WEATHERING & EROSION

Earth's surface is not flat because of different landforms it has which are a result of Internal Processes of Earth.
The difference (of the distance) between the highest & lowest point on the Earth is 20km.

Internal Processes are pretty quicker.

External Processes

- Their work is slow & not of great magnitude (exception - deserts)
- It is the work of rivers, glaciers, waves, winds etc
- Land forms aren't built by them.

Gradation

- Gradation means to bring Earth's surface to a common level
- That level would be called PENEPLAIN & it is not possible to achieve/occur.
- The central part of Australia - The Cobar Plain is somewhat like a peneplain but it is not a peneplate completely.
- Agents of Gradation: Rivers
  Waves
  Winds
  Glaciers.

Sub Processes
Degradation - eroding of mountains
Aggradation - uplifting of sea floor

The process of degradation is brought about by weathering.

Weathering is breaking up of rocks.

- It is not just breaking up of rocks, but it is also IN-SITU which means 'as is where is'; they are broken at the same place where they are
- Broken Rock fragments are called regolith
- INSITU - regolith lies at the same place where the rock is.
- Causes (Agents) of Weathering → are slow & static
  - Roots of trees
  - Atmospheric gases
  - Moisturising atmosphere
  - Burrowing of animals
  - Heat (thermal expansion)

Erosion is breaking up of rock followed by immidiate removal of regolith

- It is an non insitu process
- Causes/Agents of Erosion → running water are faster & dynamic. glaciers
  wind
  sea waves

Types of weathering:

1. Mechanical weathering:

- Agents → Temperature
  → Pressure
  → Frost
- Mechanism → The break-up of rock is PHYSICAL
- Product → The product, that is the regolith is same as the parent rock.
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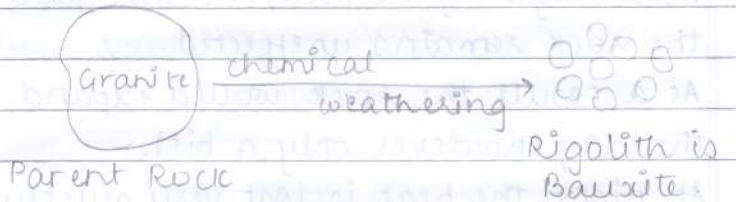
Parent Rock

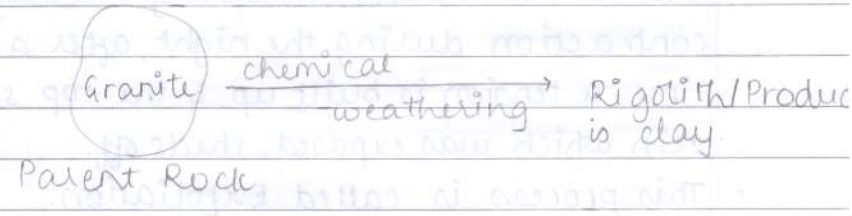
Regolith is Granite.

2. Chemical weathering:

- Agents → Atmospheric Gases
  → Moisture
- Mechanism → The break-up of rock is CHEMICAL
- Product → The product, that is the rigolith is different from/than the parent rock.
- Tropical Regions



- Temperate Regions

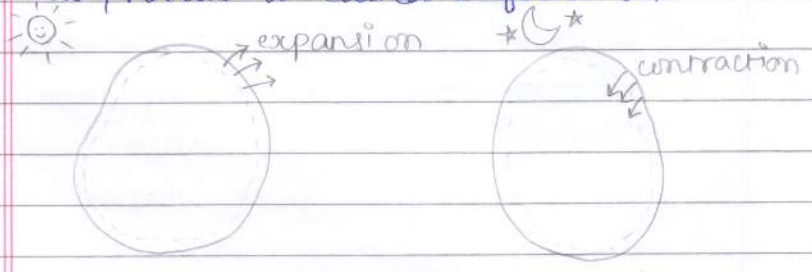


Examples:

1. Mechanical weathering:

a. Exfoliation:

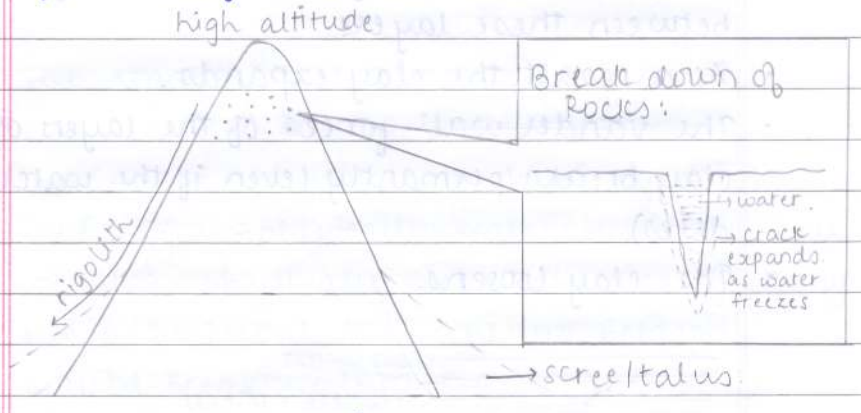
- Takes place at the places where the temp. during the day is extremely high & temp. ~~temp~~ during the night is extremely low.
- Rocks are bad conductors of heat.
- Hence whatever heat is there during the day, it is confined to move to the top outer most layer of the rock; the inside part of the rock remains uneffected
- As a result the rock would expand during the day (however, only a bit).
- At night, the heat is lost very quickly from the outer surface which results in contraction of the rock.
- Due to the expansion during the day & contraction during the night, after a long time, a tension is built up & the top surface/ skin which was exposed, sheds off.
- This process is called Exfoliation.



- Example: at Rajasthan.

b. Frost weathering / Freeze Thaw:

- Occurs at places where the night temp is below 0°C & day temp. is above 4°C; that is, the ~~type of weathering~~ places ~~at~~ in low latitudes but high altitudes.
- Some rocks have cracks in them which are filled up by water.
- When the water freezes to ice (more volume), the crack expands due to the anamolous expansion of water
- During the day, when the ice melts & the crack deepens.
- After a long time, the rock shatters.



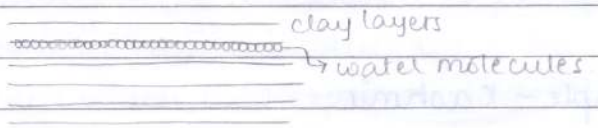
- Example - Kashmir.

c. Pressure Release:

- When lower layers of any rock are subjected to pressure by their upper layers, they get compact
- When these above lying layers are ~~completely~~ suddenly removed, due to pressure release, parallel cracks would be formed & finally the rock would break.

d. Hydration.

- Occurs in rocks which are made up structured layers of clay.
- When these rocks get wet, water (water molecules) gets between these layers
- As a result, the clay expands.
- The ~~vander waal~~ van der waal forces of the layers of clay breaks permantly (even if the water dries)
- The clay loosens.



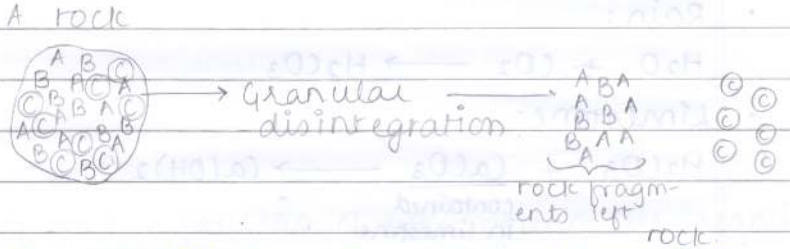
★ Van der waal forces → largely electro-static forces.

- Eg: Shale -
  (rock entirely made up of clay ie it is like compacted clay)

2. Chemical Weathering:

a. Solution:

- Occurs in rocks which contain minerals like halite (compacted NaCl) & Grypson (compacted $CaSO_4$)
- Due to running water or rain, one or more of these minerals could be removed.



- The regolith is not same as the ~~regolith~~ rock
- Eg: Granite - contains minerals: ~~such~~
  → Quartz - physically & chemicaly strong
  → Feldspar - physically ~~weak~~ strong; chemically weak
  → Mica - physically weak; chemically strong

When subjected to weathering, Feldspar would break up into K_2O, Al_2O_3 & SiO_2

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Bauxite (formed in tropical regions)

b. Oxidation

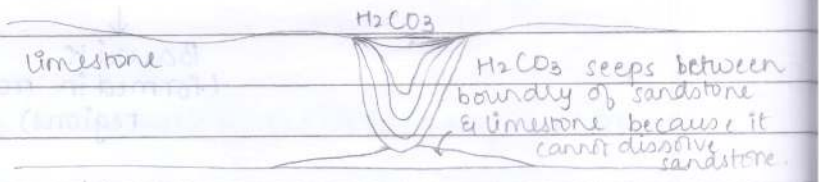
- Occurs when a rock conraing pyrite (FeS), Cu_2S, PbS or ZnS is exposed to oxygen
- $FeS + O_2 \longrightarrow \underset{\text{rust}}{Fe_2O_3}$
- The rock becomes soft & can be easily broken by any forces.

c. Carbonation

- Rain:
  $H_2O + CO_2 \longrightarrow H_2CO_3$
- Limestone:
  $H_2CO_3 + \underset{\text{contained in limestone}}{CaCO_3} \longrightarrow Ca(OH)_2$
- Limestone is compact but due to carbonation it becomes loose.

★ Carbonation causes – stalagtites & stalagmites

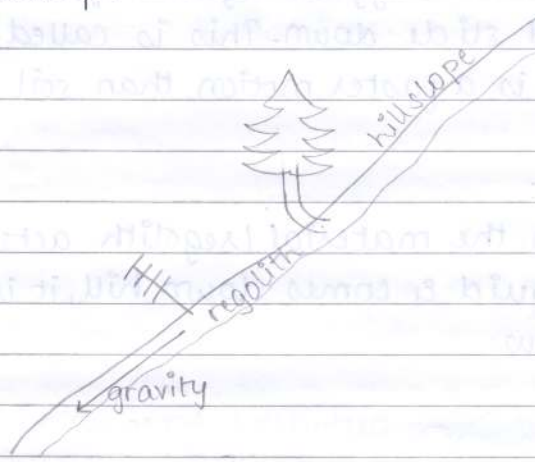
Underground caves.



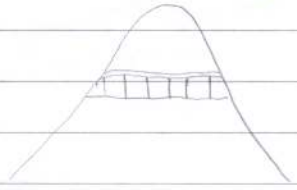
sandstone =
made up of quartz
(physically & chemically strong

Mass Movement:

1. Soil Creep:



- After the process of weathering, the regolith forms its layer / settles on the hillslope.
- Under the force of gravity, the regolith moves downhill (about 2-3 cm every years). This movement is called soil creep.
- It is a slow process & could be remain unnoticable if we didn't have the evidences.
- Evidence 1: The ~~trees~~ trunks of the ~~trunks~~ trees & telephone cables bend.
- Evidence 2: Wall that is built across the hill develops cracks & becomes wavy.

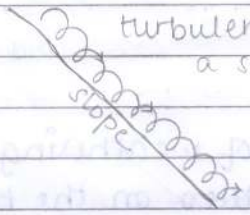


2. Slide:

- If the regolith ~~is~~ becomes heavy due to rain or if it is triggered by earthquake, regolith would slide down. This is called a slide.
- Slide is a faster motion than soil creep.

3. Flow:

- When the material/regolith acts as a liquid & comes down hill, it is called a flow.



After weathering has taken place:

→ The regolith can move as a result of mass movement

→ It can remain at the same place OR

→ It can mix up with humus to form soil: humus + regolith = soil

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Regolith ⟺ Regolith

Parent Rock → Parent Rock → Parent Rock

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The Soil Profile.

Top soil
Sub soil → leaching of nutrients from surface by water
Weathered Rock
Parent Rock