

## UPSC Civil Services Examination

### UPSC Notes [GS-I]

#### Topic: Physical Weathering [Geography Notes for UPSC]

##### Physical Weathering Processes

- Physical or mechanical weathering processes are influenced by some applied forces.
- The applied forces are:
  - Gravitational forces like shearing stress, load, and overburden pressure.
  - Expansion forces due to crystal growth, animal activity or temperature variations.
  - Water pressures regulated by drying and wetting cycles.
- Many of these forces are applied both at the surface and within different earth materials leading to rock breakage.
- Most of the physical weathering processes are caused by pressure release and thermal expansion.

##### Unloading and Expansion

- Elimination of covering rock load because of sustained erosion causes vertical pressure release with the result that the upper layers of the rock enlarge producing fragmentation of rock masses.
- Fractures will occur roughly parallel to the ground surface.
- In areas of curved ground surface, arched fractures incline to create massive sheets or exfoliation slabs of rock.
- Exfoliation sheets causing from expansion due to pressure release and unloading may measure hundreds or even thousands of metres in horizontal extent.
- Big, smooth rounded domes are called exfoliation domes.

##### Temperature Changes and Expansion

- Several minerals in rocks possess their own limits of contraction and expansion.
- With an upsurge in temperature, all minerals enlarge and thrust against its neighbour and as temperature drops, a corresponding shrinkage takes place.
- Due to diurnal changes in the temperatures, this internal movement among the mineral grains of the superficial layers of rocks takes place repeatedly.
- This process is effective in high elevations and arid climates where diurnal temperature variations are extreme.

## Freezing, Thawing and Frost Wedging

- Frost weathering happens due to development of ice within openings and cracks of rocks during recurrent cycles of melting and freezing.
- This process is effective at high elevations in mid-latitudes where melting and freezing is frequently recurrent.
- Glacial regions are subject to frost wedging every day.
- In this course, the rate of freezing is significant.
- Hasty freezing of water causes its high pressure and rapid expansion.
- The resulting expansion affects joints, cracks and small intergranular fractures to become wider and wider till the rock breaks apart.

## Salt Weathering

- Salt crystallisation is most effective of all salt-weathering processes.
- Salts in rocks enlarge due to hydration, crystallisation and thermal action.
- Various salts like sodium, barium, calcium, potassium, and magnesium, have an inclination to enlarge.
- Enlargement of these salts relies on temperature and their thermal properties.
- High-temperature ranges between 30 and 50 degrees Celsius of surface temperatures in deserts support such salt expansion.
- Salt crystals in the adjacent surface pores cause splitting of single grains within rocks, which ultimately drop.
- This process of dropping of individual grains may result in granular disintegration or granular foliation.