



Geography:		Grade 10	
TERM 1		Week 5 Lesson 5	
TOPIC	<b>CLIMATOLOGY: Moisture in the atmosphere – Clouds and forms of precipitation</b>		
AIMS OF LESSON	<p>How and why clouds forms</p> <p>The main types of clouds and associated weather conditions.</p> <p>What are the different forms of precipitation?</p> <p>The different types of rain and how it forms.</p>		
RESOURCES	<b>Paper based resources</b>	<b>Digital resources</b>	
	<p>Refer to your textbook: Read the topic: Moisture in the atmosphere. - Clouds</p>	<p>How does a cloud form?: <a href="https://www.youtube.com/watch?v=q87Ekar3emA">https://www.youtube.com/watch?v=q87Ekar3emA</a></p> <p>Types of clouds: <a href="https://scijinks.gov/clouds/">https://scijinks.gov/clouds/</a></p> <p>Types of rain <a href="https://www.youtube.com/watch?v=dWZ5_0wcYJ0">https://www.youtube.com/watch?v=dWZ5_0wcYJ0</a></p> <p>How snow forms: <a href="https://www.youtube.com/watch?v=Cf6EI0ml1fM">https://www.youtube.com/watch?v=Cf6EI0ml1fM</a></p> <p>Hail formation <a href="https://www.youtube.com/watch?v=AN-XFCYdew">https://www.youtube.com/watch?v=AN-XFCYdew</a></p>	
INTRODUCTION	<ul style="list-style-type: none"> <li>• <i>How and why does clouds form?</i></li> <li>• <i>What are the difference types of clouds?</i></li> <li>• <i>What does clouds tell us about the expected weather?</i></li> <li>• <i>What are the different types of precipitation?</i></li> <li>• <i>What are the different why in which rain occur?</i></li> </ul>		
CONCEPTS AND SKILLS	<ul style="list-style-type: none"> <li>• The processes involved in forming of clouds</li> <li>• The processes involved in forming convection rain, frontal rain and orographic rain.</li> <li>• The processes involved in the formation of hail and snow</li> <li>• How dew and frost forms and why it differs from rain and hail.</li> </ul>	<p><b>CAN YOU?</b></p> <p>Distinguish between the three basic types of clouds?</p> <p>Explain the different weather conditions that is link to each cloud type as well as the type of precipitation.</p> <p>Distinguish between the three basic types of rain?</p> <p>Explain the pro and cons of the different types of rainfall.</p> <p>Is snow an advantage or a disadvantage for living organisms?</p> <p>What is the effect of hail on humans, animals and plants?</p>	
ACTIVITIES/ ASSESSMENT	<p><i>Complete the attached activities as well as those in your textbook.</i></p>		
CONSOLIDATION	<ul style="list-style-type: none"> <li>• <i>Complete the activities.</i></li> <li>• <i>Study the diagrams to understand clouds and precipitation</i></li> <li>• <i>This information is important to understand the conditions that must exist to determine when and how precipitation will occur.</i></li> </ul>		
VALUES	<p><i>It is important to understand the preservation of the atmosphere of the earth is crucial to maintain the processes to provide precipitation to all living organisms.</i></p>		

Clouds	What are Clouds?
<p>Clouds is a daily occurrence and sometimes it indicates fine a good weather and another day it can spell stormy and bad weather. Clouds has inspired many authors to write poems and songs about clouds.</p>	<p>A cloud is a large collection of tiny drops of water or ice crystals. The drops are so small and light it can float in the air. Clouds cover about half of the sky on any day.</p>
<p><b>How do clouds form?</b></p>	
<p>The sun heats the earth surface which heats the air above the surface and the air starts to rise and as it rises it expands and cools. Cool air holds less water vapour than warm air, so the water vapour condenses on tiny particles (very small pieces of dust, salt, smoke or pollution – known as condensation nuclei) in the air.</p> <p>Tiny drops form around the condensation nuclei and float in the air. When many of these tiny droplets come together, they form a cloud. The altitude where this start happening is called the condensation level.</p>	
<p><b>Where is it? What are the types</b></p>	
<p>(Source: adapted from <a href="https://www.weatheregg.com/different-types-of-clouds-and-what-they-do">https://www.weatheregg.com/different-types-of-clouds-and-what-they-do</a>)</p>	
<p>There are three basis types of clouds – Cirrus, Stratus and cumulus clouds.</p> <p><b>Cirrus clouds:</b> Fine wispy clouds that is transparent and very high and consist of ice crystals.</p> <p><b>Cumulus clouds:</b> Look like big cotton wool balls in the sky.</p> <p><b>Stratus clouds:</b> Are flat low clouds that are flat and stretch horizontally across the sky.</p> <ul style="list-style-type: none"> <li>○ If a cloud type has a prefix with <b>alto</b>- it means it is a middle level cloud e.g. altostratus</li> <li>○ If a cloud type has a prefix with <b>cirro</b>- it means it is a high-level cloud e.g. cirrocumulus.</li> </ul>	
<p><b>Why is it there? –Weather associated with clouds.</b></p>	
<p>Every cloud tells a story.</p> <p>If a cloud name contains, nimbus, it means that it is a rain producing cloud.</p> <ul style="list-style-type: none"> <li>• <b>Cumulonimbus</b> clouds are the clouds responsible for most of the summer rains in South Africa. They are very tall, 8 km to 10 km and are initially white and then turn grey and can become very dark. They are normally associated with thunderstorms and will produce heavy showers and may include hail.</li> </ul>	
	<ul style="list-style-type: none"> <li>• <b>Nimbostratus</b> is grey in colour and stretch across the horizon and produce a light rain called a drizzle.</li> </ul>
<p><b>Cirrus</b> clouds produce no rain, but they may indicate a cold front which may produce rain.</p>	

## Climatology:

### Consolidation Activity 1 Term 1 Week 5 Lesson 5

1. Complete the practical activity below. Give feedback on the observations you made.

#### Material needed:

- ✓ One clear glass jar with a lid
- ✓ Boiling Water –
- ✓ Three to five ice cubs
- ✓ Your notebook
- ✓ Patience



#### Instructions

- ✓ Pour 1 cup of hot boiling water into a glass **jar**. ...
- ✓ Quickly spray hairspray into the **jar**.
- ✓ Immediately put the lid onto the **jar**. ...
- ✓ Place a 3-5 pieces of ice on top of the lid of the **jar**.
- ✓ Watch the top of the **jar** carefully and you will see a **cloud** begin to form.
- ✓ Write a short paragraph of what you have observed.

## Forms of precipitation

Precipitation is defined as any form of moisture that falls from clouds to the ground. This include droplets as rain and solids in the form of hail and snow. Dew and frost forms on the earth's surface but is included.

### What are the different types of precipitation?

**Rain** are formed as droplets that form first as a cloud when they join and then when it becomes too heavy for the air it fell to the ground as rain.



**Hail** is formed when droplets froze and become too heavy and fall to the earth.



**Snow** is formed when the water vapour freeze and ice crystals form that reach the earth's surface as snowflakes.



**Dew** occurs during the night or early morning when droplets form on the plants or objects.



**Frost** occur when dew point is reached at a temperature below zero °C and the dew froze on the object or the earth's surface.

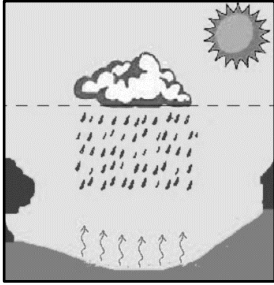
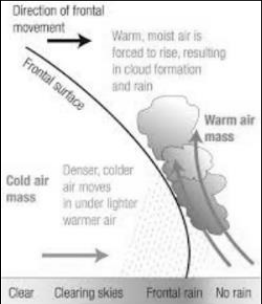
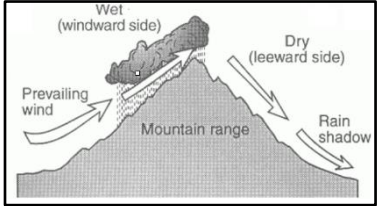


### How do the different types of rain forms?

#### Conditions needed for rain in the atmosphere:

- The air must be saturated.
- The air must contain condensation nuclei around which raindrops can form.
- The temperature of the air must be cooled to dew point or below that so that condensation can take place.

## Types of rainfall

Convective rain:	Cyclonic / Frontal rain:	Orographic / Relief Rain
		
<ol style="list-style-type: none"> <li>1. The sun heats the ground and warm air rises.</li> <li>2. As the air rises it cools and condenses to form clouds</li> <li>3. Large cumulonimbus clouds can form</li> <li>4. Heavy rainstorms occur. It can include thunder and lightning as well as hail.</li> </ol>	<ol style="list-style-type: none"> <li>1. An area of cold air meets an area of warm air</li> <li>2. The cold air force the warm air to rise.</li> <li>3. The warm rising air cools down and water vapour condenses.</li> <li>4. Clouds form and frontal rain occurs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Warm wet air is forced to rise over high land.</li> <li>2. As the air rises it cools and condenses. Clouds form and orographic rain occurs.</li> <li>3. The drier air descends and warms.</li> <li>4. Any moisture in the air (cloud) evaporates.</li> </ol>

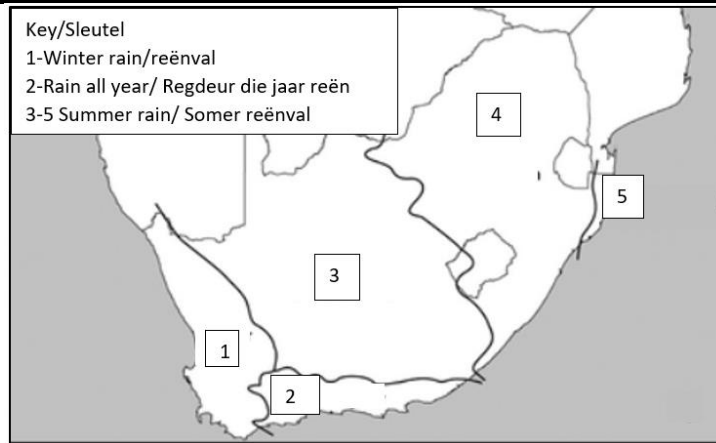
## Other forms of precipitation:

<p><b>Hail</b></p> <ul style="list-style-type: none"> <li>• At times the up draughts, in a cumulonimbus cloud, are so strong that the raindrops which have been formed are carried up to layers of air where the temperature is below freezing point, and they freeze.</li> <li>• Later the small hailstones descend because of weaker up-draughts, while descending they pass through air which is above freezing point and a layer of moisture forms around them.</li> <li>• Stronger ascending air currents then carry them to air below freezing point. Here the moisture freezes.</li> <li>• By going through this process repeatedly, a hailstone eventually comes to consist of a whole series of concentric layers.</li> <li>• Eventually the hailstones become too heavy to be supported by the ascending air currents and they fall to the ground</li> </ul>	<p><b>Snow</b></p> <p>When rising moist air is cooled until it is below freezing point, the water vapour crystallizes spontaneously to produce flat, symmetrical, hexagonal crystals of ice formed in beautiful patterns called <b>sublimation</b>.</p> <ul style="list-style-type: none"> <li>- Groups of these crystals unite to form snowflakes, which float to the ground.</li> <li>- This will happen if the air temperature is very low, otherwise the snowflakes melt and fall as rain or sleet if the snowflakes have only partially melted.</li> </ul>
<p><b>Dew</b></p> <ul style="list-style-type: none"> <li>- At night the earth, or any object that absorbs heat, radiates the heat until it becomes colder than the atmosphere above it.</li> <li>- Conduction from the atmosphere to the earth or the object now takes place until the</li> </ul>	<p><b>Frost</b></p> <p>When dew point is <b>above</b> freezing point, <b>dew</b> is formed. When dew point <b>is below</b> freezing point, <b>frost</b> is formed.</p>

atmosphere immediately above it is colder than the air in the upper layers of the atmosphere.

- If there is no movement in the atmosphere to bring about mixing of the air, and if the layer of air cools down to dew point, condensation occurs. This takes place first on the objects that cool most quickly. When dew point is above freezing point, dew is formed

**Where is it? When and where are the types normally found in South Africa**



(Adapted from - Simplified-principal-rainfall-areas-of-South-Africa-after-Schulze-1997)

**Rain**

The different types of rain are:

- Convectonal rain – Occurs mostly in South Africa in the summer rainfall regions.
- Cyclonic / Frontal rain – This type of rain occurs in the Western and South western Cape during winter months.
- Orographic / Relief rain- in SA is most common on the slopes of the Drakensberg Mountains and the mountains of the Southern and Western Cape

**Hail** is

associated with thunderstorms and occurs mostly in the summer rainfall areas of South Africa.

**Snow** is common

on the high lying areas of South Africa during the winter months.

**Frost** occur mostly in the interior of South Africa and on the highveld regions where the temperature decreases to below freezing point during winter nights. Frost seldom occur close to the ocean because of the temperate influence of the ocean the earth's surface rarely drop to below freezing point.

**Dew** occurs in all areas of South Africa.

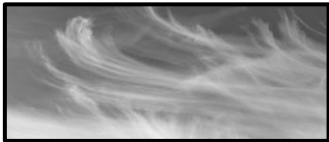



**Some of the effects on the environment.**

**Rain:**

- provide water to replenish soil and reservoirs for people, animals and plants on earth surface to survive.
- Can produce floods that may destroy structures, crops and people as well as well animals may lose their lives.

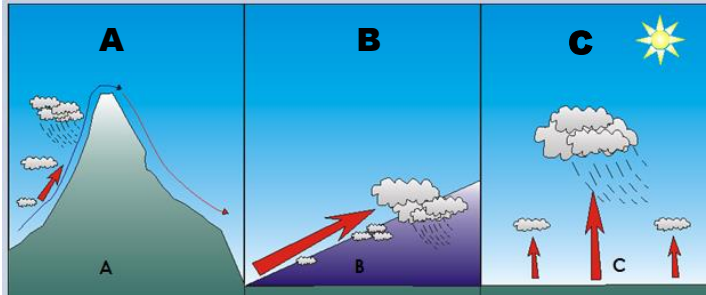
**Hail:** – the force may damage structures, motorcars, windows, destroy plants and may cause injuries to animals and people.

<p><b>Snow:</b></p> <ul style="list-style-type: none"> <li>➤ Provide water to replenish groundwater as snow melts slowly and water seeps into the soil.</li> <li>➤ The weight of the snow may damage structures and may disrupt transport in making roads too dangerous to use or may cause accidents.</li> <li>➤ People snowed in may die due to exposure or freezing weather conditions.</li> <li>➤ Animals, like cattle and sheep, when exposed to very cold and wet conditions may die because of the weather conditions.</li> </ul>	<p><b>Frost:</b> – cause damage to sensitive plants or crops due to sudden cold conditions and farmer must invest in measures to prevent frost from forming.</p>
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<b>Climatology:</b>		
<b>Consolidation Activity 2 Term 1 Week 5 Lesson 5</b>		
<b>2.</b>	<b>Choose the correct word in brackets</b>	
2.1.1	Cirrus clouds are (high/low) clouds.	
2.1.2	Cirrus clouds indicate a (thunderstorm / front) is approaching.	
2.1.3	Cumulus clouds is normally in the air on a (rainy / sunny) summers day.	
2.1.4	Cumulonimbus clouds indicate a (thunderstorm / front) is approaching	
2.1.5	Nimbostratus clouds is associated with (drizzle/ showers).	
2.2.	Redraw and complete the table below:	
2.2.1	Cloud name _____  Shape: Altitude: Weather:	2.2.2 Cloud name _____  Shape: Altitude: Weather:
2.2.3	Cloud name _____  Shape: Altitude: Weather:	2.2.4 Cloud name _____  Shape: Altitude: Weather:
2.3	Describe how a cumulonimbus develop.	
2.7	Voluntary fieldwork - Use the camera on your phone and take pictures of the different types of clouds in your area in the next two weeks period. Try to identify each type of cloud that you have recorded. (Alternatively draw the clouds you observe if you do not have a camera.)	

**Climatology:**  
**Consolidation Activity 3 Term 1 Week 5 Lesson 5**

1. Study the diagram below and answer the questions.



(Adapted from <http://geoschooley.com/2018/08/17/types-of-rainfall/>)

1.1 The type of rain illustrated by A, in the diagram is:

- A. Convection rain.
- B. Orographic rain.
- C. Cyclonic rain.

1.2 The type of rain illustrated by B, in the diagram is:

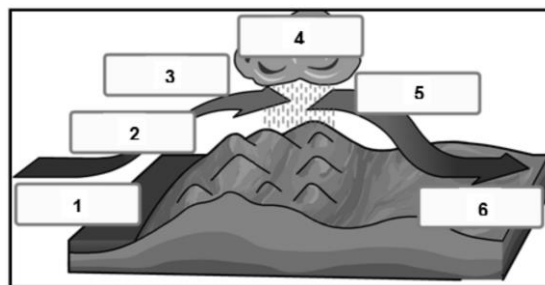
- A. Convection rain.
- B. Orographic rain.
- C. Cyclonic rain.

1.3 The type of rain illustrated by C, in the diagram is:

- A. Convection rain.
- B. Orographic rain.
- C. Cyclonic rain.

1.4 Name the three conditions that need to exist in the atmosphere for rain to form.

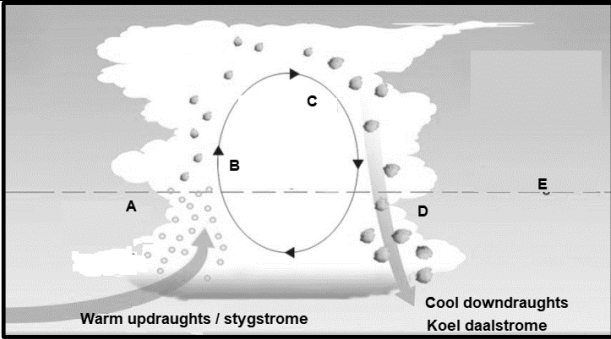
1.5 Refer to the diagram below:



Use the number to identify and explain each process of this type of rainfall.  
 (Tip: you need to refer to your textbook as a source)

1.6 What are the benefits from this type of rainfall as indicated at 4?

1.7 What are the disadvantages of this type of rainfall for the farmer situated at 6?

Climatology: Consolidation Activity 4 Term 1 Week 5 Lesson 5		
2.	<b>Choose the correct word/s in brackets</b>	
2.1.1	Dew form in the (in the clouds/on a surface).	
2.2	Dew is normally only visible on plants and metal surfaces, explain why.	
2.3	Why is frost a rare occasion in coastal areas?	
2.4	Convection rain occurs in the summer rainfall regions of South Africa. Explain how this type of rain develop.	
2.5	Describe the characteristic of a rain that occurs from convection currents.	
2.6	 <p>(Adapted from Bureau of Metrology of Australia@BOM_au 8 Nov 2016)</p> <p>Hail is possible from a cumulonimbus cloud. Use the diagram above of a cumulonimbus cloud, and create a flow diagram of how hailstones are formed?</p>	
2.7	In a paragraph of about 8 lines describe the advantages and disadvantages of convection rain.	
2.8	The south western cape receives cyclonic rain during winter months. Explain briefly how cyclonic rain is formed.	
2.9	List some of the advantages of cyclonic rain for the agricultural sector in the Western Cape.	