



**KWAZULU-NATAL PROVINCE**

EDUCATION  
REPUBLIC OF SOUTH AFRICA

**CURRICULUM GRADE 10 -12 DIRECTORATE**

**NCS (CAPS) SUPPORT**

**JUST IN TIME LEARNER REVISION DOCUMENT**

A photograph of a potted plant, possibly a succulent, with a small globe in the background. The image is partially obscured by the text 'GEOGRAPHY'.

**GEOGRAPHY**

**GRADE 10**

**2026**

**PREAMBLE**

This support document serves to assist Geography Grade 10 learners in dealing with curriculum content gaps and learning losses. Activities serve as a guide on how various topics are assessed at different cognitive levels and prepare learners for informal and formal tasks in Geography.

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## THE ATMOSPHERE

### WHAT IS THE ATMOSPHERE?

The layer of gases surrounding the Earth's surface.

### COMPOSITION OF THE ATMOSPHERE

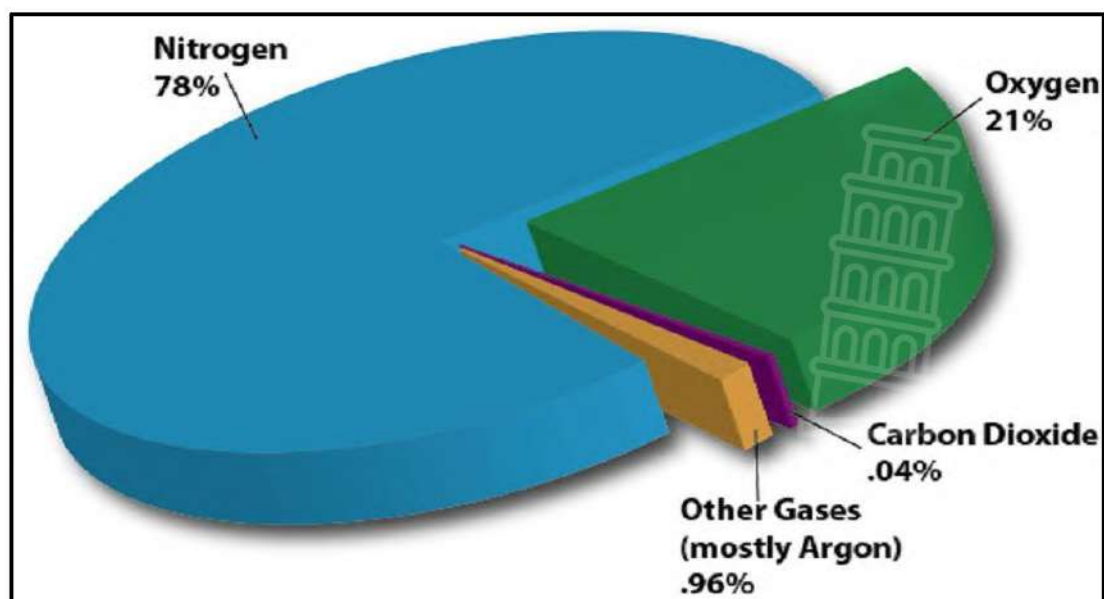
- Solid particles (ice, salt, smoke, carbon, and dust),
- Liquid (water) and
- Gas (permanent and variable)

### IMPORTANCE OF THE ATMOSPHERE

- Contains oxygen which is essential for respiration in humans
- Contain carbon dioxide for plants to grow
- Acts as blanket around the earth
- Protects life on earth



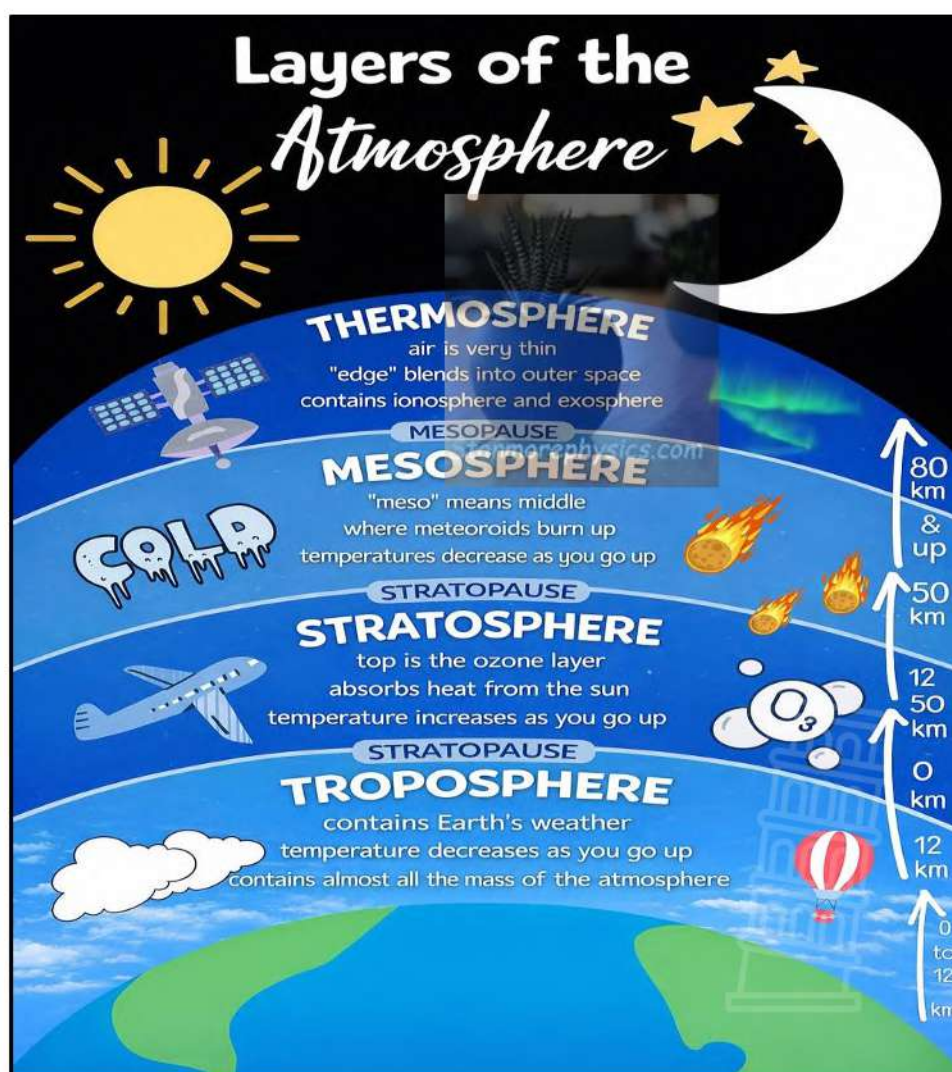
### GASES IN THE ATMOSPHERE





[Source: <https://studiousguy.com/wp-content/uploads/2021/08/Separation-Process.jpeg>]

PERMANENT GASES	VARIABLE GASES
<p>These gases occur in a fixed percentage in the atmosphere</p> <ul style="list-style-type: none"> <li>• Nitrogen has a fixed quantity of 78%</li> <li>• Oxygen – 21%</li> <li>• Argon – 0.9%</li> </ul>	<p>These are gases that do not occur in the fixed % in the atmosphere</p> <ul style="list-style-type: none"> <li>• Water vapour</li> <li>• Carbon dioxide</li> </ul>

### STRUCTURE OF THE ATMOSPHERE



[Source: <https://ecdnteacherspayteachers.com/cdn-cgi/image/format=avif,quality=70,width=525,height=525,onerror=redirect/thumbitem/Layers-of-the-Atmosphere-Poster-9129404-1676023591/750f-9129404-1.jpg>]

LAYER OF THE ATMOSPHERE	IMPORTANCE
 <p><b>THERMOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Outer layer of atmosphere</li> <li>• From 80km to above</li> <li>• Temperature increases with altitude.</li> <li>• Air particles reach temperature of about 500°C-1800°C</li> </ul>	<p><b>THERMOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Absorbs high energy radiation from the sun</li> <li>• Prevents rocks from space entering the lower atmosphere</li> </ul>
<p><b>MESOSPHERE</b></p> <ul style="list-style-type: none"> <li>• From about 50km to 80 km above the stratosphere</li> <li>• Temperature <b>decreases</b> with altitude</li> <li>• Temperature can be about -80°C.</li> <li>• Upper limit is <b>mesopause</b></li> </ul>	<p><b>MESOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Prevents rocks from space entering the lower atmosphere</li> </ul>
<p><b>STRATOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Located above the troposphere</li> <li>• Contains Ozone layer</li> <li>• Temperature <b>increases</b> with altitude (negative lapse rate)</li> <li>• Upper limit is <b>stratopause</b></li> </ul>	<p><b>STRATOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Contains ozone which supplements our oxygen</li> <li>• Airplanes are flown in this layer</li> <li>• Airplanes uses winds in this layer to pick up speed</li> </ul>
<p><b>TROPOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Closest to the Earth's surface</li> <li>• Air densest in the layer</li> <li>• Highest amount of oxygen and water vapor</li> <li>• Temperature <b>decreases</b> with altitude</li> <li>• Separated from stratosphere by <b>Tropopause</b></li> </ul>	 <p><b>TROPOSPHERE</b></p> <ul style="list-style-type: none"> <li>• Produces weather</li> <li>• We breath oxygen in from this layer</li> <li>• Has gases such as oxygen and water vapor that are essential for life on earth.</li> <li>• Produce water through rain</li> <li>• Produce food to eat</li> </ul>

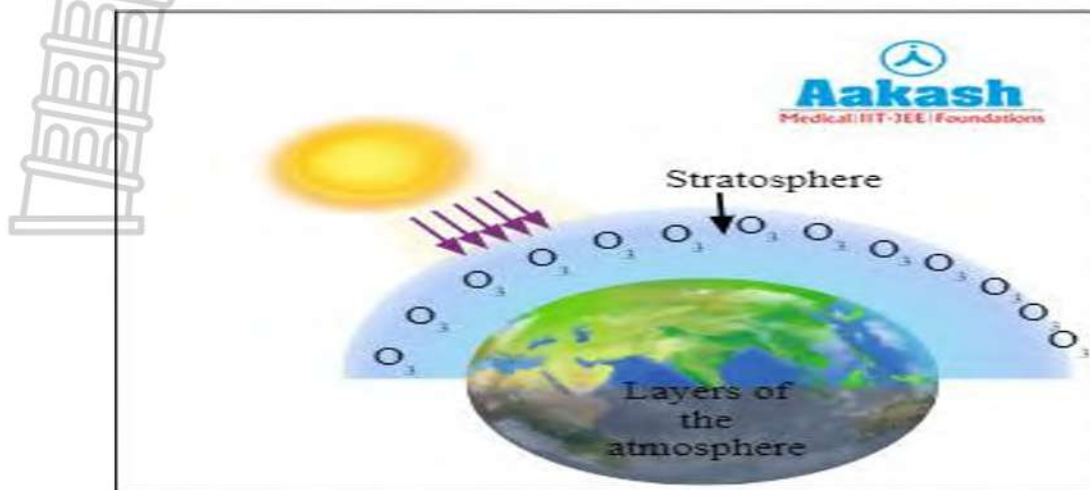
### THE OZONE LAYER

**WHAT** is OZONE? – Gas made up of 3 oxygen atoms (O<sub>3</sub>)

**WHERE** is it located? - Located in the Stratosphere

**OZONE DEPLETION:** The gradual thinning of Earth's ozone layer in the upper atmosphere.

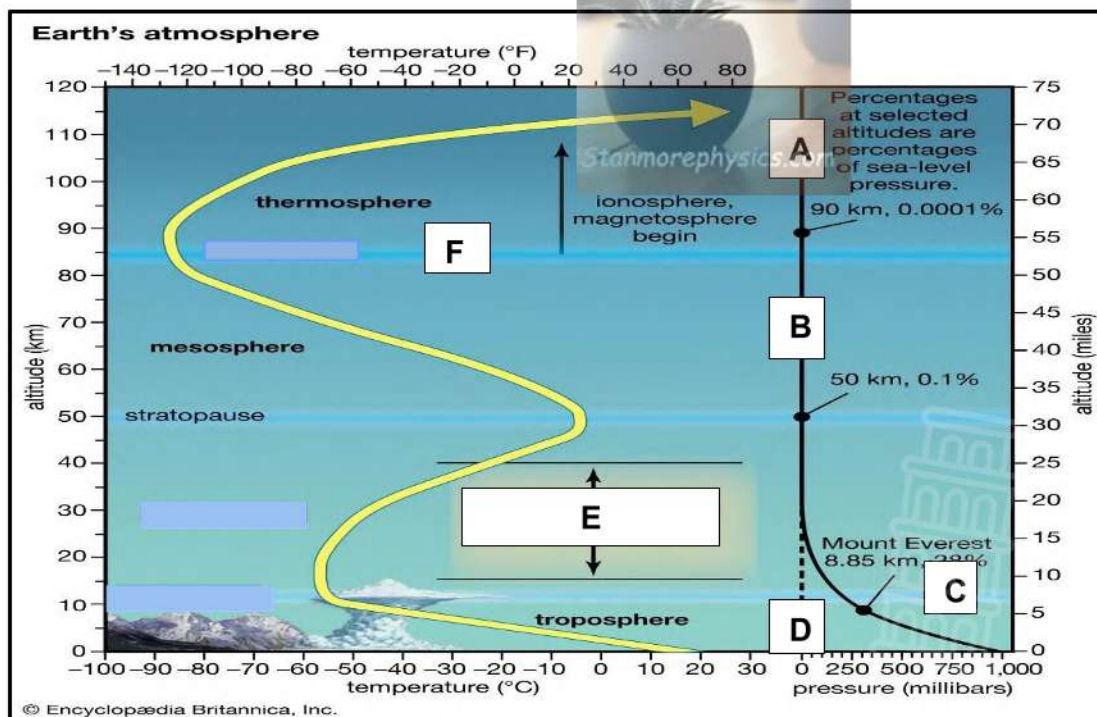
**Ozone Layer** is a layer high concentration of ozone, which absorbs most of the ultraviolet radiation reaching the earth from the sun.



[Source: Adapted from Gemini AI]

### Activity 1

1.1 Study the following sketch on the layers of the atmosphere.



[Source: Adapted from Gemini AI]

1.1.1	The layer in which temperatures are extremely high.	(1 x 1)	(1)
1.1.2	Zone of transition between Troposphere and Stratosphere at <b>C</b> is called ...	(1 x 1)	(1)

1.1.3	Temperature increases with altitude in these <b>TWO</b> layers ...	(2 x 1)	(2)
1.1.4	Temperature decreases with altitude in these <b>TWO</b> layers ...	(2 x 1)	(2)
1.1.5	Airplanes are flown in this layer ...	(1 x 1)	(1)
1.1.6	The furthest layer from the Earth's surface ...	(1 x 1)	(1)

1.2 Read the following extract on the Ozone layer.

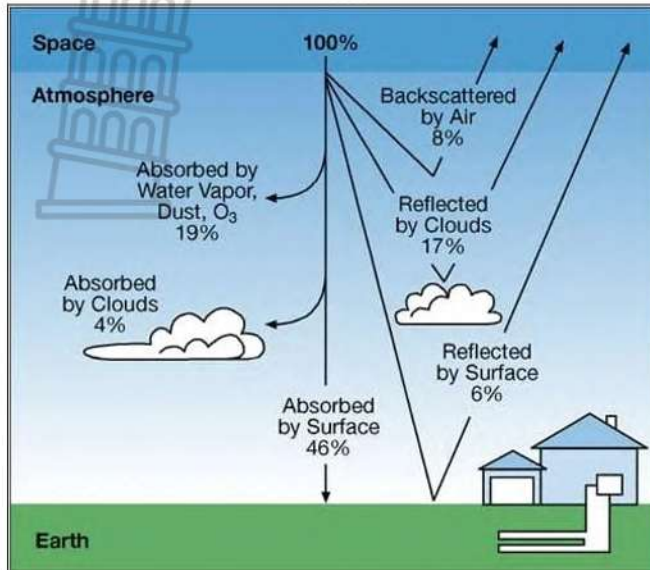
### THE OZONE LAYER

The ozone layer is vital for life on earth because it serves as a protective shield in the earth stratosphere, the ozone layers helps maintain the temperature and balance the atmosphere by absorbing the redistributing sun rays. Chlorofluorocarbons gases threats to the ozone layer and other ozone depleting substance have significantly thinned the ozone layer and creating seasonal "holes" especially over the Antarctica. The protection of ozone layer the Montreal Protocol (1987) successfully curbed the production of ozone depleting substance, the ozone layer is now showing signs of recovery, but continued efforts are necessary to ensure its full restoration. The ozone layer is an essential natural shield for preserving life on earth making its protection critical for present and future generations.

1.2.1	Define the concept <i>Ozone layer</i> .	(1 x 2)	(2)
1.2.2	Quote ONE international environmental agreement mentioned in the extract that regulates the production and use of chemicals like CFCs.	(1 x 1)	(1)
1.2.3	Provide ONE importance of the Ozone layer as evident in the extract.	(1 x 2)	(2)
1.2.4	Explain the impact of Ozone depletion on the life expectancy of people.	(1 x 2)	(2)
1.2.5	In a paragraph of approximately EIGHT lines discuss possible strategies to reduce the ozone depletion.	(4 x 2)	(8)

## HEATING OF THE ATMOSPHERE AND TRANSFER OF HEAT IN THE ATMOSPHERE

### HEATING OF THE ATMOSPHERE

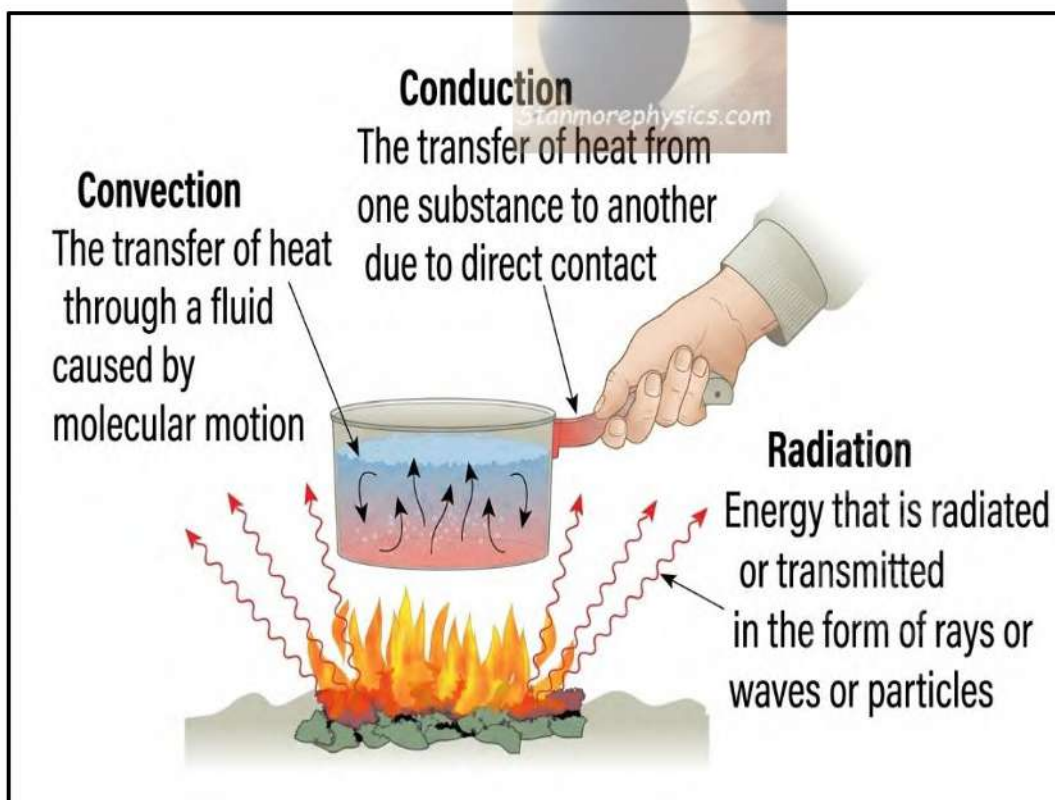


[<https://sageography.co.za>]

### SOLAR RADIATION:

- The amount of sun's energy/heat given off by the sun.
- Only 46% of the sun's energy reaches the Earth's surface because it moves in short waves
- 54% is lost by scattering, absorption and reflection.
- **Varies by location:** The intensity of radiation reaching the surface depends on the **angle of the sun**, which is why the equator is hotter than the poles.

### TRANSFER OF HEAT IN THE ATMOSPHERE



[Source: <https://sageography.co.za>]

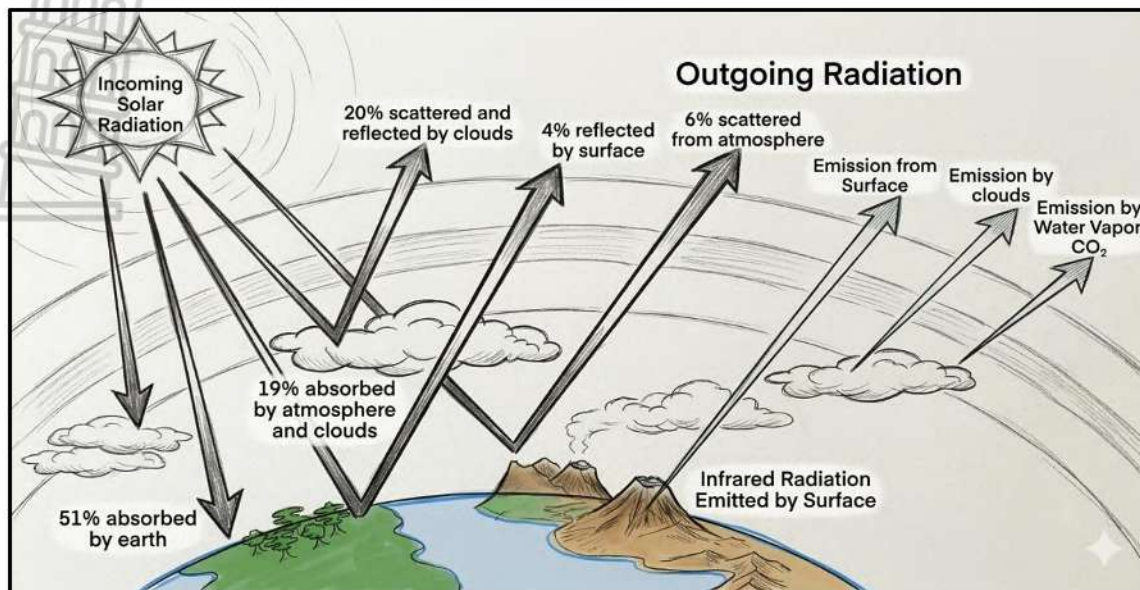
**PROCESSES HEATING THE ATMOSPHERE**

<b>SCATTERING:</b>	<b>REFLECTION:</b>	<b>ABSORPTION:</b>
<ul style="list-style-type: none"> <li>Occurs when small particles and gases diffuse (split up) the sun's rays in random directions without altering the wavelength at all.</li> <li>About 8% of heat is scattered by dust, smoke, and air particles before the sun's heat reaches the surface.</li> </ul>	<ul style="list-style-type: none"> <li>The act of sending the sun's energy back in the direction it came from without much absorption.</li> <li>Clouds appear white because they reflect a lot of light.</li> </ul>	<ul style="list-style-type: none"> <li>The process whereby clouds, and solid matter absorb energy</li> <li>About 24% is absorbed by water vapor, carbon dioxide, smoke and dust particles</li> </ul>

**PROCESSES TRANSFERING HEAT**

<b>CONVECTION:</b>	<b>CONDUCTION:</b>	<b>TERRESTRIAL RADIATION:</b>
<ul style="list-style-type: none"> <li>Earth's surface warms up, expands, gets lighter and rises.</li> <li>As air rise it cools and sinks again to earth's surface</li> </ul>	<ul style="list-style-type: none"> <li>The transfer of heat between substances that are in direct contact.</li> <li>When air touch the warm surface of the Earth.</li> </ul>	<ul style="list-style-type: none"> <li>The earth's surface is heated by means of radiation from the sun.</li> <li>This radiation is in the form of short waves.</li> <li>The atmosphere in turn is heated by radiation from the earth</li> </ul> <p>Long wave radiation from the sun is called <b>Terrestrial Radiation</b></p>

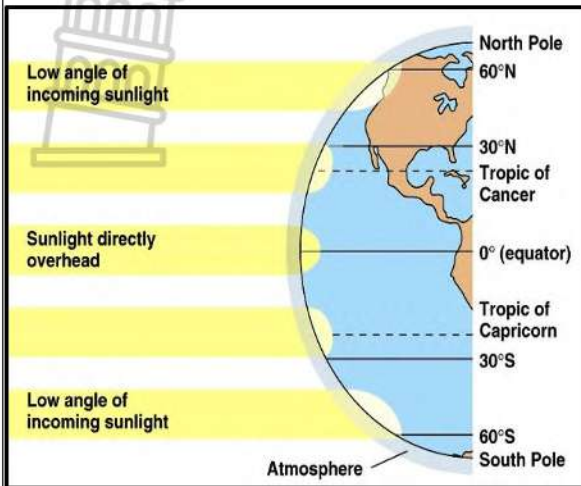
1.3 Refer to the sketch on the heating of the atmosphere.



[Source: Adapted from Gemini AI]

1.3.1	Define the term <i>Albedo</i> .	(1 x 2)	(2)
1.3.2	Name the main source of insolation for the earth as seen in the sketch above.	(1 x 1)	(1)
1.3.3	Identify THREE greenhouse gases mentioned in the diagram that are responsible for absorbing terrestrial radiation.	(3 x 1)	(3)
1.3.4	Explain the concept <i>terrestrial radiation</i> .	(1 x 2)	(2)
1.3.5	Explain how a cloudy day will influence the percentage of insolation received by the earth..	(2 x 2)	(4)

## FACTORS AFFECTING TEMPERATURE



[Source: Focus, grade 10]

### 1. LATITUDE

#### EQUATOR

- Experience high temperature throughout the year
- The further you move away from equator the lower the temperature

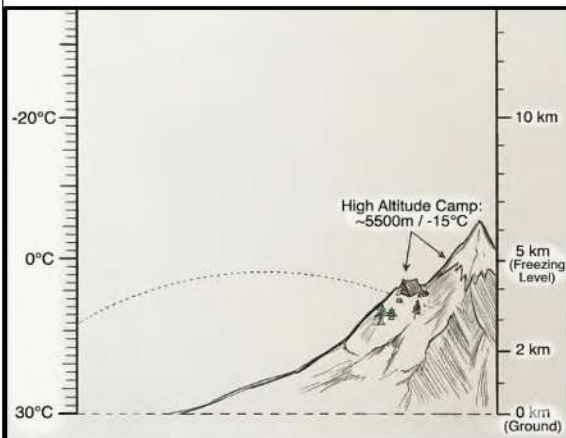
#### POLES

- Experience low temperature throughout the year
- The further you move away from the poles the higher the temperature.

### 2. ALTITUDE

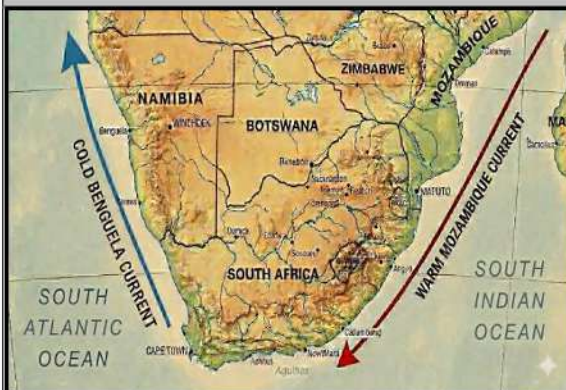
#### THE TEMPERATURE DECREASES WITH ALTITUDE

- The sun heats up the surface of the earth and then heat is radiated back into the atmosphere
- The air in the higher atmosphere is less dense and cannot hold heat as easily.
- Additionally, higher altitudes are further away from heat radiating from the earth's surface
- As we go from surface of the Earth to higher elevations atmosphere temperature decreases.



[Source: Adapted from Gemini AI]

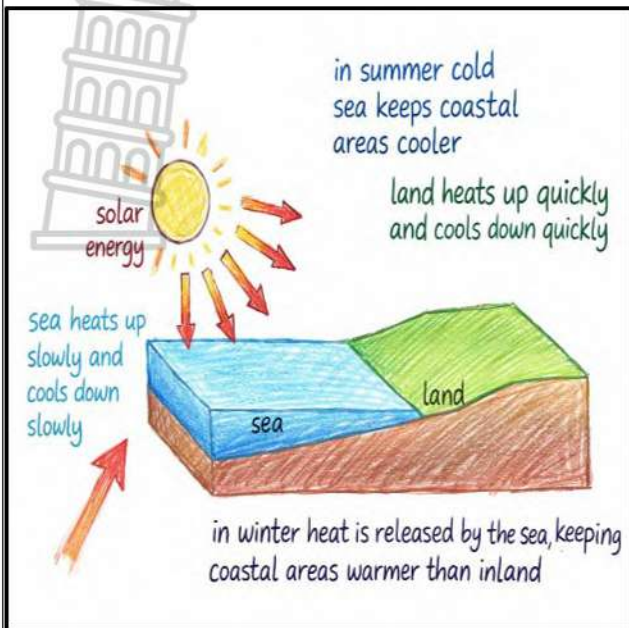
### 3. OCEAN CURRENTS



[Source: Adapted from Gemini AI]

- The temperature of an ocean current affects temperature of the air mass that passes over it.
- Warm ocean current increases the temperature of the air in coastal area
- Cold ocean current decreases the temperature of the air in coastal area
- NB. Warm currents on the east coast and Cold currents on the west coast.

#### 4. DISTANCE FROM THE OCEAN



- The land is heated faster than the sea
- The land loses heat faster than the sea

#### SUMMER

- Coastal areas are cool
- Inland is warm
- The further you move away from the sea the higher the temperature.

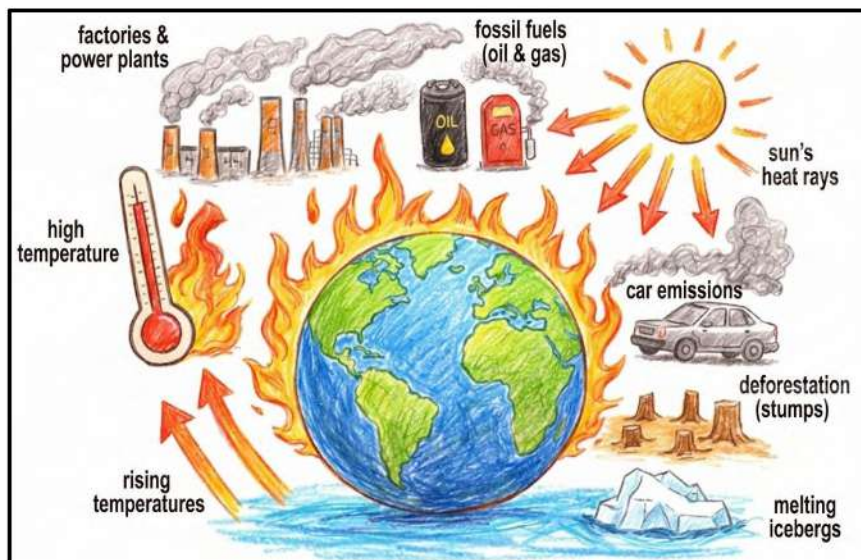
#### WINTER

- Coastal areas are warm
- Inland is cold
- The further you move away from the sea the lower the temperature.



[Source: Adapted from Gemini AI]

- Places that are influenced by sea temperature have a maritime climate – wet with a small temperature range.
- Places inland that are not influenced by sea temperatures have a continental climate – dry with a large temperature range.

#### THE GREENHOUSE EFFECT and GLOBAL WARMING



[Source: Adapted from Gemini AI]

GREENHOUSE EFFECT	RESULT OF GREENHOUSE	STRATEGIES TO REDUCE
 <ul style="list-style-type: none"> <li>This refers to the way in which the earth is able to trap radiation from a planet's atmosphere and warms the planet's surface heat within its atmosphere.</li> <li>The gases in the atmosphere absorb the long wave radiation from the sun.</li> <li>The temperature above what it would be without this atmosphere</li> </ul>	<ul style="list-style-type: none"> <li>The problem however is that over the years more and more heat is being trapped and this is making the earth warmer than it should be and we refer to this as global warming</li> <li>Warmer atmosphere.</li> </ul> 	<ul style="list-style-type: none"> <li>Reduce greenhouse gasses</li> <li>Plant more trees</li> <li>Use of solar and wind energy</li> <li>Regulate the release of gasses from industries</li> </ul>

GREENHOUSE GASSES:	GAS	%	What produce the gas
These gases have the ability to absorb and retain heat.	Methane	10%	Cattle, landfills, agriculture
	Nitrous oxide	5%	Manure, transport, agriculture
	Carbon dioxide	72%	Transport, industries
	Chlorofluorocarbons	13%	Transport

## GLOBAL WARMING

**Global warming** is the gradual increase in Earth's average temperature due to the accumulation of greenhouse gases from human activities.

CAUSES OF THE GLOBAL WARMING	IMPACT ON PEOPLE	IMPACT ON ENVIRONMENT
<ul style="list-style-type: none"> <li>• Burning of fossil fuels, releases carbon dioxide into the atmosphere</li> <li>• Deforestation: trees convert carbon dioxide into oxygen</li> <li>• Destruction of the ozone layer</li> <li>• Increased pollutants that trap heat.</li> <li>• Greater demand for cattle results in more methane gas.</li> <li>• Use of CFC's in the manufacturing industry.</li> <li>• Use of more cars and human activities that generate heat.</li> </ul> <p>Rapid population growth</p>	<ul style="list-style-type: none"> <li>• Increase in global warming.</li> <li>• Melting of polar ice – caps</li> <li>• Rising sea levels, which results in the flooding of low-lying areas Climatic changes</li> <li>• Spread of desertification</li> <li>• Increase in drought-stricken areas</li> <li>• Increase in diseases such as malaria Drop in food production due to droughts, extinction of plants, fish and animals</li> <li>• Infectious diseases (Cholera, Malaria), because of warmer temperatures</li> </ul> <p>Migration of people to cooler climates</p>	<ul style="list-style-type: none"> <li>• Rise of global temperatures</li> <li>• Plants and animals that can't adapt to the higher temperatures become extinct.</li> <li>• Oceans become warmer</li> <li>• Marine organisms become extinct</li> <li>• More extreme weather e.g. storms, droughts, heat waves fires and floods</li> <li>• Melting of snow and ice at the poles</li> <li>• Rising sea levels because of the melting snow</li> <li>• Climate change</li> </ul>

1.4 Refer to the infographic on global warming.

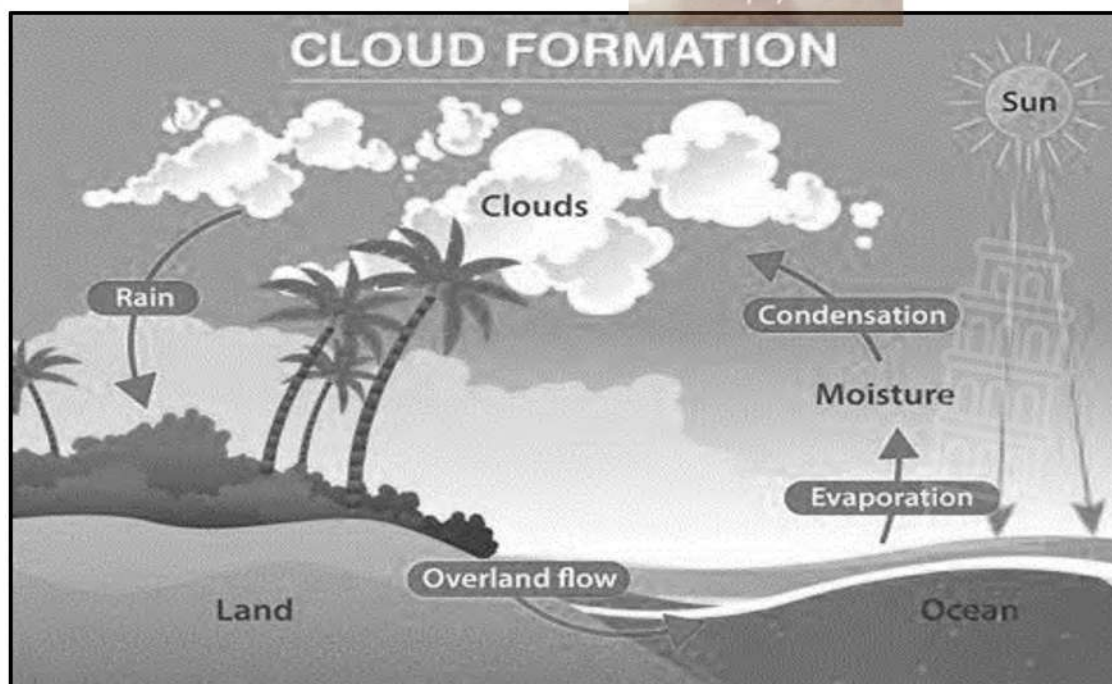


[Source: Adapted from Gemini AI]

1.4.1	Define the concept <i>Global Warming</i> .	(1 x 2)	(2)
1.4.2	Give TWO examples of greenhouse gases.	(2 x 1)	(2)
1.4.3	Identify THREE human activities that contribute to the enhanced greenhouse effect.	(3 x 1)	(3)
1.4.4	In a paragraph of approximately EIGHT lines, discuss the impacts of global warming on South Africa's environment and suggest how the country can adapt to these changes.	(4 x 2)	(8)

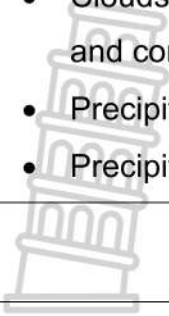
<b>MOISTURE IN THE ATMOSPHERE</b>	
<b>Concept</b>	<b>Definition</b>
Moisture	Presence of water vapour in the atmosphere
Humidity	Amount of water vapour in the atmosphere
Condensation	When water vapour changes to water
Dew- point temperature	Temperature at which condensation occurs
Evaporation	When water changes from liquid to water vapour
Latent heat	Energy released during condensation
Condensation nuclei	Particles on which water vapour condenses
Condensation level/ point	Altitude at which condensation take place
Sublimation	When ice changes direct into gas
Freezing	When water changes into ice
Melting	When ice changes into liquid

### Clouds formation

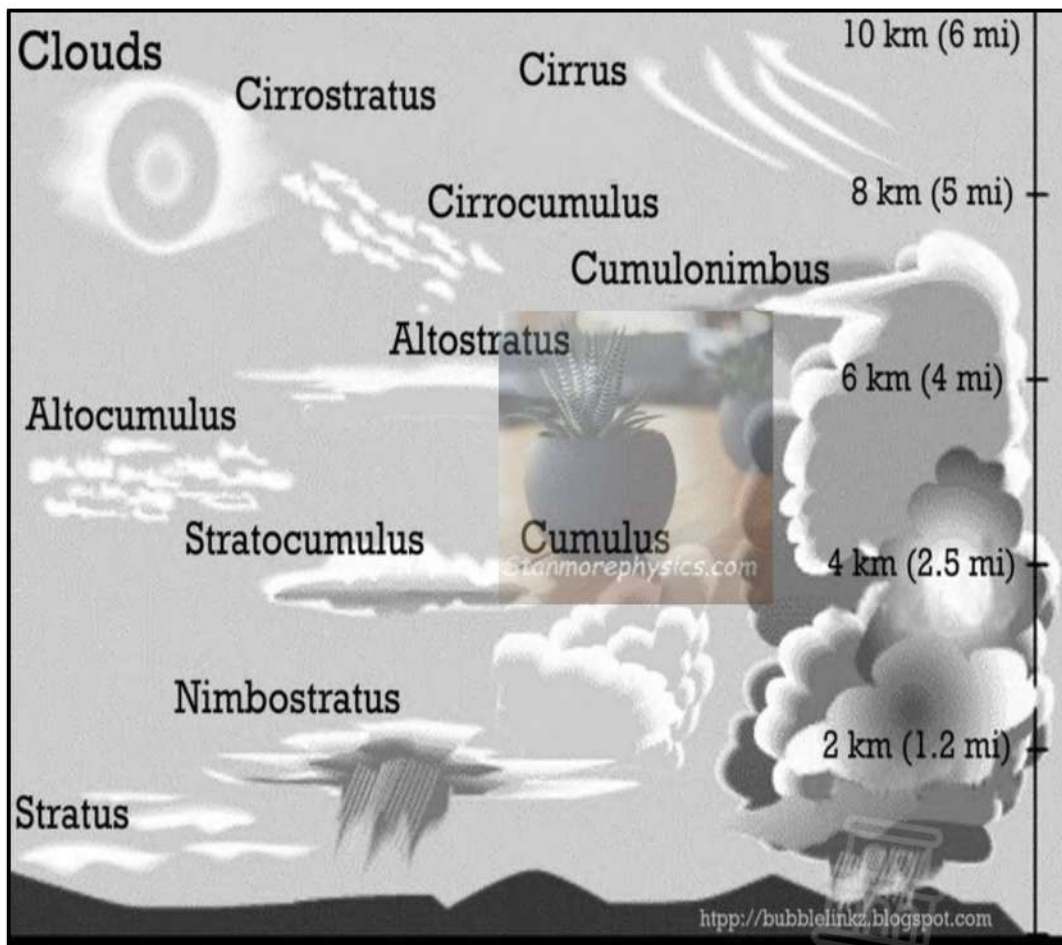


[Source: <https://cdn1.byjus.com/wp-content/uploads/2019/03/cloudformation.png> ]

- Clouds are formed when air that contains moisture rises and reach a condensation point and condense on condensation nuclei to form precipitation
- Precipitation refers to all forms water (liquid or solid) in the atmosphere
- Precipitation include rainfall, snow fall, hailstones, frost, dew etc.



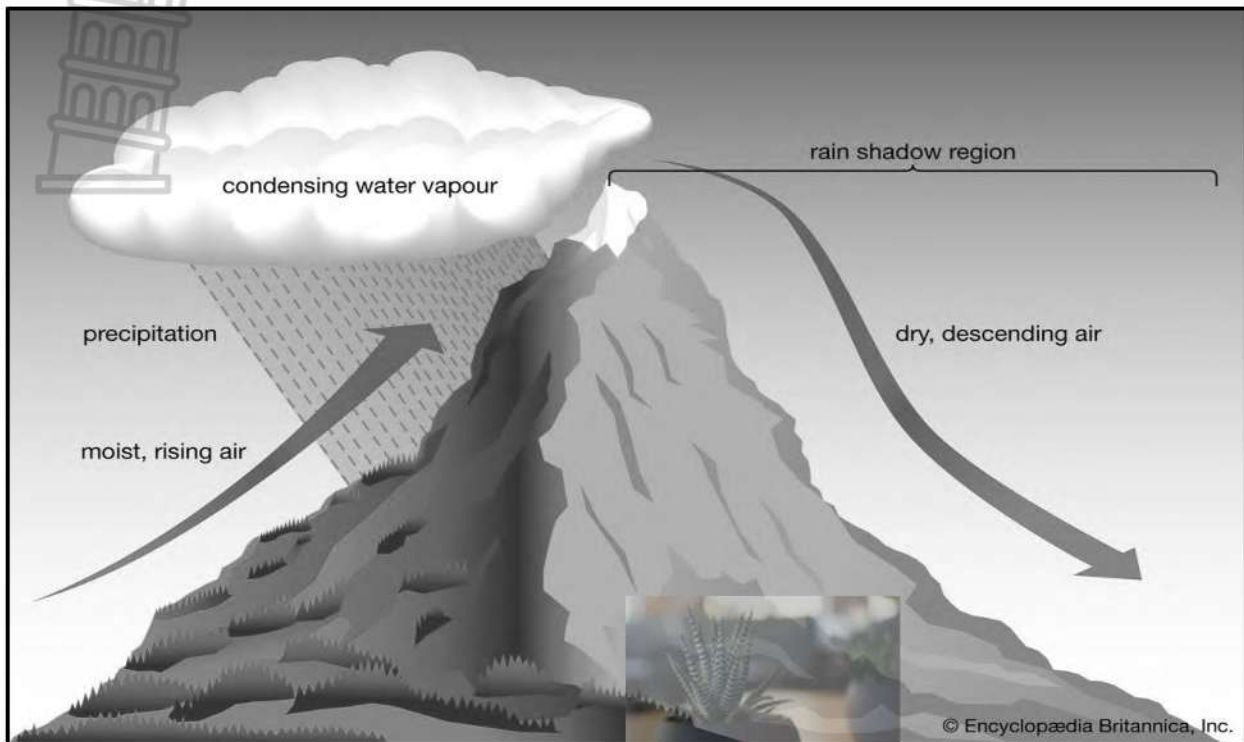
### Types of clouds



[Source: <https://i.pinimg.com/originals/7b/93/20/7b9320e49ef589e7f57fc1c65e98777b.jpg>]

- Cumulonimbus clouds are tall, dark and vertically formed clouds associated with heavy rainfall
- Nimbostratus clouds form when stratus clouds thicken enough and they can cause light rainfall
- Stratus clouds are low lying thin layers of clouds often found over mountains and they can cause little or no rainfall

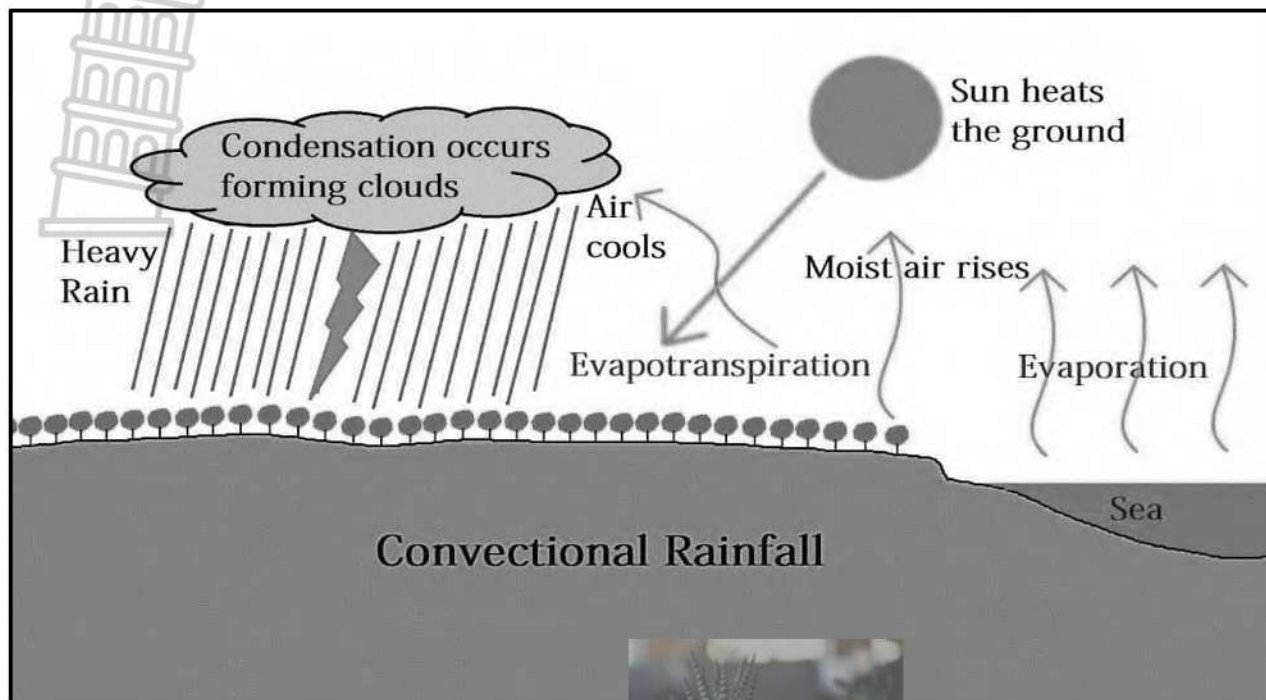
## RELIEF RAINFALL



[Source: <https://cdn.britannica.com/51/135451-050-ED1EC2D5/Condensation-precipitation-rain-shadow-effect-lift.jpg>]

- Relief rainfall forms when air moves horizontal along the earth's surface.
- When air moves towards the hill or mountain, it is forced to rise
- Air rises and reaches the condensation point, form clouds and produce rainfall on one side of the hill/ mountain
- The side that do not receive rainfall is called rain shadow

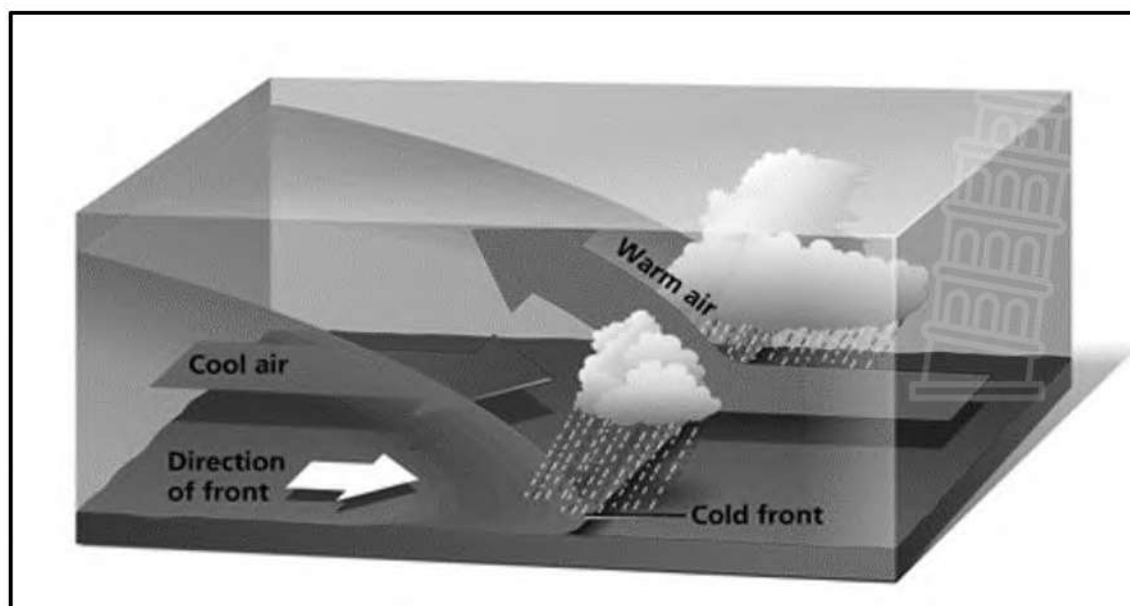
## CONVECTIONAL RAINFALL



Source: <https://lotusarise.com/wp-content/uploads/2020/07/Convectional-Rainfall-1.jpg>

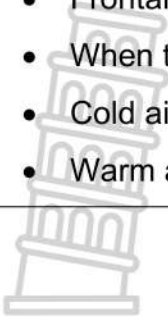
- Convectional rainfall forms on hot days and there is high rate of evaporation.
- Warm air with moisture rises and reach condensation point
- Air condenses, form clouds and produces rainfall

## FRONTAL RAINFALL

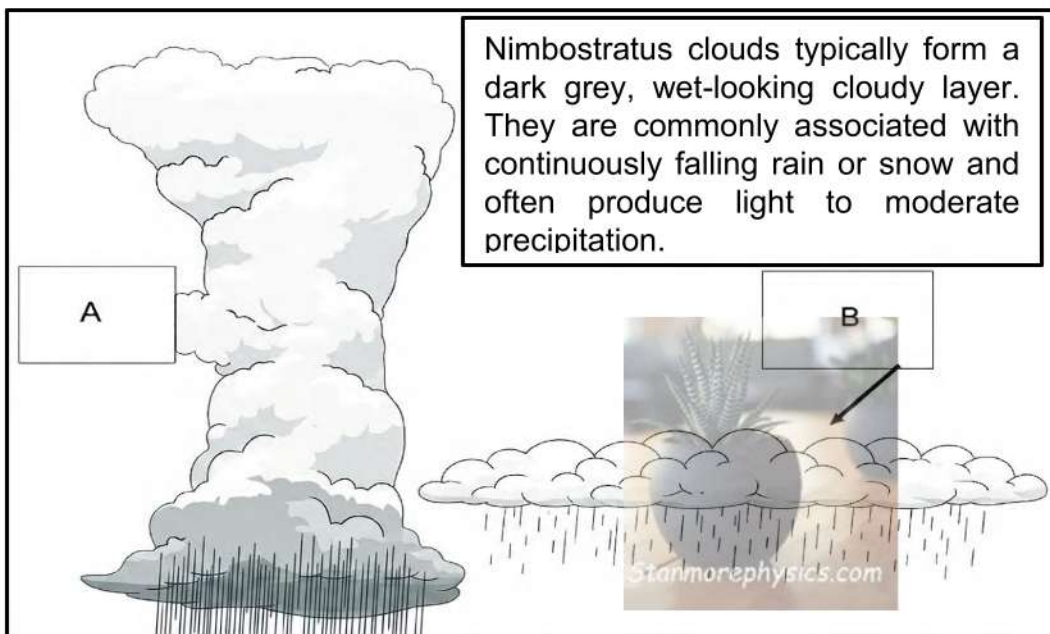


[Source: <https://geography4u.com/wp-content/uploads/2020/04/frontal-rainfall.png>]

- Frontal rainfall forms when cold air meet with the warm air
- When these air masses meet they do not mix
- Cold air undercut warm air and force it to rise
- Warm air rises, reach condensation pint, condense, form clouds and produce rainfall



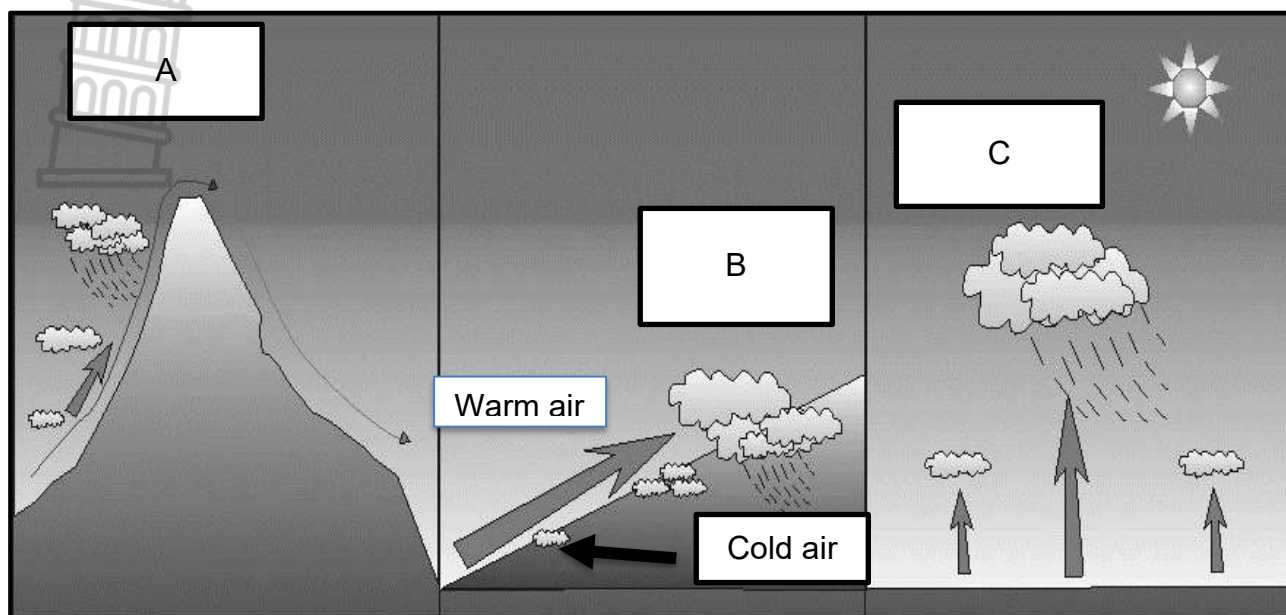
1.5 Refer to the diagram below on the types of clouds.



[Source:[https://svg.staging.mindthegraph.com/realistic/cumulonimbuscloud/900x772/cumulonimbus\\_cloud-04.png](https://svg.staging.mindthegraph.com/realistic/cumulonimbuscloud/900x772/cumulonimbus_cloud-04.png) ]

1.5.1	Define the term <i>condensation</i> .	(1 x 2)	(2)
1.5.2	Identify types of cloud in diagram <b>A</b> and <b>B</b> respectively.	(2 x 1)	(2)
1.5.3	According to the text above list any type of precipitation that can be associated with cloud type <b>B</b> .	(1 x 1)	(1)
1.5.4	Describe cloud type <b>A</b> .	(1 x 2)	(2)
1.5.5	Differentiate between cloud type <b>A</b> and <b>B</b> in terms of the associated rainfall.	(2 x 2)	(4)
1.5.6	Explain the formation of clouds.	(2 x 2)	(4)

1.6 Refer to the diagram on different forms of rainfall.



Source: <https://media.geeksforgeeks.org/wp-content/uploads/20240425163417/Types-of-Rainfall-Class-11-Geography-Notes.webp>

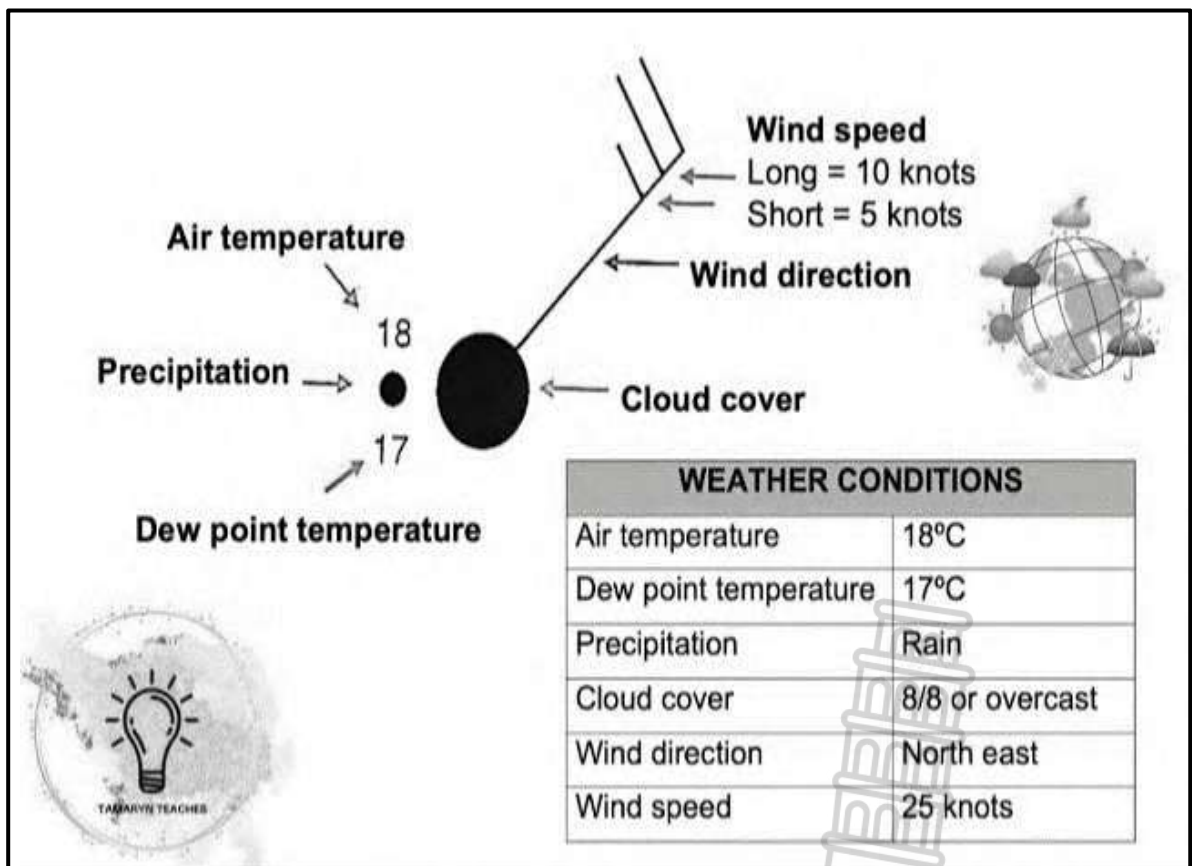
1.6.1	The side of the hill/ mountain with sinking air is known as the...	(1 x 1)	(1)
1.6.2	Identify the types of rainfall at <b>A</b> and <b>C</b> as shown in the diagram.	(2 x 1)	(2)
1.6.3	Explain why the air rises at <b>A</b> and <b>C</b> .	(2 x 2)	(4)
1.6.4	In a paragraph of approximately EIGHT lines explain the formation of the rainfall at <b>B</b> .	(4 x 2)	(8)

## READING AND INTERPRETING SYNOPTIC WEATHER MAPS

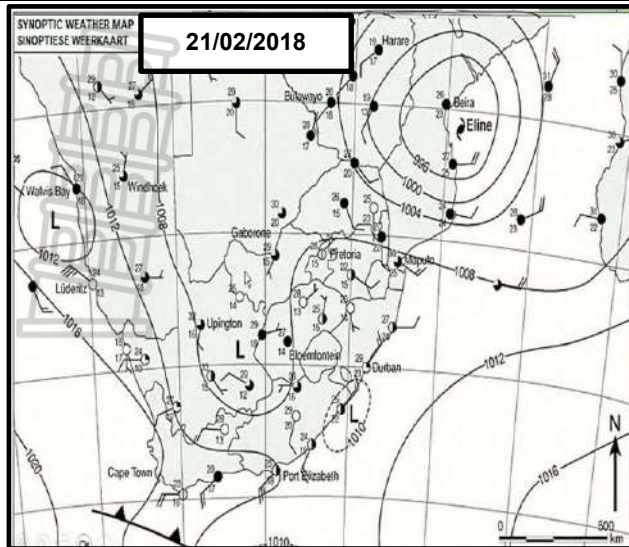
**Synoptic weather map:** it is a summary of prevailing weather conditions over a certain area at a specific time.

- Information about the weather condition at a place can be obtained by examining a weather station on a synoptic weather map.
- Several weather elements are included on a synoptic weather map i.e.: **air temperature, dew point temperature, nature of precipitation, cloud cover, wind direction and wind speed** which are indicated by means of symbols.

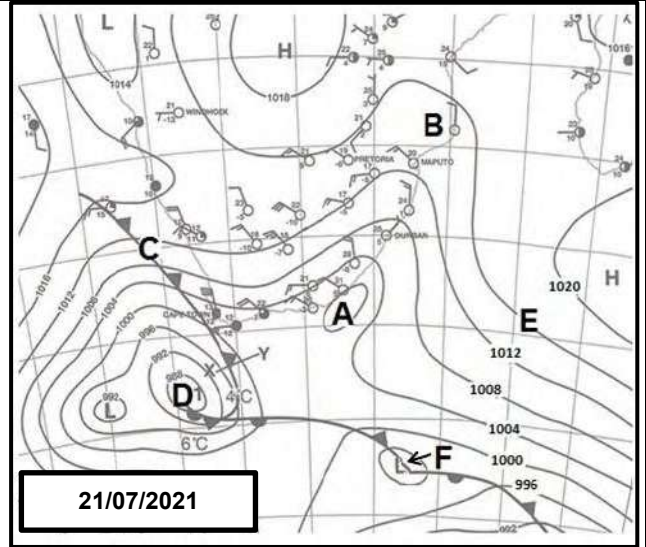
### AN EXAMPLE OF A WEATHER STATION



[Source: South African Weather Bureau]

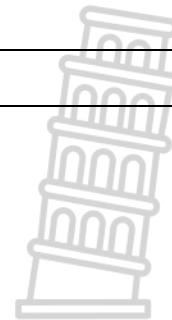


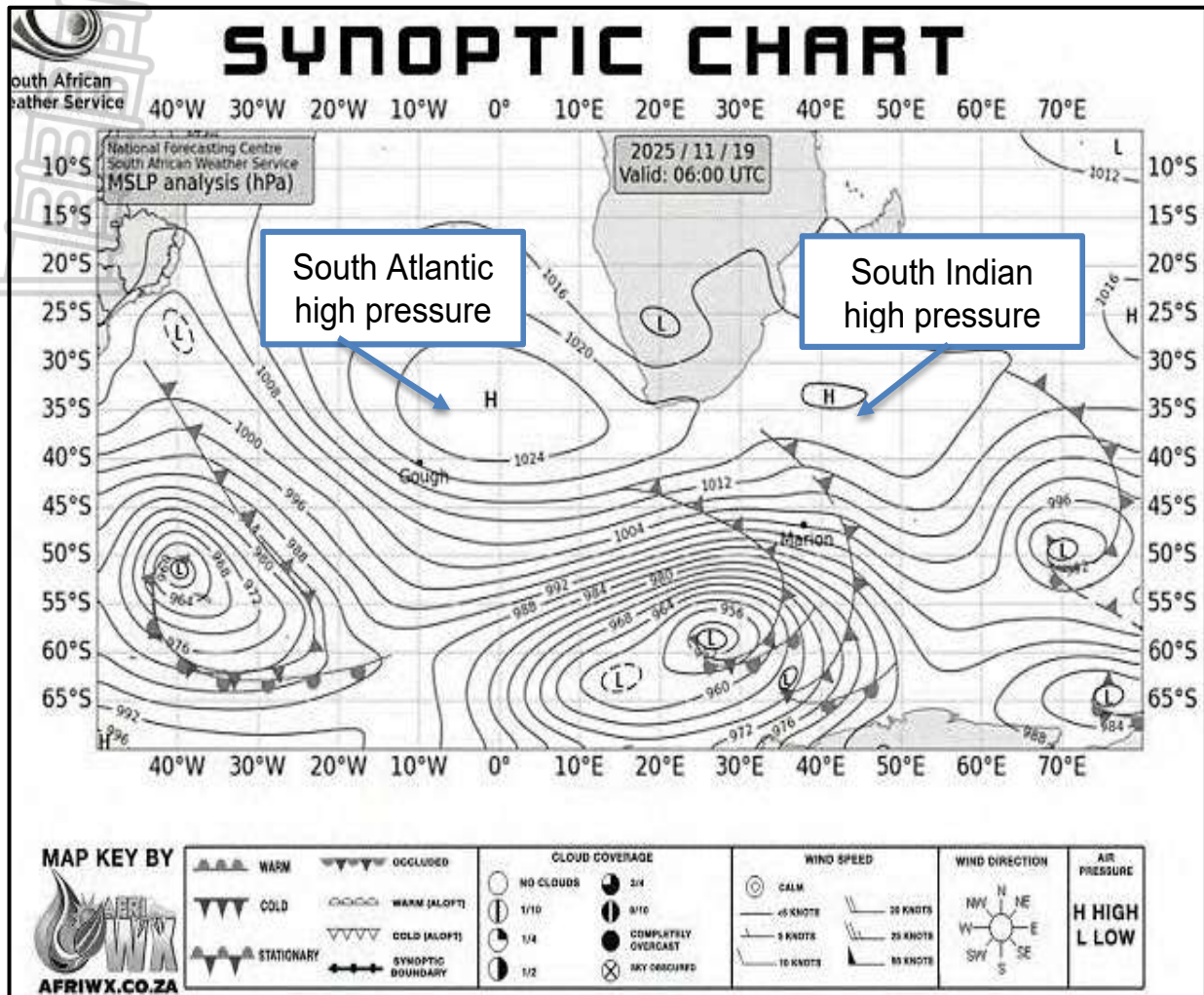
[Source: South African Weather Bureau]



[Source: South African Weather Bureau]

Typical summer conditions	Typical winter conditions
Date (summer months)	Date (winter months)
Interior temperatures are high	Interior temperatures are low
Cold front will pass further south of the main land	Cold front comes closer to the land
Thermal low/heat low pressure over the land	Kalahari high dominates the land
Overcast conditions over the land	Generally clear skies over the land
South Indian high and South Atlantic high generally occupy a southerly position	South Indian high and South Indian high generally move further North and closer to the mainland
Presence of a tropical cyclone	

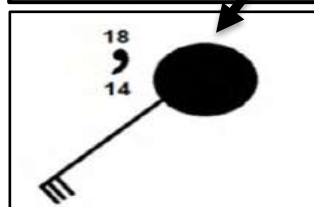
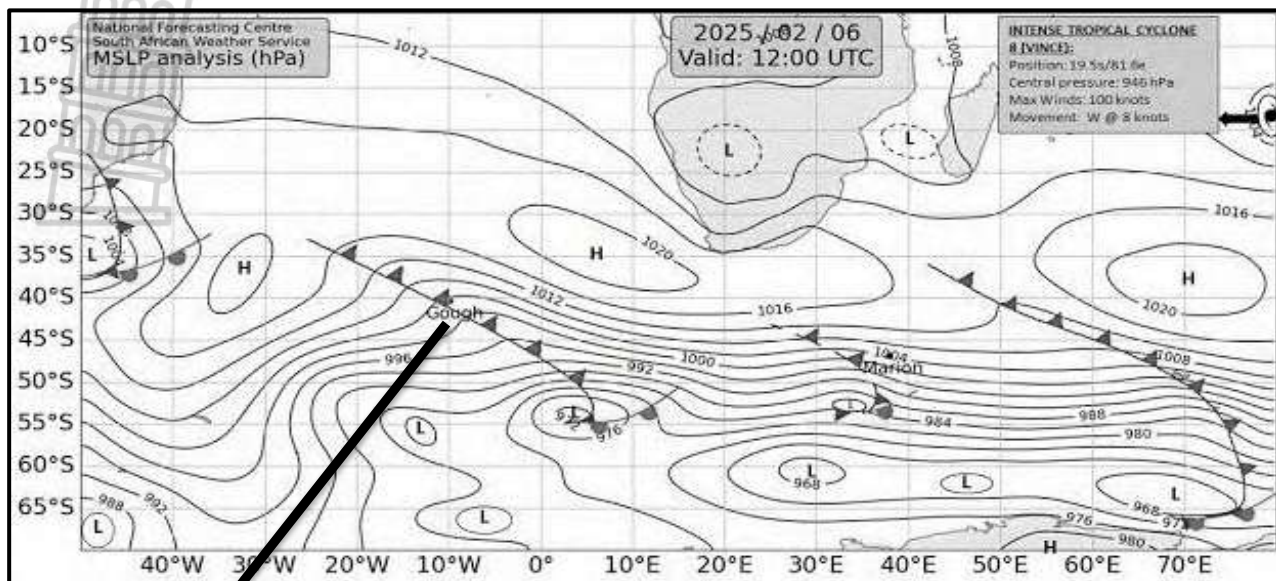




[Source: <https://afriwx.co.za/synoptic-charts/2023-05-08-15-Synoptic-Weather-Chart-South-Africa.jpg>]

- **Isobars:** lines that are used to join places of equal air pressure above sea level in hPa
- **Isobaric interval:** the difference in pressure between two adjacent isobars on a weather map
- **Pressure gradient - Steep:** strong winds- isobars are close together / **Gentle:** light winds – wide isobars
- High pressure located on the west is called the **South Atlantic high**.
- High pressure located on the east is called the **South Indian high**.

1.7 Refer to the synoptic weather chart and Gough Island station model insert below.



**Gough island insert**

[Source: <https://afriwx.co.za/synoptic-charts/2023-05-08-15-Synoptic-Weather-Chart-South-Africa.jpg>]

1.7.1	Name the lines that joins places with the same air pressure	(1 x 1)	(1)
1.7.2	The season that this chart represent is (summer/winter)	(1 x 1)	(1)
1.7.3	Provide TWO pieces of evidence to support your answer in 1.7.2.	(2 x 1)	(2)
1.7.4	Determine the isobaric interval for this synoptic chart.	(1 x 1)	(1)
1.7.5	Identify the front moving over Gough Island on the synoptic map and state the type of rainfall experienced in the area.	(2 x 1)	(2)
1.7.6	Gough and Marion Island are located in the same latitude. Account for the difference in temperatures between the two Islands.	(1 x 2)	(2)
1.7.7	Describe the weather experienced in Gough Island.	(6 x 1)	(6)

## GEOMORPHOLOGY

**Geomorphology** refers to the study of the changing surface of the earth by both internal as well as surface (external) forces and their resultant landforms.

### THE STRUCTURE OF THE EARTH

#### RELATED CONCEPTS

**Oceanic crust:** thin, dense, and young outer layer of the Earth's lithosphere, forming the seafloor.

**Continental crust:** thick, buoyant, and older layer of the Earth's surface lithosphere that forms the continents and continental shelves.

**Mohorovich Discontinuity or Moho Discontinuity:** the discontinuity between the earth and crust.

**SIMA:** The major constituent elements of the mantle are Silicon and Magnesium.

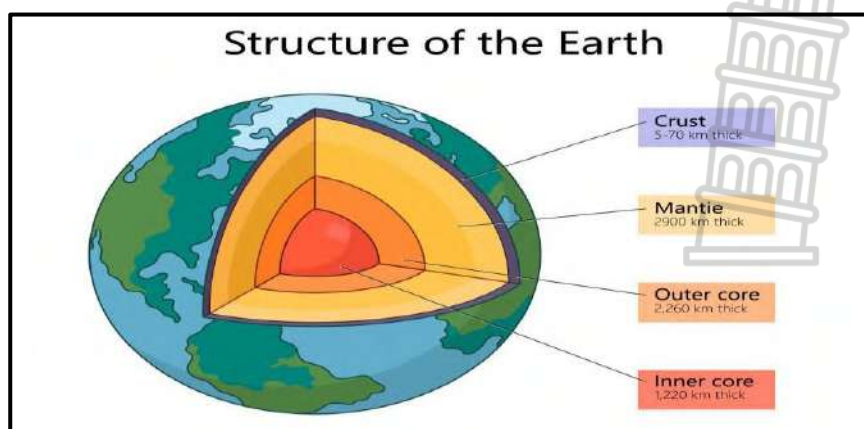
**SIAL:** The main rock is granite with dominant minerals Silicon and Aluminium.

**Igneous rock :** formed from the solidification of magma or lava.

**Sedimentary rock:** formed by the accumulation and cementation of mineral or organic particles on the earth surface.

**Metamorphic rock:** formed when other rocks are affected by great temperatures and pressures.

**Asthenosphere:** is a highly viscous, mechanically weak and ductile, deforming region of the upper mantle which lies just below the lithosphere.



[source: Google images]

The earth consists of three layers: Crust, Mantle, Core

### **Continental crust**

- Crust is the outermost layer of solid rock, on which we live in.
- The lithospheres consist of the crust and the solid top part of the mantle.
- The crust is 6-90km thick (solid rock).
- Temperature increases with depth.

### **Mantle**

- Mantle is under the crust.
- It is 2900 km thick, consisting of hot and plastic but solid.
- Temperature may reach 5000°C.
- The Moho discontinuity is the boundary between the crust and mantle.

### **Outer core**

- This layer is very dense but liquid due to extremely high temperatures.
- It consist of nickel (Ni) and iron (Fe). Known as NiFe.
- It is 2250km thick

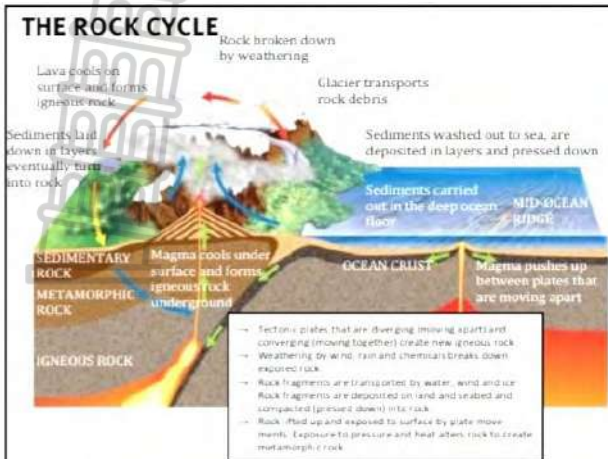
### **Inner core**

- The inner core is extremely hot
- It is 1200km thick
- It is solid due to extreme pressure

### **The Rock cycle**

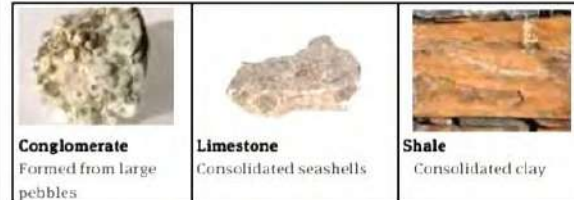
Processes that change rocks in the rock cycle

- Pressure and temperature turn sedimentary rocks into igneous rocks.
- Pressure and temperature turn rocks into metamorphic rocks.
- Temperature turns sedimentary rocks into metamorphic rocks.
- Weathering turns metamorphic rocks into sedimentary rocks.



**UPPER CRUST - SEDIMENTARY ROCK**

- Sediments deposited by wind, water and ice build up in layers.
- Older layers are squeezed under the weight from above and become solid rock.



- All rocks can be classified into one of three main rock types: *igneous*, *sedimentary* or *metamorphic* rocks, depending on how they were formed and how they were changed.

**CRUST - IGNEOUS ROCK**

- Magma rises through the crust, cools and crystallises into new rock.
- The slower the cooling, the larger the crystals formed in rock.



**DEEPER CRUST – METAMORPHIC ROCK**

- Igneous and sedimentary change by heat and pressure.



[Source: Google image]

**CLASSIFICATION OF ROCKS**

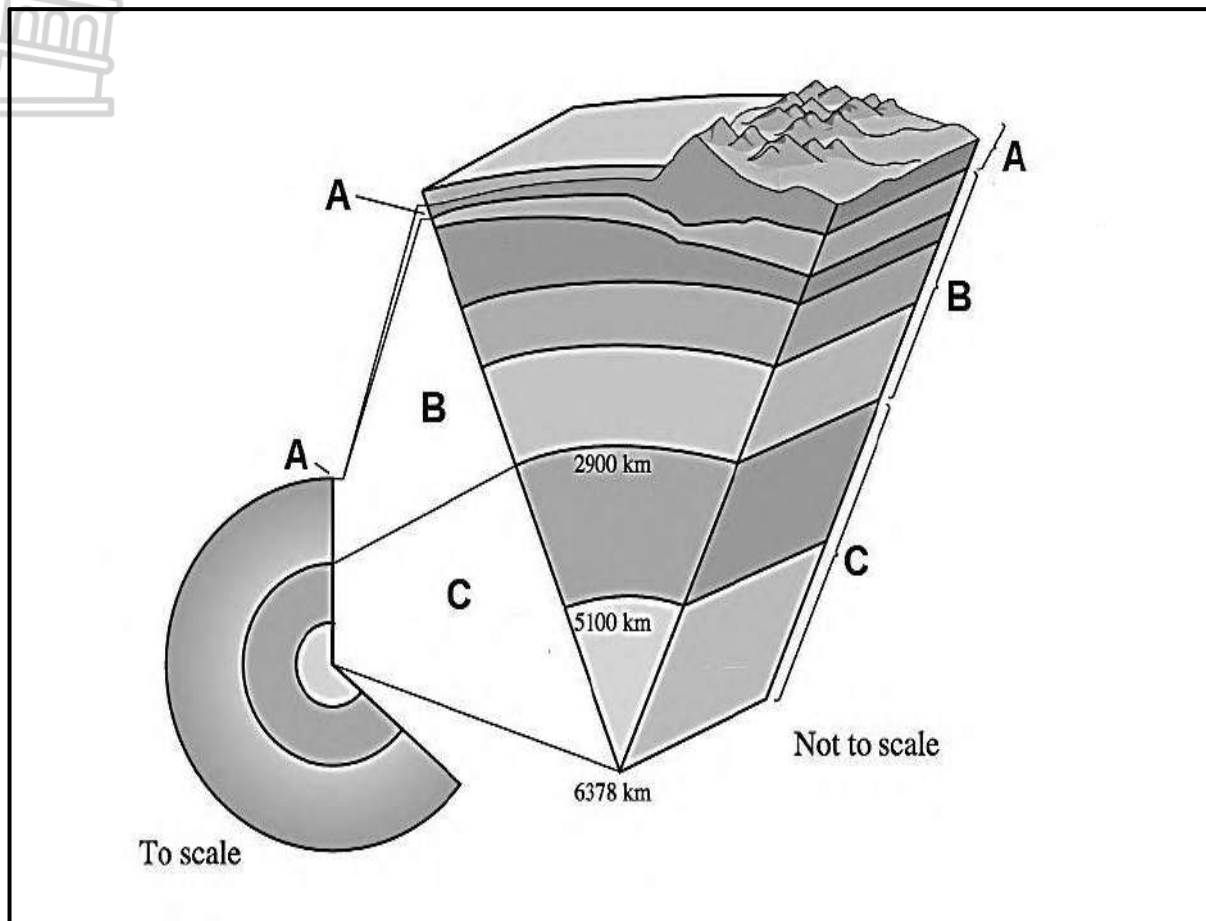
Rocks are classified into three main types based on their origin and mode of formation: Igneous, Sedimentary, and Metamorphic

**Igneous rocks:** formed by cooling and solidification of molten rock (magma or lava).

**Sedimentary rock:** formed by the compaction and cementation of sediments over time.

**Metamorphic rocks:** formed when existing rocks (igneous or sedimentary) are transformed by high heat and pressure deep within the earth's crust.

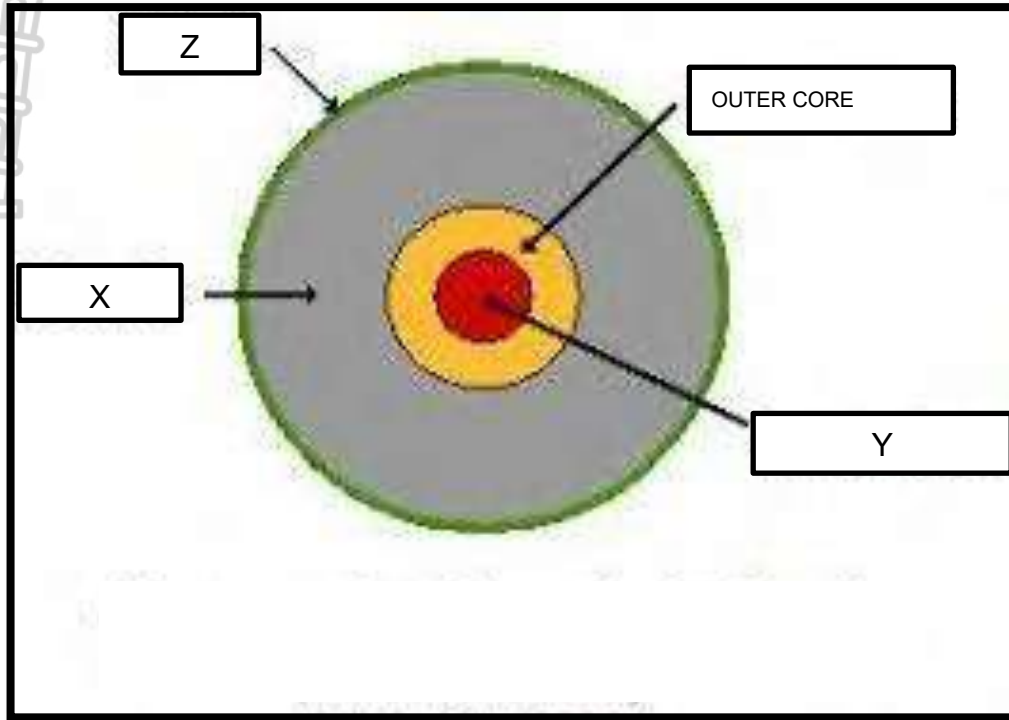
2.1 Refer to the diagram below illustrating the internal structure of the earth. Match each of the descriptions (2.1.1 – 2.1.7) with the letters (A-C) on the diagram e.g. 2.1.8 D



[Source: Google image]

2.1.1	The layer that is made up of iron and nickel.		
2.1.2	The asthenosphere forms part of this layer.		
2.1.3	In this layer, the convection currents create the earth's magnetic field.		
2.1.4	This is the outer layer of the internal structure of the earth.		
2.1.5	This layer consists of iron and magnesium.		
2.1.6	The layer is in a molten stage, but too heavy to move like liquid.		
2.1.7	In this layer, Sial and Sima form part of the rocks that form.		
		(7 x 1)	(7)

2.2 Refer to the diagram on the structure of the Earth.



[Source: google images]

2.2.1	Name the layers labelled <b>X</b> , <b>Y</b> and <b>Z</b> .	(3 x 1)	(3)								
2.2.2	Fill in the following thicknesses for each layer to complete it. 1200 km, 5 to 90 km and 1 200 km.										
	<table border="1"> <thead> <tr> <th>LAYER</th> <th>THICKNESS</th> </tr> </thead> <tbody> <tr> <td><b>X</b></td> <td></td> </tr> <tr> <td><b>Y</b></td> <td></td> </tr> <tr> <td><b>Z</b></td> <td></td> </tr> </tbody> </table>	LAYER	THICKNESS	<b>X</b>		<b>Y</b>		<b>Z</b>		(3 x 1)	(3)
LAYER	THICKNESS										
<b>X</b>											
<b>Y</b>											
<b>Z</b>											
2.2.3	Is the temperature change decreasing or increasing as one moves from layer <b>Y</b> to layer <b>Z</b> ?	(1 x 1)	(1)								
2.2.4	Layer <b>Z</b> consists of TWO layers. Name these layers.	(2 x 1)	(2)								
2.2.5	Explain how layer <b>X</b> results in volcanic activity.	(1 x 2)	(2)								
2.2.6	Describe TWO ways in which the layer labelled <b>Z</b> is important to humans.	(2 x 2)	(4)								

## PLATE TECTONICS




IMPORTANT CONCEPTS	DEFINITIONS
<b>Tectonic plate</b>	Section of the earth's crust that can move on the mantle
<b>Transforming plates</b>	Refers to when the plates are sliding past each other.
<b>Plate boundary</b>	Refers to the edge of a tectonic plate.
<b>Oceanic plates</b>	It is the crust under the sea mass.
<b>Converging boundaries</b>	Plates that move towards each other.
<b>Diverging boundaries</b>	Plates moving apart.
<b>Continental plates</b>	It is the crust under the land mass.
<b>Alfred Wegner's Theory</b>	In a number of million years ago a scientist discovered that the earth was just one united land mass called Pangea.

## EVIDENCE OF CONTINENTAL DRIFT

Continental Fit	Fossil Match	Sea Floor Spreading	Glacial Deposits
<ul style="list-style-type: none"> <li>➤ Coastlines of South America and West of Africa fit together like a jigsaw puzzle.</li> <li>➤ Rocks of a similar age and sequence are found</li> </ul>	<ul style="list-style-type: none"> <li>➤ The fossils of the same animals found in South America and Africa.</li> <li>➤ Some fossils are only found Antarctica, India, South Africa and Australia.</li> <li>➤ Some fossils can only be</li> </ul>	<ul style="list-style-type: none"> <li>➤ The age of the sea floor rocks is younger than the age of the continent rocks.</li> <li>➤ Ocean floor is new and is being added on a regular basis.</li> <li>➤ Age of rocks on either side of the mid</li> </ul>	<ul style="list-style-type: none"> <li>➤ Similar glacial deposits are found in Antarctica, Africa, South America, India and Australia.</li> <li>➤ Glacial striations show the direction of movement from the continents.</li> </ul>

<p>on both continents.</p> <p>➤ Mountain belts are same on both continents.</p>	<p>found in Antarctica, India and South Africa.</p>	<p>ocean ridge mirror to each other.</p> <p>➤ The youngest rocks are found closest to the ridges and oldest rocks closest to the continent.</p>	
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### CONTINENTAL DRIFT

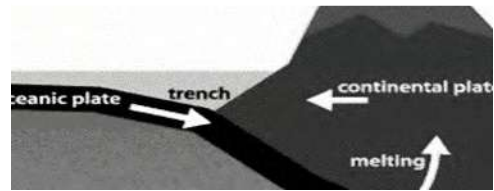
<p><b>225 Million Years Ago</b></p>	<p>The earth was just one united land mass called Pangea.</p>	
<p><b>200 Million Years Ago</b></p>	<p>The large land mass split into the Northern part called Laurasia and Southern part called Gondwana land.</p>	 <p>200 million years ago</p>
<p><b>Present Day</b></p>	<p>The earth is divided into different continents in north part there is North America, Asia and Europe. South there is South America, Africa, India, Australia and Antarctica.</p>	

[Sources: Google image]

### TYPES OF PLATE BOUNDARIES

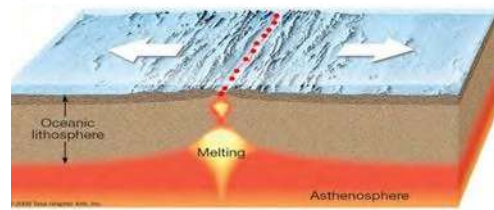
**Converging:**

Plates that move towards each other.



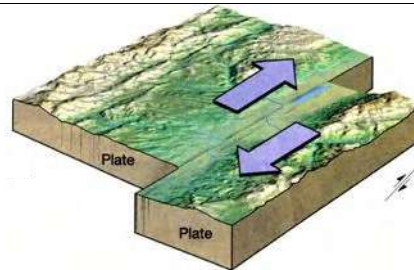
**Diverging:**

Plates move away from each other.



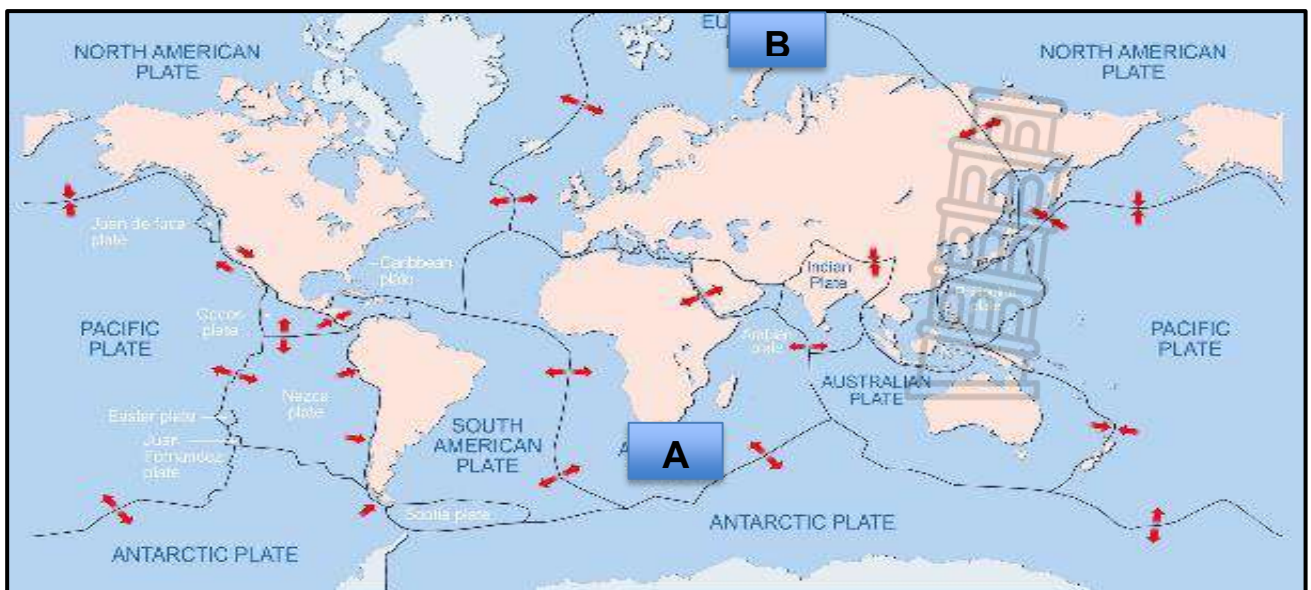
**Transforming:**

Plates move past each other.



[Sources: Google image]

2.3 Refer to the map on world plate boundaries.

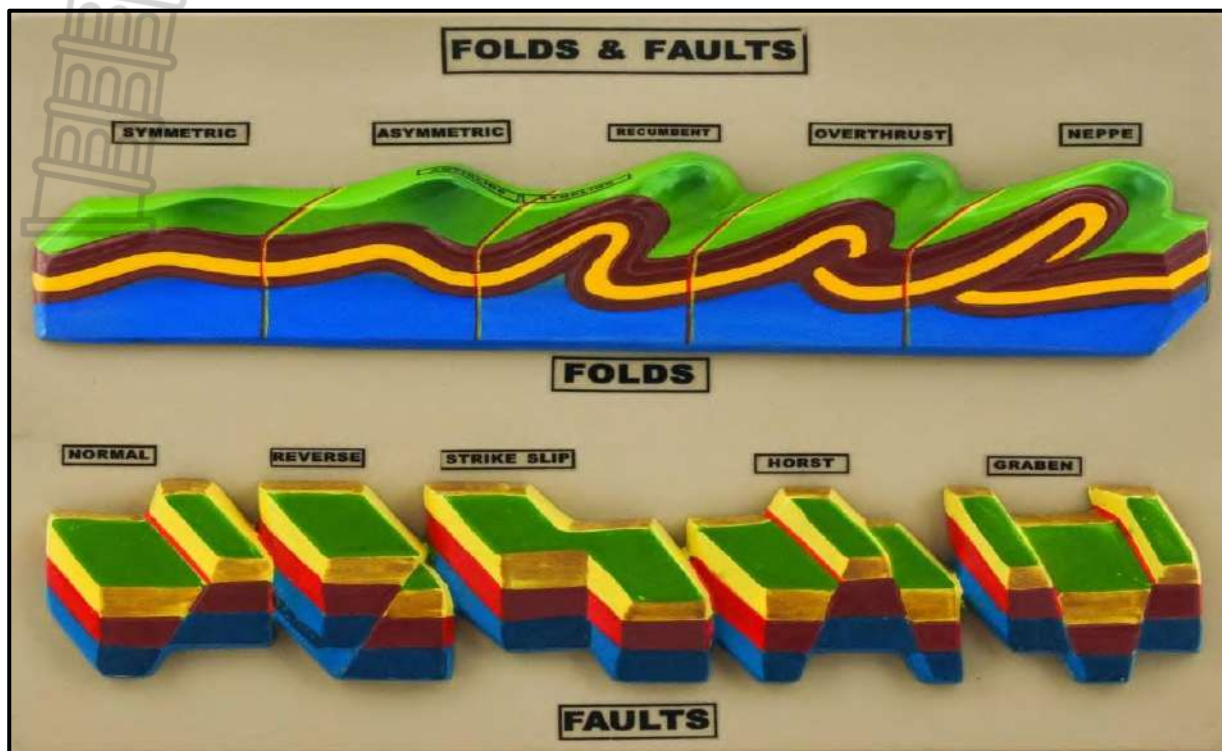


[Source: Google images]

2.3.1	Define the concept <i>plate tectonic</i> .	(1 x 2)	(2)
2.3.2	What name did Alfred Wegener give to the large supercontinent that existed before continents broke up?	(1 x 1)	(1)
2.3.3	Briefly explain how these continents move.	(1 x 2)	(2)
2.3.4	Identify the plate at <b>A</b>	(1 x 1)	(1)
2.3.5	Locate any TWO of the present day continents that used to be part of the plate located at <b>B</b> .	(2 x 1)	(2)
2.3.6	Explain how the movement of tectonic plate causes earthquakes and volcanic eruptions.	(2 x 2)	(4)
2.3.7	Briefly discuss TWO evidences that scientists used to prove that the continents of Africa, Antarctica and South America were once joined.	(2 x 2)	(4)

### FOLDING AND FAULTING

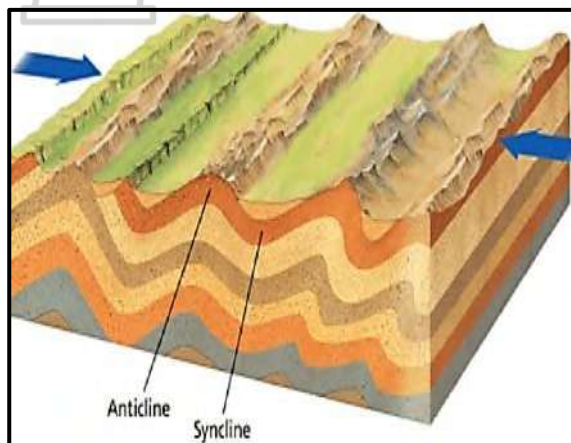
CONCEPT	DEFINITION
<b>Folding</b>	Bending of rocks into folds due to strong compressional forces from the side.
<b>Faulting</b>	Cracks in rocks formed due to tension and compression forces.
<b>Fault line</b>	Line along the surface of the earth where a fault occurs
<b>Syncline</b>	Upward fold
<b>Anticline</b>	Downward fold
<b>Block Mountain</b>	Block of land uplifted between two parallel faults.
<b>Rift Valley</b>	Block of land which slips down between parallel faults.



[Source: <https://images.zentail.com>]

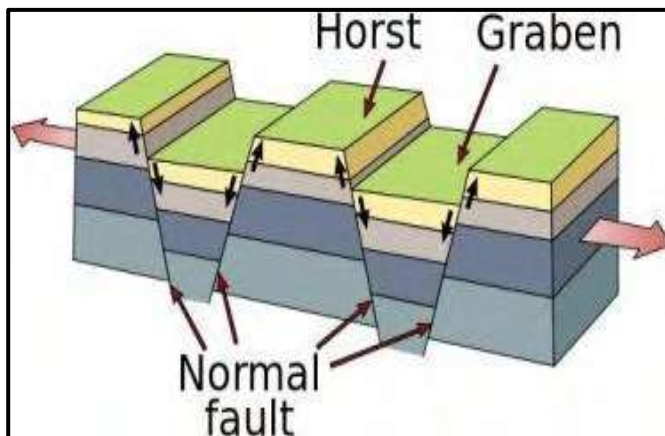
Fold	
Type of fold	Type of stress
Symmetrical	Equal pressure from both sides
Asymmetrical	Pressure greater from one side Fold leans to one side
Over fold	Pressure even greater on one side One limb very steep
Over thrust	Pressure from one side results in a break in the Earth's crust
Faults	
Type of fault	Type of stress
Normal	Tension Hanging wall drops relative to foot wall
Reverse	Compression Hanging wall is pushed up over the footwall

Transform	Shear Movement in the opposite direction
Parallel	Tension



[Source: Google image]

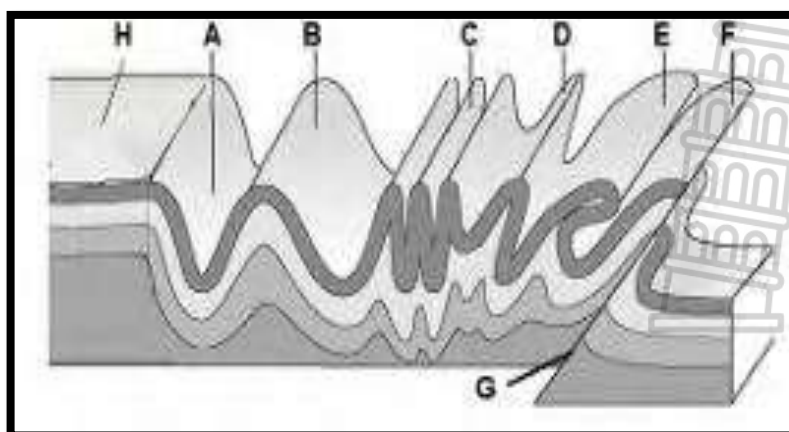
**Fold mountains:** At these colliding, compressing boundaries, rocks and debris are warped and **folded** into rocky outcrops, hills, **mountains**, and entire **mountain** ranges.



[Source: Google image]

*Horst* and *Graben* are always formed together. *Graben* are usually represented by low-lying areas such as rifts and river valleys whereas horsts represent the ridges between or on either side of these valleys.

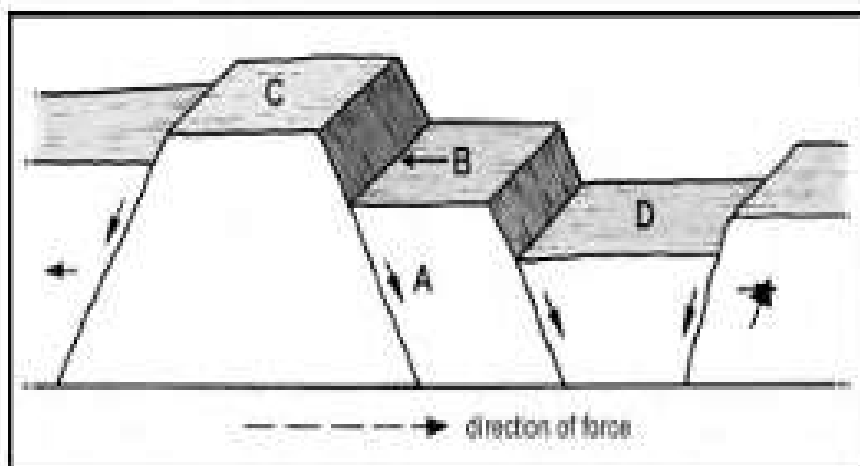
2.4. Refer to the diagram on different types of folds. Complete the statements below.



[Source: Google images]

2.4.1	The letter that represents an over thrust fold.		
2.4.2	The letter that represents an over fold.		
2.4.3	The letter that represents an asymmetrical fold.		
2.4.4	The force that forms a fold is (compression/tensional)		
2.4.5	The part of the fold indicated by letter <b>A</b> represents a/an (anticline/syncline).		
2.4.6	The letter that represents a fault line is...		
2.4.7	A monocline is indicated by letter...		
			(7 x 1) (7)


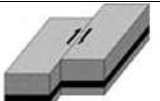

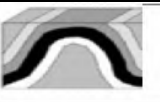
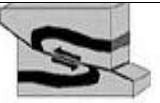


2.5. Study the sketch below on faults.



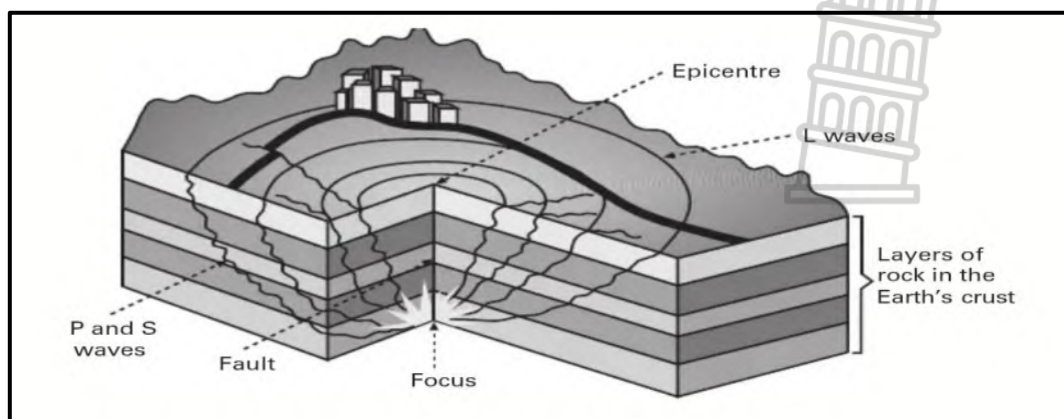
[Source: Google images]

2.5.1	Name the fault labelled <b>A</b> .	(1 x 1)	(1)
2.5.2	State the feature labelled <b>C</b> .	(1 x 1)	(1)
2.5.3	Give ONE use of the landform labelled <b>D</b> .	(1 x 2)	(2)
2.5.4	Identify the land formation illustrated at <b>D</b> on the diagram.	(1 x 1)	(1)
2.5.5	Explain the formation of feature <b>C</b> and <b>D</b> .	(2 x 2)	(4)


2.6 Match the image in COLUMN A with the correct term in COLUMN B. Write ONLY the question number and the term in your answer book e.g., 2.6.8 Asymmetrical.

	COLUMN A	COLUMN B
2.6.1		Anticline
2.6.2		Syncline
2.6.3		Over fold
2.6.4		Over thrust
2.6.5		Normal fault
2.6.6		Reverse fault
2.6.7		Literal fault
		(7 x 1)   (7)

## EARTHQUAKES



[Source: Focus Geography Textbook, Grade 10, 2018]



**Earthquake:** An earthquake refers to the sudden and violent trembling of the Earth's crust caused by the vibrations.

### IMPORTANT CONCEPTS:

**Fault:** Is the break in the earth's outer layer where the tectonic plates meet.

**Focus:** Is the point underground where an earthquake originates. It is found directly below the epicentre.

**Epicentre:** Is the point on the surface of the Earth where the intensity of the earthquake is the greatest. The most damage occurs at the epicentre.

**Seismograph:** Is an instrument that measures the vibrations during an earthquake.

**Seismogram:** Is the graph that records the vibrations during an earthquake.

**Seismic waves:** Are invisible waves of energy that are released by an earthquake.

**Richter scale:** Is the scale used to measure the intensity (magnitude) of an earthquake.

**Earth tremor:** Refers to the gentle trembling of the Earth's crust.

### CAUSES OF EARTHQUAKES:

- Faulting and folding
- Volcanic eruptions
- Landslides
- Collision and sliding of tectonic plates along each other

### TYPES OF SHOCK WAVES:

The vibrations that occur during an earthquake lead to the occurrence of shockwaves in the Earth's crust.

**P-waves:** These are the primary waves. They make the rock particles to move forward and backwards.

**S-waves:** These are the secondary waves. They occur right after the P-waves.

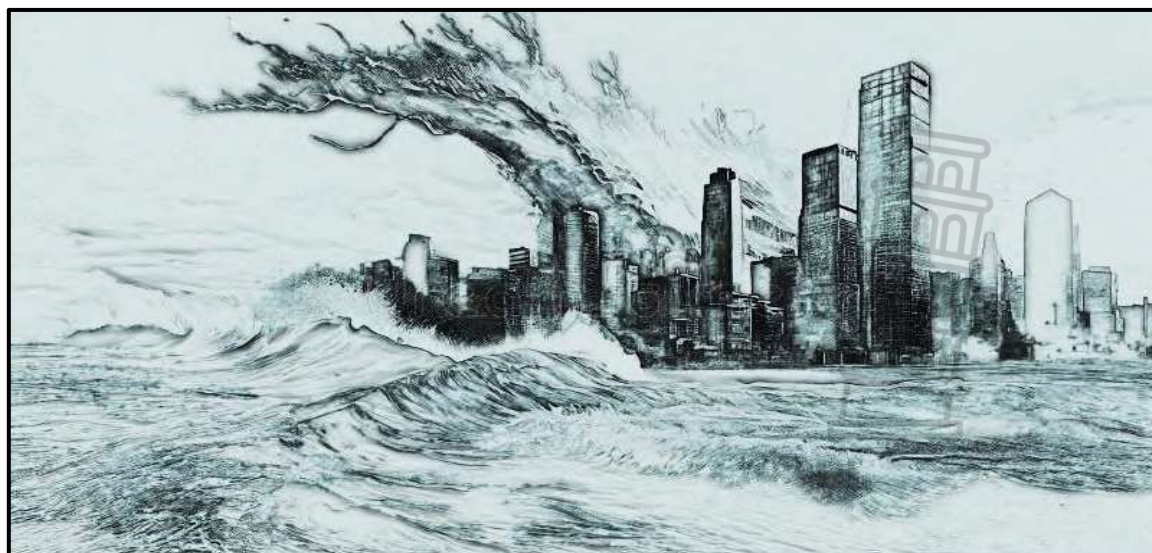
**L-waves:** When the P and S waves reach the surface of the Earth, they become L-waves. These waves cause the most dangerous damage during an earthquake.

**THE IMPACTS OF EARTHQUAKES ON:**

ENVIRONMENT	PEOPLE/SOCIAL	ECONOMIC
<ul style="list-style-type: none"> <li>• Destruction of the natural vegetation.</li> <li>• Disruption of habitats.</li> <li>• Dams crack which leads to flooding.</li> <li>• Landslides and mudslides.</li> <li>• Contamination of natural resources e.g., water, soil.</li> </ul>	<ul style="list-style-type: none"> <li>• Cracked walls make buildings unsafe.</li> <li>• Buildings get destroyed.</li> <li>• Bridges and roads collapse.</li> <li>• Electricity and gas pipes cause fires.</li> <li>• Lack of water due to burst water pipes.</li> <li>• People and animals are injured.</li> <li>• Death of people and animals.</li> <li>• People become homeless.</li> </ul>	<ul style="list-style-type: none"> <li>• Businesses are destroyed.</li> <li>• Loss of employment</li> <li>• Expensive to rebuild or fix the damaged infrastructure.</li> <li>• Developing countries are more affected because of lower economic growth.</li> </ul>

**TSUNAMI**

**Tsunami:** Is a series of high oceanic waves which form when there is an earthquake under the seabed.



[Source: Google Images]

**IMPACTS OF A TSUNAMI ON:**

ENVIRONMENT	PEOPLE/SOCIAL
<ul style="list-style-type: none"><li>• Results in widespread flooding</li><li>• Fresh water resources are contaminated</li><li>• Wetlands are polluted</li><li>• Salination of rivers, lakes and ground water</li><li>• Deposition of sediments lead to changes in the natural habitat and biodiversity</li></ul>	<ul style="list-style-type: none"><li>• Injuries on people</li><li>• People drown due to flooding</li><li>• Infrastructure is destroyed</li><li>• Spread of waterborne diseases</li><li>• Water sources are contaminated</li></ul>

**STRATEGIES THAT CAN BE IMPLEMENTED TO REDUCE THE IMPACT OF EARTHQUAKES AND TSUNAMIS:**

- Install adequate warning systems which link to rescue agencies.
- Create awareness of the precautions which people can take in an event of an earthquake. Example; media such as television etc.
- Have necessary equipment to help with the rescue operations.
- Provide rapid and efficient services (clean water, food & medical supplies) after an earthquake.
- Repair any gas or electrical connections that could cause fire hazards.
- Strengthen houses and infrastructure.
- Have efficient disaster management programs.
- Have a unified plan of action for local services e.g. police, army.



2.7 Choose the correct term in COLUMN B that matches the description in COLUMN A. Write the letter (A-J) next to the question number (2.7.1 – 2.7.8) in your answer book.

	COLUMN A	COLUMN B
2.7.1	Vibrations on the surface of the Earth.	A. Epicentre
2.7.2	The point where an earthquake begins.	B. Richter scale
2.7.3	An instrument used to measure vibrations of an earthquake.	C. Loss of lives
2.7.4	One of the causes of earthquakes.	D. Tsunami
2.7.5	An impact of an earthquake.	E. Fertile soil
2.7.6	An instrument used to measure the magnitude of an earthquake.	F. Focus
2.7.7	Vibrations on the sea bed leads to...	G. Collision of plates
2.7.8	The point on the Earth surface where most damage occurs.	H. Seismograph
		I. Waves
		J. Earthquake
		(8 x 1) (8)

2.8. Refer to the extract on earthquakes below.

**Earthquake of 5,3 magnitude! (Amended to 5,5 by experts at a depth of 10 km)**

Centred in Orkney, 120 km Southwest of Johannesburg, an area with many gold mines. At around 13h15 South African gold miners with head offices in Johannesburg and Sandton advised that they had felt the earthquake at their head offices but have so far received no reports of damage from their mines. Earthquakes and deep-level mining do not bode well, and I hope that no mine workers will be injured. Measuring 5.3; today's earthquake can be described as 'Moderate'. It can cause damage to buildings with poor construction, and everybody will feel its tremors. On a global scale, approximately 500-1500 of these earthquakes occur per year. Only earthquakes that reach above 7 cause great damage to buildings and are classified as Major (around 7) and Great (above 8). Earthquakes of magnitude 8 release an equal amount of energy to 6 million tons of TNT.

[Source: Roots 'n' Shoots: Earthquake hits Central South Africa! (rsands.blogspot.com)]

2.8.1	What instrument is used to measure the magnitude of an earthquake?	(1x 1)	(1)
2.8.2	Name the city that experienced the earthquake.	(1 x 1)	(1)
2.8.3	Explain why mining activities can be a possible cause of this earthquake.	(1 x 2)	(2)
2.8.4	Differentiate between the <i>focus and epicentre</i> of an earthquake	(2 x 2)	(4)
2.8.5	Discuss any possible impacts of earthquakes.	(3 x 2)	(6)

2.9 Read the article below on earthquakes.

### A DEVASTATING EARTHQUAKE IN HAITI

This weekend, 7.2 magnitude earthquake hit Haiti. The disaster is the second crisis to befall the Caribbean nation in just over a month- its president, Jovenel Moise, was assassinated in July. In the aftermath of the earthquake, the situation on the ground has been horrible as water infrastructure and buildings were damaged. This also includes damage to bridges, electricity and communication infrastructure. Haiti's government is in no position to offer help. Foreign aid has not been as forthcoming as it has been in the past. And churches, as source of aid for many Haitians, lie in ruins.

*[Source: New York Times. Article by: Micheal Barbaro]*

2.9.1	Define the term <i>earthquake</i> .	(1 x 2)	(2)
2.9.2	State the magnitude of the earthquake that hit Haiti.	(1 x 1)	(1)
2.9.3	According to the article, what is the source of aid for many Haitians?	(1 x 1)	(1)
2.9.4	Name the instrument used to measure the intensity of an earthquake.	(1 x 1)	(1)
2.9.5	Explain why Haiti was hit hard by the earthquake.	(1 x 2)	(2)
2.9.6	In a paragraph of approximately EIGHT LINES suggest strategies that can be put in place to reduce the impact of earthquakes.	(4 x 2)	(8)

## VOLCANOES

### Definition

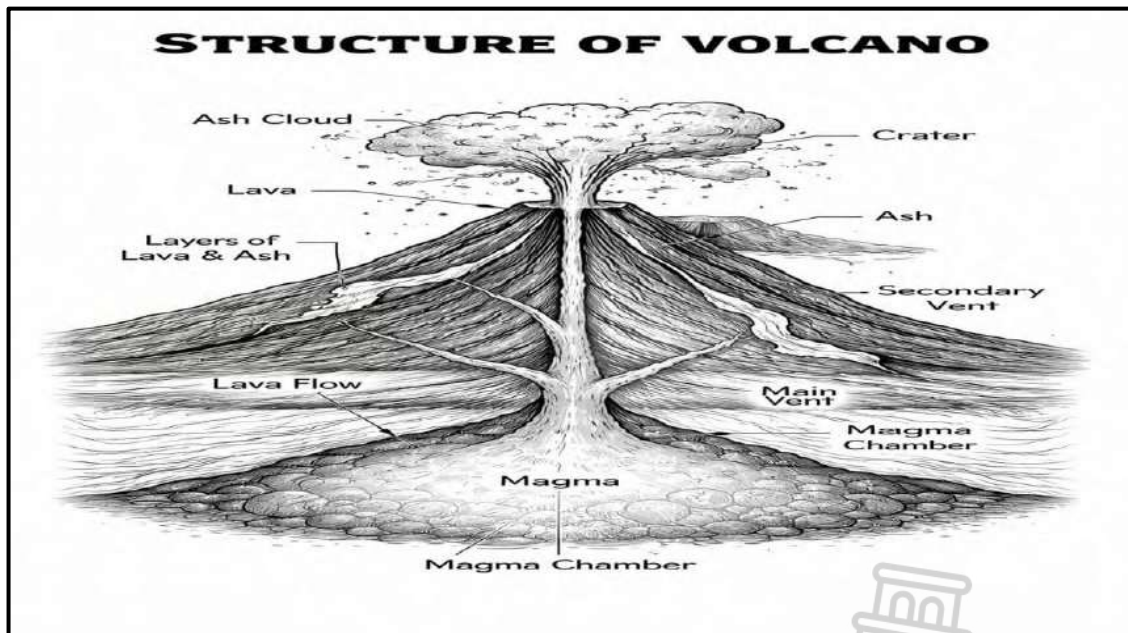
- **Volcano:** an opening in the Earth's crust through which molten rock (magma), gases, and ash erupt.
- **Volcanism:** the process of magma rising to the surface.

### Causes:

- Divergence and convergence plate boundary.
- Hotspots.

### Kind of volcanic activity

- **Extrusive volcanic activity:** takes place above Earth's surface.
- **Intrusive volcanic activity:** takes place below Earth's surface.



[Source: Google images]

- **Magma chamber:** underground pool of molten rock.
- **Main vent:** passage through magma travels.
- **Crater:** bowl-shaped depression at the summit.
- **Lava flows:** molten rock that reaches the surface.
- **Ash cloud:** fine particle ejected during eruption.
- **Secondary vent:** smaller opening on the volcano's flank.

## TYPES OF VOLCANOES

### TYPES OF VOLCANOES BASED ON ACTIVITY

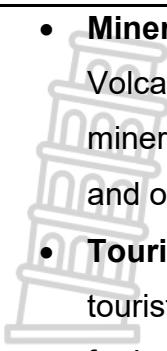
1. **Active volcano:** a volcano that has erupted recently or is likely to erupt in the near future. Examples (Mount Etna- Italy, Kilauea- Hawaii, Mount Nyiragongo- DR Congo)
2. **Dormant volcano:** a volcano that has not erupted for a long time but may erupt again in the future. Examples (Mount Fuji- Japan and Mount Vesuvius- Italy)  
Dormant volcanoes are often mistaken for extinct, so monitoring is important.
3. **Extinct volcano:** a volcano that is not expected to erupt again. Examples (Edinburgh Castle Hill- Scotland and Table Mountain- South Africa)

### CLASSIFYING VOLCANOES BY THEIR SHAPE AND THE WAY THEY ERUPT.

Type of volcano	Shape	Eruption Style	Example
Cinder Cone	Small, steep, cone-shaped	Explosive, ejects ash, cinders and small rock	Paricutin (Mexico) Sunset Crater (USA)
Shield volcano	Broad, gentle slope	Non-explosive: lava flows easily and spreads far.	Mauna Loa (Hawaii)
Composite volcano	Steep-sided, conical	Explosive, alternation layers of lava and ash	Mount Fuji (Japan)

### THE IMPACT OF VOLCANOES ON PEOPLE AND THE ENVIRONMENT

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• <b>Fertile Soil:</b> volcanic ash and lava break down into minerals that make soil rich for farming.</li> <li>• <b>Geothermal Energy:</b> Heat from underground magma can be harnessed for electricity and heating.</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Loss of life and injury:</b> Explosive eruptions can kill or injure people living nearby.</li> <li>• <b>Destruction of property:</b> Lava flows, ash, and pyroclastic flow can destroy homes, roads and infrastructure.</li> </ul> |
|---|--|

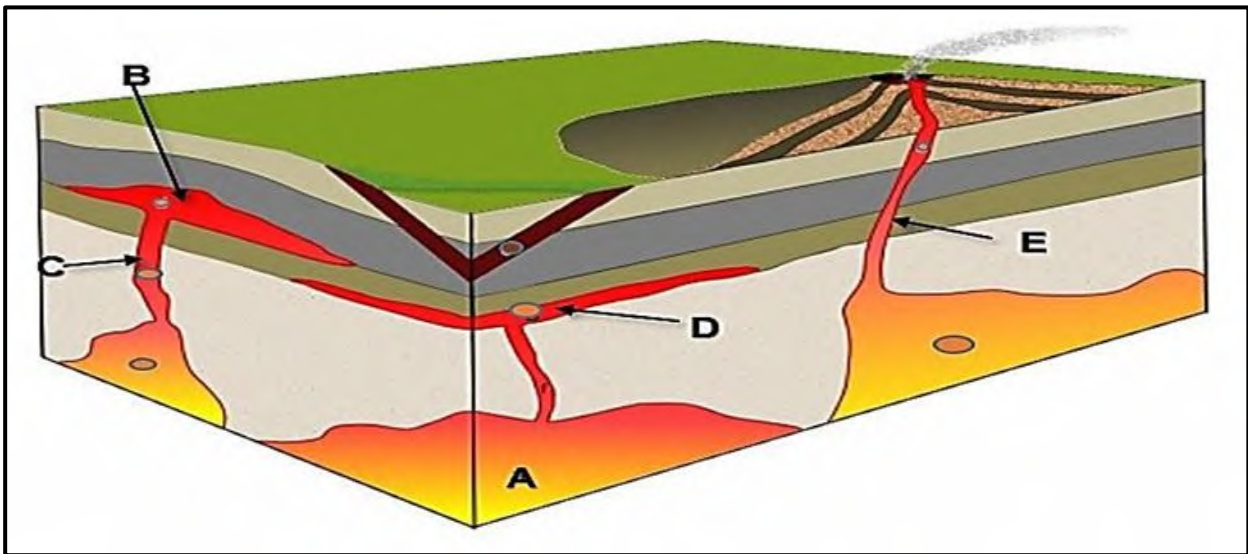
 <ul style="list-style-type: none"> <li>• <b>Minerals and resources:</b> Volcanoes provide valuable minerals such as pumice, sulphur and obsidian.</li> <li>• <b>Tourism: Volcanoes</b> attract tourists, creating jobs and income for local communities.</li> <li>• <b>Landform formation:</b> new islands, mountains and lava plateaus are created.</li> <li>• <b>Habitats for wildlife:</b> Some volcanic areas develop unique ecosystems and support rare species.</li> <li>• <b>Water sources:</b> volcanoes can create lakes in calderas or depressions.</li> <li>• <b>Climate regulation:</b> over long periods, volcanic activities can influence climate pattern by releasing gases.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Air travel disruption:</b> Ash clouds can close airports and affect flights.</li> <li>• <b>Health problems:</b> Breathing volcanic ash can cause respiratory issues.</li> <li>• <b>Economic losses:</b> Damage to farmland, businesses and infrastructure leads to economic hardship.</li> <li>• <b>Vegetation damage:</b> Lava and ash can destroy forests and crops.</li> <li>• <b>Water pollution:</b> Ash and debris can contaminate rivers and lakes.</li> <li>• <b>Climate impact:</b> large eruptions can temporarily cool the climate by blocking sunlight with ash clouds.</li> <li>• <b>Habitat loss:</b> Animals may lose their homes due to lava flows and ash deposition.</li> </ul>
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### PRECAUTIONARY MEASURES AND MANAGEMENT STRATEGIES

Precautionary measures	Management strategies
<ul style="list-style-type: none"> <li>• <b>Monitoring:</b> track signs of volcanic activity (earthquakes, gas emissions, temperature changes)</li> <li>• <b>Early warning systems:</b> use alarm, sirens and communication networks to alert communities.</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid affected areas until declared safe.</li> <li>• Check water sources for contamination.</li> <li>• Ensure roads, buildings and power lines are safe before use.</li> <li>• Wear masks to avoid inhaling ash.</li> </ul>

- **Evacuation plans:** Prepare and practice evacuation routes and safe zones.
- **Education and awareness:** teach communities about volcanic hazards and how to respond.

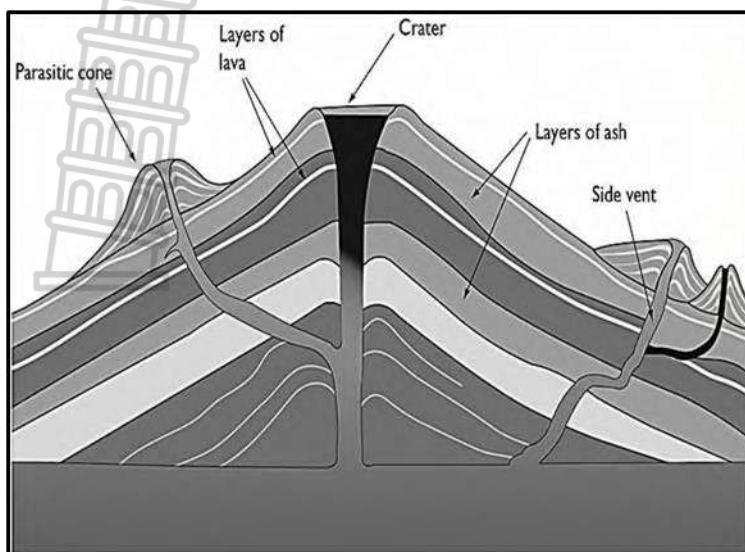
2.10 Refer to the diagram on igneous intrusions.



[Source: Google image]

2.10.1	Label the igneous intrusions indicated by letters <b>A, B, C</b> and <b>D</b> as a dyke, sill, batholith and laccolith.	(4 x 1)	(4)
2.10.2	Name the process that is responsible for the exposure of intrusive igneous features on the Earth's surface.	(1 x 1)	(1)
2.10.3	Which letter indicates a volcanic pipe?	(1 x 1)	(1)
2.10.4	Name ONE intrusive igneous feature that is associated with granite.	(1 x 1)	(1)

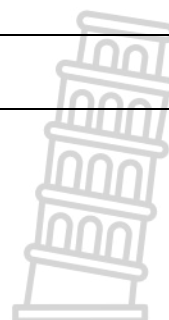
2.11 Refer to the sketch and text on a volcano.

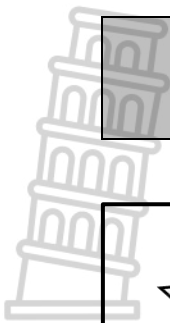


The only dark thing darker than the plume of ash emitting from Iceland's volcano may be its long-term implications to the planet, its climate and public health. Despite some airspace being reopened after volcanic ash forced its closure, millions of passengers worldwide are still stuck because of the ongoing cancellations.

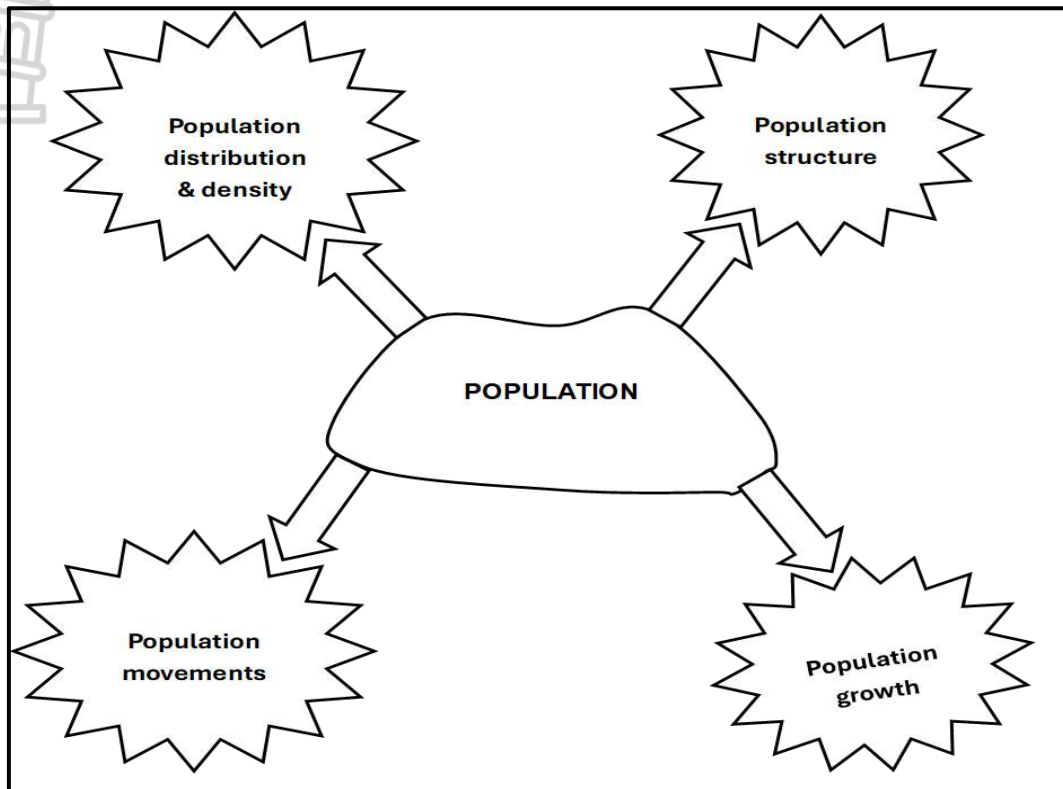
[Source: [www.google.image.com](http://www.google.image.com) ]

2.11.1	Define the concept active <i>volcano</i> .	(1 x 2)	(2)
2.11.2	Give the difference between <i>magma</i> and <i>lava</i> .	(2 x 1)	(2)
2.11.3	Explain why volcanic ash is regarded as a serious threat to people.	(1 x 2)	(2)
2.11.4	Describe how volcanic eruptions can negatively affect aircraft during a flight.	(1 x 2)	(2)
2.11.5	In a paragraph of approximately EIGHT lines, discuss the positive and negative impacts of volcanic eruptions on people and the environment.	(4 x 2)	(8)





**POPULATION**

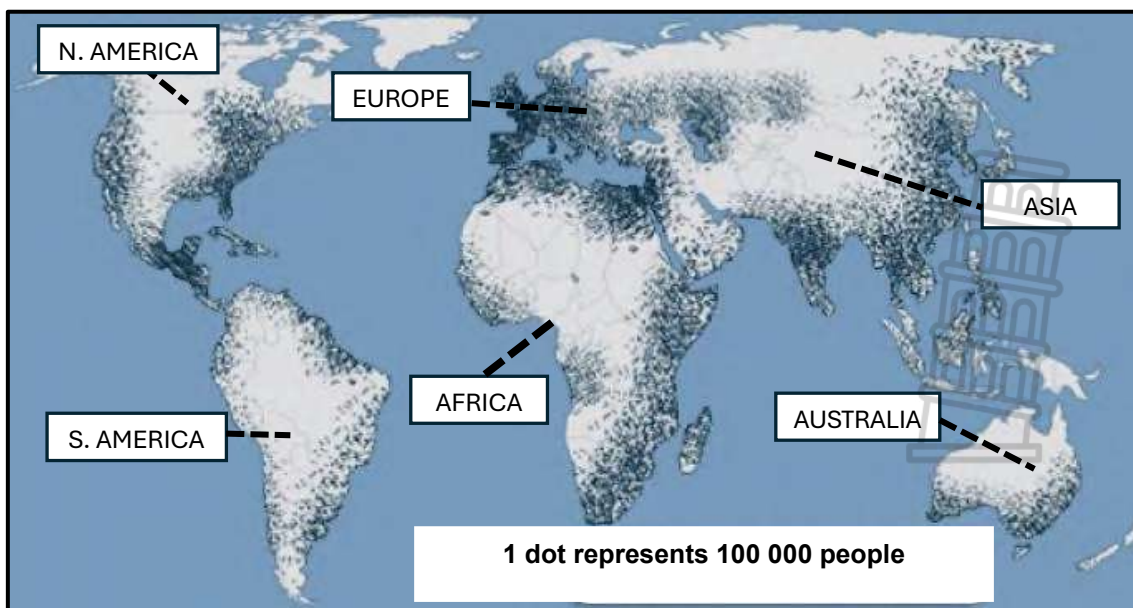


**POPULATION DISTRIBUTION AND DENSITY**

Key concepts	Definition
<b>Demography</b>	The study of population statistics.
<b>Ecumene</b>	Parts of the Earth favourable for people to live.
<b>Nonecumene</b>	Parts of the Earth unfavourable for people to live.
<b>Population</b>	The total number of people living in a particular area.
<b>Population density</b>	The number of people living per unit area.
<b>Population distribution</b>	How people are spread across a region.
<b>Population indicators</b>	Different measurements which provide information about a country's population characteristics.
<b>Population pyramid</b>	Kind of a graph that shows population structure of a particular country.

### Meaning of population distribution and population density

- **Population distribution** refers to the way people are spread or distributed in an area or region.
- People are distributed unevenly across the world, including South Africa.
- For example, in the South African context, more people live in urban areas than in rural areas for various reasons.
- This means urban areas have dense population while rural areas have sparse population
- **Population density** refers to the number of people living per unit area.
- It is calculated by dividing the total population by the area people live in.
- Formula: **Population Density =  $\frac{\text{Total population of an area}}{\text{Area (km}^2\text{)}}$**
- For example; Durban with an area of 225.91 km<sup>2</sup> and a population of 595 061 will have a population density of 2634 persons per km<sup>2</sup>.
- There is a very close correlation between the distribution and the density of people in the world.
- The map below shows how population is distributed around the world.
- In comparison, Asia has the largest distributed population whereas Australia has the least distributed population
- Similarly, Asia will have a dense population density than Australia.

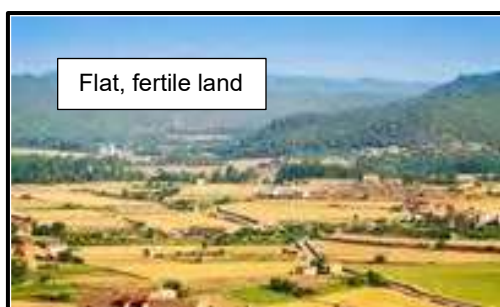


[Source: adapted from <https://www.jkgeography.com/physical-and-human-factors>]

## Factors that affect distribution and density of the world's population



<https://encrypted-tbn0.gstatic.com>



<https://gabalarealestate.com/wp-content>



<https://encrypted-tbn0.gstatic.com>



<https://www.engineeringnews.co.za>

### Natural or physical factors

**Water supply:** settlements need water for domestic use.

**Soils:** fertile soils are favourable for agriculture.

**Relief:** people need flat land rather than hilly landscapes.

**Resources:** settlements develop where there is coal, forests, fish etc.

**Climate:** people prefer ideal climate i.e. no extreme rain or temperature.

**Natural environment:** natural harbours are good for settlements on the coast.

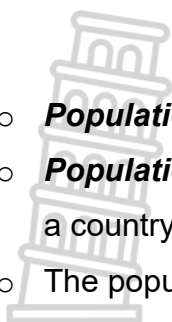
### Socio-economic-cultural factors

**Infrastructure:** roads & railways offer good opportunities for both people & the economy.

**Economy:** people are more attracted to live in areas where there are job opportunities & good standard of living.

**Politics:** Most people prefer to live in stable political environments i.e. no wars etc.

**Cultural:** Religion, language & culture determine where people choose to live.



## POPULATION STRUCTURE

- **Population structure** refers to how a country's population is made up.
- **Population indicator** refers to different measurements which provide information about a country's population characteristics.
- The population indicators of a country or nation are presented in the table below.

Population indicator	Brief explanation
<b>Birth rate (BR)</b>	Number of births per 1000 of the population.
<b>Death rate (DR)</b>	Number of deaths per 1000 of the population.
<b>Fertility rate (FR)</b>	The average number of births per 1000 women falling between 15 to 49 years.
<b>Life expectancy (LE)</b>	The average number of years a person is expected to live.
<b>Natural increase (NI)</b>	The rate at which the country's population is growing (birth rate minus death rate).

### Factors that influence population indicators

There are huge variations of population indicators in different countries.

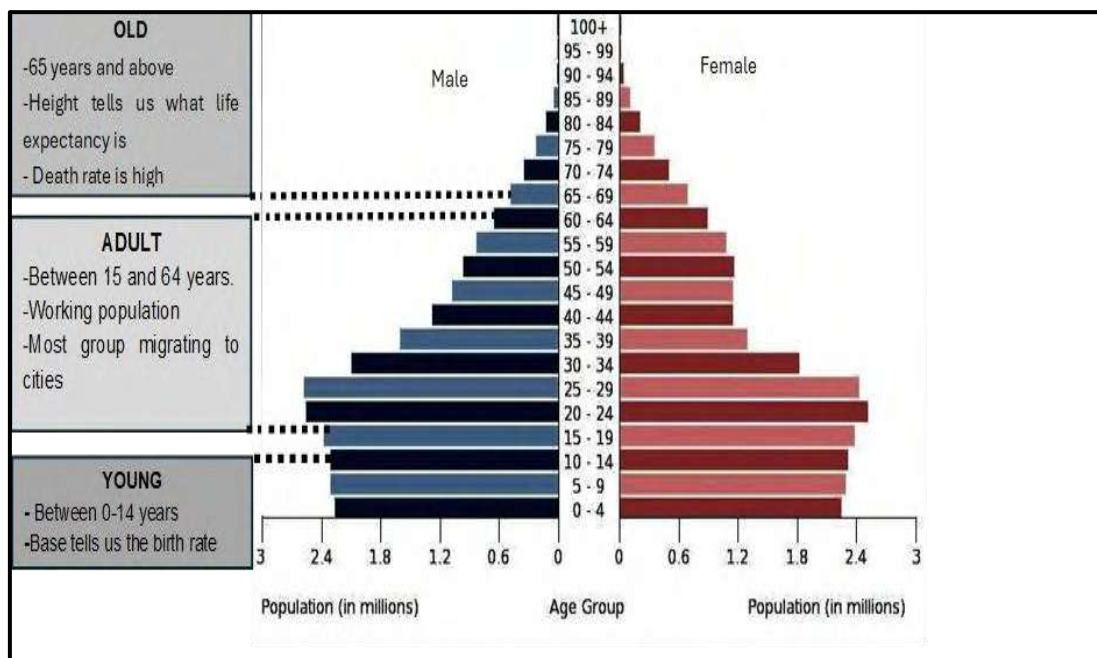
For example, in the South African context, birth rates and death rates are higher in rural areas than in urban areas.

Factors that influence population indicators are summarised in the table below.

Population indicator	Influenced by the following factors
<b>Birth rate (BR)</b>	Education levels, lack of contraceptives, polygamy etc.
<b>Death rate (DR)</b>	Diseases, wars & conflicts, natural disasters etc.
<b>Fertility rate (FR)</b>	Early marriages, lack of contraceptives, illiteracy etc.
<b>Life expectancy (LE)</b>	Health care, nutrition, economic conditions etc.
<b>Natural increase (NI)</b>	GDP per capita, urbanisation, education system etc.

## Population structure: age and sex, gender represented in a population pyramid

- **Population pyramid** refers to a graph that shows population structure of a particular country.
- It demonstrates how men and women are distributed across age groups of a population.
- A country's people are divided into the young; adult and old.
- A progressive (expansive) pyramid, typically for South Africa (2014) is shown below.

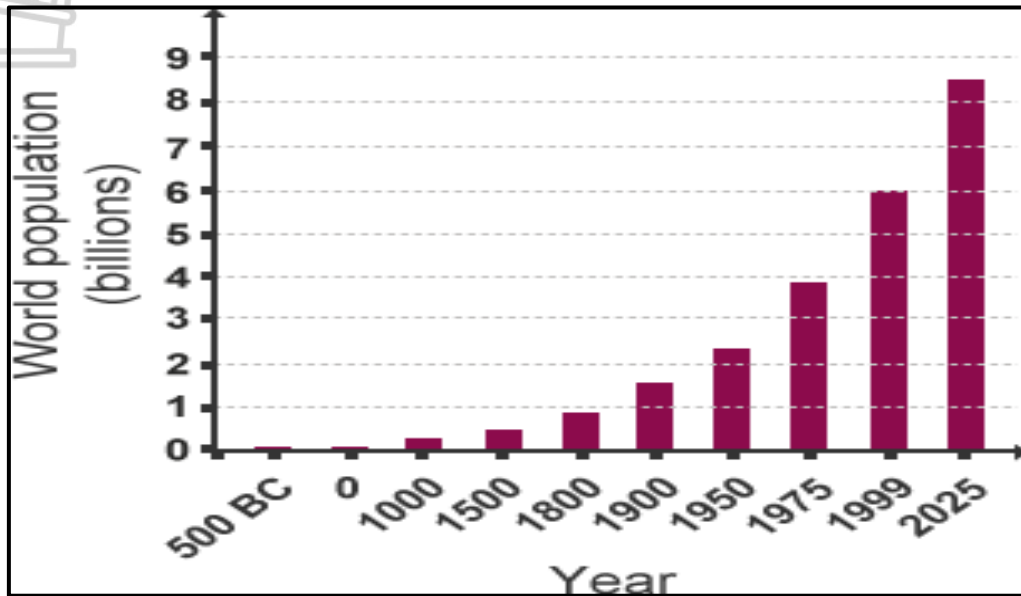


[Source: Adapted from <https://www.researchgate.net/profile/Grace-Montgomery> ]

## POPULATION GROWTH

- **Population growth** refers to an increase in the world's population over time.
- An increase in population is determined by both natural increase and migration.
- Natural increase: the number of births or fertility rate exceeds the number of deaths in a country.
- Migration: people move into a country through immigration. This also contributes to the world's population.
- When the population exceeds the carrying capacity of an area, we refer this to **overpopulation**.
- Recently, the world's population is growing faster.

- Estimates are that by 2045 (Statistics SA-2025), the world population will reach 9 billion.
- As of January 2025, the world population was 8 197 690 454.
- Below is a graph showing the world's population between 500 BC and 2025.



[Source: <https://bam.files.bbci.co.uk/bam/live/content/z7x3kqt/large> ]

### Managing population growth

- There are several problems associated with overpopulation.
- They include amongst others; food shortage, living space shortage, overconsumption, global warming, pollution etc.
- These challenges require nations/countries to manage overpopulation using the following strategies:
  - One-child policy
  - Use of contraceptives
  - Family planning
  - Infanticide
  - Vasectomy
  - Sterilization
  - Safe abortion



### POPULATION MOVEMENTS

- **Migration** refers to any movement of people from one place to another.
- There are different types of population movement (migration). They are explained in the table below.

Population movement	EXPLANATION
<b>International migration</b>	Movement of people across a country's borders. Example, South Africa to USA or vice versa.
<b>Emigration</b>	Movement of people out of their own country to another country. Example, South Africa to USA.
<b>Immigration</b>	Movement of people into a country. Example, Nigerians into South Africa (immigrants).
<b>Regional migration</b>	Movement of people within a region. Example, South Africans moving to Mauritius (both are SADC countries)
<b>Rural-urban migration</b>	Movement of people from rural areas to urban areas. Example, people from Swayimane (rural) move to Pietermaritzburg (urban).
<b>Urbanisation</b>	Process whereby an increased percentage of people live in urban areas.
<b>Voluntary migration</b>	When people choose (on their own free will) to migrate to another place.
<b>Forced migration</b>	When people have no choice but they must leave to survive or to be safe.

Type of migrant	Definition
<b>Migrant labour</b>	A person moving from one place to another for jobs (labour).
<b>Economic migrant</b>	A person going in search of jobs only, not to settle for a long term.
<b>Political migrant</b>	A person where their countries are in conflict and move to another to seek political asylum.

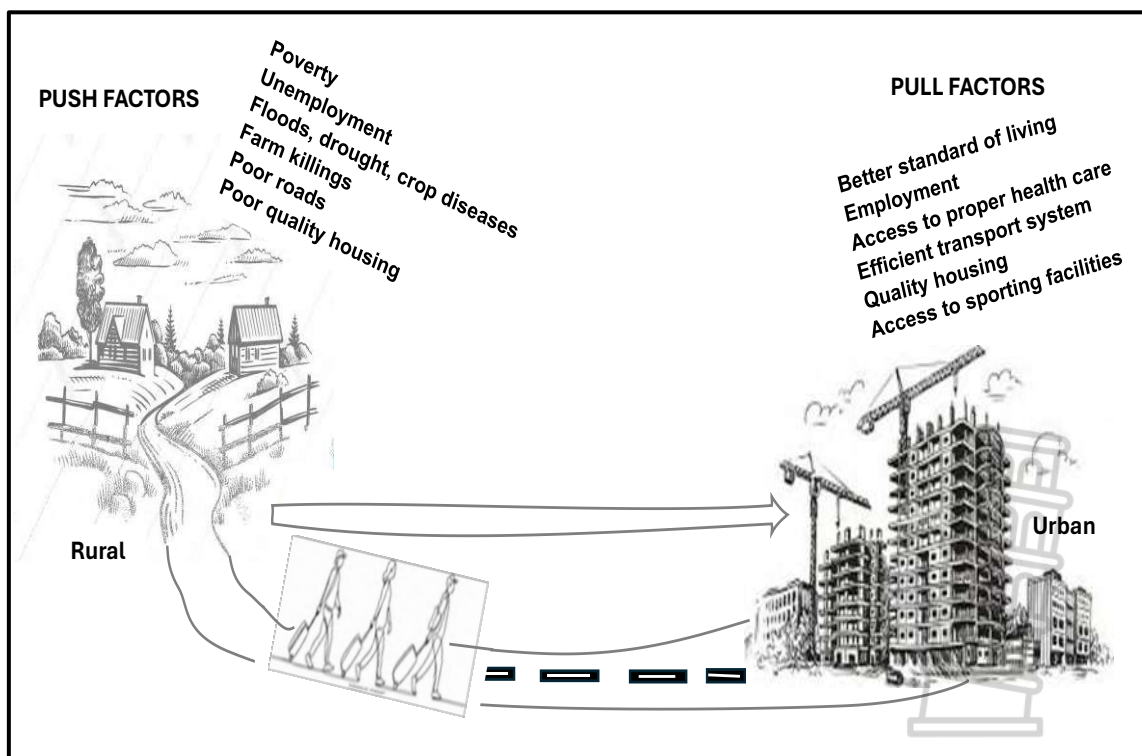
## Refugees

People flee their own countries due to wars as their lives are threatened—they temporarily stay in another country.

- People migrate due to different reasons.
- Reasons maybe socio-economical, physical, political, religious, health etc.
- Some of these reasons are often applying to the South African context— people moving from rural areas to urban areas. This is called **rural-urban migration**.
- Those factors that force people to leave rural areas are called **push factors**.
- Some factors draw (attract) people into urban areas. They are called **pull factors**.

## Rural-urban migration

- As people move from rural areas to urban areas, the population in rural areas declines (decreases). This is called **rural depopulation**.
- Below is a sketch demonstrating rural-urban migration



[Source: Adapted from <https://www.vectorstock.com/royalty-free-vector/village-houses-sketch-rural-landscape-countryside-vector-46254598>]

## ACTIVITIES ON POPULATION

### ACTIVITY 3.1

3.1 Refer to the table on population distribution and density.

Continent	Population	Area (km <sup>2</sup> )
Europe	742 556 200	22 134 710
Africa	1 549 867 500	29 648 481
Australia/Oceania	46 609 600	8 486 460
North America	617 286 600	21 329 947
Asia	4 835 320 000	31 033 131
South America	438 105 300	17 461 112

[Source: [www.worldpopulationreview.com](http://www.worldpopulationreview.com)]

3.1.1 Define the concept *population distribution*. (1 x 2) (2)

3.1.2 Which continent has the widely distributed population? (1 x 1) (1)

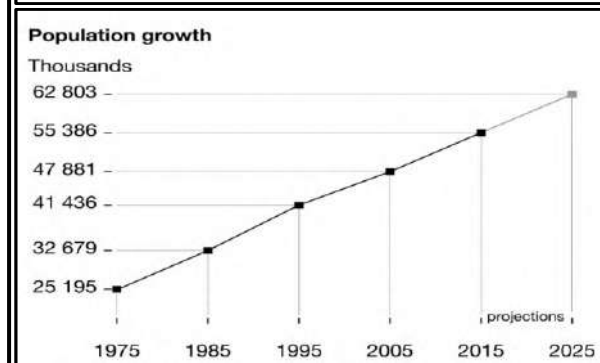
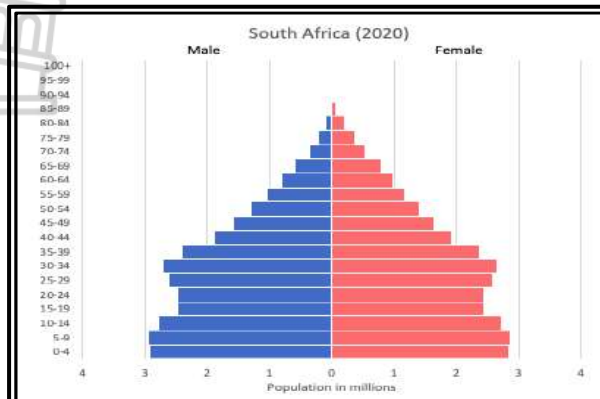
3.1.3 Using the continental population figures above, calculate the world population. (1 x 2) (2)

3.1.4 Calculate the population density of Africa.  
Formula:  
**Population Density =  $\frac{\text{Total population of an area}}{\text{Area (km}^2\text{)}}$**  (1 x 2) (2)

3.1.5 In a paragraph of approximately EIGHT lines, explain how physical factors could have potentially influenced the highest population distribution of people in the continent mentioned in QUESTION 3.1.2. (4 x 2) (8)

**ACTIVITY 3.2**

3.2 Refer to the infographic on population structure and growth.



**ILLEGAL IMMIGRATION  
POSES A THREAT TO SA'S  
GROWING POPULATION**

The Department of Home Affairs has deported nearly 110 000 illegal immigrants from South Africa to their home countries over the past two financial years. South Africa is being hollowed out by illegal immigration and cross-border crimes such as human trafficking, drug smuggling, arms trafficking, vehicle theft, livestock theft, and illicit goods, among others, stemming from porous borders, according to experts.

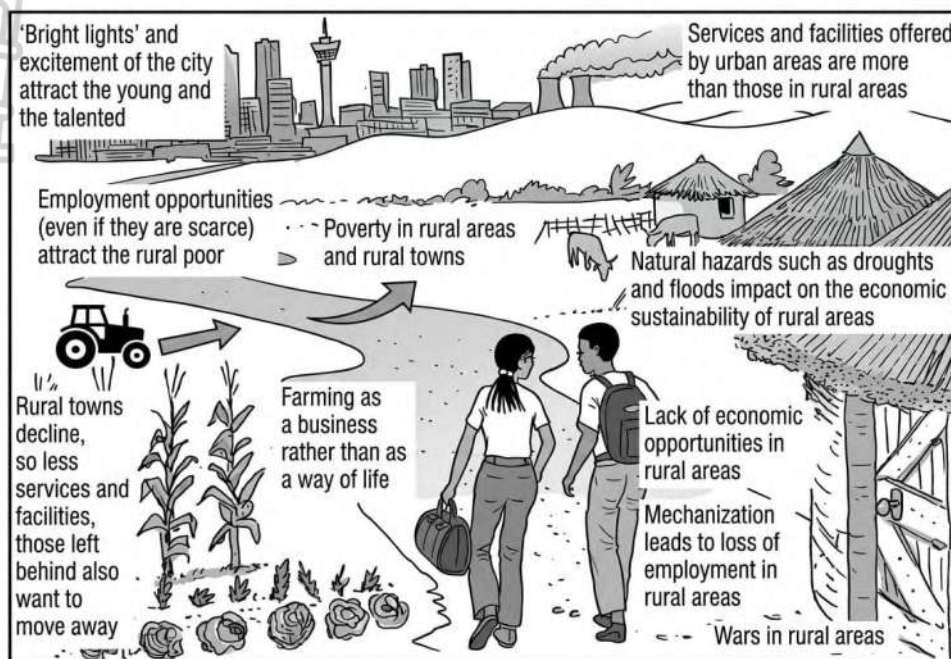
<https://www.bing.com/news/search?q=news+about+illegal+immigration+in+south+africa&FORM=HDRSC7>

[Source: <https://www.indexmundi.com/graphs/population-pyramids/south-africa-population-pyramid-2020.jpg> ]

3.2.1	Define the concept <i>population growth</i> .	(1 x 2)	(2)
3.2.2	Refer to the text.		
	(a) Identify the main cause of illegal immigration.	(1 x 1)	(1)
	(b) Mention TWO consequences of illegal immigration.	(2 x 1)	(2)
3.2.3	Refer to the graph on population growth. Describe the trend of the population between 1975 and 2025.	(1 x 2)	(2)
3.2.4	Refer to the population pyramid. Account for the narrow top (apex) of the population pyramid.	(1 x 2)	(2)
3.2.5	With reference to the population pyramid and the graph, Explain THREE strategies that can be implemented by the government to manage population growth.	(3 x 2)	(6)

**ACTIVITY 3.3**

3.3 Refer to the picture on rural-urban migration.



[Source: <https://tse1.mm.bing.net/th?id/OIP.Q2BVQFG0YoKpQbMXjG4w3QAAAA?rs=1&pid=ImgDetMain&o=7&rm=3> ]

3.3.1	Define the concept <i>rural-urban migration</i> .	(1 x 2)	(2)
3.3.2	Identify ONE physical and ONE social push factor from the picture.	(2 x 1)	(2)
3.3.3	Give the term that describes the decline of people living in rural areas.	(1 x 1)	(1)
3.3.4	Explain how employment opportunities in urban areas could improve the lives of rural people.	(1 x 2)	(2)
3.3.5	In a paragraph of approximately EIGHT lines suggest strategies that local municipalities could adopt to improve living conditions in rural areas.	(4 x 2)	(8)

## WATER RESOURCES

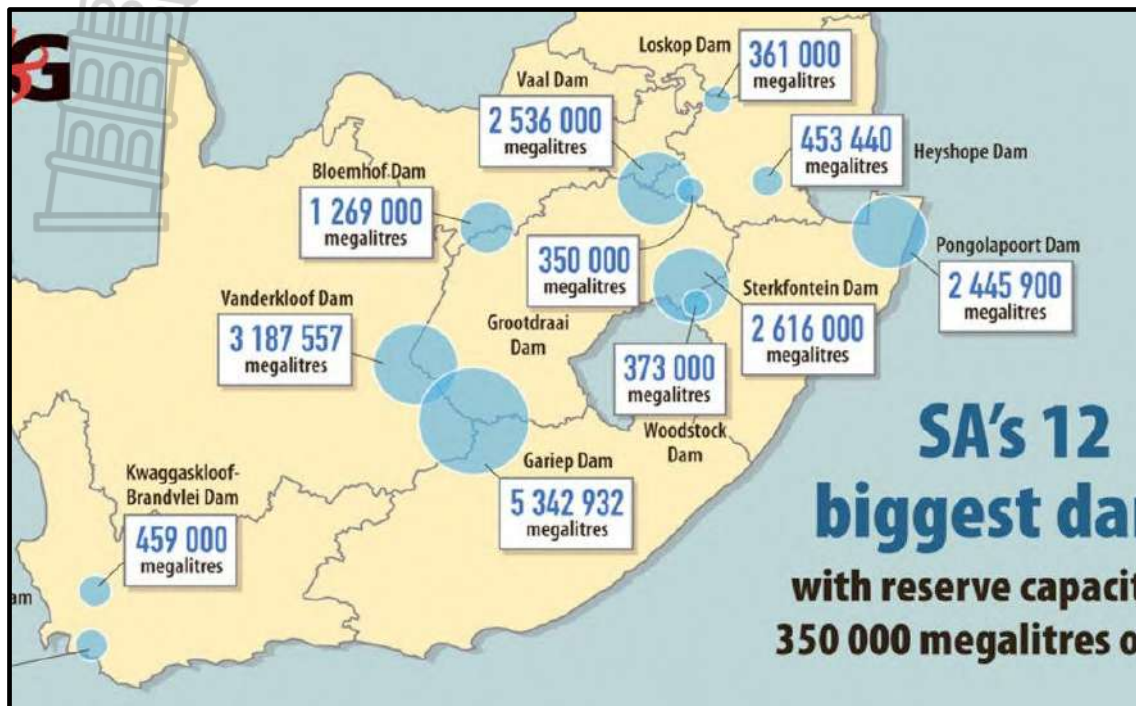
### WATER MANAGEMENT IN SOUTH AFRICA

Key concepts	Definition
<b>Water resources</b>	These are natural and artificial resources of water which can be used by humans for various purposes.
<b>Grey water</b>	Waste water that comes from household uses and further used for other purposes.
<b>Flood</b>	Sudden overflow of water which covers land that is usually dry.
<b>Flash flood</b>	A sudden flood caused by a heavy storm.
<b>Groundwater</b>	Water that occurs under the ground in saturated rocks and sand.
<b>Water table</b>	The upper limit (level) of ground water.
<b>Desalination</b>	The process of turning salty water into fresh water.
<b>Inter-basin water transfer</b>	Moving water from one drainage basin to another.

### Rivers, lakes and dams in South Africa

- About 75% of the country's water supply is from rivers and dams
- South Africa is a dry country with an average rainfall of 460 mm per year.
- Consequently, the government has supplemented the rivers with dams, built especially in the wetter eastern part of the country.
- The maps below show some major dams of South Africa.

### Major dams of South Africa



[Source: <https://mg.co.za/wp-content/uploads/2019/03/a90cb241-00-call-to-decolonise-water-laws.jpeg> ]

### Factors affecting the availability of water

- The availability of water is determined by both human and physical factors.
- There are several factors that influence water shortages.
- These factors are categorised as human and physical factors, as tabulated below.

Human factors	Physical (environmental) factors
<ul style="list-style-type: none"> <li>➤ <b>Population growth:</b> The higher the population, the higher the demand for water.</li> <li>➤ <b>Increased demand for food:</b> The higher the population, the higher the usage of water for irrigation.</li> <li>➤ <b>Urbanisation:</b> The higher the percentage increase of people</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Rainfall:</b> The western part of the country is drier (receives less rainfall) than the eastern part, which receives more rainfall.</li> <li>➤ <b>Alien vegetation:</b> Alien plants consume a lot of water than indigenous plants thus a drop in the water table.</li> </ul>

<p>in urban areas, the higher the demand for water.</p> <ul style="list-style-type: none"><li>➤ <b>Mining and factories:</b> High usage of water for their operational activities</li><li>➤ <b>Pollution of water sources:</b> Water pollution limits the sustainable use of water.</li><li>➤ <b>Agricultural activities:</b> Poor farming methods such as irrigating crops in a sunny day wastes a lot of water.</li></ul>	<ul style="list-style-type: none"><li>➤ <b>Climate change:</b> This has contributed to more water shortages due to rising temperatures etc.</li><li>➤ <b>Wetland destruction:</b> An increasing population directly reduces water sustainability from wetlands.</li><li>➤ <b>Soil erosion:</b> The water-storing capacity of rivers and dams are highly affected by the washing away of top soils.</li></ul>
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### Challenges of providing free basic water to rural and urban communities

- Research shows that demand will exceed supply after 2030.
- This means water supply will not meet the needs of all people in the near future.
- There are several challenges that governments, municipalities and water transfer schemes face in providing free basic water to the South African population.

**High construction costs:** The national government's allocation to water projects account to a minimum of 0.5 % yet 3% is needed to construct water projects.

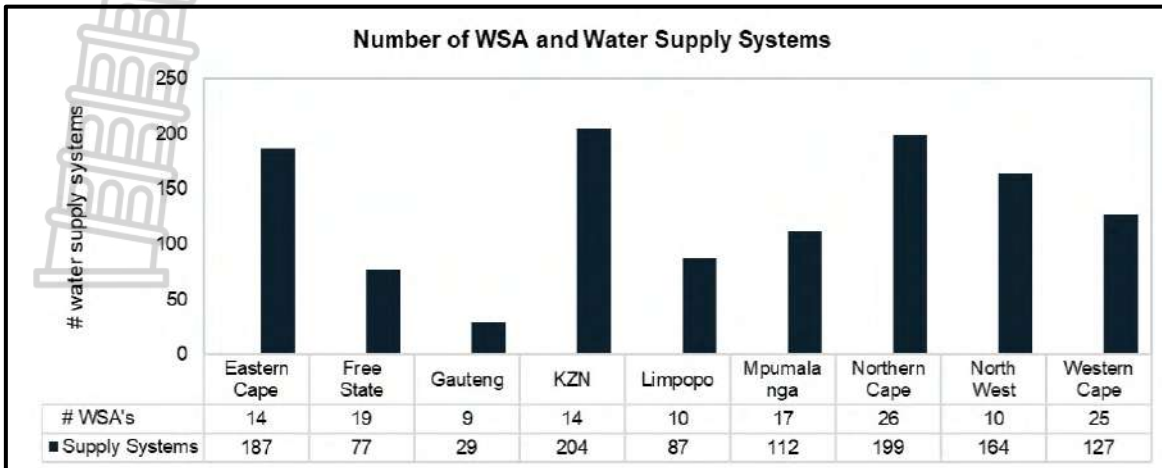
**Costs of maintenance:** Some water reservoirs require regular maintenance which again raises costly concerns.

**Illegal connections/ non-payment:** Some households illegally connect water or not pay for bills as they exceed the actual allocated free basic water.

**High consumer demands:** The ever-increasing population require more amount of water despite the limited supply.

**Ageing infrastructure:** Very old infrastructure such as water pipes may leak, leading to large amount of water lost.

- In South Africa, each province has its Water Services Authorities (WSA) and Water Supply Systems (WSS)

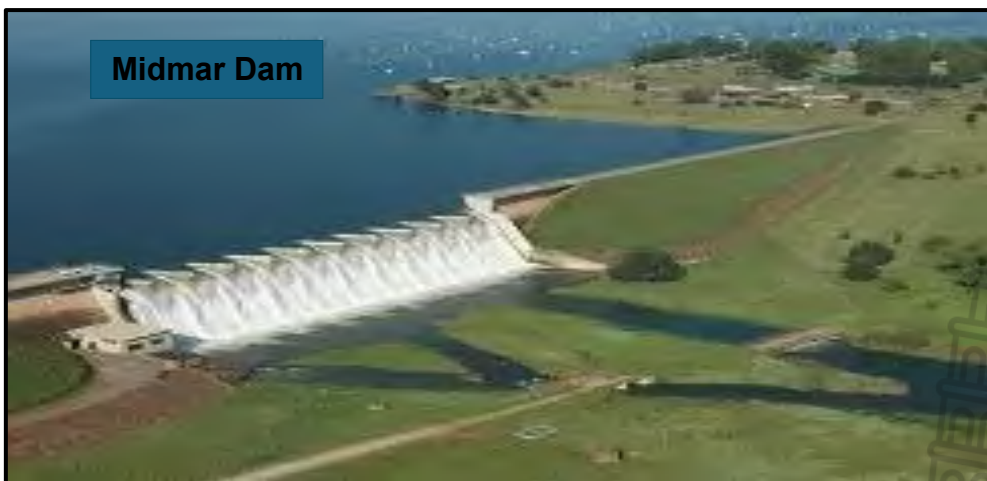


[Source: <https://mergence.co.za/wp-content/uploads/2023/12/Number-of-WSA-and-water-suooly-1.png> ]

### Role of government initiatives towards securing water

- **Dam construction**

The government has played a role towards securing water by building dams especially in the water-scarce provinces (Limpopo, Northwest, Northern Cape). Example, the Midmar Dam.



[Source: <https://tse3.mm.bing.net/th/id/OIP.tmwjYq2Ta5SsVabdQFQF3AHaEk?rs=1&pid=ImgDetMain&o=7&rm=3> ]

- **Inter-basin transfers**

The government has transferred water from river systems (including dams) in high rainfall areas to low rainfall areas in South Africa. For example, the Lesotho Highlands water project which transfers water from Limpopo into the Vaal dam.



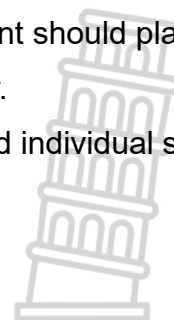
[Source: <https://www.lhda.org.ls>]

### **Role of municipalities in providing and purifying water**

- Municipalities remain the key role players in providing water to the local people.
- They (municipalities) purchase water in bulk from the government.
- They then distribute water in smaller quantities to industries, farmers, businesses and households.
- Municipalities take charge in monitoring and controlling the use of water.

### **Strategies towards sustainable use of water**

- To increase the sustainable water supply, the government should play a national role. Likewise, individuals should ensure the domestic supply.
- The table below presents the role of the government and individual strategies to increase water supply.



Government strategies (national role)	Individual strategies (domestic role)
<ul style="list-style-type: none"> <li>○ <b>Dams:</b> Through the Lesotho Highland project, water has been bought to fill South African dams.</li> <li>○ <b>Fixing leaks:</b> Replacing old, leaking pipes not only saves water but creates jobs.</li> <li>○ <b>Recycling:</b> Waste water can be purified through national &amp; local governments.</li> <li>○ <b>Ground water:</b> Boreholes can supplement supplies but the natural state of ground water should not be depleted.</li> <li>○ <b>Desalination:</b> although expensive but removing salt from sea water can be another strategy.</li> </ul>	<ul style="list-style-type: none"> <li>○ <b>Rainwater harvesting:</b> People can use tanks to collect rainwater from the roofs.</li> <li>○ <b>Greywater:</b> People can still use water they used from showers/baths to water their plants.</li> <li>○ <b>Water saving campaigns:</b> Educational campaigns can create awareness about the importance of managing water resources.</li> <li>○ <b>Water saving practices:</b> People can be responsible for water saving methods. Example; using showers instead of bath.</li> </ul>

**FLOODS**

- A **flood** refers to a situation where there is overflow of water on the land surface, rivers and dams at a particular time.
- Different places (provinces) in South Africa have experienced floods which have affected people, their economies and the natural environment.



[Source: <https://tse4.mm.bing.net/th/id/OIP.ghcETEfv8HdRot-WfCnBKAHaFj?rs=1&pid=ImgDetMain&o=7&rm=3> ]

- The table below summarises the **causes of flooding**, **effects** and strategies to **manage** them.

Physical causes of flooding	The effects of river floods (negative & positive*)	Managing flooding (rural, urban & informal settlements)
<ul style="list-style-type: none"> <li>➤ The type and amount of rainfall</li> <li>➤ Type of soil and underlying rock structure</li> <li>➤ Vegetation cover</li> <li>➤ Relief</li> </ul>	<ul style="list-style-type: none"> <li>➤ Destroy crops</li> <li>➤ People and livestock drown</li> <li>➤ Erosion of top soil</li> <li>➤ Damage to homes and other buildings</li> <li>➤ Destruction of infrastructure</li> <li>➤ Financial strain</li> <li>➤ Waterborne diseases</li> <li>➤ Disruption of food chains</li> <li>➤ Interruption of tourism activities</li> <li>➤ Food insecurity</li> <li>➤ Balance health of river system*</li> <li>➤ Increase water levels in dams*</li> <li>➤ Contribute to soil fertility*</li> </ul>	<ul style="list-style-type: none"> <li>➤ Afforestation</li> <li>➤ Sandbagging</li> <li>➤ Building embankments</li> <li>➤ Buffering rivers</li> <li>➤ Building dams</li> <li>➤ Restore natural wetlands</li> <li>➤ Awareness campaigns</li> <li>➤ Sustainable methods of farming</li> <li>➤ Banning building along rivers</li> <li>➤ Storm water drains/ maintenance</li> <li>➤ warning systems on media</li> <li>➤ flood walls built around dense settlements</li> </ul>
Human causes of flooding		
<ul style="list-style-type: none"> <li>➤ Deforestation</li> <li>➤ Urbanisation</li> <li>➤ Poor management of drainage facilities</li> </ul>		

**ACTIVITY 3.4**

3.4 Refer to the case study on water management.

**Remote monitoring transforms South Africa's water crisis management**

South Africa is a water-scarce country, the 30th driest in the world. Using water wisely will become more and more important as the population grows and droughts related to climate change increase. A lack of clean, fresh water has a negative impact on people's health and on the amount of food that can be grown. The country is harnessing remote monitoring technology to tackle its persistent water challenges. By ensuring the role of the government strategies towards securing water, the country could realise an improved supply of water to the rural and urban people.

<https://www.bizcommunity.com/article/remote-monitoring-transforms-south-africa-water-crisis-management-283247a>

3.4.1	Define the concept <i>water management</i> .	(1 x 2 )	(2)
3.4.2	Identify TWO factors (from the case study) contributing to water crisis.	(2 x 1)	(2)
3.4.3	Mention the general strategy that the country is trying to adopt as means to monitor water resources.	(1 x 1)	(1)
3.4.4	Explain TWO challenges that the government face in the provision of free basic water to the people.	(2 x 2 )	(4)
3.4.5	Discuss the role of government initiatives towards securing water supply to rural and urban communities.	(3 x 2)	(6)

**ACTIVITY 3.5**

3.5 Refer to the case study on floods.

**Limpopo floods claimed lives**

Limpopo Premier Phophi Ramathuba has described the floods in the province as a “dark cloud” that has devastated the province, claiming about nine lives, and requiring billions to repair damages. Ramathuba was updating the media on Friday following persistent rain and devastating floods. “Roads have been swept away.

Water and electricity infrastructure have been severely damaged, causing consternation amongst our communities, because this is a basic necessity that we all rely on for survival. “Schools have been destroyed. Health facilities, crippled, and families are displaced. As of today, we regret to inform you that we have lost a total of nine lives to these floods.” said Ramathuba.



[Source:<https://cdn.24.co.za/files/Cms/General/d/13082/9d6596be09894981a5c59d731ea72f32.jpg>]

3.5.1	According to the text, name the South African province that was affected by floods.	(1 x 1)	(1)
3.5.2	Identify the weather condition from the case study that resulted to floods.	(1 x 1)	(1)

3.5.3	Mention the type of infrastructure evident from the picture that was destroyed by floods.	(1 x 1)	(1)	
3.5.4	Explain how vegetation cover and relief (slope) could increase chances of floods.	(2 x 2)	(4)	
3.5.5	In a paragraph of approximately EIGHT lines, suggest strategies that the local authorities of Limpopo could implement in the future to minimise the impact of floods.	(4 x 2)	(8)	

