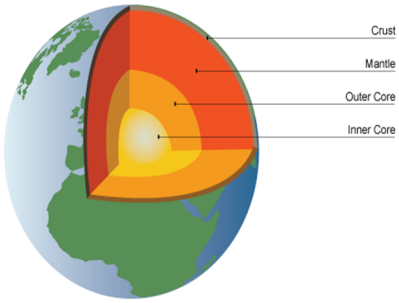
SECTION "A"

IMPORTENT QUESTIONS

1) Define pedology & (edaphology). Draw the structure of earth showing different sphere (pedogenic processes) and explain?

Ans:- Pedology:- The Science dealing with the study of genesis ,survey and classification of Soils as a body in nature.

Edaphology:- The science that deals with the influence of soils on living things, particularl plants, including man's use of land for plant growth.



Different sphere of earth crust

The solid zone is **Lithosphere.**
The incomplete covering of water forming seas and oceans (liquid spheres) is **Hydrosphere.**
The gaseous envelop over the earth surface is **Atmosphere.**

Atmosphere:- The atmosphere forms an envelope, 322 Km over the earth's surface. This envelop of air that covers both lithosphere and hydrosphere is called atmosphere. It contains water modules and dust, which act as nuclei for the condensation of water vapour to form cloud or fog.

N_2 - 78.054 % O_2 - 20.946 % CO_2 - 0.033 % Argon - 0.934 %

In addition, inert gases such as helium, neon, krypton and xenon are present. The water vapor content in atmosphere varies from place to place and time to time. Air becomes less dense with height until it gets too thin to support life. Atmosphere contributes only 0.03 % weight to the earth.

Hydrosphere :-Covers almost 3/4th of earth crust. The Hydrosphere is 10 Km deep and occupies 70 % of earth's surface. Hydrosphere makes only 6.91 % of the earth mass but by volume 15 times than that of the visible land above the sea level. It contains absorbed air and carries particles of rocks as sediments. Most of it lies within the ocean basins and also appears on surface of land in the form of rivers, ponds, lakes and as ground waters. The quality of different waters, varies

Lithosphere It is the solid sphere. It consists of continents, ocean basins, plains, plateaus and mountains, valleys, sand dunes, lava flows and fault scraps. The interior of earth consists of rocks and minerals. It is covered by gaseous and watery envelops. It amounts to 93.06 % of earth's mass.

2) Define rock enlist classification with example & explain sedimentary rock?

Ans:- Rock :- Rock is defined as a hard mass of mineral matter comprising two or more rock forming minerals.

Earth crust - Igneous rocks **95%** and Sedimentary rocks **5%**

Upper 5km of earth crust : Igneous rocks 18% Sedimentary rocks 74% Others 8%

Formation of Rocks: - The various processes that lead to the formation of rocks are:

1 **Cooling and consolidation of Magma:-** Rocks are formed by cooling and consolidation of molten magma with in or on the surface of the earth e.g. **igneous or primary rocks**. (Magma is defined as the complex hot solution of silicates containing water vapour and gases having a temperature ranging from 700 – 14000C and originating at great depths in the earth crust)

2 Transportation and Cementation of Fragmentary Material:- Disintegration and decomposition lead to the breaking down of pre-existing rocks. The resulting fragmentary material is either compacted *in situ* or transported in solution by the natural agencies of wind, water and ice to low lying areas like oceans. Consolidation of these materials after their deposition results in the formation of rocks called **sedimentary or secondary rocks.**

3 Alteration of Pre-existing rocks:- The primary and secondary rocks when subjected to earth's movement and to high temperature and pressure are partially or wholly reconstituted or altered to new rocks called **metamorphic rocks.**

Types of Rock:- The rock is classify in three major classes:-

1) <u>Igneous rocks :</u> These are characterized by non-laminar massive structure and 95% of the earth crust is made by that rock. They are the source of parent material for the others rocks. Igneous rocks can be classified based on the mode of origin and chemical composition **Based on the mode of origin** they are classified as **Extrusive or Volcanic rocks and Intrusive or Plutonic rocks.**

Igneous rocks are further classified **based on the relative amounts of acid** and basic components. An acid component is silicic acid or silica. Basic components are soda, potash, alumina, lime, manganese and iron oxides.

Acid rocks - >65% silica Ex:- Granite, Pitchstone Sub acid rocks - 60-65% silica Ex:- Syenite, Trachyte

Sub basic rocks - 55-60% silica Ex:- Deorite, Basic rocks - 45-55% silica Ex:- Gabbrose, Basalt

Ultra basic rocks - < 45% silica

Composition of Igneous Rocks :-

Basalt:- This is the most abundantly formed rock form molten material. It is fine grained and dark colored rock which contains 50% feldspars and 50% Ferro magnesium minerals, including pyroxene and olivine.

Granite:- A coarse textured and light colored rock that contains 60 -70% feldspars of which orthoclase 40-45%, plagioclase 20-25% ferromagnesian minerals 3-10% and quartz 20-30%.

2)<u>Sedimentary rocks:-</u> The sedimentary rocks are formed from sediments, derived from the breaking down of pre-existing rocks. The sediments are transported to new places and deposited in new arrangements and cemented to form secondary rocks. These rocks are also called as **stratified rocks or aqueous rocks.**

Formation of Sedimentary rocks:-

Weathering:- The igneous rocks (Primary rocks) disintegrate owing to physical, chemical and biological weathering and provide basic materials for the formation of sedimentary rocks.

Transportation:- The disintegrated material is transported by the agencies, such as water, wind, glaciers, runoff and gravity. Transportation is a function of speed of water

Deposition or Sedimentation:- The detrietal materials , comprising minerals and rock fragments are deposited when the carrying agent has no longer energy enough to move it further. In this process, coarser particles settle first and the finer particles later. This kind of deposition is called 'graded bedding'.

Digenesis:- It refers to the transformation of unconsolidated sediments to hard rock. It involves compaction and cementation. **Compaction:-** The weight of the upper incumbent layers with thousands of meters thickness, causes compression of the lower layers or deposits. The sediments consolidate and the interstitial water and air are removed by the pressure of overlying sediments. The fine grained deposits under such environments are transformed to clays, shales etc. **Cementation:-** The most common materials that serve as cementing agents are lime, silica, iron oxide. Water that percolates, carries the binding minerals / materials in solution deposits these in the voids of the loose sediments and binds the sediments together on desiccation.

Types:-

Arenaceous rock- Sand stone, **Argillaceous rock-**mudstones, **Calcareous rock-** lime stone, **Carbonaceous rock-** lime stone(Contents of carbonized tissue of plant and animal) **Silliceous rock-** (consist SiO_2 derives from plant and animal) **Precipated rock-** peat rock

3) <u>METAMORPHIC ROCKS :-</u> Metamorphosis is used as a general term for all those changes that alter more or less completely the original characters of rock. The structure and mineralogical composition of metamorphic rocks depend on the composition of original rock and the kind of metamorphism.

Types:-Changes brought about by chemically activated waters - **Hydro-metamorphism** Ex: Sand stone to Quartzite; Granite or Basalt to Laterite.

Changes brought about by Heat -- **Thermo-metamorphism** Ex: Limestone to crystalline marble

Changes brought about by Pressure -- **Dynamo –metamorphism** Ex: Granite - Granite-gneiss (Partial foliation)

3) <u>Define mineral enlist salient characteristics and properties of minerals & write any two ex. Of mineral. & also Que. On Classification enlist and explain?</u>

Ans:- Mineral :- Mineral is define as a naturally occurring, homogenous element or inorganic compound that has a definite chemical composition.

CLASSIFICATION OF MINERALS

1. Based on mode of origin	**2. Based on the Quantity**	**3. Based on Chemical composition**
o Primary Minerals	o Essential Minerals	* Native elements
o Secondary Minerals	o Accessory Minerals	*Oxides and hydroxides
		* Sulphates
4 Based on Specific Gravity		* Sulphides
o Light Minerals		* Carbonates
o Heavy Minerals		* Halides
		* Silicates

1. Based on mode of origin :-

Primary Minerals : The primary minerals are those which are formed owing to the crystallization of the molten magma. Depending up on the tetrahedral linkage, the silicate minerals are divided in to four groups. eg. Quartz, Feldspars, Biotite, Muscovite.

SECONDARY MINERALS: The secondary minerals are formed at the earth's surface by the weathering of the pre-existing primary minerals under variable conditions of temperature and pressure. Due to the action of weathering processes primary minerals are altered or decomposed.eg. Illite, Montmorillonite, Kaolinite

2. Based on the Quantity :-

Essential Minerals : The minerals which form the chief constituents of rock and which areregarded as the characteristic components of that rock are known as "Essential Minerals" eg. Quartz, Feldspars and Micas

Accessory Minerals : These minerals occur only in small quantities and whose presence or absence is of no consequence as far as the character of the rock is concerned, are called as accessory minerals eg. Tourmaline, Pyrite, Magnetite.

4 Based on Specific Gravity :-

Light Minerals : Are the minerals which have spe cific gravity below 2.85 eg. Quartz (2.60), Feldspar (2.65), Muscovite (2.50-2.75)

Heavy Minerals : Having specific gravity above 2.85 g/cc e.g. Haematite (5.30), Pyrite (5.0), Limonite (3.8), Augite (pyroxene) (3.1 – 3.6), Hornblende (amphiboles) (2.9 – 3.8), Olivine (3.5)

4) Define weathering. Enlist define different types of weathering, explain any two (mostly ask oxidation and reduction) chemical weathering, biological weathering?

Ans:- weathering:- Weathering is the process of disintegration and decomposition of rocks and minerals, leading towards formation of regolith.

Types of Weathering

1 Physical / Mechanical Weathering (Disintegration)

2 Chemical Weathering (Decomposition)

3 Biological Weathering (Disintegration and decomposition)

Physical Weathering :- Physical weathering is a mechanical process, causing disintegration of consolidated massive rocks in to smaller pieces. In this weathering rock size will be reduced without any change in chemical composition of rock. The agents responsible for physical weathering are: the physical condition of rock, changes in temperature, action of water, action of wind and atmospheric electric phenomena.

Physical condition of rock:- The permeability of rock is probably the most important single factor which determines the rate at which the rocks weather Ex:- Coarse textured sand stone (porous) weathers more rapidly than a fine textured (almost solid) basalt.

Temperature : As a result of diurnal temperature changes the rocks heated during day and cooled during night. thus heating and cooling of rocks results in eventually produce cracks in rocks, thus facilitating mechanical break down. This creates stress and strain between heated surfaces and the cooled unexpanded parts, resulting in fragmentation of rocks. That process taking more time for decomposition.

Water: all the agents of physical weathering the effect of water is more pronounced and wide spread. Water acts as disintegrating, transporting and depositing agent. A current moving at a speed of 15cm, 30cm, 1.2m and 9.0m per second can carry fine sand, gravel, stones, and boulders of several tonnes respectively. The greater the amount of suspended matter the quicker will be the disintegration of rocks. Hence the disintegration of rocks is greater near the source of a river than at its mouth. In cold regions, the water in the cracks and crevices freezes in to ice, which increases the volume of water by nine percent. In colder regions, the moving glaciers cause great deal of cutting and crushing of bed rocks.

Wind : Wind has both erosive and transporting effect. Wind when laden with fine particles (fine sand, silt and clay) has a serious abrasive effect on the rocks.

Chemical Weathering:-

Chemical weathering is more complex in nature and involves the transformation of the original material in to some new compounds by bringing about alteration in minerals. Chemical weathering takes place mainly at the surface of the rocks. Chemical weathering is highly pronounced in humid tropical regions. Its effectiveness is closely related to the mineral composition of rocks. The plants and animals also contribute directly or indirectly to chemical weathering as they produce O2, CO2, and certain acids that react with earth materials. Various chemical processes are:

1) **Solution :- 2) Hydration : 3) Hydrolysis : 4) Oxidation: 5) Reduction: 6) Carbonation:**

Solution : Water is a universal solvent. Its solubility action is enhanced when it contains dissolved CO2, organic and inorganic acids or salts in it. Most of the minerals are affected by solubilizing action of water, though by varying degrees. When the soluble substances are removed by the continuous action of flowing or percolating waters, the rock no longer remains solid and develops holes, rills or rough surface and ultimately decomposes. Solubilization of rock minerals under the influence

NaCl + H2O ® Na + , Cl - , H 2O
C02+H2O ® H2CO3
CaCO3 +H2CO3 ® Ca(HC03)2

Oxidation: The process of combination of oxygen is known as oxidation. Moisture aids in oxidation process and this process mostly occur after hydrolysis

4FeO + O2 - ? 2Fe2O3 Fe2+ - ? -Fe3++e-

Oxidation of iron reduces its size and increased the electrical charge and creates electrical and structural imbalance in iron containing minerals such as pyroxenes, amphiboles and biotite.

Reduction:

The process of removal or loss of oxygen is called reduction. It occurs in submerged areas. In reduction reaction iron reduces to highly soluble ferrous form.

Fe3++e- ? Fe2+ 2Fe2O3 ? 4FeO + O2

-Oxidation and reduction are more common in minerals with Fe, Mn and S

5) **<u>Define soil formation. State soil forming factors (jenny's equation) & enlist different soil forming processes explain any two?</u>**

Ans :- Jenny (1941) formulated the following equation

S= F(Cl, B, R ,P,T----)

S= any soil property **Cl** = Climate **B** = Biosphere **R** = Relief / topography **P** =Parent Material **T**= Time

Parent material, Relief / Topography and Time -- Passive factors
Climate, Vegetation & Organisms ------- Active factors

Active soil forming factors

The active soil forming factors are those which supply energy that acts on the mass for the purpose of soil formation.

Climate : Temperature and rainfall are the two climatic agents, that influence the process of soil formation. Amongst all the soil forming factors, climate perhaps is the most influential in soil development. Climate affects the soil formation directly and indirectly. Directly climate affects the soil formation by supplying water and heat to react with parent material. Indirectly it determines the flora and fauna activities which furnish a source of energy in the form of organic matter. This energy acts on the rocks and minerals in form of acids and salts that are released, during decomposition of the organic matter. The climate i.e. precipitation and temperature affects the rate of chemical, physical and biological processes responsible for profile development.

Rainfall:

· Humid regions: If precipitation or rain fall > PET (Potential evapo transpiration) leaching of bases take place. pH of the soils is decreased. Soils become acidic. Vegetation will be more. The soils have more organic matter due to less decomposition. Soils exhibits good horizonation.

Temperature:

· According to Vant Hoff's law For every 10ºC rise in temperature , the chemical reactions are increased by a factor of 2 or 3. Hence as temperature increases the weathering of rocks increases due to more biological activity and faster chemical reactions. Usually weathering will be more in tropical climate than temperate climate.

Biota (Vegetation and Organisms): The nature of vegetation in an area is influenced by the type of parent material in the initial stages, but with time, it is the climate which controls the kind of vegetation i.e.

grasses, forests, shrubs etc., The nature of the soil thus developed to a great extent is governed by the type of vegetation.

Parent Material : Parent material as such exerts significant influence on soil characteristics during the initial stages of soil development. The nature of parent material profoundly influences soil characteristics like texture, which is the basic property of the soil and can not be altered easily. Soil texture controls downward movement of water, there by affecting the translocation of fine soil particles and plant nutrients.

Relief : Relief or topography relates to the configuration of the land surface and is described in terms of difference in elevation, slope and so on. The topography of the land can hasten or delay the work of climatic forces. The significance of topography, as a genetic factor, is more noticeable locally as it influences the climate and vegetation of an area. Topography influences the thickness of the profile. The soils on flat topography tend to be thick, but as the slope increases, so does the erosion hazard resulting in thin stony soils.

Time : The length of time required for a soil to develop the distinct layers, called as genetic horizons (Matured soil with A,B,C horizons) depends on many interrelated factors of climate, nature of plant material, organism and topography. Horizons tend to develop more rapidly under the warm humid and forested conditions than in cold or hot, and arid climates. Generally soils age faster on flat to gently sloping uplands than on flat low lands or on steeply sloping positions.

SOIL FORMING PROCESSES :-

FUNDAMENTAL PEDOGENIC PROCESSES :-

HUMIFICATION:

ELUVIATION :

ILLUVATION :

SPECIFIC PEDOGENIC PROCESSES :-

CALCIFICATION :

DECALCIFICATION :

PODZOLIZATION :

LATERIZATION :

SALINIZATION :

ALKALIZATION :

DEALKALIZATION :

PEDOTURBATION :

HUMIFICATION: Humification is the process of transformation (decomposition) of raw organic matter in to 'HUMUS'. It is an extremely complex process involving various organisms such as bacteria, fungi, actinomycetes, earth worms and termites. The decomposition of organic matter takes place in two phases: mineralization and humification. Mineralization is a biochemical breakdown of dead plant tissues by soil microorganisms to produce simple structured soluble organic substances, mineral compounds, metal cations and gases (CO_2).

ELUVIATION : Eluviation means "Washing out". It is the process of removal of constituents in suspension or solution by the percolating water from the upper to lower layers. The eluviations encompasses mobilization and translocation of mobile constituents resulting in textural differences.

Illuvation

The process of deposition of soil materials (removed from the eluvial horizon "E") in the lower layer (or horizon of gains having the property of stabilizing translocated clay materials) is termed as "illuviation". The horizons formed by this process are termed as illuvial horizons (B-horizon especially Bt).

SPECIFIC PEDOGENIC PROCESSES :-

Calcification

The process of precipitation and accumulation of calcium carbonate in some part of the profile is called calcification.This is a common process in arid and semi-arid regions, which are low in rainfall (Rainfall<PET).

The illuviated horizon of $CaCO_3$ is designated as 'calcic horizon' . Whenever high carbon dioxide is produced in soils, it combines with water and forms into carbonic acid. This dissolves the calcium carbonate in soils into soluble calcium bicarbonate, which moves along the percolating water.

DECALCIFICATION : It is the reverse of calcification that is the process of removal of $CaCO_3$ or calcium ions from the soil by leaching. $CaCO_3 + CO_2 + H_2O$ ---- $Ca(HCO_3)_2$ [Soluble] This occurs mostly in high rainfall or humid regions.

PODZOLIZATION : (Russian term) It is a process of soil formation resulting in the formation of podzols and podzolic soils. It is the process of accumulation of silica and eluviation of sesquioxides It is almost a reverse of calcification process due to leaching of all bases including calcium. The favourable conditions for podzolization are

· A cool and humid climate (Invariably found at high altitudes)

· Siliceous (sandy) or acidic parent material, having poor reserves of minerals, favor the operation of podsolization, as it helps in easy percolation of water.

6) Draw a neat diagram of ideal soil profile and explain?

Ans:-

7) Define soil structure. Its types & factors affecting soil structure?

Ans:- **Soil Structure :-** may be defined as 'the arrangement of primary particles (sand, silt and clay), secondary particles in to a certain definite pattern under field conditions'.

Three main Types of Structure is found:-

1) Plate like: (Two types platy, Laminer) Relatively thin horizontal peds or plates characterze this structure. The thicker units are called **Platy** and thinner ones are called **Laminar**. The platy types structure is created by the force or laid down by water or ice. Sometimes, compaction of clayey soils with heavy machinery can create platy structure. Found in surface layers of some virgin (true)soils**.**

2) Block Like: Blocky peds are irregular, roughly cube -like and range from 5 to 50 mm across. The individual block are not shaped independently but are molded by the shapes of the surrounding blocks. When the edges of the blocks are sharp and rectangular faces distinct, they are called **angular blocky**, and when faces and edges are some rounded they are called as **subangular blocky**. These types are usually found in B horizons,where they promote good drainage, aeration and root penetration.

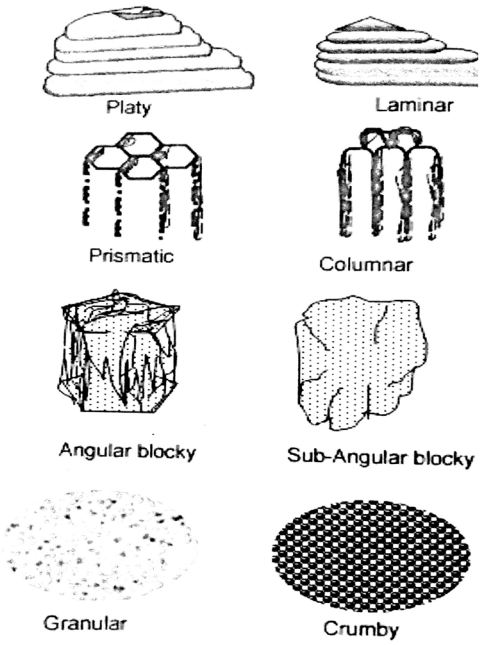


Fig. 7.2. Types of soil structure.

3) Prism – Like: These are vertically oriented pillar like peds with varying heights among different soils and may have a diameter of 150 mm or more. In **columnar** structure pillars have distinct rounded tops, and in invariably found in subsoils high in sodium (nitric horizon). If the tops of the pillars are relatively angular and flat horizontally, the structure is designated as **Prismatic**. These structures are associated with welling types of clay and commonly occur in sub surface horizons in arid and semi-arid regions

Factors affecting:- Climate, Organic matter, Tillage, Type of vegetation, plant roots, soil organisms.

Climate:- Climate has considerable influence on the degree of aggregation as well as on the type of structure. In arid reason there is very little aggregation of primary particals. But in semi- arid regions its grater.

8) List out different physical properties of soil explain any two and differentiate between bulk and particle density?

Ans:- The physical properties include Soil texture, Soil structure, bulk density, particle density, porosity, consistency, temperature, colour and water content.

Bulk density :- It is the mass per unit volume of dry soil (including pore spaces). Loose and porous soils have low bulk densities as compared to compacted soils. Bulk density is of importance than particle density in understanding physical behaviour of soils. Generally in normal soils bulk density ranges from 1.0 to 1.60 Mgm-3. Finer the texture of the soil, lesser is the bulk density. Bulk density of the soil determines not only total pore space but the macro and micro pore space also.

Factors affecting bulk density:- More is the pore space, per unit volume of soil, less is the bulk density. Higher is the depth of soil, more will be the bulk density. Finer is the texture of the soil, lesser is the bulk density. High organic matter contents, lead to reduced bulk density. Crumb soil structure shows low bulk density than that of platy structure. Cropping increases the bulk density of top soils.

Particle density It is the mass per unit volume of soil solids. Particle density is essentially the same as the specific gravity of solid substances. The chemical composition and crystal structure of a mineral determines its particle density. Particle density is not affected by pore space and therefore is not related to particle size or to the arrangement of particles. Particle densities for most mineral soils vary between the narrow limits of 2.60 to 2.75 Mg m-3. The particle density of soils with very high organic matter content may vary from 0.9 to 1.3 Mgm-3.

9) Define soil texture. classify soil separater based on international system?

Ans:- SOIL TEXTURE : Soil texture may be defined as the relative proportion of sand, silt and clay particles
of various sizes.

ISSS : International Society of Soil Science

USDA : United States Department of Agriculture

Soil Separates	ISSS system (mm)	USDA system (mm)
* Very Coarse Sand	--	2.00 – 1.00
* Coarse Sand	2.00 – 0.20	1.00 – 0.50
* Medium Sand	--	0.50 – 0.25
* Fine Sand	0.20 – 0.02	0.25 – 0.10
* Very Fine Sand	--	0.10 – 0.05
* Silt	0.02 – 0.002	0.05 – 0.002
* Clay	< 0.002	< 0.002

1) <u>Write stoke's low & its assumptions?</u>

Ans:- **STOKES' LAW** According to Stokes' Law the terminal velocity of a spherical particle settling under the influence of gravity in a fluid of a given density and viscosity is proportional to the square of the particle's radius.

$$V = \frac{2gr2}{9h} \quad (ps - pf)$$

v = Settling velocity (cm/sec.) r = Radius of the particle

ps = Density of the solid particle (Mg/m3) pf = Density of the fluid (Mg/m3)

h = Viscosity of the fluid

Assumptions of STOKES' LAW

1. Particles must be spherical, smooth and rigid.
2. Particles must be of uniform density.
3. Particles must be sufficiently large (>0.001mm) as compared to molecules of fluid so as to be unaffected by the thermal (Brownian) motion of the fluid molecules.
4. The particles should not interfere with one another and should settle independently. (Unhindered fall).
5. The suspension must be still without any turbulence.

LIMITATIONS OF STOKES'LAW

1. Some colloidal particles are plate shaped and fall slower than spherical particles of the same mass.
2. Soil particles are not all of the same density. Most silicates have . density values of 2.6- 2.7 gm/cm3; whereas iron oxides and other heavy minerals may have density values of 5.0 gm/cm3 or even more.
3. The larger limit of particles exhibiting Brownian movement is approximately 0.0002 mm. so soil particles smaller than this exhibit Brownian movement.
4. Many fast falling particles may drag finer particles down along with them.
5. Particles >0.08 mm diameter settle quickly and cause turbulence.

10) **<u>Define humus and enlist primary & secondary source of soil organic matter?</u>**

Ans:- **Humus** is a complex and rather resistant mixture of brown or dark brown amorphous and colloidal organic substances that results from microbial decomposition and synthesis and has chemical and physical properties of great significance to soils and plants.

11) Define soil colloid. enlist properties & Draw a diagram of kaolinite & its properties?

Ans:- Thomas Graham (1861) coined the term 'colloid' (Greek Kolla = glue eidos = like) In a true solution as sugar or salt in water the solute particles are dispersed in the solvent as single molecules or ions its called colloid.

Properties of Colloid :-

1 Shape **2** Size **3** Surface area **4** Electrical charge **5** Adsorption
6 Plasticity **7** Cohesion **8** Swelling & Shrinkage **9** Flocculation & Deflocculation
10 Brownian movement **11** Tyndal effect.

Kaolinite :- Kaolinite :- It is 1:1 type clay mineral made up of one silica tetrahedral sheet combined with one aluminum octahedral sheet.

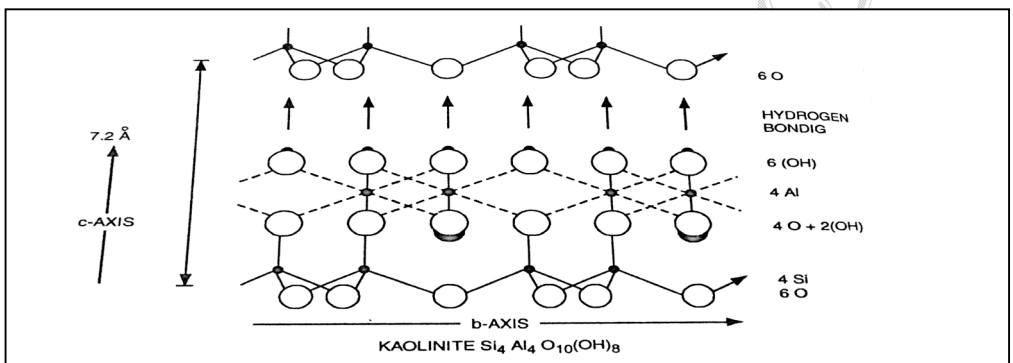


Fig. 9.3. Structure of kaolinite (1 : 1 layer silicate) mineral.

Montmorillonite :- This is a 2:1 type mineral comes under smectite group. Other minerals of this group are beidellite, nontronite, saponite etc. It is an expanding type of clay mineral.

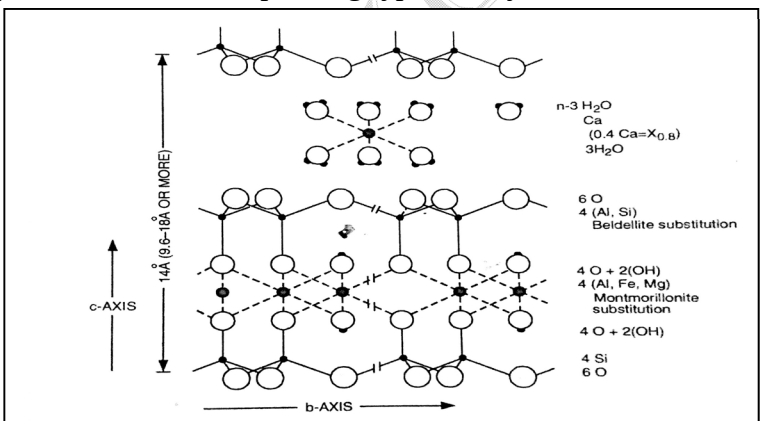
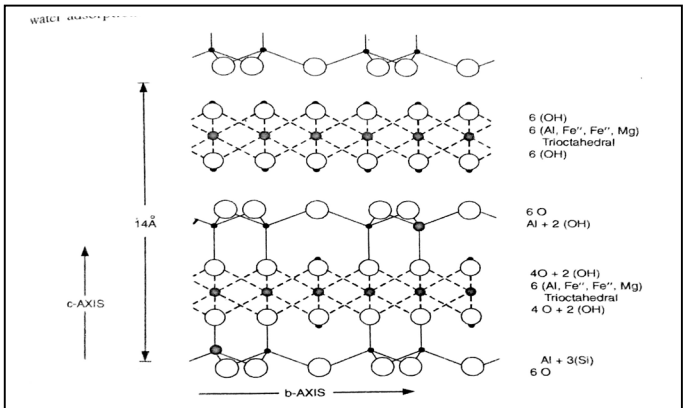


Fig. 9.4. Structure of montmorillonite (2 : 1 layer silicate) mineral.

Illite : It is a 2:1 non-expanding type clay mineral. It is also called as hydrous mica. In a given layer, the tetrahedral and octahedral sheets are oriented as that of montmorillonite. In tetrahedral sheet 20% silicon is substituted by aluminum.



CHLORITE FOR EXAMPLE, $AlMg_5 (HO)_{12} (Al_2Si_6) AlMg_5 O_{20} (OH)_4$

Fig. 9.7. Structure of Chlorite (2 : 2 layer silicate) mineral.

12) Explain land capability classification?

Ans :- Class I - Very good land
Class II – Good land
Class III – Moderately good land
Class IV – Fairly good land
Land suitable for cultivation for agro And horticultural crop

Class V,VI,VII ----- land suitable for grazing
Class VIII -- land suitable for Wild life and watershed
Land not suitable for cultivation for agro And horticultural crop

13) Define soil classification. Enlist the name of soil order? (A GAVAMI HOUSE)

Ans:- soil classification :- classification is the grouping of soil of object in some orderly and lorical manner into compartment .attampts to classify soils. (A GAVAMI HOUSE)

A :- Andisols
G :- Gelisols
A :- Alfisols
V :- Vertisols
A :- Aridisols
M :- Mollisols
I :- Inceptisols
H :- Histosols
O :- Oxisols
U :- Ultisols
S :- Spodosols
E :- Entisols

14) Define soil biology (microbiology). Explain role of micro-organisms?

soil biology :- soil biology is define as a study of living organisms in soil is called Soil biology.

Role of micro-organisms :- Organic matter decomposition O.M. Inorganic Transformations. Nitrogen fixation. Solubilisation of insoluble phosphorous compounds. Solubilisation of insoluble Sulphur compounds(S oxidizing and reducing organisms). Formation and development of soil. Production of soil enzymes, growth promoting substances and antibiotics. Detoxification of soil pollutant. Protect plant roots from invasion by soil parasites and pathogens.

What is soil aeration? Its significances, write composition of soil air and atmospheric air?

1) **What do you mean by ion exchange? State its important in agriculture?**
2) **What do you mean by soil moisture constant? Enlist them and explain any one?**
3) **Define erosion. And explain soil and water erosion?**
4) **Define PH. Enlist different kind of acidity and write significance of PH?**
5) **Describe in brief thermal properties of soils?**

SECTION "B"

1) Match the pairs.

1. Podzolization	--	Silication
2. Pedologist	--	Origin of soil
3. Argillaceous rock	--	Mudstone
4. Wilting point	--	Water content of soil
5. Desert soils	--	Aridisols
6. Nutrient store house	--	Humus
7. Mechanical analysis	--	Dispersion
8. Jenny	--	Soil forming factors
9. PH	--	Sorenson
10. Acidic rock	--	Granite
11. EC	--	dSm^{-1}
12. Secondary mineral	--	Montmorillonite, Gibbsite
13. Primary minerals	--	Feldspar, Quartz, Hornblend
14. Mohr's scale	--	Hardness of mineral
15. AEC	--	Cmol/(e) kg^{-1}
16. Basic textural class	--	Sandy soil
17. Primary partical	--	Sand
18. Streak	--	Colour
19. Physical weathering	--	EX1 foliation
20. Organic colloids	--	Humus
21. Speroidal structure	--	Granular
22. Particle size analysis	--	Stokes's law
23. Plate like structure	--	Laminar
24. Dokuchaiev	--	Soil genesis & classification
25. Montmorillonite	--	2:1 type clay mineral
26. Kaolinite	--	1:1 type clay mineral
27. Basalt	--	Basic igneous rock
28. Infiltration	--	Process of water enter into soil
29. Univarsal siol loss equation	--	RKLSCP
30. Dolomite	--	Reclamation of acidic soil
31. Iron pyrite	--	Reclamation of sodic soil
32. Liebig	--	Mineral nutrition
33. Soil moisture content	--	Field capacity
34. Munsell	--	soil colour
35. Bulk density	--	Mg/m^3
36. Dorcy	--	Soil water movement

2) Fill in the blanks.

1. The dynamometemorphosis is due to **Pressure** which brought about by folding of rock due to crust movement of earth.
2. Soil air contains much greater proportion of CO^2 than **Atmospheric air.**
3. **Pedology** is the science dealing with the genesis, classification of soils in nature.
4. The gaseous envelop that covered the earth surface is the **Atmosphere.**
5. The amount of heat required to produce a given change in the temperature of a body is the **Heat capacity** of the body.
6. **Jenny** formulated the equation of soil forming factors as S=f(p,cl,b.r.t)
7. The instrusive rocks consolidated in vertical cracks and formed wall like masses are called **Dykes.**
8. The material transport and deposited by the wind is known as **Loess.**
9. The process of aggregation is combine process of flocculation and **cementation.**
10. Marble is the product of **thermo** metamorphism of limestone.
11. The first scientific classification of soil was proposed in 1886 by **Dokuchaev .**
12. In most mineral soils the mean density of particle is about **2.65** mgm^{-3}
13. The process of transportation of weathered material is known as **weathering.**
14. Parent material formed is situ is called as **Residual.**

3) Answer to the point.

1. **What are the division of earth?** Lithosphere, Hydrosphere, Biosphere, Atmosphere.
2. **What is dyke?** It is a sheet of rock that formed in a crack in a pre-existing rock body.
3. **Name the cementing agents in soil structure?** Iron, aluminum, oxides of silicon, humus.
4. **What is the dominant spectral colour in munsell's colour chart?** Yellow, white, black indicated by "Hue".
5. **What is soil consistence?** It is the resistance of a soil at various moisture contents to mechanical stress.
6. **What is active acidity?** The H^+ ion present in soil solution gives rich or active at any given time.
7. **Universal soil loss equation?** RKLSCP.
8. **What is flocculation?** The soil particles especially fine clay aggregate or clump together into clumps or floccules.
9. **Name the 12 soil orders? (a gavami house)** Alfisols, gelisols, andisols, vartisols, aridisols, mollisols, inceptisols, histisols, oxisols, ultisols, spodosols, entisols.
10. **Which soil order is recently added** entisols.
11. **Example of thermo-metamorphic rock?** Marble, quartzite.
12. **Name the fundamental processes of soil formation?** Humification, illuvation, eluvaiation.
13. **Size of silt and clay?** S-0.02 to0.002, c-below 0.002.
14. **Jenny's equation?** S= f(p,cl,b.r.t).
15. **Enlist type of Soil Survey?** Detail soil survey, reconnaissance, Detail reconnaissance.
16. **Name the two imp. Metamorphic Rock's?** Marble, Qaurtzite, Gneiss, Slate.
17. **Name of two imp. Soil Order in Maharashtra?** Vertisols, inseptisols.
18. **Enlist the forms of soil water?** Gravitational water, Capillary water, hygroscopic water.

Formulae of Stock's Law?

$$V = \frac{2gr2}{9h} \quad (ps - pf)$$

Name of book and author you have referred?

1. Introductory Soil Sceince (D.K.Das),
2. Fundamental of Soil Science (V.D.Patil,C.V.Mali).

4)Objectives :-

1. Iron pyrite example of **sulphide** group.
2. The luster of mineral talc is **Resinous**.
3. **Diamond** is a hardest mineral.
4. **Petrology** is science which deals with study of rock.
5. The rock containing gas cavities are called **Vesicular.**
6. Example of sub-basic rock is **Diorite.**
7. The physical weathering is essentially process of **disintegration.**
8. The soil forming process in which new organic substances are synthesized is **Humification.**
9. **Desalinization** is the process of removal of excess soluble salts.
10. For deflocculation of clay **NaOH** is used.
11. Blocky structure is found in **Clayey soil**.
12. The scale of detailed Soil Survey is **1:10,000.**
13. The ideal soil structure is **Crumb.**
14. C:N ratio of cultivated soil is **10:1.**
15. **Bulk density** of sub-soil is higher as compare to surface soil.
16. In red soil the dominant clay mineral is **Kaolinite**.
17. Recently 12th soil order added to USDA soil taxonomy is **Gelisols**.
18. **Bacteria** are unicellular micro-organism.
19. The micro-spores have diameter **less than 0.006 mm.**
20. Soil colloids have **less than 0.01 mm** diameter.