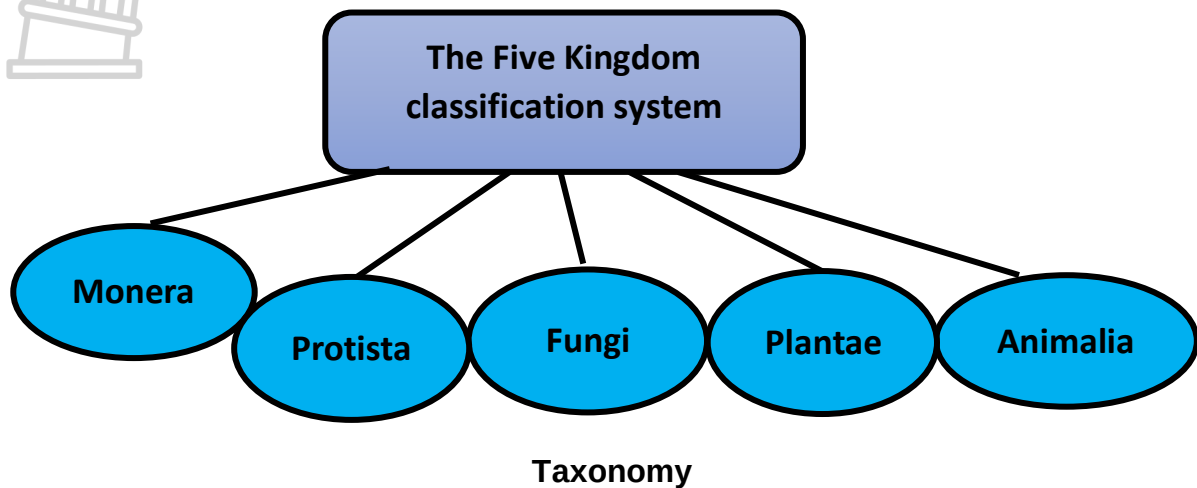
Developed by Robert H. Whittaker in 1969.

All living organisms were placed into 5 kingdoms based on certain characteristics.

Terminology:

- 
- **Eukaryotes:** A true nucleus is a nucleus that is surrounded by a nuclear membrane. Organisms that possess true nuclei are called eukaryotes. The organelles in eukaryotes are all bound by membranes.
 - **Prokaryotes:** All organisms with nuclear material not enclosed by membranes are called prokaryotes. All the organelles found in prokaryotes do not have membranes.
 - **Autotrophic organisms:** are those that can manufacture their own food by photosynthesis.

- **Heterotrophic organisms:** are those organisms that are unable to manufacture their own food.
- **Saprophytes:** organisms that feed on dead and decaying matter.
- **Unicellular:** Organisms that are made up of one cell only.
- **Multicellular:** Organisms that are made up of many cells.



- Taxonomy is the branch of biology that classifies all living things. It was developed by the Swedish botanist **Carolus Linnaeus**, who lived during the 18th Century, and his system of classification is still used today.
- Linnaeus and other scientists used Latin because it was a dead language—meaning nobody spoke it anymore. Hence, it is a neutral language, and the scientific name can be used to avoid confusion with common names.
- Linnaeus invented **binomial nomenclature**, the system of giving each type of organism a **genus** and **species** name.
- He also developed a classification system called the taxonomic hierarchy, which has seven ranks from general to specific: **kingdom, phylum, class, order, family, genus, and species**.
- Genus and species are always typed in italics and underlined when it is handwritten.
- The Genus name will be written with a capital letter while the species name is written with a small letter.

Example of taxonomic classification:



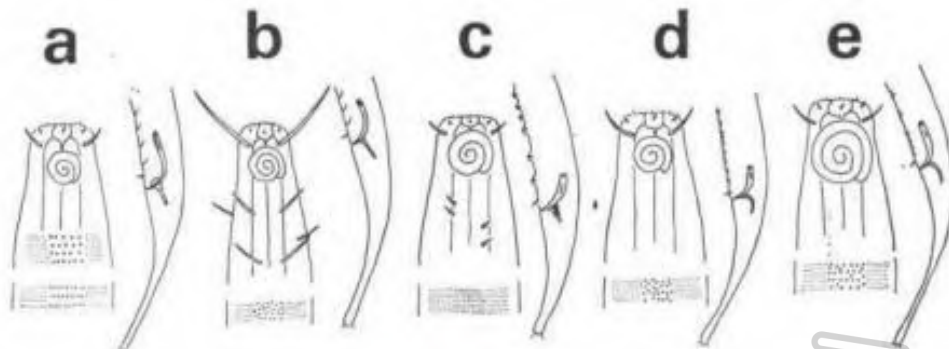
	HUMAN	OSTRICH
KINGDOM	Animalia	Animalia
PHYLUM	Chordata	Chordata
CLASS	Mammalia	Aves
ORDER	Primate	Struthioniformes
FAMILY	Hominidae	Struthionidae
GENUS	<i>Homo</i>	<i>Struthio</i>
SPECIES	<i>sapien</i>	<i>camelus</i>

Remember this sentence: “King Philip Came Over For Good Spaghetti”.

The two types of taxonomic keys:

1. Pictorial

- These keys have illustrations.
- These illustrations maybe in the form of pictures, photographs or a combination of these.
- Organisms are identified by comparing them to the illustrations.



Pictorial key to the five *Sabateria* species: a *praedoatrix*, b. *armata*, c. *pulchra*, d. *celtica*, e. *ornate* (source: Platt, British Natural Museum)

2. Verbal

- Clues are in the form of statements or questions of characteristics.
- By answering the questions or following the statements and looking at the specimen the correct taxon can be identified to which the specimen belongs.

For example:

Key to the five kingdoms of living organisms

1. Do the organisms have a definite nucleus?

YES. Go to question 2. If NO then its Kingdom Monera.

2. Is the organism multicellular or unicellular?

If it is **unicellular** then Kingdom Protista. If it is **multicellular** then go to question 3.

3. Is the organism autotrophic?

YES then its Kingdom Plantae. If **NO** then go to question 4.

4. Does the organism digest food outside its body and then take it in?

YES then its Kingdom Fungi. If **NO** then its Kingdom Animalia.

ACTIVITIES/WORKSHEETS/EXAM TYPE QUESTIONS

QUESTION 1

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.3) in your ANSWER BOOK, for example 1.4 D.

- 1.1 A classification system where every organism has a dual name.
- A Binomial system
 - B Taxonomy
 - C Hierarchical system
 - D Two-domain system.
- 1.2 What is the correct order for classifying an organism?
- A Kingdom, phylum, class, order, family, genus, species
 - B Kingdom, phylum, genus, class, order, family, species
 - C Kingdom, order, family, phylum, class, genus, species
 - D Phylum, kingdom, class, order, family, genus, species
- 1.3 The five-kingdom system proposed by Whittaker uses the following taxa to classify organisms:
- A Eubacteria, Protista, Fungi, Plantae, Animalia
 - B Bacteria, Archae, Eukaryotes, Plantae, Animalia
 - C Archaeobacteria, Protista, Eukaryotes, Plantae, Animalia
 - D Monera, Protista, Fungi, Plantae, Animalia

(6)

QUESTION 2

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.3) in your ANSWER BOOK.

- 2.1 An organism that lacks a true nucleus.
 2.2 Organisms that feed on dead and decaying matter.
 2.3 Organisms that manufacture their own food.

(3)

QUESTION 3 (Questions taken from various sources)

Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (3.1 to 3.2) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	The genus name of <i>Homo sapiens</i>	A B	Homo sapiens
3.2	The specie name of the cat (<i>Felis catus</i>).	A B	Felis catus

(2 x 2)

(4)

QUESTION 4

According to the five –kingdom system of classification, each of the organisms shown below belongs to a different kingdom. Complete the table by filling in the missing words next to the numbers.





ORGANISM		
Prokaryote or eukaryote?	Eukaryote	1.
Unicellular or multicellular?	2.	3.
Example	4.	5.
Kingdom	6.	7.

QUESTION 5

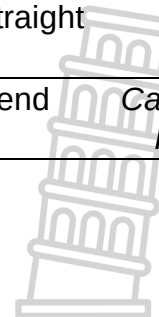
Identify the following birds using the verbal dichotomous key below:
Write the bird number and name next to it.



Dichotomous key to representative birds

1 a. The beak is relatively long and slender	<i>Certhidea</i>
b. The beak is relatively stout and heavy	go to 2
2. a. The bottom surface of the lower beak is flat and straight	<i>Geospiza</i>
b. The bottom surface to the lower beak is curved	go to 3
3. a. The lower edge of the upper beak has a distinct bend	<i>Camarhynchus</i>
b. The lower edge of the upper beak is mostly flat	<i>Platyspiza</i>

QUESTION 6





Organism A



Organism B



Organism C

6.1 Use the pictorial key below to name the three organisms above.

6.2 Give the genus name of organism C.

The pictorial key to identify the type of cats in the photographs above:



QUESTION 7

Use the pictorial key to identify the bird in the photo, write only the name of the bird.

