

## Quadrant III – Notes

<b>Programme</b>	<b>: Bachelor of Science (Third Year)</b>
<b>Subject</b>	<b>: Geology</b>
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<b>Paper Title</b>	<b>: Indian Stratigraphy</b>
<b>Unit</b>	<b>: I</b>
<b>Module Name</b>	<b>: Tectonic and Physiographic Divisions of India: Their characters and peculiarities with respect to Geo-Tectonics, Stratigraphy and Physiography -Part 2</b>
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### Notes:

Physiography, drainage, structure and tectonism of Extra Peninsular India

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The large Indian region can be conveniently divided into three distinct regions of contrasting characters with respect to physiography, drainage, tectonics, and stratigraphy.

These divisions are:

1. **Peninsular India**: the triangular plateau south of alluvial plains of north India.
2. **Extra peninsular India**: the mountainous ranges of Himalayas.
3. **Indogangetic plains**: the alluvial plains of Punjab [partly in India and partly in Pakistan], Uttar Pradesh, Bihar and Assam, which separate peninsular India from extra-peninsular India.

These three great divisions of Indian region show striking dissimilarities in terms of physiography, their structure and geological makeup.

### II. Extra Peninsular India:

*Physiography:* The physiographic features of extra peninsular India are more rugged as compared to those of peninsular India. The hill ranges clearly exhibit a line of extension or strike. These are true tectonic mountains with lofty hills and steep and deep valleys. The rivers of this region are forceful and have great erosive power. They have cut deep gorges several thousand meters deep. The drainage of this region is of antecedent type and has their water shed beyond the line of highest mountainous axis.

While some Himalayan rivers drain parts of Tibetan area, some tributaries have captured the Tibetan streams by their accelerated headward erosion.

#### Classification of Himalayas

##### A. Geographical

1. Punjab Himalayas
2. Kumaon Himalayas
3. Nepal Himalayas
4. Assam Himalayas.

##### B. Parallel longitudinal zones:

1. Greater Himalayas
2. Lesser Himalayas
3. Outer Himalayas or Siwalik foothills

##### C. Geological structure and age of the rocks:

1. Northern/Tibetan zone
2. Central crystalline zone
3. Outer/sub Himalayan zone

*Geology/Stratigraphy:* The Extra-peninsular India constitutes a part of the Alpine-Himalayan fold mountain belt. The Himalayas are composed of both crystalline Archaean and Phanerozoic rocks. This region has served as a sedimentary basin for the greater part of geological history. The central crystalline zone comprises of Pre-Cambrian basement intermixed with granitic plutons of Tertiary age. The Tethyan Himalayan zone, which lies beyond high central zone, is composed of a fairly continuous marine succession of Paleozoic and Mesozoic ages resting unconformably over the Precambrian basement of the crystalline zone. The Phanerozoic succession of the lesser Himalayan zone i.e. the zone lying south of central crystalline axis are largely unfossiliferous unlike those of Tethyan Himalayan zone. The northern parts of the Tethyan Himalayan zone are overlapped by the Indus Suture Zone consisting of Ophiolites i.e. ultrabasic, basic and intermediate volcanic and hypabyssal igneous rocks intermixed with sediments. According to the theory of plate tectonics, the Indus Suture Zone constitutes the subduction zone along which the Indian plate collided with the Tibetan plate giving rise to formation of Himalayan Mountains.

*Geotectonics or Structure:* The extra-peninsular India is a comparatively weak and flexible portion of the earth's crust unlike peninsular India. The ancient geosyncline called the 'Sea of Tethys' received great amount of sediments throughout the Phanerozoic Eon. This sea gradually closed and upheaved in successive phases due to tectonic movements. These are truly tectonic or orogenic mountains. The area has undergone high degrees of deformation and rocks show high angles of dip and closely packed system of folds, thrusts, nappies etc. The forces responsible for the deformation were more superficial and acted tangentially to the Earth's surface. According to the theory of Plate Tectonics the Himalayan mountains came into existence as a result of the closure of Tethyan marine geosyncline as the Indian plate collided with the Tibetan Plate. The angles of the thrust planes, disposition of nappies and steep gradient on slopes facing Indian peninsula etc. all suggest that the forces acting from the Tibetan side were more powerful and Earth's flexure advanced from North towards the Peninsula. The resistance offered to these advancing earth flexures by rigid block of Indian Peninsula with Aravalli and Satpura mountains acting like

horns have resulted into two syntaxial bends, i.e. in Kashmir and Assam and also, curvilinear central portion of Himalayas.

### III. Indo-Gangetic Plains:

The great alluvial tract of the Ganges, Brahmaputra and Indus river systems is the third physiographic division of India. These plains separate the peninsular India from the Extra-Peninsular India and cover an area of about 8,50,000 sq.km. Indogangetic plain is a deep crustal trough filled with quarternary alluvial deposits of rivers of Indus, Ganges and Brahmaputra system. Its origin and structure are closely related with the rise of Himalayas. This entire area is geologically uninteresting but being rich agricultural tract is of great interest and importance in human history.

Regarding its origin there are divergent views but generally accepted view at present is that, it has been formed by the sagging down of the northern border of peninsular shield beneath the sediments thrust over it from the north. The basement surface under these alluvial deposits slopes down from south to north at an average angle of 1 to 3 degrees. The maximum thickness of the quarternary sediments is encountered along its northern fringes near the Siwalik Hills. The basement configuration of the Indogangetic plains is not uniform in character. It is divided into four shelf areas separated from one another by three transverse high or buried ridges. The aeromagnetic and gravity surveys and boreholes drilled for petroleum exploration have revealed the presence of Delhi – Haridwar Ridge, Faizabad Ridge and Monghyr-Sahara Ridge below the alluvial cover. Thus, the bottom configuration of the Indogangetic plains is very irregular with ridges; shelf's and deeps. The thickness of the alluvial is very high around 7500m at places.

### **Offline Resources:**

### **Online Resources:**

