Toppersnotes
Unleash the topper in you

UGC-NET

Environmental Science

NATIONAL TESTING AGENCY (NTA)

PAPER – 2 || VOLUME – 3

ENVIRONMENTAL GEOSCIENCE & ENERGY ENVIRONMENT

SIERRA INNOVATIONS

CONTENT

UNIT 4

Environmental Geoscience

Biofuels

UNIT 5

Energy Environment

Unit - 4

Environmental Geoscience

Rocks

→ Weathering describes the breaking down or dissolving of rock & minerals on the surface of earth. Water, Ice, Acids, salts, plants, Animals, & Changes in temp. are all Agents of weathering.

→ Weathering is often divided into processes of mechanical weathering and chemical weathering. Biological weathering in which living or once-living organisms contribute to weathering, can be part of both processes.

* Biological Weathering.

→ Microscopic organisms like Algae, moss, lichens & bacteria can grow on the surface of rock & produce chemicals (breaks down layers of rocks).

→ The amount of biological activity depends upon how much life is in that area.

→ Biological weathering is the disintegration or decay of rocks & minerals caused by chemical or physical agents of organisms.

→ Organic Activity from lichen & Algae
→ Rock disintegration by plant growth
→ Burrowing and tunneling organisms
→ Secretion of acids

Mechanical Weathering

→ physical disintegration & reduction in size of rock without changing their chemical & composition.

* Exfoliation:
* Frost wedging:
* Temp. Changes: (warmer temp. may cause some minerals to expand & cooler temp. cause them to contract.
* Salt wedging: (As the salt crystals grow, they apply pressure to the surrounding rock weakening it. until it eventually cracks & breaks down, enabling the salt crystal to continue growing.

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* Abrasion: (when rocks collide against each other while they are transported by water), (glacial ice, wind, any gravitational force).

Types of Weathering

→ Carbonation
→ Hydrolysis
→ Hydration
→ Oxidation
→ Solution.

* An eg. of hydrolysis: Anhydrite ($CaSO_4$) can absorb two water molecules to become gypsum ($CaSO_4 : 2H_2O$).

Types of Rocks

1. Igneous rocks
2. Sedimentary rocks
3. Metamorphic Rocks.

→ Magma is composed of a mixture of molten or semi-molten rock, along with gases & other volatile elements.

* When magma cools, it turns into rock; if it cools while still underground at high temp.

(but at temp. still slower than that of magma).
the cooling process will be slow giving larger crystals

→ If the magma erupts or is cooled rapidly
we instead get a volcanic rock
- small crystals
- volcanic rocks are also called extrusive igneous rocks. as opposed to intrusive igneous rocks

* Plutonic Rock :-

inside the earth surface magma cooling slowing formed the coarse grained rock called Intrusive rock eg:- Granite, Diorite, & Gabbro.

* on the basis of molten magma acquires after cooling & take the landforms.

* Batholiths
→ large granitic rock.

* Laccoliths
→ dome-shaped intrusive bodies
→ Karnataka plateau is spotted with dome hills of granite rocks.

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* Lapolith
→ In case it develops into a saucer shape Concave to the sky body. it is called Lapolith.

* Phacolith
→ A wavy mass of intrusive rocks

* Sills
→ near horizontal bodies of the intrusive igneous rocks.
→ The thinner ones are called sheets

* Dykes
→ perpendicular to the ground.
→ wall-like structure.
Such structure are called dykes
→ western Maharashtra Area.
→ Deccan traps
* Extrusive rock :-

A/C to type of Extrusive / eruption.
The Extrusive igneous rock can for plateau / cone.

* Pyroclash : Airborne fraction of volcano & when they fall back they form Tephra, which are further

Classified :-

Bombs (>64mm)
Lapilli (2-64mm)
Ashes (<2mm)
Tephra particles are called tuffs when they are either lapilli or Ash.

Classification of igneous rocks based on grain size & SiO_2 content :-

	Acid	Intermediate	Basic	Ultrabasic
Fine grained	Rhyolite	Andesite	Basalt	Rare
Medium "	Microgranite	Microdiorite	Dolerite	Rare
Coarse "	Granite	Diorite	Gabbro	Serpentinite

(a) → Acidic igneous rocks
→ silica presence is more than 66%
→ granite, pegmatite, & rhyolite.

(b) Intermediate igneous rocks
→ silica presence in b/w 55 & 66%.
eg:- Syenite, Trachyte.

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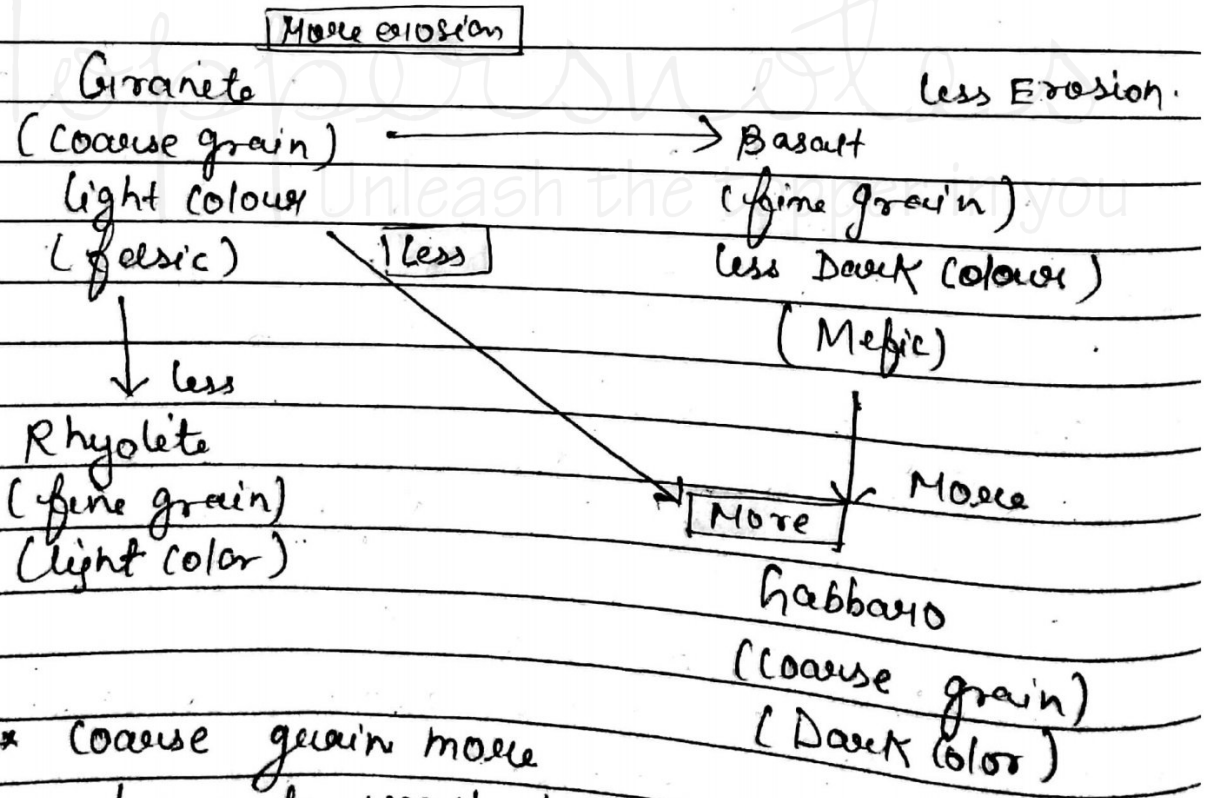
(e) Basic igneous rocks

Silica presence in b/w 44 & 55%
eg:- Basalt, Dolerite, Gabbro

(f) Ultrabasic igneous rocks.
→ Silica present is less than 44%
Eg:- olivine basalt.



* Coarse grain more prone to weathering.
* Gabbaro will show more erosion.

Sedimentary Rocks

→ formed by Deposition Compression hardening of "Weathered Matarial derived from other rock

→ Metamorphic Rock :—

→ Rock formed under Action of high pressure, high temp. Chemical reaction or by regrouping of the Components of eroded rocks.

→ 2 - types of Metamorphism (Change) that can cause this

* Contact metamorphism (or thermal metamorphism).

Sandstone — Quartzite
Limestone — Marble

* (Dynamic Metamorphism)

Granite —
Clay, Shale — Schist

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Processes of Rock cycle :-

→ Several processes can turn one type of rock into another type of rock.

→ Key processes of rock cycle are

1. Crystallization
2. Erosion
3. Sedimentation
4. Metamorphism

Classification of Rocks.

Sedimentary

Clastic	Chemical	Biologic
Conglomerate	Limestone	Coal
Breccia	Dolostone	Chert
Sandstone	Evaporites	
Siltstone		
Mudstone		
Shale		

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* Amphibole:-
double chain Silicate
5% of earth crust.
Al, Na, Ca, Mg, Fe & SiO_2
Eg:- Hornblende, Actinolete

Mica - 5% of earth crust
They are phyllosilicates (potassium Rich)
Eg:- Muscovite (White mica)
Biotite (Black mica)

feldspar - 50% of the crust
Three types: K- feldspar (Orthoclase) - $KAlSi_3O_8$
Na- feldspar (Albite) - $NaAlSi_3O_8$
Ca- " (Anorthite) - $CaAl_2Si_2O_8$
Na+Ca = plagioclase

* Granite magma: K-feldspar + Quartz + Mica + Amphibole
* Basaltic magma: Plagioclase + Olivine / Pyroxene
* Distribution of rock crust =
95% Igneous + Metamorphic And 5% sedimentary rock.
* out of which 5% =
* 80% Shale + 15% Sandstone + 5% limestone
* As a whole Earth - 75% Sedimentary rock + 25% Igneous & Metamorphic.

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Pure Silica

Olivine :- most Abundant in mantle, they are Mg, Fe silicate, The minerals are basaltic in nature
Eg :- Serpentine

Pyroxene :- 11% of earth crust
Eg :- Augite, Enstatite.

Most Abundant Minerals in Earth's Crust

Plagioclase feldspar — 39%
Alkali feldspar — 12%
Quartz — 12%
Pyroxenes — 11%
Amphiboles — 5%
Mica — 5%
Clays — 5%
other silicates — 3%
Non-silicates — 8%

* Amphibole :—
  double Chain Silicate
  5% of earth Crest.
  Al Na, Ca, Mg, fe, & SiO_2
  Eg :— Hornblende, Actinolete

Mico – 5% of earth Crest
They are phyllosilicates (Potasium Rich)

Eg :— Muscovite (Whitemica)
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Feldspar – 50% of the Crest
Three types : K – feldspare (Orthoclase) – $KAlSi_3O_8$
Na – feldspare (Albite) – $NaAlSi_2O_8$
Na + Ca = plagioclase

* Coranite Magma : K – feldspar + Quartz + Mica + Amphibale
* Basaltic magma : Plagioclase + Olivine / Pyroxene
* Distribution of rock Crest =
  95% igneaes + Metamorphic and 5% sedimentary rock.
* Out of which 5% =
* 80% shale + 15% sandstone + 5% limestone
* As a whole Earth – 75% sedimentary rock + 25% igneous & Metamorphic.

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* Shale

fine-grained, Moderately to well-sorted rock formed by compaction of very rounded silt-and-clay-sized grains.

→ 50% silt, 35% clay, & 15% Chemical materials.

→ Shales are clastic rocks made up mainly fine silt/clay.

Mohn Hardness Scale.

increasing Hardness ↑

10	Diamond
9	Corundum
8	Topaz
7	Quartz
6	Orthoclase
5	Apatite
4	Fluorite
3	Calcite
2	Gypsum
1	Talc

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Ground water

* largest reservoir of liquid freshwater on Earth. It is found in Aquifers.

porous rock & sediment with water in b/w. water is attracted to soil particles & capillary action, which describes how water moves through a porous media moves water from wet soil to dry areas.

Types of ground water :-

* Connate water or fossil water - (interstices or voids of sedi. rock)
* Juvenile Groundwater - (new water, prst in Magmatic or volcanic region)
* Meteoric water - (water which come from Rainfall)
* Rejuvenated water (Result from compaction of loosely packed sediments)

Types of Geological Formations

4- types of geological formations :-

1. Aquifers
2. Aquitard
3. Aquiclude
4. Aquifuge.

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* An Aquifer is a ground-water ~~reservoir~~ reservoir composed of geologic units that are saturated with water & sufficiently permeable to yield water in a usable quantity to wells and springs.

Aquifer provide 2 - Imp. functions.
(1) To transmit ground water from area of recharge to area of discharge
(2) To provide ~~stor~~ storage medium for useable quantities of ground water.

* Amount of water a materials can hold depends upon its porosity.

* Aquitard

→ Partly permeable geologic formation.
→ transmits water at such slow rate that the yield is insufficient for pumping by wells is not possible.
for eg - Sand lenses in a clay formation well form an Aquitard. also known as leaky confining layer.