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Q4

Describe the characteristics and types of primary rocks.

UPSC Civil Services Mains 2022 · GS I · 10 marks · World's Physical Geography

Salient features of world's physical geography.

Core demand of the question

- Describe the characteristics and types of primary rocks
- Treat primary rocks as igneous rocks and cover both intrusive and extrusive types
- Keep the explanation within a 10-mark length

Revision summary

Primary rocks are igneous rocks frozen from magma or lava.

They are crystalline or glassy, usually hard, and lack fossils.

Intrusive types include **granite**, **gabbro**, and **dolerite**.

Extrusive types include **basalt**, **rhyolite**, and **fragmental tuff**.

Texture follows cooling speed; mineralogy follows silica content.

Introduction

Primary rocks are igneous rocks formed by the cooling of magma or lava. They are the first crustal stock from which many sedimentary and metamorphic rocks are later made.

Body**Characteristics**

- Igneous rocks are crystalline or glassy, generally hard, and they do not contain fossils because they freeze from melt, not from surface mud.
- **Texture records cooling speed:** coarse grains mean slow underground cooling; fine grains or glass mean rapid surface or underwater cooling.
- Chemistry ranges from silica-rich acidic rocks such as **granite** and **rhyolite** to silica-poor basic rocks such as **gabbro** and **basalt**.
- They may be vesicular where gas escapes, or porphyritic where large crystals sit in a finer groundmass.
- Joints, sills, dykes, and batholiths are structural habits, not separate chemistries.

Intrusive or plutonic types

- **Granite** is a coarse, quartz-feldspar rock of continental batholiths and forms much of the Peninsular basement.
- **Gabbro** is a coarse basic equivalent of **basalt** and appears in layered intrusions.
- **Dolerite** (diabase) fills dykes and sills with a medium grain, common in the Deccan and the Gondwana coalfields.

- Pegmatite veins carry very large crystals and sometimes mica or rare minerals.

Extrusive or volcanic types

- **Basalt** is the main plateau lava of the Deccan Trap, dark, fine-grained, and often columnar.
- Rhyolite and andesite are more silica-rich lavas of continental arcs; pumice and obsidian are glassy extremes.
- Tuff and volcanic breccia are fragmental ejecta welded or packed after eruption.
- Primary rocks therefore split first by place of cooling, then by silica and mineral content.

Flow diagram

Magma lava -> Intrusive slow cool
Magma lava -> Extrusive fast cool
Intrusive slow cool -> Granite gabbro dolerite
Extrusive fast cool -> Basalt rhyolite tuff
Granite gabbro dolerite -> Primary igneous crust
Basalt rhyolite tuff -> Primary igneous crust

Conclusion

- **Primary rocks are igneous:** hard, crystalline or glassy, and without fossils. Types are intrusive **granite-gabbro**-dolerite suites and extrusive **basalt**-rhyolite suites, sorted by cooling and chemistry.

Facts & figures

Granite

Coarse acidic plutonic rock of continental batholiths, common in the Indian Peninsula.

Basalt

Fine basic lava that builds the Deccan Trap plateaus.

Gabbro

Coarse plutonic equivalent of basalt.

Dolerite dykes

Medium-grained basic sheets cutting older rocks in the Deccan and Gondwana belts.

No fossils in igneous rock

Melt origin destroys or never hosts organic remains, unlike most sedimentary rocks.