STONE

LECT.1

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1 Stone

1.1 Classification of rock, uses of stone, natural bed of stone,

1.2 Qualities of good building stone,

1.3 Dressing of stone

1.4 Characteristics of different types of stone and their uses

Classification of ROCK:-

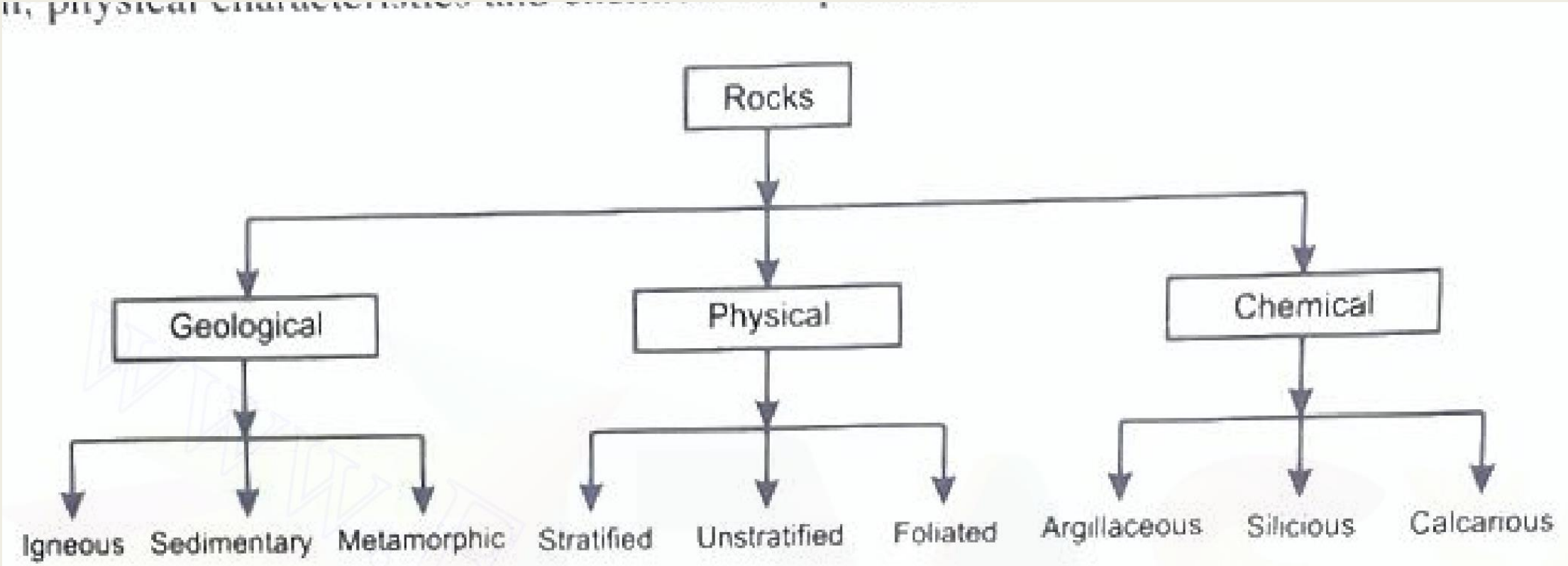

Fig. 2.1

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GEOLOGICAL CLASSIFICATION :-

- ***Igneous rocks*** are formed by the solidification of magma below the earth's surface. When the magma is unable to erupt through the earth surface during its upward journey, it is held up below the earth's surface and unable to descend. This magma cools down gradually and solidifies into igneous rocks.

1. Plutonic:- (greater depth solidification and best igneous rock) ex :- granite
2. Volcanic:- (solidification of the rock occurs near to the earth surface and extremely fine grained structure) ex:- BASALT
3. Hypobasal:- (shallow depth from the earth's surface & the finely grained crystalline structure of rock will be obtained) ex:- Dolerite

- ***Sedimentary Rocks*** formed by the deposition of sediments obtained by the weathering of pre-existing rocks and these sediments are transported by various agents such as water, wind, frost, gravity, etc.

Ex:- Sandstone, limestone, lignite, etc.

- ***Metamorphic rocks*** are formed by the metamorphism process. Metamorphism is the process of changing the characteristics of the pre-existing rocks under the influence of heat and pressure. The pre-existing rocks may be of the sedimentary or igneous type of rocks.

Examples: Slate, Gneiss, Schist, marble, soapstone etc.

S.No.	Original rocks	Metamorphic rock
1.	Granite	Gneiss
2.	Syenite	Gneiss
3.	Sandstone	Quartzite
4.	Limestone	Marble, schist
5.	Marl	Marble
6.	Shale	Slate, schist, phyallite
7.	Mudstone	Slate
8.	Dolomite	Marble
9.	Dolerite, basalt	Schist
10.	Felsite, tuff	Schist, slate
11.	Conglomerate	Gneiss, schist

Fig 2: Igneous Rock – Granite

Fig 3: Metamorphic Rock – Gneiss

PHYSICAL CLASSIFICATION

- ***Stratified rocks*** consist of different layers in its structure and these layers are separated by planes of stratification. These planes are also called cleavage planes or bedding planes. These rocks can easily split up along these bedding planes.

Ex:- sandstone, limestone, shale,

- ***unstratified rocks*** is crystalline or compact granular.
- They possess a similar kind of structure throughout their whole body. Most of the igneous rocks and some sedimentary rocks come under unstratified rocks.

Ex:- Granite, marble, trap

- ***Foliated rocks*** possess a layered or banded structure which is obtained by exposure of pressure and heat. Unlike the stratified rocks, these rocks can split up in a certain direction only.

examples are gneiss, schist, slate etc.

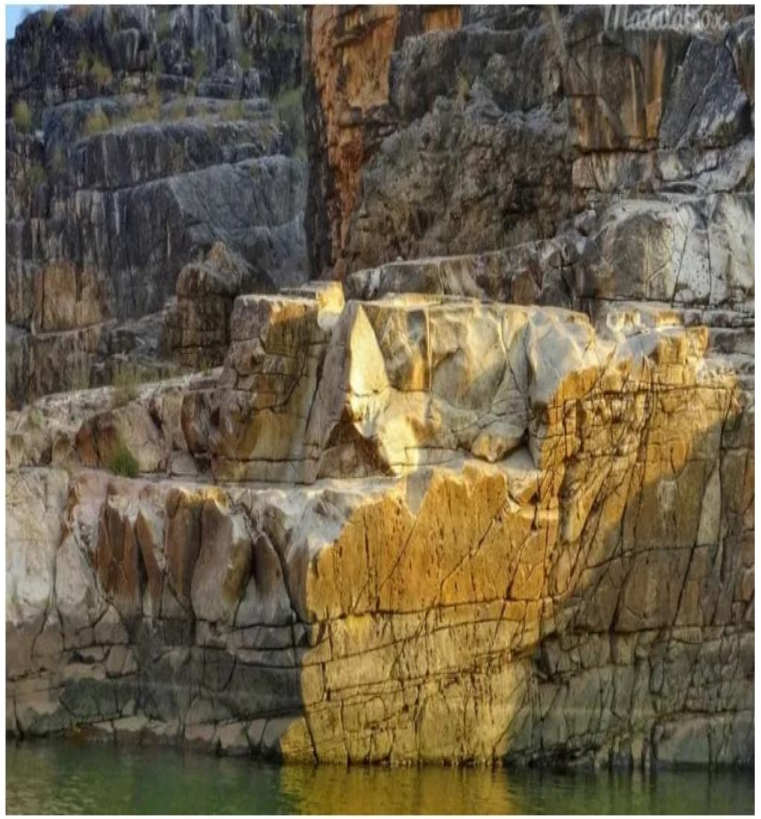

Fig 5: Unstratified Rock

Fig 6: Foliated Rock

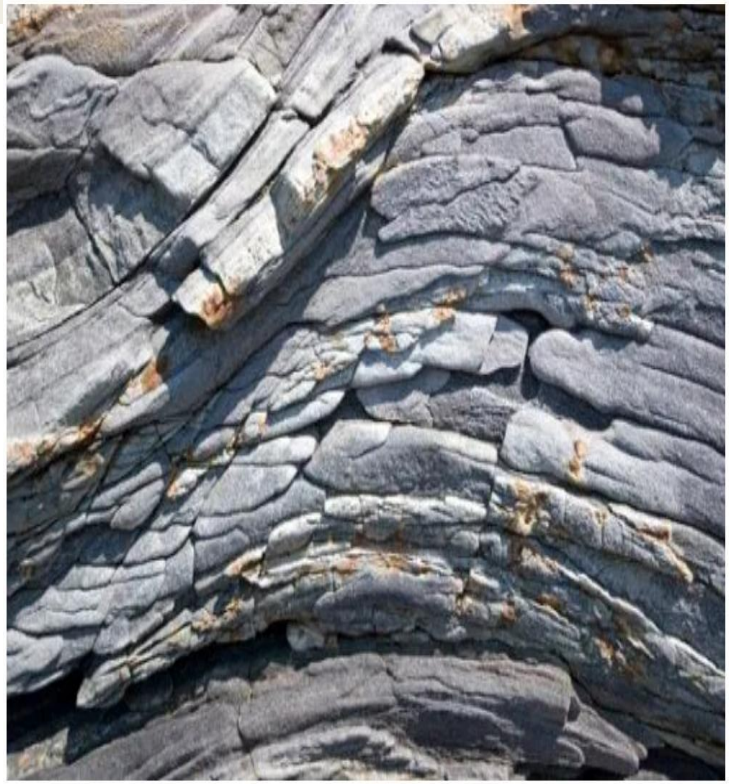

Fig 4: Stratified Rock

structure.

3. Chemical Classification: This classification is known as the scientific or engineering classification and according to this classifications, the rocks are of the following three types:

(i) Silicious rocks
(ii) Argillaceous rocks
(iii) Calcareous rocks

(i) Silicious rocks: In these rocks the major constituent is silica (SiO_2) i.e. sand. The rocks are very hard and durable. e.g.: granite, basalt, trap, quartzite, gneiss, syenite etc.

(ii) Argillaceous rocks: In these rocks, the argil or clay predominates. Such rocks may be dense and compact or they may be soft. These stones are hard and durable but brittle. e.g.: slates, laterites etc.

(iii) Calcarious: In these rocks, the major constituent is lime. The durability of these rocks will depend upon the constituent present in the surrounding atmosphere. e.g. limestones, marbles, dolomite, etc.

- ***QUALITIES OF GOOD BUILDING STONES :-*** *(SWIFT CAR IS HARD, DURABLE & TOUGH)*

1. Specific gravity :- minimum 2.7
2. Water absorption :- must be less than 5%
3. Fracture:- fracture should be sharp, even bright and clean with grains well cemented together.
4. Texture.:- there should not any sign of cavities, cracks or patches of soft or loose material.
5. Crushing strength :- minimum 100N/mm^2
6. Appearance :- must be good in appearance i.e. fine and compact structure Which is used for face work.
7. Resistance to fire:- it must resist fire with temp 600ºC.
8. Hardness:- stone should not scratch when rubbed with steel ball in loss angles machine (17- Road work,14 to 17 medium hardness and less than 14 soft stone used for ornamental work)
9. Durable :- must have resistance to atmospheric action
10. Toughness:- must have resistance against impact or sudden loading.

- ***Dressing of stone:-***
- The stones, after being quarried, are to be cut into suitable sizes and with suitable surfaces .This process is known as the dressing of stones .

it is carried out for the following purposes:

(i) To get the desired appearance from stone work,

(ii) To make the transport from quarry easy and economical,

(iii)To suit to the requirements of stone masonry

Uses of Stones:

The stones are used in the construction of buildings from the ancient times and most of the ancient temples and forts of our country were built with stones.

Following are the various uses to which stones are employed:

(1) Structure:

The stones are used for foundation, walls, columns, lintels, arches, roofs, floors, damp-proof courses, etc.

(2) Face- Work:

The stones are adopted to give massive appearance to the structure. The walls are of bricks and facing is done in stones of desired shades. This is known as the composite masonary.

(3) Paving:

The stones are used to cover floor of buildings of various types such as residential, commercial, industrial, etc. They are also adopted to form paving of roads, footpaths, etc.

(4) Basic Material:

The stones are disintegrated and converted to form a basic material for cement concrete, marum of roads, calcareous cements, artificial stones, hollow blocks, etc.

(5) Miscellaneous:

In addition to above uses, the stones are also used as:

(i) Ballast for railways,

(ii) Flux in blast furnaces,

(iii) Blocks in the construction of bridges, piers, abutments, retaining walls, light houses, dams, etc.

S.No.	Stone	Suitability	Characteristics
1.	Granite or Syenite	1. Most suitable for important Engg. works. 2. Used for Exterior facing of buildings 3. Fine grained granite offers high resistance to weathering	1. It can be easily polished & worked 2. Excess of felspar causes Early decay. 3. Water absorption < 1%
2	Marble	1. Most suitable for Monuments, ornamental work 2. Flooring & Decorative work (Electric switch boards also)	1. Specific gravity = 2.65 2. Crushing strength = 70 N/mm²
3	Basalt	1. Road metal & Concrete aggregates	1. High sp gr = 2.6 – 3 2. High Crushing = 150-190 N/mm²
4	Quartzite	1. Railway Ballast, Road metal & C.A	
5	Slate	1. Used in Cisterns, Damp proofings. 2. Excellent roof Covering material	2. Specific gravity = 2.89 1. Crushing Stn = 77-210
6	Sandstone	1. Tile stone (Roofing), Flag stone (Paving) 2. Grit (Heavy work), Natural (Ornamental)	1. 2.65 – 2.95 2. 65 N/mm² 3. Quartz + lime + Silica
7	Lime stone	1. Flooring, roofing & Pavings & walls. 2. In the manufacture of Lime & Cement	1. 2 – 2.75, 55 N/mm² 2. Affected by frost & atmos
8	Gneiss	1. Rough stone work (like street pavings)	1. Quartz + felspar (Strong & durable)
9	Laterite	1. Very good road metal	1. Sandy clay Stone
10	Kankar	1. Foundation of buildings	1. Irregular in shape 2. Impure lime stone
11	Moorum	1. Fancy paths, like garden walks.	1. Decomposed Laterite