



OBJECTIVES

(6th Dean Committee Syllabus)

Course No.: SOIL-111 (New)

Course Title: Fundamentals of Soil Science

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- All Important Definitions, Objectives are shortlisted in this file for the convenience of the students.
 - Students are required to take a print of this file to study at the time of exam.
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Definitions:

- 1. Soil :** Soil is a natural body composed of mineral and organic constituents, having a definite genesis and a distinct nature of its own. **(V. V. Dokuchaev) OR**
A dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms. **(Buckman and Brady)**
- 2. Soil Science :** Soil science deals with soil considered as natural body and as an important medium for crop growth. A Study of soil science includes soil fertility, soil chemistry, soil physics, soil microbiology, soil conservation, pedology.
- 3. Pedology :** The study of genesis, survey, classification and geological distributions of soils.
- 4. Edaphology :** Study of soil from stand point of higher plants. **Or** Edaphology is the study of soil in relation to plant growth and crop production.
- 5. Soil Fertility :** It refers to the nutrients supplying properties of soil, nutrient requirement of plant nutrient losses from the soil and maintenance and restoring fertility of soil.
- 6. Soil Physics :** It refers to the study of physical properties of soil viz., density, infiltration rate, water holding capacity, texture, structure, etc.
- 7. Soil Chemistry :** It is the study of chemical composition, chemical reactions and chemical properties of soil in relation to crop needs.

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- 8. Soil Microbiology :** It is the branch of soil science which deals with the microorganism population of soil.
- 9. Soil Conservation :** It deals with the process of soil against soil loss due to erosion, chemical deterioration as management of soil and method of conservation of soil.
- 10. Weathering :** The process of disintegration and decomposition of rocks and minerals. **Or** Weathering is a physical disintegration and chemical decomposition of rocks and minerals resulting in the formation of parent material.
- 11. Physical Weathering :** Physical weathering is mechanical process causing disintegration of consolidated massive rocks into small pieces.
- 12. Chemical Weathering :** Decomposition of rocks and minerals brought about by chemical reaction called as chemical weathering.
- 13. Mineral :** An mineral is a naturally occurring inorganic substance having a definite chemical composition and distinct physical properties. **Or** Naturally occurring, homogeneous element or inorganic (mostly crystalline) compound that a definite chemical composition and characteristic geometric form.
- 14. Primary Minerals :** A mineral that forms a original component of a rock is known as primary mineral.
- 15. Secondary Minerals :** A mineral which has been formed and deposited as a result of subsequent change in rock is known as secondary minerals.
- 16. Essential Minerals :** Minerals which forms the chief constituent of rock and which are regarded as the characteristics component of rock are known as essential minerals.
- 17. Accessory Minerals :** Mineral which occur only in small quantity and whose presence or absence is of no consequences as for the characteristics of rock is concerned are called as accessory minerals.
- 18. Soil formation :** The transformation of rocks into soil may be termed as soil formation.
- 19. Soil Profile :** A vertical section of soil which is showing all its horizon is called soil profile. **Or** The vertical section of the soil showing the various layers from the surface to unaffected parent material is known as soil profile.
- 20. Rock :** A rock may be defined as an aggregate of one or more minerals. **Or** A naturally occurring hard mass of mineral matter formed after the solidification of two or rock forming minerals.
- 21. Igneous Rocks :** Igneous rocks may be defined as the solidification of molten magma from the interior of the earth.
- 22. Sedimentary Rocks :** The rocks formed from the consolidation of sediments accumulated through wind or water action at the surface of the earth is called as sedimentary rocks.
- 23. Metamorphic Rocks :** When the change is considerable, the rock is said to have undergone metamorphosis and the new rock known as metamorphic rocks.

- 24. Soil formation :** The transformation of rocks into soil may be termed as soil formation.
- 25. Soil Texture :** The relative proportion of sand, silt and clay is called soil texture. **Or** The relative percentage of sand, silt and clay in soil is called as soil texture.
- 26. Soil Structure :** The arrangement and organization of primary and secondary particles in a soil mass is known as soil structure. **Or** The arrangement of primary and secondary soil particles in a certain structural pattern. **Or** The manner in which the individual grains and aggregates are arranged in the soil mass is known as soil structure.
- 27. Pore Space :** The empty space in soil not occupied by the soil solids is called pore space, and is filled with air or water.
- 28. Porosity of Soil :** Porosity refers to percentage of soil volume which is occupied by pore spaces.
- 29. Soil Moisture Constant :** The amount of water that contains at each of these equilibrium points is known as soil moisture constant.
- 30. Infiltration :** The downward entry or movement of water from the surface into soil.
- 31. Soil Colloids :** The soil colloid is a material made of organic and inorganic particles less than 0.001 mm in diameter possess properties like typical colloidal substances are known as soil colloids.
- 32. Temperature :** Degree of hotness.
- 33. Soil Biology :** Soil Biology is the study of microbial and faunal activity and ecology in soil.
- 34. Soil Erosion :** Soil Erosion may be defined as the detachment, transportation and deposition of soil particles from one place to another under the influence of wind, water or gravity forces.
- 35. Land Capability Classification :** Land capability classification is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time.
- 36. Humus :** Humus is complex and rather resistant mixture of brown or dark brown amorphous and colloidal substance modified from the original tissues or synthesized by the various soil organisms.
- 37. Humification :** The process of decomposition of organic matter material in soil is called humification. **Or** Humification is a process of transformation of raw organic matter into humus.
- 38. Eluviations :** Eluviations (wash out) is a process of removal of constituents by percolating water from upper layer to lower layer, this layer of loss called as eluviations.
- 39. CEC (Cation Exchange Capacity) :** CEC is defined as the sum of positive (+) charges of the adsorbed cations that a soil can adsorb at a specific pH. **Or** The capacity of solid (clay) to adsorb and exchange cations is called cation exchange capacity.
- 40. Drainage :** It is defined as removal of excess gravitational water from the soil surface or below the surface to create favourable condition for plant growth by providing surface and subsurface drainage.

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- 41. Field Capacity :** The percentage of moisture retained by soil in micro or capillary pores at tension of $1/3$ atmospheres or 2.51 PF or 33 kpa is called field capacity.
- 42. Flocculation :** The phenomenon of coalesce and formation of flocs is known as Flocculation.
- 43. Particle Density :** The mass per unit volume of soil particles is called as particle density.
Or The weight per unit volume of the solid portion of soil is called particle density.
- 44. Bulk Density :** The oven dry weight of a unit volume of soil inclusive pore spaces is called bulk density.
- 45. Soil Classification :** Soil specification is the systematic arrangement of cells into groups or categories on the basis of their characteristics.
- 46. Soil Survey :** it is systematic examination, description, classification and mapping of soil of an area. **Or** It is a study and mapping of soil in their natural environment.
- 47. Soil Taxonomy :** Soil taxonomy is a classification of soils according to natural relationships among the soil characteristics.
- 48. C:N Ratio :** The ratio of the weight of organic carbon (C) to the weight of total nitrogen (N) in soil (or organic material), is known as C:N ratio.
- 49. Soil Aeration :** The constant movement or circulation of air in the soil mass resulting in the renewal of its components gases is known as soil aeration.
- 50. pF :** pF may be defined as the logarithm of the height in centimetre of a water column that is necessary to produce desired suction.
- 51. Adhesion :**
- 52. Cohesion :**
- 53. Ion Exchange :** Ion exchange is defined as a reversible process by which cations and anions are exchanged between solid and liquid phases between solid phase it in close contact with each other. For the exchange of cations and anions the term is used as cation and anion exchange respectively.
- 54. Adsorption :** Adsorption is defined as facts by which an increased in concentration or accumulation of an ion species on a solid occurs due to ion exchange or other reaction.
- 55. Desorption :** Desorption is fact by which the replacement or release of an absorbed ion species occurs.
- 56. Hydration :** Chemical combination of water molecule with mineral is known as hydration.
- 57. Hydrolysis :** It is a decomposition reaction as H^+ ion of water tends to change place with the cations of mineral.
- 58. Luster :** The reflection of light from the surface of mineral.
- 59. Stokes Law :** The velocity of falling particle is proportional to the radius square and not to its surface.
- 60. Streak :** It is the colour of the powder of mineral.

Answer in One Sentence :

1. **What is soil consistence?** – Soil consistence is defined as “the resistance of a soil at various moisture contents to mechanical stresses or manipulations “.
2. **What is Hue?** – It is the dominant spectral colour.
3. **Name the scientist who is known as the Father of Soil Science** – V. V. Dokuchaev.
4. **Name two reference books along with author’s used for SSAC 111** –
 - ISSS. 2009. Fundamentals of Soil Science. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
 - Das D. K. 2011. Introductory Soil Science, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
5. **Give the mineral composition of marble** – Limestone.
6. **What is streak of mineral?** – It is the colour powder of a mineral.
7. **Name the cementing agent in soil structure** – Silica, Lime and Iron oxide.
8. **Name the rocks in which the vesicles are filled up with mineral crystals** –
9. **What is streak of hematite ?** – Hematite is black in colour.
10. **What is principle law behind mechanical analysis of soil?** – According to size, the soil particles grouped into gravels, sand, silt and clay which is termed as soil separates, the process of determine amounts of individual soil separates below 2 mm in diameter.
11. **Which is the accepted hypothesis of origin of earth?** – Nebular Hypothesis.
12. **What is dyke?** – It is a sheet of rock that formed crack in a pre-existing rock body.
13. **Name the store house of the plant nutrients in soil** –
14. **Give the two examples of cementing agents in soil** – Silica, Lime and Iron oxide.
15. **State Universe Soil Loss Equation** –
16. **Give volumetric composition of soil** –
17. **Which is the most abundant element in the earth’s crust?** –
18. **Give the content of Carbon dioxide in soil air** –
19. **Define specific heat capacity of soil** – It is the amount of heat required to raise the temperature of one gram of substance by 1 0C. The values for most minerals present in the soil are between 0.18 to 0.20 cal/gm
20. **Give one example of 2:1 type of clay mineral** – Montmorillonite.
21. **The study of soil from stand point of higher plants is called?** – Edaphology.
22. **Planetesimal hypothesis was developed by?** – Chamberlin and Moulton.
23. **The study of soil genesis, survey, classification and geological distributions of the soils is called?** – Pedology.
24. **Nebular hypothesis was proposed by?** – Kant and Laplace.
25. **The study of earth crust is called?** – Geology.
26. **The study of rock is called?** – Petrology.

27. The description of rocks is called? – Petrography.
28. The study about origin of rocks is called? – Petrogenesis.
29. Dominant rocks in the earth crust? – Igneous Rock.
30. Stratification is main feature of rock? – Sedimentary Rock.
31. Banded and laminated character is feature of rock? – Metamorphic Rock.
32. Example for monomineralic mineral? – Olivine and Dunite.
33. Softest mineral is? – Talc.
34. Hardest mineral known? – Diamond.
35. Transformation of unconsolidated sediments to hard rocks is called? – Diagenesis.
36. Chief constituent of sand fraction is? – Quartz .
37. Who defines parent material is initial stage of soil system? – Jenny.
38. First phase of soil formation is? – Weathering.
39. Soil formation factors initially developed by Dokuchaev – $S = f(P, Cl, O)$.
40. Which equation is formulated for soil formation by Jenny? – $S = f(Cl, B, R, P, T)$.
41. Active factors of soil formation? – Climate and Biosphere.
42. Passive factors of soil formation? – Relief or Topography, Parent Material, Time.
43. Who given active and passive factors of soil formation? – Joffe.
44. The soil forming factor that has no relevance after soil reaches its maturity? - Time.
45. Most important factor for soil formation is? – Climate.
46. Alkalization also called? – Solonization.
47. Dealkalization also called? – Solodization.
48. Transformation of organic matter into humus is called? – Humification.
49. Immigration also called? – Illuviation.
50. Emigration also called? – Eluviation.
51. A vertical section of soil body which shows different layers is called? – Soil Profile.
52. Five master horizons are recognized by capital letters? – OAEBC.
53. Dark coloured horizon in soil is? – A Horizon.
54. Top most mineral horizon in soil profile is? – A Horizon.
55. The horizon which is called organic horizon in soil profile? – O Horizon.
56. O horizon present in? – Forest land.
57. O horizon absent in? – Arable land.
58. In soil profile “Solum” means? – A+B Horizons.
59. The horizons contain properties of one master horizon and possess subordinate properties of horizon is called? – Transitional Zone.
60. Soil components are? – Mineral matter, Organic matter, Soil air, Soil water.
61. Father of Soil Physics? – Hillel.

62. The relative proportion of sand, silt and clay is called? – Texture.
63. The arrangement of primary soil particles into definite pattern is called? – Structure.
64. Oxidising material used in the mechanical analysis for humus destruction? – Hydrogen Peroxide.
65. The survey which is using for watershed and village development? – Detailed Survey.
66. The survey which is using for district planning? – Semi-detailed Survey.
67. The survey used for large areas (Regional Level)? – Reconnaissance Survey.

Fill in the blanks.

1. At wilting coefficient water is held at **15 atmospheres**.
2. The original material from which soil develops is called _____.
3. **Topaz** is the example of transparent mineral.
4. The scale of detailed soil survey is _____.
5. Pedogenic process in which removal of silica and accumulation of Al and Fertilizer oxides takes place known as _____.
6. Law of minimum is stated by **Carl Sprengel**.
7. Horizon A and B collectively known as **Solum**.
8. The irregular and narrow cracks are deposited by molten material and which consolidated is known as _____.
9. The dynamometmorphosis is due to **pressure** which brought about by folding of rocks due to crust movement of earth.
10. Soil air contains much greater proportion of carbon dioxide than **Atmospheric air**.
11. The gaseous envelop that covers the earth surface is the **Atmosphere**.
12. The amount of heat required to produce given change in the temperature of a body is the **Heat Capacity** of the body.
13. **Jenny** formulated the equation of soil forming factors as $S = f(cl, o, r, p, t)$.
14. The intrusive rocks consolidated in vertical cracks and formed wall like masses are called **Dykes**.
15. The material transported and deposited by the wind is known as **Lords**.
16. **Pedology** is the science dealing with the genesis, survey and classification of soils in nature.
17. The process of aggregation is combine process of flocculation and **cementation**.
18. Marble is the product of **thermo** metamorphism of limestone.
19. The first scientific classification of soil was proposed in 1886 by Russian **V. V. Dokuchaev**.
20. In most mineral soils the mean density of particle is about **2.65** mgm⁻³.

21. The process of transportation of weathered material is known as **deposition**.
22. Basalt is **igneous** type of rock.
23. Parent material formed in situ is called **residual**.
24. The microbial theory of plant nutrition is put forth by _____.



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