MAHARASHTRA AGRICULTURAL UNIVERISITIES EXAMINATION BOARD,
SEMESTER END EXAMINATION
B.Sc. (Hons.) Agriculture

Semester	**:**	**Ist (New)**			**Academic year**	**:**	**2021-2022**
Course no	**:**	**SSAC-111**	**Course Title**	**:**	**Fundamentals of Soil Science**		
Credits	**:**	**3 (2+1)**					
Day & Date	**:**	**13.11.2021**	**Time**	**:**	**Total marks**	**:**	**80**

Note: 1. Solve **any 8** questions from **Section "A"**
2. Solve **any 12** questions from **Section "B"**
3. All questions are compulsory from **Section "C"**

SECTION "A"

Q.1. Answer in five sentences only (Any eight)		**(4 x 8 = 32 marks)**
1)	What is weathering? Distinguish between physical and chemical weathering.	
	Weathering: is a process of disintegration and decomposition of rocks and minerals which are brought about by physical agents and chemical processes, leading to the formation of regolith (unconsolidated residues of the weathering rock on the earth's surface or above the solid rocks) **Physical weathering:** The physical weathering may be defined as the process by which disruption of consolidated massive rocks into smaller bits was found without any corresponding chemical change. The extreme climatic conditions physical weathering is more prominent. Physical weathering is a slow process. **Chemical weathering:** The chemical weathering may be defined as transformation of original rocks and minerals into new compounds having different chemical compostionan physical properties. It is the most important process as the soil formation is concerned. The effectiveness of chemical weathering is very closely related to the mineralogical composition of rocks.	04
2)	State Jenny's equation (1941) and explain in brief.	
Ans	Jenny's (1941) formulated the following equation S = f (cl, 0, r, p, t) Where, S - any soil property, such as pH, N, clay etc. cl – environmental climate. O - organismsand vegetation (biosphere) r - relief or topography p - parent material t - time … - addition unspecified factors(Like fire, storms etc.,)	04
3)	Define soil structure and enlist the types of soil structure.	
Ans	**Soil Structure:** The arrangement and organization of primary and secondary paricles in a soil mass is known as soil structure. Types of soil structure: ➢ Spheoridal Granular and Crumb types ➢ Plate like Platy and Laminar ➢ Prism like Prismatic or columnar ➢ Block like Blocky and sub angular blocky	**01** **03**

4)	Define mineral and classify minerals on the basis of mode of formation.	
Ans	**Mineral:** A mineral is a naturally occurring homogenous element or inorganic compounds that has a definite chemical composition and a characteristics geometric form **Classification:** On the basis of mode of formation minerals are classified into A) Primary mineral: A mineral that forms an original component of a rock is known as primary mineral. eg. Feldspar, Mica, Hornblende. They are originated from original molten magma. They are most prominent in the sand and silt fractions. B) Secondary mineral: The minerals which are formed, deposited or introduced as a result of subsequent changes in rocks are known as secondary minerals. eg. Limonite, Gibbsite and clay minerals. Secondary minerals tend to dominate in the clay and in some cases the silt fraction of soil.	**01** **03**
5)	Give the classification of rocks as per the mode of formation with suitable example.	
Ans	A) Igneous rock: Intrusive eg.- Granite Extrusive eg.- Basalt B) Sedimentary rocks: Arenaceous rocks: eg.- Sand stone Argillaceour rocks: eg.- Mud stone Calcareous rocks: eg.- Line stone Carbonaceous rocks: eg. - Peat, Coal Siliceous rocks: eg.- Diatomaceous earth Precipitated rocks: eg.- Rock salts C) Metamorphic rocks: Hydro-metamorphic rocks: eg.-Quartzite Thermo-metamorphic rocks: eg.-Marble Dynamo-metamorphic rocks: eg.- Schist	**04**
6)	Enlist the different properties of soil colloid and describe any one.	
Ans	1) Size 2) Surface area 3) Isomorphous substitution 4) Broken bonds 5) Adsorption of cations 6) Adsorption of water 7) Cohesion 8) Adhesion 9) Swelling and shrinkage 10) Dispersion and flocculation 11) Brownian movement 12) Non permeability (Discriptio of any one)	**04**
7)	State Stoke's law and give its limitation.	
Ans	Stoke's Law: The simplest form of stokes law tells that Stokes (1851) stated that "the velocity of a falling particle is proportional to the redius square and not to its surface" $V=kr^2$ Where, V - is velocity of a falling particle, k – is a contant and r – is redius **Limitation of Stokes law:** 1) Shape of particle 2) Viscocity of fluid 3) Particle density	**02** **02**

4) Brownian movement
(Brief explanation on above points)

8) Discuss about soil aeration and its significance.

Ans The constant movement or circulation of air in the soil mass resulting in the renewal of its component gases is known as soil aeration **04**

Composition of soil air

Air	Percentage by volume		
	Nitrogen	Oxygen	Carbon Dioxide
Soil air	79.2	20.6	0.30
Atmospheric air	79.9	20.97	0.03

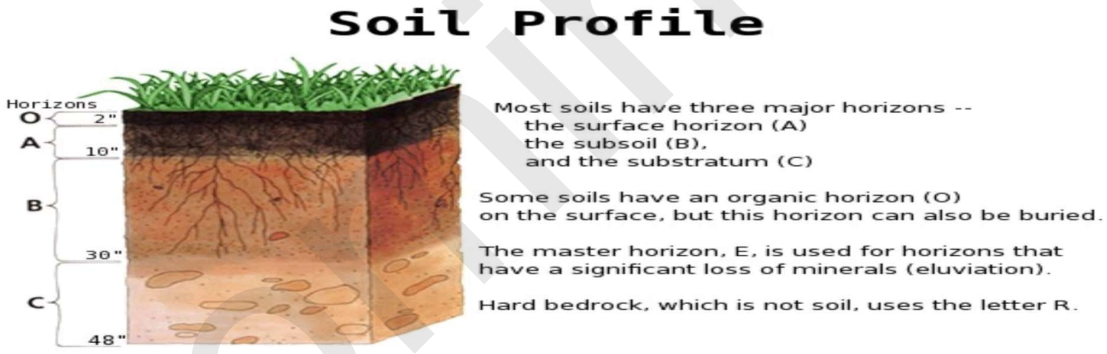
Significance:

The role of soil air in relation to fertility of soil and plant growth.

- Plant and root growth
- Microorganism population and activity
- Formation of toxic material
- Water and nutrient absorption
- Development of plnat disease

9) Draw schematic diagram of soil profile showing master horizons.

Ans **04**



10) What is soil formation? Enlist different soil forming processes.

Ans **Soil formation:** The mode of origin of the soil, with special reference to the processes responsible for the development of the solum or true soil, from the unconsolidated parent material. **01**

Two types of soil forming processes

1) **Fundamental soil forming processes.** **03**
   a) Humification
   b) Eluviation
   c) Illuviation
   d) Horizonation
2) **Specific soil forming processes**
   a) Calcification
   b) Decalcification
   c) Podzolization
   d) Laterization
   e) Salinization
   f) Desalinization
   g) Alkalization
   h) Dealkalization
   i) Pedoturbation.

SECTION "B"

Q.2.	Answer in one sentence (Any 12) (2 x 12 = 24 marks)	
1)	Define humus	
Ans	Humus is a complex and rather resistant mixture of brown or dark brown amorphous and colloidal organic substance that results from microbial decomposition and synthesis and has chemical and physical properties of great significance to soil and plant.	**02**
2)	Define eluviation	
Ans	Removal of soil material from the upper to the lower horizon in solution or in colloidal suspension	**02**
3)	Define flocculation	
Ans	Aggregation of individual particles into small group or granules.	**02**
4)	Define pedology	
Ans	The science dealing with the origin of the soil, its classification and its description and geological distribution.	**02**
5)	What is soil consistency?	
Ans	Soil consistency is the strength with which soil materials are held together or the resistance of soils to deformation and rupture. It measured for wet, moist and dry soil samples.	**02**
6)	Define cation exchange capacity and means of expression	
Ans	The CEC is the capacity of soil to hold and exchange cations. It is simply defined as the sum total of the exchangeable cations that a soil can adsorb. The cation exchange capacity is expressed in terms of equivalent or more specifically as milli equivalent per 100 grams and is written as meq/100g.	**02**
7)	Enlist factors affecting soil temperature	
Ans	1) Soil texture 2) Soil structure 3) Soil composition 4) Soil colour 5) Soil moisture 6) Slope of the land 7) Vegetative cover	**02**
8)	What is hue?	
Ans	Hue is the dominant spectral colour (rainbow) and is related to wavelength of light	**02**
9)	Define edaphology	
Ans	Edaphology is the study of soil from the standpoint of higher plants.	**02**
10)	Enlist important physical properties of mineral	
Ans	1) Colour 2) Luster 3) Light transmission 4) Hardness 5) Streak 6) Specific gravity 7) Clevage	**02**
11)	Define soil science	
Ans	Soil science is the study of soil as a natural resources on the surface of the earth including soil formation, classisfication and mapping.	**02**
12)	Define soil pollution	
Ans	Soil pollution is defined as the presence of toxic chemicals (pollutants or contaminants) in soil, in high enough concentration to pose a risk to human health and or the ecosystem.	**02**
13)	Define soil pH	
Ans	Is the negative logarithum of the hydrogen (H^+) ion concentration in solution	**02**

14)	Define soil plasticity	
Ans	It is the capacity to be moulded or change in shape when stress is applied and after remaining the stress it keeps the changed shape.	

SECTION "C"

Q.3	**Multiple Choice Questions**	**(1 x 24 = 24 marks)**
1)	Diameter of clay is A) >2 mm B) 2 -0.2mm C) 0.2- 0.02mm **D) <0.002mm**	**01**
2)	1:1 type of soil colloid is _____ A) Montmorrilonite**B) Kaolinite** C) Vermiculite D) Chlorite	**01**
3)	Soil formed from materials high in organic matter are grouped under the order A) Entisols B) Mollisols**C) Histisols** D) Andisols	**01**
4)	The process of transportation of weatherd material from upper horizon of soil is known as **A) Eluviation** B) Illuviation C) Humification D) Horizonation	**01**
5)	The specific soil forming process is_____ A) Humification B) Illuviation C) Horizonation**D) Laterization**	**01**
6)	In the structure in which horizontal section more developed as to vertical section A) Prismatic structure B) Columnar structure **C) Platy structure** D) Spheroidal structure	**01**
7)	In composition of plant residue, the carbon % is A) 40% B) 8% **C) 44%** D) 5%	**01**
8)	The content of CO_2 in soil air is A) 0.03% B) 3% **C) 0.3%** D) 30%	**01**
9)	The soil moisture constant at field capacity is A) -15 bar B) -31 bar **C) 1/3 bar** D) <0 bar	**01**
10)	Soils developed from volcanic pouroff above surface A) Inceptisols B) Histosols C) Mollisols**D) Andisols**	**01**
11)	Besalt is type of igneous rock A) Acidic **B) Basic** C) Sub acidic D) Sub basic	**01**
12)	Abundant element in the earth crust is A) Aluminium**B) Oxygen** C) Iron D) Magnesium	**01**
13)	Is the example of 2:1 type of clay mineral A) Kaolinite B) Serpentine **C) Montmorillonite**D) None of this	**01**
14)	The value of Munsell notation 10 YR 3/6 is A) 10 B) YR **C) 3** D)6	**01**
15)	Average particle density of minerals soil is **A) 2.65 Mg/m^3**B) 3.25 Mg/m^3 C) 1.65 Mg/m^3 D) 2.15 Mg/m^3	**01**
16)	As the water content of soil Increaes. Soil moisture tension _____. A) Decreases B) Increases C) Remain constant D) None of this	**01**
17)	The C:N ratio of saw dust is A) 10:1 B) 100:1 C) 200:1 **D) 400:1**	**01**
18)	Is the process of precipitation and accumulation of calcium carbonate in parts of the profile A) Podzolization B) Laterization C) Salinization **D) Calcification**	**01**
19)	Is the horizontal layers parallel to soil surface A) Soil profile **B) Soil horizon** C) Soil morphology D) Soil layer	**01**
20)	Hygroscopic water is held at tension A) < 1/3 bar B) -15 bar **C) -31 bar** D) 1/3 Bar	**01**
21)	The example of hardest mineral is_____ **A) Diamond** B) Talc C) Gypsum D) Calcite	**01**
22)	The colour of the powder of a mineral is called_____ A) Hue **B) Streak** C) Value D) Luster	**01**

23)	Height of a column of water to produce necessary suction A) pH B) Field capacity **C) pF** D) Capillary water	**01**
24)	When the outline of the object appears distinct and clear through a mineral A) Translucent B) Opeque**C) Tansparent**D) None of this	**01**