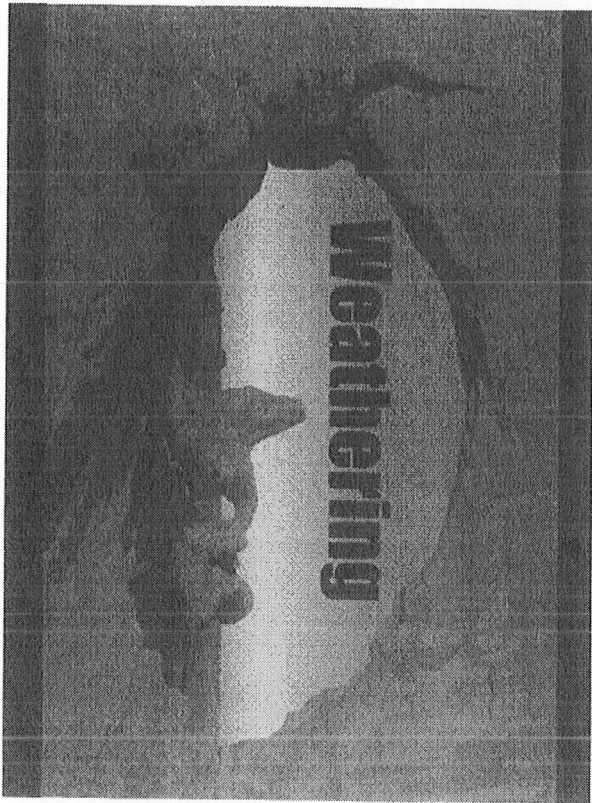


Social Sciences – Geography

Grade 9

Term 3 Content



THE IMPACT OF PEOPLE ON SOIL EROSION

1. How agriculture contributes to soil erosion

- Clearing vegetation for fields, buildings and roads – Plant roots hold the soil. They slow the wind and running water down, reducing their erosive power. Slower-flowing water sinks into the ground, or infiltrates it. Thus less water is left to flow over the surface as run-off. Where vegetation is removed, the soil is not protected in these ways.
- Driving heavy vehicles over the land – Tractors, bulldozers and one-trucks press down on the soil compacting it so that its particles are packed tightly together and form a hard surface. The hardened surface limits infiltration, and makes it harder for plants to grow down into the ground, so decreasing the vegetation cover.
- Overgrazing – This means keeping more animals on the land than there is grass to feed them. The grass is eaten more quickly than it can regrow, and so the vegetation cover on the land is lost and erosion increased. The soil is compacted especially along tracks that animals make by walking along the same path over and over again. Over time deep gullies called dongas are eroded in tracks and large amounts of soil are lost.
- Mono-cropping which is cultivation of only one kind of crop year after year. This reduces soil fertility making the soil more easily eroded.
- Using pesticides and chemical fertilisers kill soil organisms that are important for good soil structure.
- Planting crops in rows up and down hillsides enables water to flow downhill fast, and so to erode channels between the rows. It is better to use contour planting, in which crops are planted in rows along the contour lines which reduces the speed of water flowing downhill.
- Using overhead irrigation such as sprinklers, as the drops falling on the soil increase its compaction.

2. How construction and mining contributes to soil erosion

- Covering land surfaces with buildings, paved areas and tared roads – these reduce infiltration and increase run-off and erosion
- Disturbing the soil by ploughing or digging it up for foundations or holes for mining – The disturbed soil is loosened and can be more easily eroded, especially when it is left in a large mound. Soil animals which help hold soil particles together are killed and soil structure is damaged.

Term 3:

Week 1

1. WHAT IS WEATHERING?

Weathering is the process by which rocks are broken down into small particles. OR is the breakdown of rock into smaller pieces through exposure to wind, water, heat, and cold (concrete).

Important facts about weathering:

- It is caused by the action of moving water, air, chemicals, plants, or animals and changing temperature
- It is usually a very slow and invisible process.
- Weathering of rocks occurs in the same place and rocks are not moved.

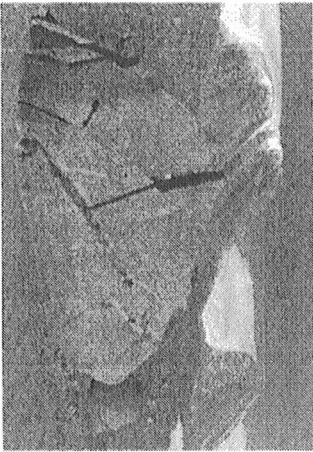
- Soil is produced as a result of weathering
- It wears away exposed surfaces over time and smoochens sharp, rough areas on rocks
- There are three types of weathering, namely, physical, chemical and biological

1.1 PHYSICAL (MECHANICAL) WEATHERING
 Is the breakdown of rock into smaller fragments by natural physical forces without changing its chemical composition (concept)

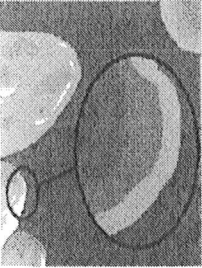
EXAMPLES OF PHYSICAL WEATHERING

- Freeze-thaw/frost shattering/frost wedging
- Exfoliation
- Thermal expansion
- Salt wedging
- Abrasion

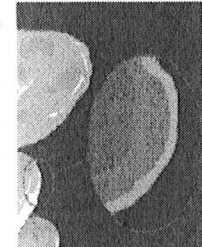
Freeze-thaw/frost shattering: occurs when water freezes between the cracks and holes in a rock. The frozen water will expand and forces the cracks in the rock to widen, eventually breaking the rock apart.



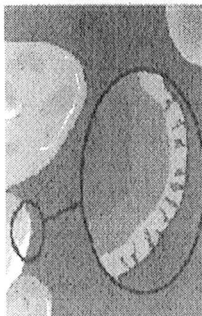
Exfoliation: is the process by which the outer layers of rock slowly peel away due to pressure changes. The rock layers peel off due to contraction (very cold) and expansion (very hot) as temperature changes.



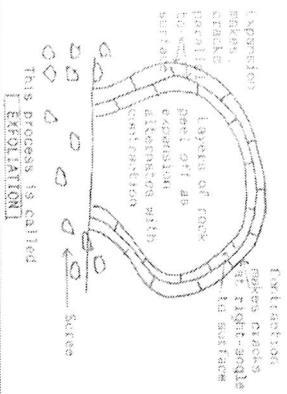
The rock expands as it warms up.



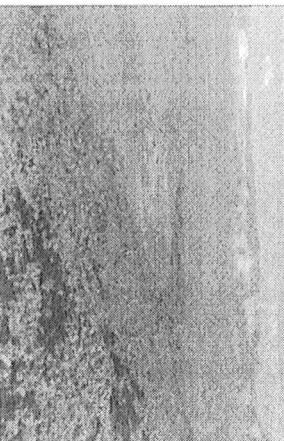
The rock contracts as it cools down.



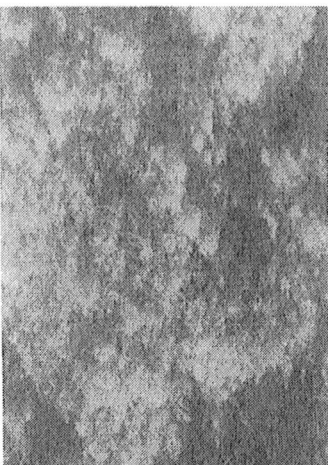
Repeated expanding and contracting causes pieces to take off.



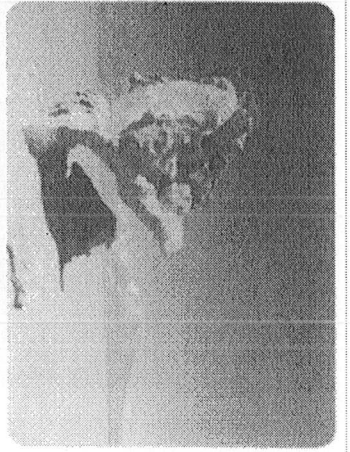
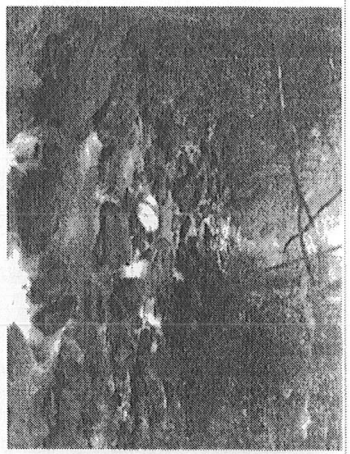
Thermal expansion: is the breaking down of rocks due to expansion and contraction of rocks as a result of extreme range of temperatures. This process is common in desert environments. Repeated swelling and shrinking of minerals with different expansion rates will also shatter rocks.



Salt wedging: occurs when salts crystallize out of solution as water evaporates. As the salt crystals grow, they apply pressure to the surrounding rock weakening it, until it eventually cracks and breaks down. Salt wedging is most common in drier climates, such as deserts.



Abrasion: is the breaking down and wearing away of rock material by the mechanical action of other rocks. Three agents of physical weathering that can cause abrasion are moving water, wind, and gravity.

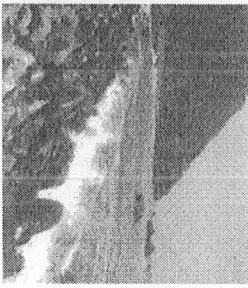
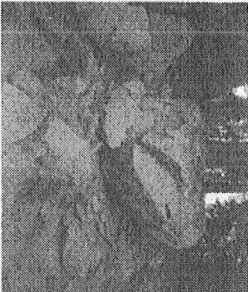


ACTIVITY 1.1: MECHANICAL WEATHERING

DURATION: 15 MINUTES

In pairs answer the following questions:

1.1.1 Identify different types of mechanical weathering from pictures labeled A to C.



1.1.2 Discuss how exfoliation, thermal expansion and frost wedging are examples of mechanical weathering

FEEDBACK

1.2 CHEMICAL WEATHERING

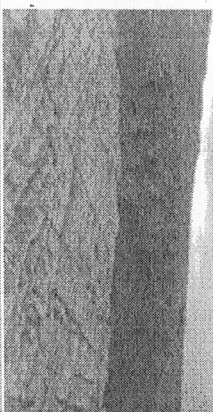
Chemical weathering is the breakdown of rocks by chemical reactions or decomposes, dissolves, alters, or weakens the rock through chemical processes to form residual materials.
Chemical weathering changes both the composition and appearance of rocks.

EXAMPLES OF CHEMICAL WEATHERING

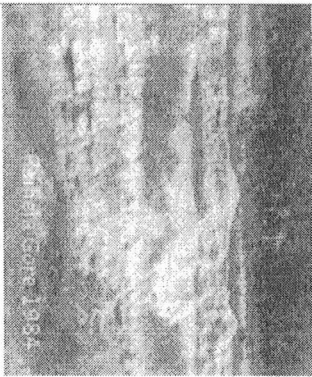
- Carbonation
- Hydrolysis
- Hydration
- Oxidation
- Solution

Carbonation is a process by which carbon dioxide and rainwater or moisture in the surrounding environment chemically react to produce carbonic acid, a weak acid that reacts with carbonate minerals in the rock.
Simplified definition: Chemical weathering happens when the minerals that make up a rock are changed, leading to the disintegration of the rock.

(When water vapour from rain reacts with carbon dioxide it forms carbonic acid)
Chemical weathering happens quickly in warm, moist environments (both on and beneath the surface) because water is needed for the chemical reactions.
It occurs with limestone or dolomite rocks and usually produces very fine, clay particles/material.



Hydrolysis: combination of hydrogen and oxygen in water with rock to form new substances
The reaction creates new compounds which tend to be softer and weaker than the original rock material. The hydrolysis of feldspars produces kaolinite, which is clay.

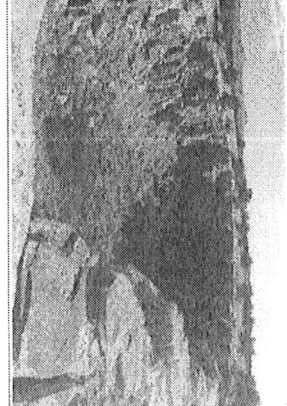
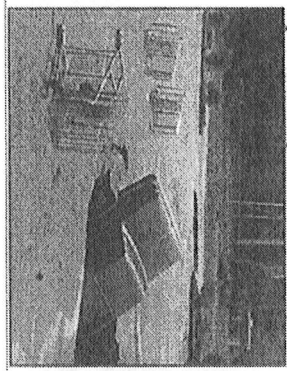


Hydration: is a process where mineral structure in the rock forms a weak bond with water which causes the mineral grains to expand, creating stress which causes the disintegration of the rock

Hydration often produces a new mineral compound that is larger than the original compound. The increased size expands (widens/spreads) the rock and can lead to decay. Once hydration begins, it accelerates other weathering processes and may also be accompanied by hydrolysis and oxidation

Oxidation: is a chemical reaction between some minerals in rocks and the oxygen in the air. Oxidation changes iron minerals in rocks from a light grey colour to a brown-red colour. This is called **rusting**. The change in colour shows the change in the composition of the rock. This chemical reaction causes the rock to break up.

Solution: is a process by which rock is dissolved in water. Solution most commonly occurs on rocks containing carbonates such as limestone, but may also affect rocks with large amount of halite, or rock salt. Solution of large areas of bedrock may cause sinkholes to form, where large areas of the ground subside or collapse forming a depression

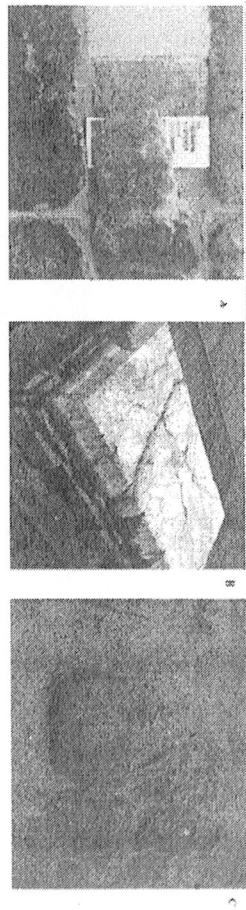


ACTIVITY 12: CHEMICAL WEATHERING

15 MINUTES

1.2.1 Carefully study each photograph A to F, showing weathered rocks and describe how chemical weathering affected each rock

1.2.2 What is the main agent of weathering that was common in the photographs?



FEEDBACK

1.3 BIOLOGICAL WEATHERING
Biological weathering is the disintegration (breaking down) or decay of rocks and minerals caused by chemical or physical agents of organisms

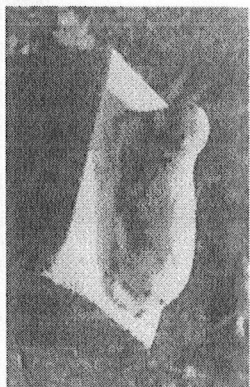
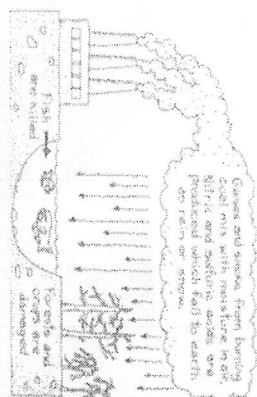
EXAMPLES BIOLOGICAL WEATHERING

- Organic activity from lichen and algae
- Rock disintegration by plant growth
- Burrowing and tunnelling organisms
- Secretion of acids
- Organic activity from lichen and algae:
- Organisms such as lichen and algae often live on bare rock and extract minerals from the rock by ion-exchange mechanisms. This bio-chemical weathering process leaches minerals from the rock causing it to weaken and breakdown.
- The decaying of plant materials can also produce acidic compounds which dissolve the exposed rock
- The presence of organisms growing, expanding, or moving across the surface of the rock also exerts a small amount of abrasion and pressure that gradually cause the mechanical weathering of the rock as the organisms extract various minerals.

<p>Rock disintegration by plant growth. The most common form of biological weathering is when plant roots penetrate into cracks and crevices of rocks and cause the rock to split or break into smaller particles through mechanical weathering. Although, this process is gradual, it can be fairly effective at breaking apart rocks that may already have a pre-existing weaknesses such as fractures, faults, or joints.</p>	
<p>Burrowing and tunneling organisms: Some animals may burrow or tunnel into rocks or cracks in rocks and cause the rock to break down and disintegrate. Ants, earthworms, rabbits, woodchucks, and other animals dig holes in the soil. These holes allow air and water to reach the bedrock and weather it.</p>	
	<p>Secretion of acids: Some organisms, such as snails, barmecles, or limpets, attach themselves to rocks and secrete acid acids that chemically dissolve the rock surface.</p>

1.4 IMPACT OF HUMAN ACTIVITIES ON WEATHERING

- Burning of fossil fuels/pollution makes air to be acidic, which leads to acid rain that eats away some softer rocks.

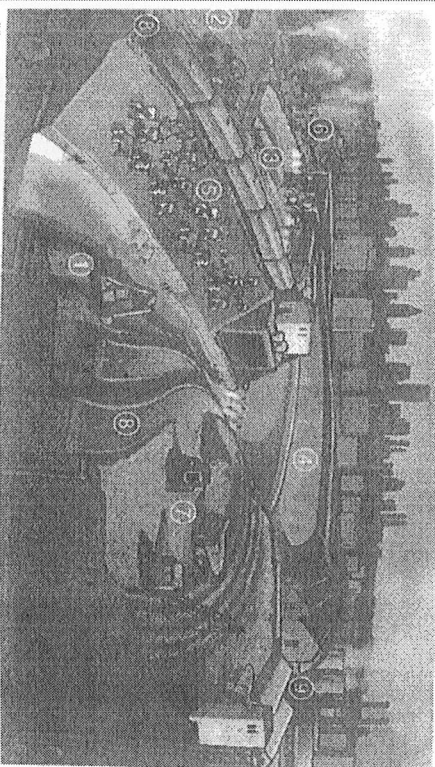


- Removal of vegetation led to the decrease in chemical and biological weathering
- Use of dynamites to blast large rocks (along the mountain side) to build roads
- Diggings of tunnels for mining operations/quarries used for construction
- Use of nitrogen fertilizers

ACTIVITY 1.3 SUMMATIVE

TIME: 30MINUTES

- 1.3 Study the diagram below, showing ways in which human activities impact on weathering and in your groups answer the questions below



- Key**
1. A factory is engaged in weathering by acids
 2. Transport removed and soil exposed by machines
 3. Human activities add chemicals to the air, soil and water
 4. Digging take up trees which cause have been used for building
 5. Animals change the soil and rocks when they burrow, walk and spread their waste
 6. They turn to or remove the physical of chemical
 7. Some weathering of soil
 8. Some weathering of soil
 9. Some weathering of soil
 10. Some weathering of soil
 11. Some weathering of soil

- 1.3.1 Identify ONE example from the diagram where each kind of weathering is taking place.
- Physical
 - Chemical
 - Biological
- 1.3.2 Name some ways that human activities expose soil and rocks. How can exposing soil and rocks increase physical weathering?

- 1.3.3 a Describe ONE way that human activities contribute to increased chemical weathering
 b What effect could increased chemical weathering have on the environment?
- 1.3.4 a What human activity has greatly increased biological weathering, as you can see from the diagram?
 b Describe the effects of this activity on the earth's surface.

FEEDBACK

UNIT 2

TIME: 6 hours

SURFACE FORCES THAT SHAPE THE EARTH: EROSION AND DEPOSITION

Outcomes: at the end of the activity you will:

- Identify features of erosion and deposition by:
 1. rivers
 2. sea
 3. moving ice and
 4. wind

Term 3:

Week 2 – 3

2.1 RIVERS – FEATURES OF EROSION AND DEPOSITION ALONG A RIVER COURSE

Features of erosion and deposition along a river course

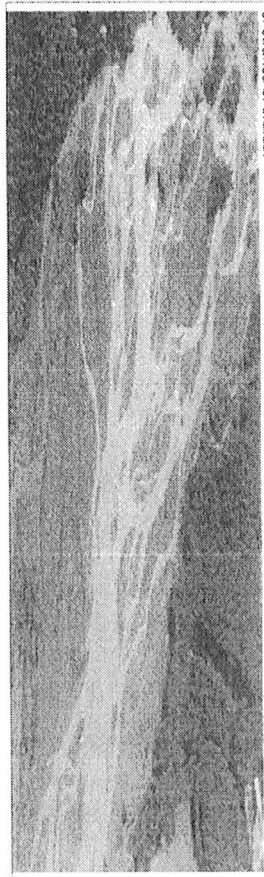
- Waterfall and rapids
- Braided stream
- Meander stream & bend
- Oxbow lake
- Levee
- Floodplain
- Delta

WATERFALL AND RAPIDS

Waterfall is when water flow over a steep/high lying area in a river/steep descent of the water of a river.

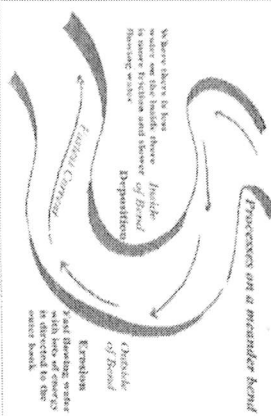
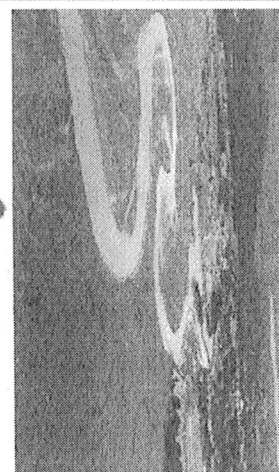
BRAIDED STREAM/CHANNEL

A stream consisting of multiple small, shallow channels that divide and recombine numerous times forming a pattern of strands or braids.



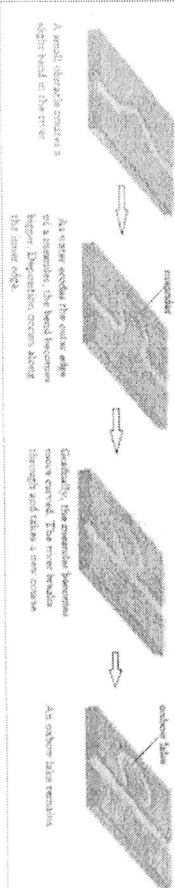
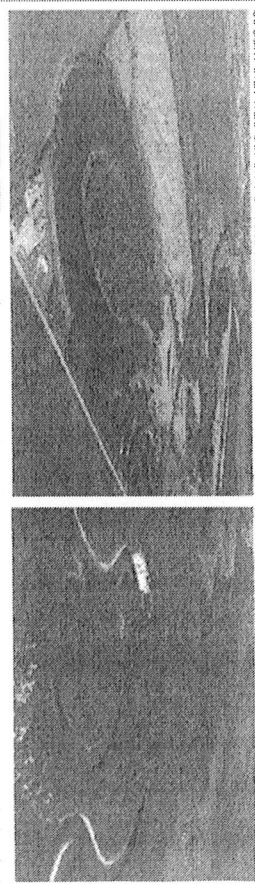
MEANDER STREAM

When a river follows a winding and turning course. At the bend of a meander, erosion occurs in the outer bank and deposition occurs on the inner bank.



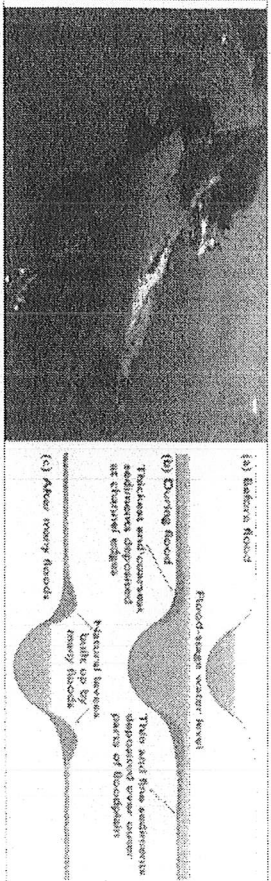
OXBOW LAKE

An oxbow lake is a meander cut off from the river by deposition of sediment/ a lake formed by a U-shaped curve in a stream that was cut off from the rest of the stream.

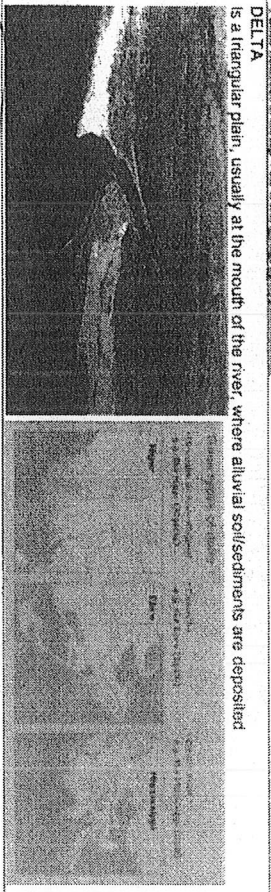
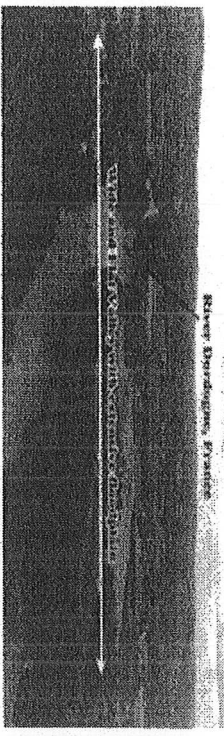


LEVEE

Ridges found along the sides of the stream channel composed of sand or gravel.



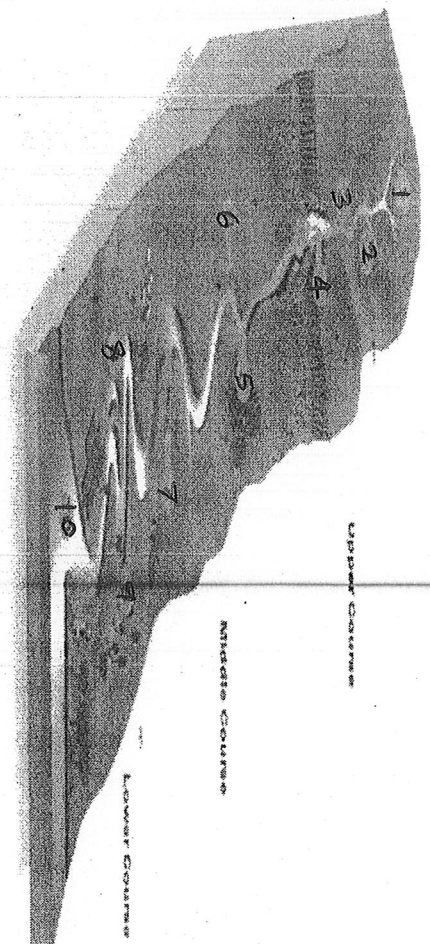
FLOODPLAIN
The flat, wide area of land along a river is a flood plain. A river often covers its flood plain when it overflows its banks during floods.



ACTIVITY 2.13
2.1 Refer to the diagram below showing the features along course of the river from the source to its mouth.
2.1.1 Choose the terms from the box to identify the features labeled 1 to 10

Intertocking spurs	levee	tributary
Oxbow lake	floodplain	estuary
Meander	river cliff (outside meander bank)	source
		waterfall
		slip-off slope (inside meander bank)

TIME: 30 minutes



Formation of an Oxbow Lake

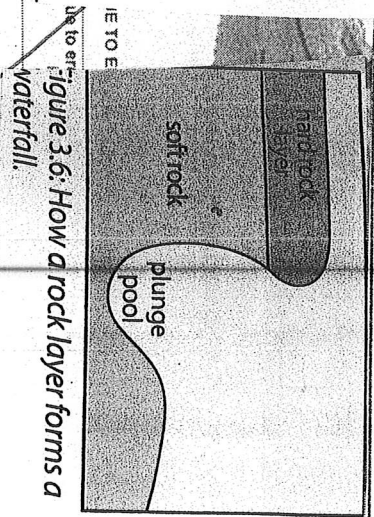
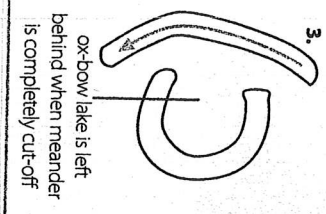
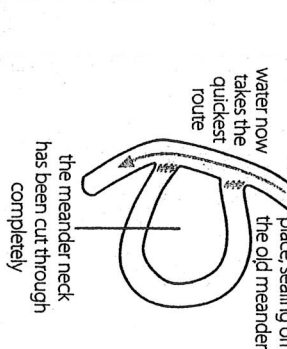
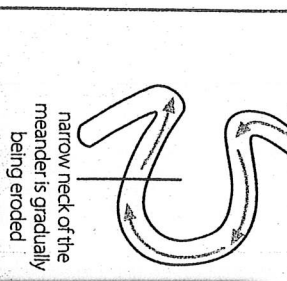
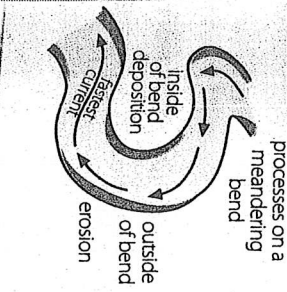


Figure 3.6: How a rock layer forms a waterfall.

GEOGRAPHY – GRADE 9
Homework Activity

MARKS: 50

QUESTION ONE

1.1 Make a copy of the following table. Name one example of each type of weathering.

TYPE OF WEATHERING	EXAMPLE
Physical weathering	
Chemical weathering	
Biological weathering	

(6)

1.2 Describe one way in which human activities contribute to chemical weathering. (3)

1.3 What is the difference between physical weathering and chemical weathering? (4)

1.4 The following are examples of how human activities impact on weathering. Write one sentence about the kind of weathering each activity will cause. Give an example of each.

1.4.1 An underground mine

1.4.2 Clearing vegetation by fire (4)

QUESTION TWO

2.1 Match each explanation that follows with one of the following words:

Erosion weathering deposition

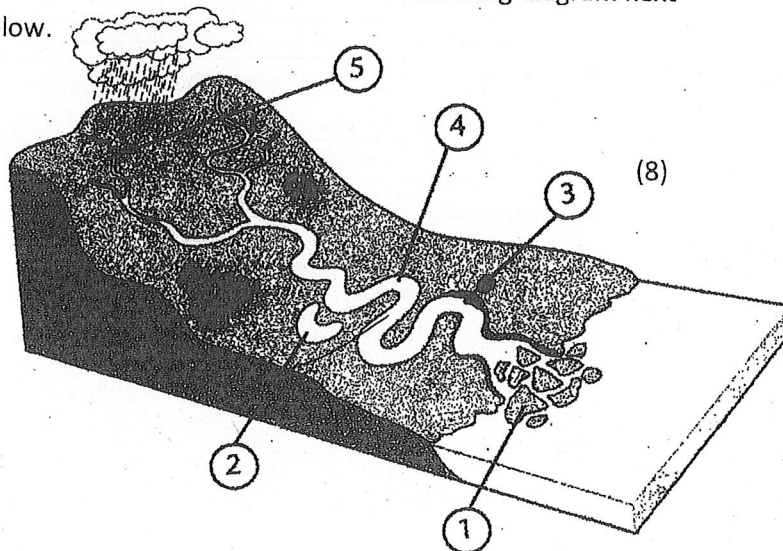
2.1.1 the breaking down of rocks and soil in one place.

2.1.2 the accumulation of material in one place.

2.1.3 the wearing away of the land by the movement of weathered material. (6)

2.2 List the numbers 1, 2, 4, 5. Write the letter of the correct feature in the following diagram next to the correct number from the diagram below.

- A. source
- B. Meander
- C. delta
- D. Ox-bow lake
- E. Floodplain



(8)

2.3 In which part of a river's course is downward erosion more active? (2)

2.4 Draw a diagram to show how a waterfall forms. Add these labels to your diagram:

Hard rock soft rock plungepool (8)

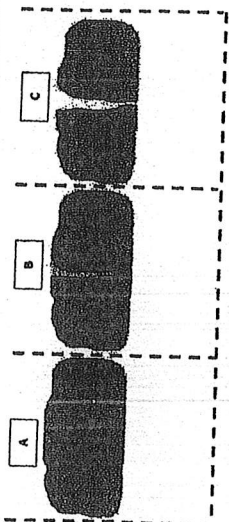
QUESTION THREE

3.1

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3.2

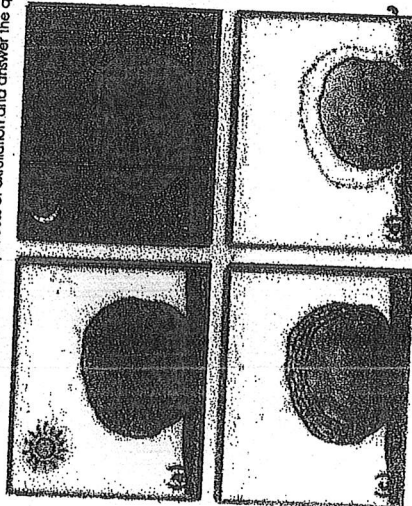
- 1.1 Define the term weathering.
- 1.2 Distinguish between weathering and erosion.
- 1.3 Give ONE similarity between weathering and erosion.
- 1.4 Name and explain the three main types of weathering.
- 1.5 Study the diagram below that illustrates the process of frost/ice wedging. Add labels and descriptions to A, B and C of the diagram to describe the process of frost/ice wedging.



1.6 Copy the table below in your workbook. Complete and fill in the missing information.

Type of weathering:	Examples of type of weathering process:	Explanation of how the process works:
	Abrasion	
	Oxidation	
	Root wedging	

4.1.7 Study the diagram that illustrates the process of exfoliation and answer the questions.



- (a) What type of weathering is the exfoliation process?
- (b) Explain what happens to the outer surface area of the rock in A and B.
- (c) Describe and explain what is busy happening with the surface of the rock in C.
- (d) What happens to the circumference of the rock in D?

(3)

(6)