ICAR AIEEA PG Soil Science 2024 Question Paper with Solutions

Time Allowed :2 hours	**Maximum Marks :**120	**Total Questions :**120

1. Match List-I with List-II.

List-I (Characteristic)	**List-II (Law/Theory)**
(A) Saturated flow in soil	(II) Darcy's law
(B) Soil textural analysis	(IV) Stokes law
(C) Wavelength of emitted radiation-temperature relation	(I) Wien's law
(D) Diffusive flux of gas	(III) Fick's law

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

(3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

(4) (A)-(III), (B)-(IV), (C)-(IV), (D)-(I)

Correct Answer: (2) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

Solution:

(A) Saturated flow in soil is described by **Darcy's law**, which explains fluid flow through porous media.

(B) Soil textural analysis relates to the motion of particles, which is explained by **Stokes law**.

(C) The relationship between radiation wavelength and temperature is given by **Wien's law**.

(D) Diffusive flux of gases follows **Fick's law**, which governs diffusion processes.

Quick Tip

Always try to recall which physical law governs a specific soil or environmental property when answering match-the-following questions.

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2. Removal of finer materials down from upper to lower part of soil profile leads to the formation of ——

(1) Saline soils

(2) Regur

(3) Karsi soils

(4) Kankar

Correct Answer: (3) Karsi soils

Solution:

Karsi soils are formed due to the process of illuviation, where fine particles like clay and silt are leached down from the upper layers and accumulate in the lower horizon.

Quick Tip

Link the soil formation process (like illuviation) with specific soil types for accurate identification.

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3. Assertion (A): Drainage increases the soil temperature.

Reason (R): Drainage decreases the heat capacity.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:

Well-drained soils retain less water, lowering their heat capacity, allowing them to warm up more quickly. Thus, drainage increases soil temperature by reducing heat retention.

Quick Tip

In assertion-reason questions, ensure that both statements are not only correct but logically connected.

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4. Assertion (A): The effective rainfall erosion index of a given area is linearly proportional to the percentage of ground that is not covered by vegetation.

Reason (R): The rain erosion index includes both the kinetic energy of rain and the maximum 30-minute rain intensity.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

Solution:

Both statements are individually true. However, the rain erosion index is a measure of erosivity and is not directly proportional to vegetation cover. Vegetation affects erosion but not through the definition of the index.

Quick Tip

Always evaluate logical connections in assertion-reason type questions independently of correctness.

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5. The O_a sub-horizon denotes-

(1) Organic horizon with highly decomposed organic matter

(2) Organic horizon with intermediately decomposed organic matter

(3) Organic horizon with least decomposed organic matter

(4) Organic horizon without decomposed organic matter

Correct Answer: (1) Organic horizon with highly decomposed organic matter

Solution:

The O_a horizon consists of well-decomposed organic matter, indicating advanced stages of decomposition, and typically appears dark and homogeneous.

Quick Tip

Remember: “a” stands for advanced decomposition in the O-horizon classification.

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Quick Tip

Remember: “a” stands for advanced decomposition in the O-horizon classification.

6. Match List-I with List-II

List-I (Rock)	List-II (Mineral)
(A) Igneous rock	(II) Granite
(B) Marine sedimentary rock	(III) Limestone
(C) Metamorphic rock	(IV) Gneiss
(D) Terrestrial sedimentary rock	(I) Volcanic ash

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

(3) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (2) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

Solution:

Igneous rocks like granite are formed from cooled magma. Marine sedimentary rocks like limestone result from sediment accumulation in marine settings. Metamorphic rocks such as gneiss form from transformation under heat and pressure. Volcanic ash is commonly linked with terrestrial sedimentary rock deposits.

Quick Tip

Focus on the origin of rocks (igneous, sedimentary, metamorphic) and their corresponding commonly associated minerals.

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7. Saturated hydraulic conductivity in situ is measured by

(1) Guelph permeameter

(2) Neutron probe

(3) Infiltrometer

(4) Piezometer

Correct Answer: (1) Guelph permeameter

Solution:

Guelph permeameter is specifically designed to measure in situ saturated hydraulic conductivity in soils by establishing a constant-head condition in a borehole.

Quick Tip

Guelph permeameter is ideal for field-based saturated hydraulic conductivity measurement.

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8. Original design of tensiometer was first proposed by

(1) Willard Gardner

(2) L. A. Richards

(3) B. E. Livingstom

(4) Henry Darcy

Correct Answer: (1) Willard Gardner

Solution:

Willard Gardner is credited with the original concept and design of the tensiometer, an instrument used to measure soil water tension.

Quick Tip

Remember Gardner in the context of soil moisture measurement instruments.

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9. The comprehensive system of soil classification is based on

(1) Soil colour and vegetation

(2) Soil environmental factors

(3) Measurable soil properties

(4) Intrinsic properties of soil

Correct Answer: (3) Measurable soil properties

Solution:

Comprehensive soil classification relies on measurable properties such as texture, structure, pH, conductivity, and horizon development, rather than appearance or subjective criteria.

Quick Tip

Soil classification focuses on quantifiable, objective soil properties.

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10. Given below are two statements:

Statement (I): The surface of a 'Pedon' is roughly polygonal.

Statement (II): The surface area of a pedon ranges from 1 m^2 to 10 m^2.

(1) Both Statement (I) and Statement (II) are true.

(2) Both Statement (I) and Statement (II) are false.

(3) Statement (I) is true but Statement (II) is false.

(4) Statement (I) is false but Statement (II) is true.

Correct Answer: (1) Both Statement (I) and Statement (II) are true.

Solution:

A pedon represents the smallest unit of soil with all the characteristics of a soil profile. Its surface is generally polygonal, and the area typically ranges between 1 to 10 m^2.

Quick Tip

A pedon is a 3D unit for studying soils in the field—both its shape and size are defined.

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11. Which of the following statement is not true for chloroplast

(1) It contains DNA as its genetic material

(2) It produces ATP

(3) It has an electron transport chain

(4) It contains transcriptional but no translational apparatus

Correct Answer: (4) It contains transcriptional but no translational apparatus

Solution:

Chloroplasts contain both transcriptional and translational machinery, enabling them to synthesize some of their own proteins. So, statement 4 is incorrect.

Quick Tip

Chloroplasts are semi-autonomous—they contain DNA, RNA, ribosomes, and can make proteins.

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12. Colchicine treated cells are arrested in

(1) S phase

(2) Prophase

(3) G1 phase

(4) Metaphase

Correct Answer: (4) Metaphase

Solution:

Colchicine disrupts microtubule polymerization, preventing spindle formation, which arrests cells in metaphase.

Quick Tip

Colchicine is commonly used in labs to arrest cells in metaphase for karyotyping.

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13. Arrange the following consequences of submergence in the soil in the correct sequence:

(A). Depletion of soil oxygen,

(B). Accumulation of toxic substances like hydrogen sulfide,

(C). Loss of beneficial soil organisms,

(D). Increased soil pH in acidic soil.

(1) (A), (C), (B), (D)

(2) (A), (B), (C), (D)

(3) (B), (A), (D), (C)

(4) (C), (B), (D), (A)

Correct Answer: (2) (A), (B), (C), (D)

Solution:

When soil is submerged, oxygen is depleted first, followed by accumulation of toxic substances like hydrogen sulfide. This harms beneficial organisms, and under prolonged submergence, pH may increase in acidic soils.

Quick Tip

Understand the biological and chemical changes occurring during waterlogging to answer sequence-based soil science questions.

14. Match List-I with List-II:

List-I (Reaction)	**List-II (Occurrence)**
(A) Dark acidification	(II) CAM plants
(B) Fatty acid synthesis	(I) Smooth endoplasmic reticulum
(C) Hill reaction	(IV) Oxygen evolution
(D) Rubisco	(V) Photorespiration
(E) Calvin cycle	(III) Regeneration of RUBP

(1) (A)-(III), (B)-(I), (C)-(I), (D)-(IV), (E)-(V)

(2) (A)-(II), (B)-(I), (C)-(IV), (D)-(V), (E)-(III)

(3) (A)-(II), (B)-(I), (C)-(IV), (D)-(V), (E)-(III)

(4) (A)-(II), (B)-(V), (C)-(I), (D)-(III), (E)-(V)

Correct Answer: (2) (A)-(II), (B)-(I), (C)-(IV), (D)-(V), (E)-(III)

Solution:

Dark acidification occurs in CAM plants, fatty acid synthesis takes place in smooth ER, Hill reaction is responsible for oxygen evolution, Rubisco plays a role in photorespiration, and Calvin cycle leads to regeneration of RUBP.

Quick Tip

Focus on biochemical processes and cellular sites involved in photosynthesis and metabolism.

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15. Arrange the following forms of soil consistencies with decreasing soil wetness:

(A) Hard

(B) Friable/Soft

(C) Plastic

(D) Viscous

(E) Sticky

(1) (A), (B), (C), (D), (E)

(2) (A), (B), (C), (E), (D)

(3) (B), (A), (E), (D), (C)

(4) (D), (E), (C), (B), (A)

Correct Answer: (4) (D), (E), (C), (B), (A)

Solution:

With decreasing soil wetness, the sequence starts from viscous (high moisture), to sticky, plastic, friable, and ends with hard, which is driest.

Quick Tip

Understanding soil moisture status helps identify consistency states in the field.

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16. Weed not found in rice crop is:

(1) Echinochloa spp.

(2) Cyperus iria

(3) Chenopodium album

(4) Eleusine indica

Correct Answer: (3) Chenopodium album

Solution:

Chenopodium album is typically a weed found in dryland crops and not associated with the wetland conditions of rice fields.

Quick Tip

Know the common weed flora of specific crops like rice, wheat, or maize to quickly eliminate incorrect options.

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17. A stem nodulating plant:

(1) Glyricidia maculata

(2) Sesbania rostrata

(3) Pongamia pinnata

(4) Sesbania aculeata

Correct Answer: (2) Sesbania rostrata

Solution:

Sesbania rostrata is known for its unique capability to form stem nodules due to its symbiosis with Azorhizobium.

Quick Tip

Memorize examples of nodulating and non-nodulating legumes for better accuracy in such questions.

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18. The pF range of soft or friable consistency of soil is:

(1) More than 4.5

(2) 2.8–4.5

(3) 0.5–2.8

(4) Less than 0.5

Correct Answer: (3) 0.5–2.8

Solution:

Friable soils generally fall within the pF range of 0.5–2.8, indicating optimum moisture conditions for tillage.

Quick Tip

Remember typical pF values corresponding to soil consistency for field condition analysis.

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19. The Indian Remote Sensing Satellite (IRS):

(A) Look over a fixed point at the same local time

(B) Are at a low altitude ($<$1000 km)

(C) Are used for weathering forecasting?

(D) Have large agricultural and natural resources application

(E) Provide service to telecommunications

(1) (A), (B), and (D) only

(2) (A), (B), and (C) only

(3) (A), (B), (C), and (D)

(4) (A), (D), and (E) only

Correct Answer: (1) (A), (B), and (D) only

Solution:

IRS satellites are sun-synchronous and polar orbiting (low altitude), useful for fixed-time imaging and agricultural applications. They do not provide telecom services or weather forecasting.

Quick Tip

Differentiate between IRS (resource satellites) and INSAT (communication/weather) systems in Indian remote sensing programs.

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20. Choose the correct sequence:

(1) Chrysanthemum cinerariaefolium → Pyrethrins → Insecticide

(2) Streptomyces griseus → Streptomycin → Nematicide

(3) Streptomyces griseochromogenes → Blasticidin → Insecticide

(4) Streptomyces griseochromogenes → Blasticidin → Herbicide

Correct Answer: (1) Chrysanthemum cinerariaefolium → Pyrethrins → Insecticide

Solution:

Pyrethrins are natural insecticides derived from Chrysanthemum flowers, commonly used in organic farming.

Quick Tip

Link organisms with bioactive compounds and their agricultural applications to tackle matching/sequencing questions.

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21. Model is an example of

(1) Display type of visual aid

(2) Attractive type of visual aid

(3) Design type of visual aid

(4) Presentation type of visual aid

Correct Answer: (1) Display type of visual aid

Solution:

A model is a three-dimensional representation of a concept, object, or system, often used to demonstrate structure or function. It serves as a physical display tool to visually support and enhance understanding of a topic, especially in educational or training contexts. Hence, it falls under the category of ”Display type of visual aid.”

Quick Tip

Models, charts, and real objects are considered display aids because they help make abstract ideas more concrete and observable during instruction.

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22. Arrange the following in decreasing order according to the number of linkages among silicon tetrahedra of soil particles:

(A) Nesosilicates

(B) Phyllosilicates

(C) Tectosilicates

(D) Inosilicates

Choose the **correct** answer from the options given below:

(1) (A), (B), (C), (D)

(2) (C), (B), (D), (A)

(3) (B), (A), (D), (C)

(4) (A), (B), (D), (C)

Correct Answer: (2) (C), (B), (D), (A)

Solution:

The number of linkages in silicon tetrahedra varies among silicate types. Tectosilicates have all four oxygen atoms shared (maximum linkages), followed by phyllosilicates (three shared), then inosilicates (two shared), and nesosilicates have isolated tetrahedra (no shared oxygens). Thus, the order is: Tectosilicates ¿ Phyllosilicates ¿ Inosilicates ¿ Nesosilicates.

Quick Tip

Linkages among tetrahedra increase from nesosilicates (no sharing) to tectosilicates (full sharing of all oxygen atoms).

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23. The organic certificate of an organic farm is valid for

(1) One year

(2) Two year

(3) Three years

(4) Four year

Correct Answer: (3) Three years

Solution:

According to the National Programme for Organic Production (NPOP) guidelines, once certified, the organic certificate is valid for a period of three years, subject to annual inspections and compliance with standards.

Quick Tip

Organic certification remains valid for 3 years with regular inspections for compliance.

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24. Organic nutrients in water bodies promote

(1) Growth of the natural population of aquatic bacteria

(2) BOD

(3) Eutrophication

(4) Growth of the natural population of aquatic bacteria, BOD and Eutrophication

Correct Answer: (4) Growth of the natural population of aquatic bacteria, BOD and Eutrophication

Solution:

Organic nutrients serve as food for aquatic microbes, leading to an increase in bacterial growth. This elevates the Biological Oxygen Demand (BOD) and can lead to eutrophication due to excessive nutrient enrichment in water, causing algal blooms.

Quick Tip

Organic matter increases bacterial growth, BOD, and can trigger eutrophication in water bodies.

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25. Assertion (A): Gypsum is commonly used for the reclamation of sodic soil.

Reason (R): Reclamation process involves reduction in exchangeable sodium with calcium and its removal from soil solution through leaching.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:

Gypsum provides calcium, which replaces sodium ions in sodic soils. The displaced sodium is leached away through proper drainage, improving soil structure. Hence, both A and R are true and R explains A correctly.

Quick Tip

Gypsum helps reclaim sodic soils by replacing sodium with calcium, which is then leached out.

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26. Statement (I): Single superphosphate, double superphosphate, triple superphosphate are mono-calcium phosphate.

Statement (II): Mono calcium phosphates are water soluble and thus have high leaching losses.

(1) Both Statement (I) and Statement (II) are true.

(2) Both Statement (I) and Statement (II) are false.

(3) Statement (I) is true but Statement (II) is false.

(4) Statement (I) is false but Statement (II) is true.

Correct Answer: (1) Both Statement (I) and Statement (II) are true.

Solution:

Superphosphates are forms of mono-calcium phosphate, and these are water-soluble. Their solubility makes them more prone to leaching losses in soils, especially under high rainfall or irrigated conditions.

Quick Tip

Mono-calcium phosphate forms are water-soluble, effective fertilizers, but can leach easily.

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27. Laterite soil is rich in

(1) Ca

(2) Fe

(3) C

(4) Cu

Correct Answer: (2) Fe

Solution:

Laterite soils are formed in hot and wet tropical areas and are rich in iron (Fe) and aluminum oxides. They are red in color due to the presence of iron oxides.

Quick Tip

Laterite soils are iron-rich and red in appearance, common in high rainfall areas.

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28. The amount of organic matter in a soil with 'Value 0' according to Munsell colour system is–

(1) High

(2) Medium

(3) Low

(4) Does not depend.

Correct Answer: (1) High

Solution:

In the Munsell colour system, the value component refers to the lightness or darkness of a color. A lower value, especially '0', indicates very dark color, which usually corresponds to high organic matter in soil, such as in humus-rich topsoil.

Quick Tip

Darker soils (lower Munsell value) generally indicate higher organic matter content.

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29. The parameters of N use efficiency are

(A) Apparent N. recovery

(B) Agronomic efficiency

(C) Production efficiency

(D) Physiological N efficiency

Choose the **correct** answer from the options given below:

(1) (A), (B) and (D) only.

(2) (A), (B) and (C) only.

(3) (A), (B), (C) and (D).

(4) (B), (C) and (D) only.

Correct Answer: (3) (A), (B), (C) and (D)

Solution:

All four parameters — Apparent N recovery, Agronomic efficiency, Production efficiency, and Physiological N efficiency — are recognized indicators to evaluate nitrogen use efficiency (NUE) in crop systems. Each reflects a different aspect of uptake, utilization, and yield benefit.

Quick Tip

Nitrogen use efficiency includes multiple measures like recovery, yield increase, and physiological response.

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30. Which of the following nutrient is related with deficiency symptoms like discoloration of leaf buds, breaking and dropping of buds?

(1) Boron

(2) Molybdenum

(3) Iron

(4) Magnesium

Correct Answer: (1) Boron

Solution:

Boron deficiency leads to terminal bud death, discoloration of leaf buds, and brittle tissues. It plays a critical role in cell wall formation and reproductive development in plants.

Quick Tip

Boron is essential for healthy bud development; its deficiency causes discoloration and bud drop.

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31. The steady-state soil infiltration rate is

(1) Soil Surface controlled

(2) Soil profile controlled

(3) Water supply controlled

(4) Ground water controlled

Correct Answer: (2) Soil profile controlled

Solution:

The steady-state infiltration rate is determined by the soil's profile characteristics like texture, structure, and compaction, which affect the soil's permeability. The surface influences initial infiltration, but long-term (steady-state) is profile-dependent.

Quick Tip

Initial infiltration is surface-driven; steady-state depends on the soil profile.

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32. Dolomite is a source of

(A) Calcium

(B) Magnesium

(C) Iron

(D) Sulphur

Choose the **correct** answer from the options given below:

(1) (A), (B) and (D) only.

(2) (A) and (B) only.

(3) (A), (B), (C) and (D).

(4) (B), (C) and (D) only.

Correct Answer: (2) (A) and (B) only.

Solution:

Dolomite is a mineral composed of calcium magnesium carbonate (CaMg(CO)). It provides calcium and magnesium to soil, but is not a source of iron or sulphur.

Quick Tip

Dolomite supplies both calcium and magnesium, useful in correcting soil acidity.

---

33. Assertion (A): Equilibrium water content in soil at a certain matric potential is higher when the soil is under the drying process (desorption) compared to when the soil is under the wetting process (sorption).

Reason (R): The contact angle between water and the soil solid phase is greater during the imbibition of water than during drainage.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:

This phenomenon is known as hysteresis in soil moisture. It occurs due to differences in contact angle during wetting and drying. During imbibition (wetting), a greater contact angle reduces water retention at same matric potential, validating the assertion and its reason.

Quick Tip

Hysteresis causes moisture content at same potential to differ between drying and wetting paths.

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34. Elements associated with nitrogenase enzyme in biological nitrogen fixation

(A) Molybdenum

(B) Iron

(C) Copper

(D) Nickel

Choose the **correct** answer from the options given below:

(1) (A), (B) and (D) only

(2) (A) and (B) only

(3) (A), (B), (C) and (D)

(4) (B), (C) and (D) only

Correct Answer: (1) (A), (B) and (D) only

Solution:

Nitrogenase, the key enzyme in nitrogen fixation, is a metalloenzyme that requires molybdenum and iron. Nickel also supports some bacterial strains. Copper, though essential for other enzymes, is not directly involved in nitrogenase activity.

Quick Tip

Mo, Fe, and Ni are essential for nitrogenase enzyme activity in nitrogen fixation.

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35. Mottle leaf of citrus is caused by the deficiency of

(1) Mo

(2) B

(3) Zn

(4) Cu

Correct Answer: (3) Zn

Solution:

Zinc deficiency in citrus results in mottled leaves, small and narrow leaves, and rosette formation. It is commonly known as ”mottle leaf” disease.

Quick Tip

Zinc deficiency in citrus causes characteristic mottle leaf symptoms.

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36. Bray No. 1 is

(1) 0.5M $NaHCO_3$ at pH 8.5

(2) 0.5N $NaHCO_3$ at pH 8.5

(3) 0.03M NH_4F + 0.025N HCl

(4) 0.03N NH_4F + 0.025N HCl

Correct Answer: (3) 0.03M NH_4F + 0.025N HCl

Solution:

Bray No. 1 method is a chemical extraction procedure used for available phosphorus estimation in acidic soils, using 0.03M NH_4F and 0.025N HCl as extractant.

Quick Tip

Bray No. 1 is used for phosphorus extraction in acidic soils using ammonium fluoride and HCl.

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37. Microorganisms that oxidise ammonia to nitrite

(A) Nitrosomonas

(B) Thiobacillus

(C) Nitrobacter

(D) Nitrosolobus

Choose the **correct** answer from the options given below:

(1) (A), (B) and (D) only.

(2) (A) and (D) only.

(3) (A), (B), (C) and (D).

(4) (B), (C) and (D) only.

Correct Answer: (2) (A) and (D) only

Solution:

Ammonia is oxidized to nitrite by Nitrosomonas and Nitrosolobus. Nitrobacter oxidizes nitrite to nitrate, and Thiobacillus is a sulfur-oxidizing bacterium, not involved in nitrification.

Quick Tip

Nitrosomonas and Nitrosolobus convert ammonia to nitrite in nitrification.

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38. According to Bray's Nutrient Mobility concept, which among following element is mobile in plants but immobile in soil?

(1) Nitrogen

(2) Phosphorus

(3) Boron

(4) Zinc

Correct Answer: (2) Phosphorus

Solution:

Bray's concept classifies nutrients based on their mobility in soil and plants. Phosphorus is mobile in plants (translocated easily) but immobile in soil due to fixation.

Quick Tip

Phosphorus is mobile in plant tissue but fixed and immobile in soil.

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39. Arrange the following in decreasing order of Basal Spacing:

(A) Kaolinite

(B) Montmorillonite

(C) Illite

(D) Vermiculite

Choose the **correct** answer from the options given below:

(1) (A), (B), (D), (C)

(2) (A), (B), (C), (D)

(3) (B), (A), (D), (C)

(4) (B), (D), (C), (A)

Correct Answer: (4) (B), (D), (C), (A)

Solution:

Montmorillonite has the largest basal spacing due to swelling properties, followed by Vermiculite, then Illite (moderate), and Kaolinite (lowest, non-expanding).

Quick Tip

Basal spacing order: Montmorillonite ¿ Vermiculite ¿ Illite ¿ Kaolinite.

---

40. Match List-I with List-II

List-I (Activity)	**List-II (Plant Direction)**
(A) Phototropism	(III) Bending towards light
(B) Geotropism	(I) Bend towards soil
(C) Thigmotropism	(IV) Response to touch or movement
(D) Photoperiodism	(II) Response to day length

Choose the **correct** answer from the options given below:

(1) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(2) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(3) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (1) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Solution:

Phototropism is growth towards light (III), Geotropism is growth towards gravity/soil (I), Thigmotropism is plant response to touch (IV), and Photoperiodism is response to day length (II).

Quick Tip

Match plant responses to specific stimuli: light, gravity, touch, and day length.

41. The term oligotrophic refers to

(1) Higher nutrients in the water

(2) High aquatic productivity

(3) Algal blooms

(4) Low nutrients and low productivity

Correct Answer: (4) Low nutrients and low productivity

Solution:

Oligotrophic water bodies are characterized by low concentrations of nutrients, especially phosphorus and nitrogen, resulting in low primary productivity and clear water.

Quick Tip

Oligotrophic = nutrient-poor and low productivity, typical of clear mountain lakes.

---

42. Which of the following is/are the example of nitrifying bacteria?

(1) Nitrosomonas

(2) Nitrobacter

(3) Nitrospira

(4) Nitrosomonas, Nitrobacter, Nitrospira

Correct Answer: (4) Nitrosomonas, Nitrobacter, Nitrospira

Solution:

All three — Nitrosomonas (ammonia to nitrite), Nitrobacter (nitrite to nitrate), and Nitrospira (complete nitrification) — are involved in the nitrification process in soil.

Quick Tip

Nitrifying bacteria convert ammonia $\rightarrow$ nitrite $\rightarrow$ nitrate in soil nitrogen cycle.

---

43. Match List-I with List-II

List-I (Event)	List-II (Observation)
(A) Harvest Planning	(III) Planning optimal routes for harvesting equipment to maximize efficiency
(B) Soil Sampling	(II) Collecting soil samples at precise locations for analysis and management decisions
(C) Boundary Mapping	(I) Determining field boundaries and property lines accurately
(D) Pest Management	(IV) Tracking pest populations and movements to inform control strategies

Choose the **correct** answer from the options given below:

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(3) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (3) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

Solution:

Each agricultural event in List-I matches with its respective purpose in List-II: Harvest planning with route optimization, soil sampling with analysis, boundary mapping with accuracy, and pest management with movement tracking.

Quick Tip

Match events with their objectives based on precision agriculture tasks.

---

44. The height of the capillary rise of water in the soil is

(A) Inversely proportional to the radius of the tube

(B) Inversely proportional to the density of water

(C) Directly proportional to the radius of the tube

(D) Inversely proportional to the surface tension of water

Choose the **correct** answer from the options given below:

(1) (A), (B) and (D) only

(2) (A) only

(3) (A) and (B) only

(4) (D) only

Correct Answer: (3) (A) and (B) only

Solution:

Capillary rise is given by $h = \dfrac{2\gamma \cos\theta}{r\rho g}$ where h is inversely related to radius r and density ρ of water. Surface tension is directly related to rise, not inverse.

Quick Tip

Capillary height $\uparrow$ when radius $\downarrow$ and density $\downarrow$.

---

45. Statement (I): Hue is a measure of the chromatic composition of light.

Statement (II): The Munsell colour system is based on five principal hues.

(1) Both Statement (I) and Statement (II) are true.

(2) Both Statement (I) and Statement (II) are false.

(3) Statement (I) is true but Statement (II) is false.

(4) Statement (I) is false but Statement (II) is true.

Correct Answer: (1) Both Statement (I) and Statement (II) are true.

Solution:

Hue refers to color type, such as red or blue. The Munsell system includes 5 principal hues: red, yellow, green, blue, and purple.

Quick Tip

Munsell color system: Hue (color), Value (lightness), Chroma (intensity).

---

46. Assertion (A): Cations adsorbed on soil colloids determine aggregate formation.

Reason (R): Cations form electropositive links between electronegative soil particles.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:

Cations (like Ca^{2+}, Mg^{2+}) bridge negative charges on colloids and help flocculate soil particles into aggregates.

Quick Tip

Divalent cations improve soil aggregation by neutralizing colloid charges.

---

47. The pF curve is same as

(1) Moisture - density relation

(2) Soil temperature - water relation

(3) Soil pH - base saturation relation

(4) Soil water content - matric potential relation

Correct Answer: (4) Soil water content - matric potential relation

Solution:

The pF curve represents the logarithmic relationship between matric potential (suction) and soil moisture content, used to assess soil water availability.

Quick Tip

pF curve = log(matric suction) vs. water content; key for irrigation and soil physics.

---

48. Assertion (A): Implementing agroforestry practices helps in soil conservation.

Reason (R): Agroforestry combines the cultivation of trees and crops on the same land, which reduces soil erosion by providing ground cover and enhancing soil structure through the roots of trees.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:

Agroforestry reduces soil erosion by integrating trees and crops, which stabilizes soil, increases organic matter, and improves structure through root systems.

Quick Tip

Agroforestry improves soil conservation via root systems and ground cover.

---

49. Arrange the following factors affecting irrigation water quality in agriculture in the correct sequence:

(A) Salinity

(B) pH

(C) Sediment content

(D) Chemical contaminants

(1) (A), (B), (C), (D)

(2) (A), (C), (D), (B)

(3) (B), (A), (D), (C)

(4) (C), (B), (D), (A)

Correct Answer: (1) (A), (B), (C), (D)

Solution:

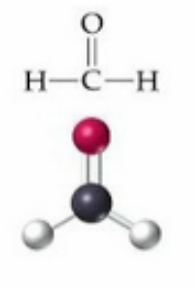
The correct order is: Salinity (affects osmotic potential), pH (influences nutrient availability), Sediment (clogs equipment), and chemical contaminants (toxic effects).

Quick Tip

Assess water quality by salinity, pH, sediment, then chemical contaminants.

---

50. Which group is this?



(1) Ketone

(2) Carboxylic acid

(3) Aldehyde

(4) Amide

Correct Answer: (3) Aldehyde

Solution:

The structure shown is a carbon double-bonded to oxygen and single-bonded to a hydrogen atom — characteristic of an aldehyde group.

Quick Tip

Aldehydes have -CHO group with C=O and C-H bonds.

---

51. Match List-I with List-II (Crops with water requirement)

Crop	Water Requirement (cm)
(A) Sugar cane	(I) 200
(B) Rice	(II) 100
(C) Wheat	(III) 35
(D) Spinach leafy vegetable	(IV) 15

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

(3) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Solution:

Typical water requirements: Sugarcane (200 cm), Rice (100 cm), Wheat (35 cm), Spinach

(15 cm).

Quick Tip

Match crops to water needs from high to low: Sugarcane ¿ Rice ¿ Wheat ¿ Spinach.

---

52. Match List-I with List-II (Acts and their year of enactment)

Act	**Year**
(A) The Environment Protection Act	(II) 1986
(B) The Forest Conservation Act	(I) 1980
(C) The Water (Prevention and Control of Pollution) Act	(III) 1974
(D) The Wildlife Protection Act	(IV) 1972

(1) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(2) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)

(3) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (2) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)

Solution:

Correct enactment years: Environment Act - 1986, Forest Act - 1980, Water Act - 1974, Wildlife Act - 1972.

Quick Tip

Remember E.F.W.W. as per years: Env ’86, Forest ’80, Water ’74, Wildlife ’72.

---

53. Which one of the following is an aromatic amino acid?

(1) Histidine

(2) Proline

(3) Tyrosine

(4) Lysine

Correct Answer: (3) Tyrosine

Solution:

Tyrosine contains a benzene ring and is classified as an aromatic amino acid along with phenylalanine and tryptophan.

Quick Tip

Aromatic amino acids = Tyrosine, Phenylalanine, Tryptophan.

---

54. Match List-I with List-II (Physical Parameters and their Units)

Physical Parameter	**Unit**
(A) Surface tension	(II) Newton per meter
(B) Viscosity	(IV) Pascal-second
(C) Soil permeability	(III) Meter per hour
(D) Particle density	(I) Kilogram per cubic meter

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(I), (B)-(IV), (C)-(III), (D)-(II)

(3) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (3) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)

Solution:

Surface tension is measured in Newton per meter, viscosity in Pascal-second, soil permeability in meter per hour, and particle density in kilogram per cubic meter.

Quick Tip

Memorize key soil physics units: Tension (N/m), Viscosity (Pa·s), Permeability (m/h), Density (kg/m^3).

---

55. Dichloral urea is used as a

(1) Soil herbicide for pre emergence treatment

(2) Soil herbicide for post-emergence treatment

(3) Soil nematicide for pre emergence treatment

(4) Soil fungicide for post emergence treatment

Correct Answer: (1) Soil herbicide for pre emergence treatment

Solution:

Dichloral urea is primarily used as a pre-emergent herbicide to prevent weed growth before seeds germinate.

Quick Tip

Pre-emergent herbicides target weeds before germination; Dichloral urea is one such example.

---

56. Mass media channels are relatively more important than interpersonal channels for

(1) Laggard

(2) Late Adopters

(3) Early adopters

(4) Early Majority

Correct Answer: (3) Early adopters

Solution:

According to diffusion of innovation theory, early adopters rely more on mass media for awareness and information, while later adopters depend more on interpersonal communication.

Quick Tip

Mass media plays a key role for early adopters in adopting innovations.

---

57. Assertion (A): The break of monsoon at critical stages for soil moisture stress leads to a reduction in yield.

Reason (R): Only when the break of monsoon exceeds 15 days duration or more.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:

A prolonged break in monsoon (more than 15 days) during critical growth stages can lead to severe soil moisture stress, impacting crop yields significantly.

Quick Tip

Monitor crop stages closely during monsoon breaks exceeding 15 days.

---

58. Assertion (A): Darc's law is valid for a steady and stationary flow process in the soil.

Reason (R): In a steady flow condition, potential and gradient at every point in the flow path remain constant.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:

Darc's law applies when flow is steady (unchanging over time) and stationary (flow at a point does not change), where potential gradient remains constant.

Quick Tip

Darc's law is valid under steady-state, laminar flow in porous media.

---

59. The most common 1:1 type of clay mineral in soil is–

(1) Montmorillonite

(2) Kaolinite

(3) Vermiculite

(4) Halloysite

Correct Answer: (2) Kaolinite

Solution:

Kaolinite is the most common 1:1 clay mineral, meaning it has one tetrahedral sheet and one

octahedral sheet per layer.

Quick Tip

Kaolinite = 1:1 clay mineral, low shrink-swell, common in weathered soils.

---

60. Stable compound formed during urea hydrolysis

(1) Ammonium hydroxide

(2) Ammonium carbamate

(3) Ammonia

(4) Ammonium carbonate

Correct Answer: (4) Ammonium carbonate

Solution:

Urea hydrolysis produces ammonium carbonate as a stable intermediate, which then releases ammonia.

Quick Tip

Ammonium carbonate is a key stable product during urea breakdown.

---

61. The form of phosphorus in rock phosphate is:

(1) $Ca(H_2PO_4)_2$

(2) $CaHPO_4$

(3) $Ca_3(PO_4)_2$

(4) $3(Ca_3(PO_4)_2)\cdot Ca(OH)_2$

Correct Answer: (4) $3(Ca_3(PO_4)_2)\cdot Ca(OH)_2$

Solution:

The major form of phosphorus in rock phosphate is tricalcium phosphate combined with calcium hydroxide, represented as $3(Ca_3(PO_4)_2)\cdot Ca(OH)_2$. This form is generally insoluble in water but becomes available to plants in acidic soils or through treatment with acids to make phosphate fertilizers.

Quick Tip

Rock phosphate primarily contains insoluble tricalcium phosphate, which is processed into soluble forms for agricultural use.

---

62. Humic substances are composed of:

(1) (A), (B) and (D) only

(2) (A), (B) and (C) only

(3) (A), (B), (C) and (D)

(4) (B), (C) and (D) only

Correct Answer: (3) (A), (B), (C) and (D)

Solution:

Humic substances are a complex mixture of many different acids containing phenolic and carboxylic groups. They are composed of phenols, quinones, carboxylic acids, and fatty acids. These components contribute to the chemical properties of humus in soil, aiding in nutrient retention and soil structure.

Quick Tip

Remember that humic substances are chemically diverse and include multiple organic compounds such as phenols and acids.

---

63. Assertion (A): Waterlogged soil typically displays a grayish color due to reduced oxygen levels.

Reason (R): Upland soil usually maintains a reddish or brownish hue due to its well-aerated nature.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:

Waterlogged soils become anaerobic, which reduces iron and manganese compounds, leading to a grayish soil color. Upland soils, which are well-aerated, promote oxidation of iron, giving them a reddish or brown hue. Thus, both statements are correct and the reason explains the assertion well.

Quick Tip

Soil color is an indicator of its aeration and redox status—gray indicates reduced (anaerobic), red indicates oxidized (aerobic).

---

64. Match List-I with List-II and select the correct answer from the options given below:

List-I (Event) **List-II (Function)**

(A) Thermal Imaging (I) Monitoring crop water stress and irrigation management

(B) Radar Remote Sensing (II) Identifying crop types and crop health

(C) Normalized Difference Vegetation Index (NDVI) (III) Mapping soil moisture content and terrain elevation

(D) Multispectral Imaging (IV) Detecting temperature variations in crops for stress detection

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

(3) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Solution:

Each listed technology corresponds uniquely with a function based on its application in agriculture: Thermal Imaging is used to monitor water stress, Radar Sensing identifies crop types, NDVI maps vegetation health and soil properties, and Multispectral Imaging detects crop stress through temperature changes.

Quick Tip

Match-the-following questions require linking each concept with its real-world application or function; understanding technological uses in agriculture helps quickly eliminate wrong matches.

---

65. Certified Organic logo in India is –

(1) India organic

(2) India green

(3) India Healthy

(4) India Fresh

Correct Answer: (1) India organic

Solution:

The certified organic logo in India is known as ”India Organic”. It signifies that the product is in compliance with the National Standards for Organic Production (NSOP), which are regulated by APEDA.

Quick Tip

Remember “India Organic” is the official logo under the National Programme for Organic Production (NPOP).

---

66. Which covalent bond is present in nucleic acid?

(1) Peptide bond

(2) Phosphodiester bond

(3) Glycosidic bond

(4) Thymine bond

Correct Answer: (2) Phosphodiester bond

Solution:

Phosphodiester bonds link the 3’ carbon atom of one sugar molecule to the 5’ carbon atom of another sugar in DNA and RNA backbones. These bonds are essential for nucleic acid

structure.

Quick Tip

Peptide bonds are for proteins; phosphodiester bonds are specific to nucleic acids.

---

67. Match List-I with List-II and choose the correct answer:

List-I (Event)	**List-II (Occurrence)**
(A) Carcinogenic	(I) Promoting cancer
(B) Pollution	(II) Photochemical smog
(C) Eutrophication	(III) Over application of fertilizer
(D) Gene	(IV) Cell

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(I), (B)-(III), (C)-(I), (D)-(IV)

(3) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Solution:

Carcinogens promote cancer, pollution leads to smog, eutrophication is caused by excess nutrients/fertilizer, and genes are located in cells—hence the appropriate mapping.

Quick Tip

Match keywords: Carcinogenic $\rightarrow$ Cancer, Pollution $\rightarrow$ Smog, Eutrophication $\rightarrow$ Fertilizer runoff.

---

68. Arrange the following in increasing order of Water Use Efficiency:

(A) Drip Irrigation

(B) Pitcher pot Irrigation

(C) Surface Irrigation

(D) Sprinkler Irrigation

(1) (A), (B), (C), (D)

(2) (D), (C), (B), (A)

(3) (B), (A), (D), (C)

(4) (C), (D), (A), (B)

Correct Answer: (4) (C), (D), (A), (B)

Solution:

Surface irrigation is the least efficient, followed by sprinkler, then drip, with pitcher pot being the most efficient due to localized delivery of water.

Quick Tip

Water Use Efficiency: Surface ¡ Sprinkler ¡ Drip ¡ Pitcher.

---

69. Chemical weathering involving complete disintegration or modification in structure and composition of primary minerals is –

(1) Hydration

(2) Oxidation

(3) Hydrolysis

(4) Carbonation

Correct Answer: (3) Hydrolysis

Solution:

Hydrolysis is the most significant chemical weathering process, where hydrogen ions replace metal ions in minerals, leading to complete structural and compositional changes.

Quick Tip

Hydrolysis alters minerals most thoroughly—especially silicates like feldspar into clay.

---

70. Certification is essential for authenticating organic products because:

(A) A third-party certification agency monitoring the organic production system

(B) Organic products are produced by following NPOP guidelines

(C) Organic farmers are dedicated in cultivation practices

(D) Potentiality of marketing of organic products are increasing

(1) (A), (B) and (D) only

(2) (A), (C) and (D) only

(3) (A) and (B) only

(4) (B), (C) and (D) only

Correct Answer: (1) (A), (B) and (D) only

Solution:

Certification validates adherence to NPOP guidelines and is done by accredited agencies. It also boosts market trust and marketing potential. While farmers' dedication is important, certification isn't based solely on that.

Quick Tip

Focus on regulatory and market-oriented reasons for certification, not farmer attitudes.

---

71. Natural Farming is associated with

(1) John Howard

(2) Nicholas Lampkin

(3) Lord Northbourne

(4) Masanobu Fukuoka

Correct Answer: (4) Masanobu Fukuoka

Solution:

Masanobu Fukuoka, a Japanese farmer and philosopher, is considered the father of natural farming. He promoted no-till, no-chemical, and no-weeding agricultural practices and emphasized minimal human interference with nature.

Quick Tip

Natural farming emphasizes "do-nothing" agriculture and is widely credited to Masanobu Fukuoka.

---

72. Match List-I with List-II:

List-I (Method) **List-II (Determination)**

(A) Kjeldahl method (III) Determines the total nitrogen content in the soil

(B) Bray P1 test (I) Primarily assesses the available phosphorus content in the soil

(C) Ammonium acetate extraction (II) Measures the potassium content in the soil solution

(D) Flame photometry (IV) Quantifies the exchangeable ammonium and potassium content in the soil

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(3) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)

(4) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Correct Answer: (4) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Solution:

Kjeldahl method determines nitrogen. Bray P1 is used for phosphorus. Ammonium acetate is for exchangeable K and ammonium. Flame photometry detects K and Na in solutions.

Quick Tip

Match each test with the nutrient it estimates—Bray for P, Kjeldahl for N, and flame photometry for K.

---

73. The different pools of potassium in soils are

(A) Soil solution K

(B) Fixed K

(C) Exchangeable K

(D) Lattice K

(1) (A), (B) and (D) only

(2) (A), (B) and (C) only

(3) (A), (B), (C) and (D)

(4) (B), (C) and (D) only

Correct Answer: (3) (A), (B), (C) and (D)

Solution:

Potassium exists in soils in four pools: soil solution (readily available), exchangeable, fixed,

and lattice (mineral form). All contribute to K dynamics in soil.

Quick Tip

All four forms—solution, exchangeable, fixed, and lattice—represent different potassium availability levels.

---

74. Match List-I with List-II:

List-I (Theory proposed)	**List-II (Name of Theory)**
(A) Hydrodynamics	(I) Daniel Bernoulli
(B) Acoustics	(II) Johannes Kepler
(C) Mechanics	(III) Hermann Von Helmholtz
(D) Aerodynamics	(IV) Ludwig Prandtl

(1) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

(2) (A)-(IV), (B)-(I), (C)-(III), (D)-(I)

(3) (A)-(I), (B)-(III), (C)-(IV), (D)-(III)

(4) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

Correct Answer: (4) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

Solution:

Daniel Bernoulli is associated with Hydrodynamics. Helmholtz contributed to acoustics. Kepler is linked to mechanics. Ludwig Prandtl developed aerodynamic theory.

Quick Tip

Associate scientists with their key contributions: Bernoulli (fluid), Helmholtz (acoustics), Kepler (motion), Prandtl (aerodynamics).

---

75. The process by which neutrons lose their kinetic energy through elastic collisions in the soil is known as

(1) Normalization

(2) Cooling

(3) Radiation

(4) Thermalization

Correct Answer: (4) Thermalization

Solution:

Thermalization is the process by which high-energy (fast) neutrons lose energy via elastic collisions until they reach thermal equilibrium with their surroundings.

Quick Tip

Remember: "Thermalization" involves energy loss by fast neutrons to reach thermal levels via collisions.

---

76. Given below are two statements:

Statement (I): Nitrobacteria are obligate autotrophic aerobes

Statement (II): Nitrate will not be produced from NH_4^+ in the absence of oxygen

(1) Both Statement (I) and Statement (II) are correct

(2) Both Statement (I) and Statement (II) are incorrect

(3) Statement (I) is correct but Statement (II) is incorrect

(4) Statement (I) is incorrect but Statement (II) is correct

Correct Answer: (1) Both Statement (I) and Statement (II) are correct

Solution:

Nitrobacteria are obligate autotrophic aerobes that oxidize nitrite to nitrate. This nitrification step requires oxygen, so without oxygen, nitrate production from ammonium is halted.

Quick Tip

Nitrifying bacteria like Nitrobacter require oxygen to convert ammonium to nitrate via nitrite.

---

77. Assertion (A): Ammonium-based fertilisers are the major contributors to soil acidification.

Reason (R): Especially the non-leachable nitrogen ions which have been taken up by plants contribute to the soil acidity

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:

Ammonium-based fertilizers acidify soil due to nitrification releasing hydrogen ions. The uptake of non-leachable ions by plants reduces basic cations, increasing acidity—thus, (R) correctly explains (A).

Quick Tip

Soil acidification is common with ammonium-based fertilizers due to nitrification and plant uptake processes.

---

78. Parent material transported by wind is called

(1) Aeolian

(2) Colluvium

(3) Loess

(4) Alluvium

Correct Answer: (1) Aeolian

Solution:

Aeolian materials are soil or sediment deposits transported and deposited by wind, often seen in arid and semi-arid environments.

Quick Tip

Aeolian = wind; Alluvium = water; Colluvium = gravity; Loess = fine wind-blown dust.

---

79. Nutrient supply in organic farming is based on feeding the soil not feeding the crop - Justify

(1) (A), (B) and (D) only.

(2) (A), (C) and (D) only.

(3) (B), (C) and (D) only.

(4) (B), (A) and (D) only.

Correct Answer: (1) (A), (B) and (D) only.

Solution:

Statements A, B, and D align with organic principles: using on-farm inputs, enhancing fertility through cultural practices, and promoting natural cycles. C emphasizes recycling but not directly soil feeding.

Quick Tip

Organic farming focuses on soil health first to support long-term crop productivity.

---

80. Given below are two statements: Statement (I): Application of nitrogenous fertilizer leads to N_2O emission from the soil.

Statement (II): Nitrous oxide is present in large quantities compared to methane in the atmosphere and therefore possesses higher potent danger.

(1) Both Statement (I) and Statement (II) are true.

(2) Both Statement (I) and Statement (II) are false.

(3) Statement (I) is true but Statement (II) is false.

(4) Statement (I) is false but Statement (II) is true.

Correct Answer: (3) Statement (I) is true but Statement (II) is false.

Solution:

Statement (I) is true because nitrogenous fertilizers enhance microbial activity in soil, especially nitrification and denitrification, leading to the emission of nitrous oxide (N_2O), a potent greenhouse gas.

Statement (II) is false because although nitrous oxide is more potent than methane in terms of global warming potential, it is not present in larger quantities than methane in the atmosphere.

Quick Tip

Remember: Nitrous oxide has higher warming potential than methane but is present in much lower atmospheric concentrations.

---

81. The term 'Organic farming' was first coined by

(1) Lord Northbourne

(2) Bill Mollison

(3) Rudolf Stainer

(4) Masanobu Fukuoka

Correct Answer: (1) Lord Northbourne

Solution:

Lord Northbourne coined "organic farming" in his 1940 book "Look to the Land", promoting holistic, ecologically balanced agriculture.

Quick Tip

Lord Northbourne is credited for defining organic farming, while others developed related practices.

---

82. Statement (I): The capacitance method measures soil moisture content by analyzing changes in electrical capacitance.

Statement (II): The finger-licking method estimates soil moisture content based on tactile sensations.

(1) Both Statement (I) and Statement (II) are true.

(2) Both Statement (I) and Statement (II) are false.

(3) Statement (I) is true but Statement (II) is false.

(4) Statement (I) is false but Statement (II) is true.

Correct Answer: (1) Both Statement (I) and Statement (II) are true.

Solution:

The capacitance method is accurate and based on measurable electrical properties. The

tactile or finger-feel method is subjective but commonly used in the field.

Quick Tip

Capacitance = accurate electronic method; Finger-feel = traditional, subjective method.

---

83. Match List-I (Parent rock) with List-II (Metamorphic rock)

List-I	**List-II**
(A) Conglomerate	(IV) Quartzite
(B) Slate	(II) Phyllite
(C) Coal	(I) Graphite
(D) Sandstone	(III) Gneiss

(1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(2) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

(3) (A) - (I), (B) - (III), (C) - (IV), (D) - (II)

(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (2) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

Solution:

Conglomerate transforms to Gneiss, Slate metamorphoses to Phyllite, Coal forms Graphite, and Sandstone becomes Quartzite.

Quick Tip

Remember parent-to-metamorphic transitions: Slate $\rightarrow$ Phyllite, Coal $\rightarrow$ Graphite, Sandstone $\rightarrow$ Quartzite.

---

84. Assertion (A): Organic farming promotes environmental sustainability.

Reason (R): Organic farming avoids the use of synthetic pesticides and fertilizers, which helps preserve soil health, conserve water resources, and reduce pollution of air and water bodies.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:

Organic farming supports sustainability by maintaining ecological balance and reducing dependence on harmful chemicals. The avoidance of synthetic inputs directly contributes to the environmental benefits stated in the assertion.

Quick Tip

In assertion-reason questions, ensure that both statements are independently true before evaluating their relationship.

---

85. Match List-I with List-II

List-I (Year):	**List-II (Milestone):**
(A) 1952	(I) Agricultural Technology Management Agency (ATMA)
(B) 1964	(II) Community Development Program
(C) 1998	(III) Intensive Agricultural District Program
(D) 1960	(IV) Intensive Agricultural Area Program

(1) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

(2) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(3) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)

(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (1) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

Solution:

1952 corresponds to the start of the Intensive Agricultural District Program, while the Community Development Program began in 1964. ATMA was launched in 1998, and the Intensive Agricultural Area Program started in 1960.

Quick Tip

Remember milestone years of agricultural development programs to tackle match-the-following questions effectively.

86. Conversion period of an organic farm is generally (for perennial crop):

(1) One year

(2) Two year

(3) Three year

(4) Four year

Correct Answer: (3) Three year

Solution:

As per NPOP guidelines in India, the conversion period for perennial crops in organic farming is typically three years to ensure the complete elimination of residues from earlier chemical farming practices.

Quick Tip

Remember: The conversion period is crucial to qualify for organic certification standards.

---

87. Bone meal is a source of:

(A) Ca

(B) N

(C) P

(D) Mo

(1) (A), (B) and (D) only.

(2) (A), (B) and (C) only.

(3) (A), (B), (C) and (D).

(4) (B), (C) and (D) only.

Correct Answer: (2) (A), (B) and (C) only.

Solution:

Bone meal is an organic fertilizer primarily rich in calcium (Ca) and phosphorus (P), and to a lesser extent, nitrogen (N). It does not provide molybdenum (Mo).

Quick Tip

Bone meal is especially useful in organic farming for promoting root growth and flower development.

---

88. Match List-I with List-II

List-I (Name of Gas) **List-II (Chemical Formula)**

(A) Methane (I) C_3H_8

(B) Ethane (II) CH_4

(C) Propane (III) C_4H_{10}

(D) Butane (IV) C_2H_6

(1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(2) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

(3) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)

(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (2) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

Solution:

Methane = CH_4, Ethane = C_2H_6, Propane = C_3H_8, and Butane = C_4H_{10}.

Quick Tip

Alkanes follow the general formula C_nH_{2n+2}.

---

89. K fixing power of clay minerals follows the order:

(A) Illite

(B) Montmorillonite

(C) Kaolinite

(D) Vermiculite

(1) (A), (B), (C), (D)

(2) (D), (A), (B), (C)

(3) (B), (A), (D), (C)

(4) (C), (B), (D), (A)

Correct Answer: (2) (D), (A), (B), (C)

Solution:

The potassium (K) fixing capacity decreases in the following order: Vermiculite > Illite > Montmorillonite > Kaolinite.

Quick Tip

K fixation depends on the layer charge and interlayer spaces in clay minerals.

---

90. Release of iron from primary minerals and their dispersal as coatings on soil particles to impart brown to red colour to soil particles is called:

(A) Braunification

(B) Ferruginisation

(C) Rubification

(D) Laterisation

(1) (A), (B) and (D) only.

(2) (B), (C) and (D) only.

(3) (A), (B) and (C) only.

(4) (A), (C) and (D) only.

Correct Answer: (3) (A), (B) and (C) only.

Solution:

Braunification, Ferruginisation, and Rubification all involve iron oxide formation or deposition that imparts red to brown coloration in soils. Laterisation is more associated with intense weathering and leaching.

Quick Tip

Processes related to iron often result in distinct red, brown, or yellow hues in soils.

---

91. Trace elements that show affinity for sulphide minerals are called

(1) Siderophile

(2) Chalcophile

(3) Lithophile

(4) Hydrophile

Correct Answer: (2) Chalcophile

Solution:

Chalcophile elements are those that show a strong affinity for sulfur and tend to associate with sulfide minerals. These include elements like Cu, Pb, Zn, etc.

Quick Tip

Remember: ”Chalco” refers to sulfur-based compounds — chalcophile means sulfur-loving.

---

92. Mixing of soil matrix within a pedon resulting in irregular or broken horizons over permafrost is called

(1) Eluviation

(2) Pedoturbation

(3) Illuviation

(4) Cryoturbation

Correct Answer: (4) Cryoturbation

Solution:

Cryoturbation is the process involving the mixing of soil layers due to freeze-thaw actions, especially over permafrost, causing horizon disturbance.

Quick Tip

Cryo = cold. Cryoturbation is commonly found in tundra and permafrost regions.

---

93. Given below are two statements:

Statement (I): 2:1 layer silicates consist of two tetrahedral sheets bound to either side of an octahedral sheet

Statement (II): Two tetrahedral sheets of 2:1 layer silicates is bound to one side of an

octahedral sheet in 2:1 layer silicates

(1) Both Statement (I) and Statement (II) are correct.

(2) Both Statement (I) and Statement (II) are incorrect.

(3) Statement (I) is correct but Statement (II) is incorrect.

(4) Statement (I) is incorrect but Statement (II) is correct.

Correct Answer: (3) Statement (I) is correct but Statement (II) is incorrect.

Solution:

In 2:1 clay minerals like montmorillonite, two tetrahedral sheets sandwich an octahedral sheet. Statement I is accurate. Statement II wrongly states the configuration.

Quick Tip

2:1 clays always follow tetrahedral-octahedral-tetrahedral arrangement.

---

94. Assertion (A): Organic mulch conserves soil moisture.

Reason (R): Organic mulches cut off solar radiation falling on the soil surface and reduce evaporation.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:

Organic mulches reduce soil temperature and minimize evaporation by blocking solar radiation, thus helping retain soil moisture. Hence, both statements are true and R correctly explains A.

Quick Tip

Mulches help conserve water by acting as a protective barrier from sun and wind.

---

95. When rainfall is inadequate to meet the evapotranspiration losses, usually

occurring in humid regions, it is called

(1) Invisible drought

(2) Contingent drought

(3) Meteorological drought

(4) Permanent drought

Correct Answer: (1) Invisible drought

Solution:

Invisible drought occurs when rainfall appears adequate but does not fulfill the water requirements due to high evapotranspiration, mostly seen in humid zones.

Quick Tip

Invisible drought = hidden water stress despite frequent rain.

---

96. In the International Union of Soil Science classification system, fine sand has a size range of

(1) 0.2 - 2.0 mm

(2) 0.02 - 0.2 mm

(3) 0.002 - 0.02 mm

(4) ¡0.002 mm

Correct Answer: (2) 0.02 - 0.2 mm

Solution:

According to the International Union of Soil Sciences, fine sand ranges from 0.02 mm to 0.2 mm in particle size.

Quick Tip

Memorize soil particle sizes: Fine sand = 0.02–0.2 mm; Silt = 0.002–0.02 mm; Clay ¡ 0.002 mm.

---

97. Ecological races are also known as

(1) Ecards

(2) Ecotone

(3) Ecophens

(4) Ecotypes

Correct Answer: (4) Ecotypes

Solution:

Ecological races, which are genetically distinct populations within a species that are adapted to specific environmental conditions, are known as ecotypes. These variations help the organisms survive better in their particular habitat.

Quick Tip

Ecotypes are a result of long-term adaptation of species to local environmental conditions.

---

98. Match List-I with List-II

List-I (Soil Order)	**List-II (Characteristics)**
(A) Ultisols	(III) Base saturation <35% with argillic or kandic horizon.
(B) Vertisols	(II) Clay-rich soils with swelling shrinkage properties according to soil moisture content.
(C) Mollisols	(I) Deep soils with high organic matter content and more than 50% base saturation.
(D) Alfisols	(IV) Soils that have argillic, kandic, or nitric horizon and a base saturation of 35% or greater with ochric epipedon, but may have an umbric epipedon.

Correct Answer: (4) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

Solution:

Each soil order has distinctive features. Ultisols have low base saturation, Vertisols are

known for their shrink-swell capacity, Mollisols are rich in organic matter and nutrients, and Alfisols have a higher base saturation with well-developed horizons.

Quick Tip

Understanding soil taxonomy helps in classifying soil types based on their physical and chemical properties.

---

99. Which sugar is present in DNA?

(1) Ribose

(2) Arabinose

(3) Deoxyribose

(4) Glucose

Correct Answer: (3) Deoxyribose

Solution:

DNA (Deoxyribonucleic acid) contains deoxyribose as its sugar component. It differs from ribose (found in RNA) by lacking one oxygen atom.

Quick Tip

DNA contains deoxyribose; RNA contains ribose — remember the 'deoxy' refers to missing one oxygen atom.

---

100. The soil hydraulic head is expressed by

(1) Potential energy per unit mass of soil water.

(2) Potential energy per unit volume of soil water.

(3) Potential energy per unit weight of soil water.

(4) Height of standing water on the soil surface.

Correct Answer: (3) (A), (B), (C) and (D).

Solution:

Hydraulic head in soil physics can be expressed in terms of energy per unit mass, volume, or weight. It can also be physically interpreted as the height of water above a reference point.

Quick Tip

Hydraulic head can be measured in terms of energy or actual water height — all are valid representations.

---

101. Assertion (A): Cover cropping is a common practice in organic farming systems. Reason (R): Cover crops help to improve soil health, suppress weeds, and enhance biodiversity, aligning with the principles of organic agriculture.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:

Cover cropping is widely used in organic farming. It enhances soil fertility, controls weeds, and promotes biodiversity. The reason provided fully supports and explains the assertion.

Quick Tip

Cover crops play a multi-functional role in organic systems — remember they are not just for covering soil!

---

102. Father of Modern Organic Agriculture is

(1) John Howard

(2) Nicholas Lampkin

(3) Lord Northbourne

(4) Masanobu Fukuoka

Correct Answer: (1) John Howard

Solution:

Sir Albert Howard (often confused with John Howard) is widely considered the father of modern organic agriculture due to his pioneering work on composting and natural farming

practices.

Quick Tip

John Howard is often mentioned in error — it's actually Sir Albert Howard credited with founding modern organic farming.

---

103. Which one of the following is not a monosaccharide?

(1) Glucose

(2) Fructose

(3) Rhamnose

(4) Maltose

Correct Answer: (4) Maltose

Solution:

Monosaccharides are the simplest form of carbohydrates consisting of single sugar units like glucose, fructose, and rhamnose. Maltose, on the other hand, is a disaccharide made up of two glucose units joined by a glycosidic bond.

Quick Tip

Monosaccharides are single sugar molecules, whereas disaccharides are made of two monosaccharide units.

---

104. The characteristic of Saline-Alkali soil are

(1) pH $>$ 8.5, EC$<$ 4 dSm^{-1}, ESP $>$ 15

(2) pH $>$ 8.5, ESP $<$ 15, EC $>$ 4 dSm^{-1}

(3) pH $<$ 8.5, ESP $>$ 15, EC $<$ 4 dSm^{-1}

(4) pH $>$ 8.5, ESP $>$ 15, EC $<$ 4 dSm^{-1}

Correct Answer: (4) pH $>$ 8.5, ESP $>$ 15, EC $<$ 4 dSm^{-1}

Solution:

Saline-Alkali soils are characterized by high pH ($>$ 8.5), high exchangeable sodium percentage (ESP $>$ 15), and low electrical conductivity (EC $<$ 4 dSm^{-1}), indicating low

soluble salt content but high sodium hazard.

Quick Tip

Remember: High pH, high ESP, and low EC are indicators of sodic (alkali) soils.

---

105. Which of the following statement(s) is/are true for tensiometer?

(A). It measures soil water potential.

(B). It is simple in operation and very useful for scheduling irrigation.

(C). It can also be used for measuring soil water flux.

(D). Although limited to < 1 bar matric potential, this range can be increased by increasing the permeability of its porous cup.

1. (A), (B) and (C) only.
2. (A), (B) and (D) only.
3. (A) and (D) only.
4. (D) only.

Correct Answer: 2. (A), (B) and (D) only.

Solution:

Tensiometers are used to measure soil water potential (A) and are commonly used for irrigation scheduling (B). While limited to < 1 bar, improvements in porous cup design can extend their use (D). They are not suitable for directly measuring water flux (C).

Quick Tip

Tensiometers are best for monitoring water availability in the field, especially in the range close to field capacity.

---

106. The most dominant exchangeable cation in the earth's crust

(1) Aluminium

(2) Calcium

(3) Sodium

(4) Magnesium

Correct Answer: (2) Calcium

Solution:

Calcium is the most dominant exchangeable cation in soils due to its abundance in minerals and its strong ability to hold onto cation exchange sites.

Quick Tip

Among basic cations in soil, Ca^{2+} is usually present in the highest quantity.

---

107. Who first observed that legumes can utilize atmospheric nitrogen?

(1) M. W. Beijerinck

(2) J. B. Boussingault

(3) A. I. Virtanen

(4) G. S. Sekhon

Correct Answer: (2) J. B. Boussingault

Solution:

J. B. Boussingault was the first to demonstrate that legumes are capable of fixing atmospheric nitrogen with the help of symbiotic rhizobia in root nodules.

Quick Tip

J. B. Boussingault is recognized for his pioneering work in nitrogen fixation in legumes.

---

108. Element associated with urease activity

(1) Ni

(2) Mo

(3) Fe

(4) Co

Correct Answer: (1) Ni

Solution:

Nickel (Ni) is an essential component of the enzyme urease, which catalyzes the hydrolysis of urea into ammonia and carbon dioxide.

Quick Tip

Urease enzyme requires Ni as a cofactor for its biological activity.

---

109. Arrange the following in increasing the amount of nitrogen in the fertilizers:

(A) Ammonium sulphate

(B) Ammonium nitrate

(C) Ammonium chloride

(D) Calcium ammonium nitrate

1. (A), (B), (C), (D)
2. (A), (C), (B), (D)
3. (B), (A), (D), (C)
4. (A), (C), (D), (B)

Correct Answer: (4) (A), (C), (D), (B)

Solution:

Approximate nitrogen content: Ammonium sulphate (21%), Ammonium chloride (25%), Calcium ammonium nitrate (26%), Ammonium nitrate (33-34%). Hence, the increasing order is: (A), (C), (D), (B).

Quick Tip

Memorize typical N% values for common fertilizers to easily answer such order-based questions.

---

110. Given below are two statements:

Statement (I): Acid sulfate soils can release harmful concentrations of heavy metals such as aluminum, iron, and manganese into the environment under acidic conditions.

Statement (II): Acid sulfate soils are typically characterized by their high organic matter content, which contributes to their fertility and ability to support diverse plant life.

(1) Both Statement (I) and Statement (II) are true.

(2) Both Statement (I) and Statement (II) are false.

(3) Statement (I) is true but Statement (II) is false.

(4) Statement (I) is false but Statement (II) is true.

Correct Answer: (3) Statement (I) is true but Statement (II) is false.

Solution:

Acid sulfate soils can indeed release harmful levels of heavy metals under acidic conditions, affecting ecosystems. However, these soils are not typically rich in organic matter, contradicting Statement (II).

Quick Tip

Remember: Acid sulfate soils are chemically active under acidic conditions and can release toxic elements.

---

111. Assertion (A): Manganese deficiency in plants primarily affects the photosynthetic process.

Reason (R): Manganese is a cofactor for several enzymes involved in the photosynthetic electron transport chain, facilitating electron transfer reactions within chloroplasts.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:

Manganese plays a critical role in photosynthesis, particularly in the oxygen-evolving complex of photosystem II. Deficiency directly impacts this process.

Quick Tip

Manganese's key role in photosynthesis makes its deficiency particularly harmful to plant growth.

---

112. Match List-I with List-II:

List-I (Element)	List-II (Occurrence)
(A) Chloride	(III) Splitting of water
(B) Zinc	(I) Little leaf disease
(C) Sodium	(V) Interveinal chlorosis
(D) Manganese	(II) Regeneration of PEP
(E) Molybdenum	(IV) Nitrogen metabolism

(1) (A)-(III), (B)-(I), (C)-(V), (D)-(II), (E)-(IV)

(2) (A)-(III), (B)-(I), (C)-(II), (D)-(V), (E)-(IV)

(3) (A)-(III), (B)-(I), (C)-(IV), (D)-(III), (E)-(V)

(4) (A)-(III), (B)-(IV), (C)-(V), (D)-(V), (E)-(I)

Correct Answer: (1) (A)-(III), (B)-(I), (C)-(V), (D)-(II), (E)-(IV)

Solution:

Chloride is essential for the water-splitting step in photosynthesis. Zinc deficiency causes little leaf. Sodium may be linked to interveinal chlorosis, manganese is vital in PEP regeneration, and molybdenum in nitrogen metabolism.

Quick Tip

Use the specific symptoms and physiological roles of elements to aid in matching-type questions.

---

113. Assertion (A): Liming should not be done along with ammoniacal fertilizer application.

Reason (R): Liming leads to volatilisation loss of ammonia.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:

Liming raises soil pH, leading to the conversion of ammonium to ammonia gas, which volatilizes, resulting in nutrient loss. Hence, liming and ammoniacal fertilizer application

should be scheduled separately.

Quick Tip

Avoid liming and ammoniacal fertilizer application together to prevent nitrogen loss via volatilization.

---

114. Match List-I with List-II:

List-I (Type of pollution)	**List-II (Effect)**
(A) Point source pollution	(I) From a specific source (e.g., factory)
(B) Non-point source pollution	(II) Diffuse sources like runoff
(C) Groundwater pollution	(III) Contamination of underground water
(D) Surface water pollution	(IV) Lakes, rivers affected by multiple sources

(1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(2) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

(3) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Correct Answer: (1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Solution:

Point sources are discrete and identifiable. Non-point pollution comes from widespread activities like agriculture. Groundwater is affected by industrial spills, and surface water includes runoff, sewage, etc.

Quick Tip

Understand pollution sources and their characteristics for accurate matching in environmental science.

---

115. Assertion (A): Free silica occurs in soil's quartz and opal.

Reason (R): Quartz consists of a continuous framework of silica tetrahedra.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:

Quartz and opal are the main sources of free silica in soil. The crystalline structure of quartz is indeed composed of continuous SiO_4 tetrahedra, validating the reason.

Quick Tip

Free silica is commonly found as quartz and opal; quartz has a strong tetrahedral SiO_4 network.

---

116. A personnel who because of special interest and fitness is selected to serve as a leader in advancing some phase of local extension programme is called

(1) Project leader

(2) Cooperator

(3) Administrator

(4) Community leader

Correct Answer: (4) Community leader

Solution:

A community leader is a person who has been selected due to their influence, special interest, and fitness to help facilitate and promote various phases of local extension programmes. Their role is vital in disseminating information and motivating community involvement.

Quick Tip

Extension programmes often rely on community leaders to ensure effective communication and community participation.

---

117. Assertion (A): Intense weathering of soil shifts its Zero Point Charge towards higher pH owing to greater accumulation of iron and aluminium oxides.

Reason (R): The application of organic matter in soil also pushes the soil Zero Point Charge towards higher pH.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

Correct Answer: (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:

Zero Point Charge (ZPC) increases with accumulation of sesquioxides like Fe and Al due to intense weathering. Organic matter can also influence ZPC through surface interactions, justifying both statements.

Quick Tip

Zero Point Charge shifts reflect soil chemical changes; organic matter and metal oxides are both influential factors.

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118. Following are four stages of group development. Arrange them in order:

(A) Healing stage

(B) Development stage

(C) Stabilisation stage

(D) Formation stage

(1) (A), (B), (C), (D)

(2) (D), (B), (A), (C)

(3) (B), (A), (D), (C)

(4) (C), (B), (D), (A)

Correct Answer: (2) (D), (B), (A), (C)

Solution:

Group development typically progresses from formation to development, healing of any internal conflict, and finally stabilisation.

Quick Tip

Knowing the sequence of group development helps manage teams effectively in extension and social projects.

119. Water erosion follows the sequence:

(A) Ravine

(B) Sheet

(C) Splash

(D) Rill

(E) Gully

(1) (A), (B), (C), (D), (E)

(2) (C), (B), (D), (E), (A)

(3) (B), (A), (D), (C), (E)

(4) (C), (B), (A), (E), (D)

Correct Answer: (2) (C), (B), (D), (E), (A)

Solution:

The stages of water erosion start from splash erosion (raindrop impact), followed by sheet, rill, gully, and finally ravine erosion.

Quick Tip

Understanding erosion stages helps in soil conservation and planning anti-erosion measures.

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120. Laterisation involves the following:

(1) Removal of Fe and Al complexed with humus from upper to lower horizon

(2) Removal of silica from soil

(3) Removal of silica and accumulation of sesquioxides in soil

(4) Accumulation of sesquioxides in soil

Correct Answer: (3) Removal of silica and accumulation of sesquioxides in soil

Solution:

Laterisation is the process where silica is leached from the soil profile while Fe and Al oxides accumulate, leading to sesquioxides dominance in the soil.

Quick Tip

Laterite soils are typically rich in iron and aluminium oxides due to intense leaching of silica.
