# Civil Engineering Department

**(B.Tech Civil)**

Engineering Geology, 6th Semester

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(**Assignment**)

**Time: 1 week**

**ID#** **6954**

**Program** **B-Tech (Civil)**

**Subject** **Geology**

**Question 1:**

Why is geology essential when it comes to the domain of civil engineering? Analyze the involvement of Geology in all the aspects of a construction project? (10)

## What is the importance of engineering geology in the field of civil engineering?

civil engineers perform 99%( excluding table, wooden products) work on the earth (above the surface of the earth or below), whatever the structures are prepare ,whatever the buildings are made they all are touch with the earth, so it is very important to have decent knowledge about the place where the structure ls resting,

i think it is very important to do a complete geology test, before constructing any huge structure, like dams 'sky crappers ,tunnels etc ,

1. It provides knowledge about materials used for construction.
2. Its knowledge is helpful for river control and shipping work.
3. Its knowledge is helpful for constructing dams.
4. Geotechnical engineers needs knowledge about this subject for digging work.
5. Its knowledge is required for foundation faults.
6. For design of highways and roads.
7. In construction of tunnels.

8. Soil tests are done before any project.
9. Economical design is advanced.
10. Determining the earth quake prone areas.
11. determining the ground water table

## scope of geology

it is will established interdisciplinary branch of science and engineering has a scope in different fields as outlined below:

### (a)In mining engineering

Geology is useful to know the method of mining of rock and mineral deposits on earth surface's and subsurface.

### (B) In Civil Engineering

Geology provides necessary information about the site of construction material used in the construction of building, tunnels, dams, tanks reservoirs' highways and bridges.

Geological information is most important in planning phase, design phase and construction phase of an engineering project.

**Question 2:**

(a) Give some possible reasons of post-volcanic changes.

# Post–Volcanic Changes

- The gases with which the magma is charged are slowly dissipated, lava flows often remain hot and steaming for many years.
  - These gases attack the components of the rock and deposit new minerals in cavities and fissures.
  - Even before these "post-volcanic" processes have ceased,

Atmospheric decomposition or weathering begins as the mineral components of volcanic and igneous rocks are not stable under surface atmospheric conditions.

Rain, frost, carbonic acid, oxygen and other agents operate continuously, and do not cease until the whole mass has crumbled down and most of its ingredients have been resolved into new products or carried away in aqueous solution.

(b) Explain how the amount of SiO2 ultimately effects the composition of igneous rocks?

## Minerals In The Igneous Rock

| Rock Composition | Amount of $SiO_2$ (%) | Minerals |
|---|---|---|
| acid | >65 | quartz, orthoclase, Na-plagioclase, muscovite, biotite (hornblende) |
| intermediate | 55-6 | plagioclase, biotite, hornblende, quartz, orthoclase (±augite) |
| basic | 45-55 | Ca-plagioclase, augite (±olivine, ±hornblende) |
| ultrabasic | <45 | Ca-plagioclase, olivine (±augite) |

## Igneous Rocks Classification

| Rock Type | Amount of $Sio_2$% | Grain size: Extrusive | Hypabyssal | Plutonic |
|---|---|---|---|---|
| acid | >65 | rhyolite, dacite | quartz and orthoclase porphyries | granite, granodiorite |
| intermediate | 55-65 | pitchstone andesite | plagioclase porphyries | diorite |
| basic | 45-55 | basalt | dolerite | gabbro |
| ultrabasic | <45 | various basic olivine-basalts | various basic dolerites | picrite, peridotite, serpentinite, dunite |

**Question 3:**

Why does weathering occur? Make a comparative analysis of different forms of weathering. (10)

**Why weathering?** Simply, it is due to the response of Earth material to a changing environment.
For example imagine an intrusive igneous rock in Earth's subsurface.
After the uplift and erosion since many years, the rock may be exposed at the surface.
Igneous rocks are formed at high temperature and pressure.
In response to the change environment (Temperature and Pressure), the rock change gradually.
This transformation is what we call as ***Weathering*****.**

**Weathering**, occurs when rock is mechanically fragmented and chemically altered.
Mechanical weathering, physical forces break rock into smaller pieces without changing mineral composition e.g. tearing paper Chemical weathering, chemical transformation of rock into new compounds e.g. burning paper.

# Forms of weathering:

## Chemical weathering

Chemical weathering changes the composition of rocks, often transforming them when water interacts with minerals to create various chemical reactions. Complex processes that break down components and internal structures of minerals converting constituents to new minerals Releasing to surrounding environment. Chemical weathering is a gradual and ongoing process as the mineralogy of the rock adjusts to the near surface environment.

## Frost Weathering

Frost weathering, frost wedging, ice wedging or cry fracturing – where ice is present.
These processes include Frost Shattering Frost Wedging Freeze-Thaw Weathering
Severe frost shattering produces huge piles of rock fragments called *Scree*, at the foothills.
Similar like soil expands due to capillary action and formation of ice,
Rock is weakened which break up − for 10% ice expansion.

## Thermal Stress Weathering

Thermal stress weathering, also called as *Insolation Weathering*.
It results from expansion and contraction of rock, caused by temperature changes (Principal Driver).
Daily changes by 300 to 500 Thermal stress weathering comprises two main types, Thermal Shock, *differential stresses* Thermal Fatigue, *cyclic phenomenon*
Thermal stress weathering is an important mechanism in deserts,
There is a large diurnal temperature range, Hot in the day and cold at night.

## Physical Weathering

Physical weathering is the class of processes that causes the disintegration of rocks without chemical change.
The primary process in physical weathering is
abrasion,
The process by which clasts and other particles are reduced in size.

However, chemical and physical weathering often go hand in hand. Physical weathering can occur due to temperature, pressure, frost etc. For example,

Cracks exploited by physical weathering will increase the surface area exposed to chemical action.