

MP RAO Memory Based Paper Held on 17 Sept. 2026

Q1. Which is the most commonly used empirical model for soil erosion prediction in watersheds?

- (a) WEPP model
- (b) Universal Soil Loss Equation (USLE)
- (c) SWAT model
- (d) RUSLE model

S1. Ans.(b)

Sol.

- Correct Answer: (b) Universal Soil Loss Equation (USLE)
- The Universal Soil Loss Equation (USLE) is one of the most widely used empirical models for estimating average annual soil loss due to water erosion.
- The USLE was developed by Wischmeier and Smith based on extensive field-plot data collected in the United States.
- The equation is represented as: $A = R \times K \times L \times S \times C \times P$.
- In this equation, A represents average annual soil loss; R represents rainfall erosivity; K represents soil erodibility; L represents slope length; S represents slope steepness; C represents crop-management factor; and P represents conservation-practice factor.
- USLE is called an empirical model because it is based mainly on statistical relationships derived from observed field data rather than a detailed simulation of the physical processes of erosion.
- It is widely applied in watershed management, soil conservation planning and estimation of potential soil loss.
- Information Booster:
 - o Full Form: USLE – Universal Soil Loss Equation.
 - o Developers: W. H. Wischmeier and D. D. Smith.
 - o Main purpose: Estimation of average annual soil loss by sheet and rill erosion.
 - o Revised form: RUSLE – Revised Universal Soil Loss Equation.
 - o WEPP is a process-based erosion prediction model, whereas USLE is an empirical model.
- Why other options are incorrect:
 - o (a) WEPP model: Incorrect. WEPP stands for Water Erosion Prediction Project and is a process-based model rather than the classical empirical USLE model.
 - o (b) Universal Soil Loss Equation (USLE): Correct. It is a widely used empirical equation for estimating soil loss due to water erosion.
 - o (c) SWAT model: Incorrect. SWAT stands for Soil and Water Assessment Tool and is primarily a watershed-scale model used for hydrology, water quality, sediment and agricultural processes.
 - o (d) RUSLE model: Incorrect in the context of the classical question. RUSLE is the revised version of USLE. Although RUSLE is also widely used, the traditional answer to this question is USLE.

Q2. In Agri. extension, which communication method is considered more participatory and interactive?

- (a) Written communication
- (b) Lecture method
- (c) Group discussion
- (d) Demonstration



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S2. Ans.(c)

Sol.

- Correct Answer: (c) Group discussion
- Group discussion is a highly participatory and interactive communication method used in agricultural extension.
- In group discussion, extension personnel and farmers communicate with one another and exchange information, experiences, opinions and ideas.
- Unlike written communication and lectures, group discussion allows immediate feedback and provides opportunities for participants to ask questions and clarify doubts.
- Farmers can contribute their indigenous knowledge and practical experiences, making the communication process more democratic and participatory.
- Group discussion is particularly useful when the objective is to understand farmers' problems, develop solutions collectively and encourage adoption of improved agricultural practices.
- **Information Booster:**
 - o Communication in agricultural extension may be individual, group or mass communication.
 - o Group discussion is a group-contact method of extension education.
 - o Important advantages include interaction, feedback, exchange of experiences and active participation.
 - o Other group methods include demonstrations, field days, group meetings and training programmes.
- **Why other options are incorrect:**
 - o (a) Written communication: Incorrect. Written communication generally provides information through printed or written material and offers limited immediate interaction.
 - o (b) Lecture method: Incorrect. A lecture is primarily an oral presentation in which information flows mainly from the speaker to the audience.
 - o (c) Group discussion: Correct. It encourages active participation, exchange of views and two-way communication.
 - o (d) Demonstration: Incorrect for this particular question. Demonstrations are highly effective for teaching practical skills, but group discussion is specifically characterized by direct exchange and interactive participation among participants.

Q3. Which crop is specifically identified as the major Rabi crop in India?

- (a) Rice
- (b) Maize
- (c) Bajra
- (d) Wheat

S3. Ans.(d)

Sol.

- Correct Answer: (d) Wheat
- Wheat is the major Rabi cereal crop of India and is one of the most important food-grain crops cultivated during the winter season.
- Rabi crops are generally sown after the withdrawal of the southwest monsoon and are harvested during spring or early summer.
- Wheat requires cool conditions during its vegetative growth and relatively warm and dry conditions during grain maturation.

● Major wheat-growing regions include the Indo-Gangetic Plains and parts of central and peninsular India.

● Wheat is important for India's food security and is a major source of carbohydrates and dietary protein.

● **Information Booster:**

o Scientific name: *Triticum aestivum* is the major bread-wheat species cultivated in India.

o Family: Poaceae.

o Season: Predominantly Rabi.

o Important requirements: Cool weather during vegetative growth and comparatively dry conditions at maturity.

o Major wheat-producing states include Uttar Pradesh, Madhya Pradesh, Punjab, Haryana and Rajasthan.

● **Why other options are incorrect:**

o (a) Rice: Incorrect. Rice is predominantly a Kharif crop in India, although it can also be cultivated in other seasons under suitable irrigation and climatic conditions.

o (b) Maize: Incorrect. Maize is grown in Kharif, Rabi and spring seasons in different parts of India, but it is not the major Rabi crop represented by the options.

o (c) Bajra: Incorrect. Pearl millet or bajra is predominantly cultivated as a Kharif crop and is especially adapted to warm and relatively dry conditions.

o (d) Wheat: Correct. Wheat is the principal Rabi cereal and a major Rabi crop of India.

Q4. Which of the following is the 1st phase of the Calvin cycle?

(a) Reduction

(b) Carboxylation

(c) Oxidation

(d) Regeneration

S4. Ans.(b)

Sol.

● Correct Answer: (b) Carboxylation

● The Calvin cycle is the major carbon-fixation pathway occurring in the chloroplast stroma of green plants.

● It is conventionally divided into three major phases: carboxylation, reduction and regeneration.

● The first phase is carboxylation, during which carbon dioxide is fixed into the five-carbon compound ribulose-1,5-bisphosphate (RuBP).

● The enzyme RuBisCO catalyses the fixation of CO_2 to RuBP.

● The unstable six-carbon intermediate formed during this reaction rapidly splits into two molecules of 3-phosphoglycerate (3-PGA).

● The second phase is reduction, during which 3-PGA is converted into triose phosphate using ATP and NADPH generated during the light reactions of photosynthesis.

● The third phase is regeneration, during which RuBP is regenerated so that the cycle can continue.

● **Information Booster:**

o Calvin cycle is also called the Calvin-Benson cycle.

o Site: Stroma of chloroplast.

- o CO_2 acceptor: RuBP.
- o Enzyme responsible for initial carbon fixation: RuBisCO.
- o Three phases: Carboxylation $\rightarrow$ Reduction $\rightarrow$ Regeneration.

● **Why other options are incorrect:**

- o (a) Reduction: Incorrect. Reduction is the second major phase of the Calvin cycle.
- o (b) Carboxylation: Correct. It is the first phase in which CO_2 is fixed to RuBP.
- o (c) Oxidation: Incorrect. Oxidation is not one of the three conventional phases of the Calvin cycle.
- o (d) Regeneration: Incorrect. Regeneration is the third phase and involves regeneration of RuBP.

Q5. Which of the following is most effective for sodant derived humigulator?

- (a) Aluminium phosphide
- (b) Hydrogen cyanide
- (c) Sulphur dioxide
- (d) Methyl bromide

S5. Ans.(a)

Sol.

- Correct Answer: (a) Aluminium phosphide

● The wording of the question appears to contain typographical errors. From the options and the given answer, the intended context is fumigation of stored agricultural commodities or grain.

● Aluminium phosphide is one of the most important fumigants used for controlling insect pests in stored grains and other stored commodities.

● Aluminium phosphide reacts with moisture and releases phosphine gas, which is highly toxic to insects and other organisms.

● The gas can penetrate through bulk stored grain and reach insects present within the stored material.

● Aluminium phosphide is therefore widely associated with stored-grain pest management and fumigation.

● **Information Booster:**

- o Common fumigant: Aluminium phosphide.
- o Active fumigant gas released: Phosphine (PH_3).
- o Main use: Fumigation of stored grains and storage structures.
- o It should be handled only by trained and authorized personnel because phosphine is highly poisonous.
- o Fumigation is different from ordinary contact insecticide application because the toxic substance acts in gaseous form.

● **Why other options are incorrect:**

- o (a) Aluminium phosphide: Correct. It releases phosphine gas and is a widely used fumigant for stored grain pest management.
- o (b) Hydrogen cyanide: Incorrect. Hydrogen cyanide has historically been used as a fumigant but is extremely toxic and is not the standard answer for the commonly used stored-grain fumigant represented here.
- o (c) Sulphur dioxide: Incorrect. Sulphur dioxide is not the standard fumigant used for routine stored-grain insect control in the context of this question.
- o (d) Methyl bromide: Incorrect. Methyl bromide was historically used as an important fumigant, but its use has been greatly restricted because of its ozone-depleting properties.

Q6. The grassroots-level cooperative society that provides short-term credit and other services to farmers, particularly in rural areas, is:

- (a) Pro Agri Credit Societies
- (b) Primary Agri Credit Societies
- (c) Tertiary Agri Credit Societies
- (d) Agri Technology Mgmt Agency

S6. Ans.(b)

Sol.

- Correct Answer: (b) Primary Agri Credit Societies
- The intended term is **Primary Agricultural Credit Societies (PACS)**.
- PACS are the grassroots-level institutions of India's short-term cooperative credit structure.
- They operate at the village or local level and provide agricultural credit and related services to their members, particularly farmers.
- PACS primarily provide short-term and medium-term loans for agricultural and allied activities.
- They may also undertake activities such as distribution of agricultural inputs, collection and marketing of agricultural produce and other services depending on their functions and local arrangements.

● **Information Booster:**

- o Full Form: PACS – Primary Agricultural Credit Societies.
- o Level: Grassroots/village level.
- o Main function: Provision of short-term and medium-term cooperative credit.
- o PACS form the lowest tier of the short-term cooperative credit structure.
- o Higher cooperative credit institutions include District Central Cooperative Banks and State Cooperative Banks.

● **Why other options are incorrect:**

- o (a) Pro Agri Credit Societies: Incorrect. This is not the standard institutional term used in India's cooperative credit structure.
- o (b) Primary Agri Credit Societies: Correct. The intended term is Primary Agricultural Credit Societies, which operate at the grassroots level.
- o (c) Tertiary Agri Credit Societies: Incorrect. This is not a standard tier of India's short-term cooperative credit structure.
- o (d) Agri Technology Mgmt Agency: Incorrect. ATMA refers to Agricultural Technology Management Agency and is associated with agricultural extension rather than being a grassroots cooperative credit institution.

Q7. A water shed is a topographically delineated area that drains into:

- (a) A single channel
- (b) Multiple watersheds/channels
- (c) Artificial reservoirs only
- (d) Underground aquifers only

S7. Ans.(a)

Sol.

- Correct Answer: (a) A single channel
- A watershed is a topographically delineated area from which water drains through a common drainage system toward a common outlet.
- The boundaries of a watershed are generally determined by ridges, elevated terrain or other topographic features that separate one drainage area from another.
- Rainfall occurring within a watershed contributes to runoff, infiltration, groundwater recharge and other hydrological processes within that drainage unit.
- In the conventional definition used in watershed-management studies, a watershed is an area draining into a single channel or common outlet.
- Watersheds can be divided into smaller units such as sub-watersheds, mini-watersheds and micro-watersheds depending on their size and management requirements.
- **Information Booster:**
 - o Watershed: A natural hydrological unit defined primarily by topography and drainage.
 - o Watershed boundary: Usually follows ridges or drainage divides.
 - o Main objective of watershed management: Conservation and efficient management of soil, water and vegetation resources.
 - o Watershed management integrates measures for reducing runoff, soil erosion and land degradation.
- **Why other options are incorrect:**
 - o (a) A single channel: Correct. A watershed conventionally drains toward a common outlet or channel.
 - o (b) Multiple watersheds/channels: Incorrect. A watershed may contain several tributaries and smaller drainage channels, but the defining feature is drainage toward a common outlet.
 - o (c) Artificial reservoirs only: Incorrect. A watershed is a natural topographical and hydrological unit and is not restricted to artificial reservoirs.
 - o (d) Underground aquifers only: Incorrect. Groundwater is an important component of watershed hydrology, but a watershed is not defined as an area draining only into underground aquifers.

Q8. Which of the following is the primary source of soil formation?

- (a) Air
- (b) Photosynthesis
- (c) Parent material
- (d) Water

S8. Ans.(c)

Sol.

- Correct Answer: (c) Parent material
- Parent material is the mineral material from which soil develops. It is therefore considered a fundamental source of the mineral fraction of soil.
- Parent material may consist of weathered rock, unconsolidated sediments, alluvial deposits, colluvial materials, aeolian deposits or other geological materials.
- Through physical, chemical and biological weathering, parent material is transformed into smaller particles and new minerals that contribute to soil formation.

● The classical soil-forming factors are commonly expressed as parent material, climate, organisms, relief or topography and time.

● Parent material influences the initial mineral composition, texture, colour, drainage and chemical characteristics of the developing soil.

● **Information Booster:**

o Five classical soil-forming factors: Parent material, climate, organisms, relief and time.

o Weathering processes: Physical, chemical and biological weathering.

o Parent material supplies much of the mineral matter from which soil develops.

o Organic matter is contributed largely through plants, animals and microorganisms.

● **Why other options are incorrect:**

o (a) Air: Incorrect. Air is an important component of soil and participates in weathering and biological processes, but it is not the primary source material for soil formation.

o (b) Photosynthesis: Incorrect. Photosynthesis produces organic compounds in green plants and is not itself a source of the mineral material from which soil forms.

o (c) Parent material: Correct. It provides the basic mineral material from which soil develops.

o (d) Water: Incorrect. Water is a major agent of weathering, transport and soil-forming reactions, but it is not the primary parent material of soil.

Q9. The specific amount of energy associated with a photon is called:

(a) Radiation pressure

(b) Spectrum

(c) Photon flux

(d) Quantum

S9. Ans.(d)

Sol.

● Correct Answer: (d) Quantum

● A quantum is a discrete packet or unit of energy associated with electromagnetic radiation.

● In the case of electromagnetic radiation, an individual quantum is commonly referred to as a photon.

● The energy of a photon is expressed by the equation $E = h\nu$, where E is photon energy, h is Planck's constant and ν is the frequency of radiation.

● Therefore, photon energy is directly proportional to frequency. Radiation of higher frequency has photons with greater energy.

● This concept is important in understanding the interaction of light with matter and is fundamental to quantum theory.

● **Information Booster:**

o Photon: A quantum or discrete packet of electromagnetic radiation.

o Energy equation: $E = h\nu$.

o h : Planck's constant.

o ν : Frequency of radiation.

o Higher frequency means higher photon energy.

● **Why other options are incorrect:**

o (a) Radiation pressure: Incorrect. Radiation pressure is the pressure exerted by electromagnetic radiation due to transfer of momentum; it is not the energy associated with an individual photon.

o (b) Spectrum: Incorrect. A spectrum is the distribution of electromagnetic radiation according to wavelength, frequency or energy.

- o (c) Photon flux: Incorrect. Photon flux refers to the number of photons passing through a specified area per unit time.
- o (d) Quantum: Correct. A quantum represents a discrete packet of energy, and a photon is a quantum of electromagnetic radiation.

Q10. Which of the following soil type has the highest cation exchange capacity?

- (a) Sandy
- (b) Silty
- (c) Clay
- (d) Loamy

S10. Ans.(c)

Sol.

- Correct Answer: (c) Clay
- Clay soil generally has the highest cation exchange capacity among the soil-texture classes given in the question.
- Cation exchange capacity, or CEC, is the total quantity of exchangeable positively charged ions that a soil can retain and exchange with the soil solution.
- Clay particles have very small particle sizes and a very large specific surface area. Their surfaces generally possess negative charges that attract and retain cations such as Ca^{2+} , Mg^{2+} , K^+ and NH_4^+ .
- Therefore, clay-rich soils generally have greater CEC than sandy soils.
- The actual CEC also depends on the type of clay mineral and the amount of soil organic matter. For example, smectite generally has a much higher CEC than kaolinite.
- **Information Booster:**
 - o CEC is expressed commonly as $\text{cmol(p+)} \text{ kg}^{-1}$ soil.
 - o Important exchangeable cations include Ca^{2+} , Mg^{2+} , K^+ and Na^+ .
 - o Organic matter can contribute substantially to soil CEC.
 - o Smectite generally has higher CEC than illite, while kaolinite has relatively low CEC.
 - o High CEC generally indicates greater capacity of soil to retain nutrient cations.
- **Why other options are incorrect:**
 - o (a) Sandy: Incorrect. Sandy soils generally have low CEC because sand particles have comparatively low surface area and limited charge.
 - o (b) Silty: Incorrect. Silt generally has greater surface area than sand but normally has lower CEC than clay.
 - o (c) Clay: Correct. Clay-rich soils generally have the highest CEC among the textural classes listed.
 - o (d) Loamy: Incorrect. Loam is a textural class containing a mixture of sand, silt and clay. Its CEC depends on its clay and organic-matter contents but is generally lower than that of clay-rich soil.

Q11. Which one of the following element is responsible for prosthetic groups and ionic balance in enzyme conformation and catalytic function?

- (a) Potassium
- (b) Nitrogen
- (c) Boron
- (d) Phosphorus

S11. Ans.(a)

Sol.

- Correct Answer: (a) Potassium
- Potassium is an essential plant nutrient that plays an important role in enzyme activation, ionic balance, osmotic regulation and maintenance of cellular homeostasis.
- Unlike nitrogen and phosphorus, potassium generally does not form a major structural component of organic compounds in plants. It primarily functions as the K^+ ion.
- K^+ activates or regulates the activity of numerous enzymes and can influence protein conformation and catalytic activity.
- Potassium also helps maintain the ionic balance of cells and regulates osmotic potential and water relations.
- It contributes to stomatal regulation, which is important for controlling transpiration and CO_2 exchange.
- **Information Booster:**
 - o Symbol: K.
 - o Nutrient category: Primary macronutrient.
 - o Absorbed by plants mainly as: K^+ .
 - o Major functions: Enzyme activation, osmotic regulation, ionic balance, stomatal regulation and water relations.
 - o Potassium generally remains in ionic form rather than becoming a structural component of organic plant molecules.
- **Why other options are incorrect:**
 - o (a) Potassium: Correct. Potassium is strongly associated with enzyme activation and maintenance of ionic and osmotic balance in plants.
 - o (b) Nitrogen: Incorrect. Nitrogen is a major constituent of amino acids, proteins, nucleic acids, chlorophyll and many other organic compounds, but the functions described in the question primarily point to potassium.
 - o (c) Boron: Incorrect. Boron is a micronutrient involved in cell-wall formation, membrane functions, reproductive development and several aspects of sugar transport and metabolism.
 - o (d) Phosphorus: Incorrect. Phosphorus is a primary macronutrient and an important component of ATP, nucleic acids and phospholipids, but it is not the principal nutrient associated with ionic balance and broad enzyme activation described here.

Q12. Which of the following is the end product of organic matter decomposition?

- (a) Humic acid
- (b) Humus
- (c) Fulvic acid
- (d) Lignin

S12. Ans.(b)

Sol.

- Correct Answer: (b) Humus
- Humus is the relatively stable and resistant organic fraction formed through the decomposition and transformation of plant and animal residues in soil.

- During decomposition, microorganisms break down organic residues into simpler compounds. Easily decomposable materials such as sugars, starches and proteins are rapidly utilized and mineralized.
- More resistant organic substances undergo transformation and humification, leading to the formation of relatively stable humified organic matter collectively referred to as humus.
- Humus is important for maintaining soil fertility and physical condition. It contributes to soil aggregation, water-holding capacity, nutrient retention and buffering capacity.
- Humified organic matter also contributes significantly to the cation exchange capacity of many soils.
- **Information Booster:**
 - o Humification: Process through which complex and relatively stable humified organic substances develop during decomposition.
 - o Humus: Relatively stable organic matter resulting from advanced decomposition and transformation.
 - o Humic substances are commonly discussed in terms of fractions such as humic acids, fulvic acids and humin.
 - o Decomposition also releases mineral nutrients through mineralization.
- **Why other options are incorrect:**
 - o (a) Humic acid: Incorrect. Humic acid is a fraction of humic substances and is not generally used as the overall term for the end product of organic-matter decomposition in this type of question.
 - o (b) Humus: Correct. Humus represents the relatively stable, humified fraction formed after decomposition and transformation of organic residues.
 - o (c) Fulvic acid: Incorrect. Fulvic acid is another fraction of humic substances and is not the overall end product referred to in the question.
 - o (d) Lignin: Incorrect. Lignin is a complex and relatively resistant component of plant tissues. It can contribute to humus formation but is not itself the final product of organic-matter decomposition.

Q13. Which one of the following amino acid is the precursor for Auxin biosynthesis?

- (a) Glutamine
- (b) Arginine
- (c) Histidine
- (d) Tryptophan

S13. Ans.(d)

Sol.

- Correct Answer: (d) Tryptophan
- Tryptophan is the principal amino acid associated with the biosynthesis of the natural auxin indole-3-acetic acid (IAA).
- IAA is the major naturally occurring auxin and plays important roles in plant growth and development.
- One major tryptophan-dependent pathway involves conversion of tryptophan into indole-3-pyruvic acid (IPA), followed by conversion of IPA into IAA.
- The TAA/TAR family of aminotransferases and YUCCA family of enzymes are important components of this pathway.
- Auxin regulates cell elongation, cell division and differentiation, apical dominance, root development, vascular differentiation and tropic responses.

● **Information Booster:**

- o Important natural auxin: Indole-3-acetic acid (IAA).
- o Important precursor: Tryptophan.
- o Major pathway: Tryptophan → Indole-3-pyruvate → IAA.
- o Important enzymes: TAA/TAR aminotransferases and YUCCA flavin monooxygenases.
- o Auxin is one of the major classes of plant growth regulators.

● **Why other options are incorrect:**

- o (a) Glutamine: Incorrect. Glutamine is an important nitrogen-containing amino acid involved in nitrogen assimilation and metabolism but is not the standard precursor for IAA biosynthesis in this question.
- o (b) Arginine: Incorrect. Arginine participates in nitrogen metabolism and is a precursor for several important metabolites, but it is not the classical amino-acid precursor of auxin.
- o (c) Histidine: Incorrect. Histidine has important metabolic and physiological functions but is not the principal precursor associated with IAA biosynthesis.
- o (d) Tryptophan: Correct. Tryptophan is the key amino-acid precursor associated with the major tryptophan-dependent pathways of auxin/IAA biosynthesis.

Q14. Which of the following most accurately describes the fundamental approach of the ATMA-based Extension Reforms?

S14. Ans. (b)

Sol. The correct answer is- (b) Decentralized, demand-driven and farmer-oriented extension

The **ATMA (Agricultural Technology Management Agency)** model was introduced to make agricultural extension more **decentralized, participatory, demand-driven and farmer-oriented**. Instead of relying primarily on a centralized, top-down system, the ATMA approach emphasizes identifying farmers' needs at the district and block levels and developing extension activities accordingly.

Important Points:

- **ATMA → Agricultural Technology Management Agency.**
- ATMA functions as a **district-level autonomous institution** for agricultural technology management.
- The approach emphasizes **bottom-up planning** and farmer participation.
- Extension activities are designed according to **farmers' needs and local priorities**.
- It promotes coordination among different **agriculture and allied departments**.
- Farmer participation is incorporated through mechanisms such as **Farmers Advisory Committees**.

Information Booster

- **Traditional approach:** Mainly top-down technology transfer.
- **ATMA approach:** Participatory, decentralized and demand-driven extension.
- **Key focus:** Farmers' needs, local conditions and convergence of extension activities.
- **ATMA structure:** District-level agency supported by block- and village-level extension mechanisms.

Why Other Options Are Incorrect

- **(a) Centralized, top-down technology transfer:** This represents the conventional extension approach rather than the participatory and decentralized philosophy of ATMA-based reforms.
- **(c) Input-subsidy-oriented agricultural development:** ATMA is primarily an **agricultural extension and technology-management framework**. Its fundamental objective is not to organize agricultural development around input subsidies.

- **(d) Research-institution-centred extension without farmer participation:** The ATMA approach specifically encourages **farmer participation and feedback**. Therefore, an extension system operating without farmer participation is contrary to its basic philosophy.

Q15. Consider the following institutional structure under the ATMA framework:

1. ATMA operates at the district level.
2. Block Technology Team (BTT) consists of representatives of line departments.
3. Block Farmers Advisory Committee (BFAC) provides farmer feedback and inputs.
4. Farmer Friend functions as a village-level link between farmers and the extension system.

S15. Ans. (c)

Sol. The correct answer is- (c) 1, 2, 3 and 4

All four statements correctly describe important components of the **ATMA-based institutional extension structure**. The framework establishes institutional arrangements at the **district, block and village levels** to improve coordination among extension agencies and strengthen farmer participation in agricultural extension.

Important Points:

- **ATMA** functions at the **district level**.
- **Block Technology Team (BTT)** facilitates coordination among the line departments and other agencies involved in agricultural extension.
- **Block Farmers Advisory Committee (BFAC)** provides a mechanism for incorporating **farmers' views, needs and feedback** into extension planning.
- **Farmer Friend** serves as a **village-level interface/link** between farmers and the extension system.
- Together, these institutions support a **decentralized and participatory extension system**.

Information Booster

- **District level** → ATMA
- **Block level** → Block Technology Team (BTT) + Block Farmers Advisory Committee (BFAC)
- **Village level** → Farmer Friend
- The institutional arrangement aims to improve **coordination, farmer participation and demand-driven extension planning**.

Why Other Options Are Incorrect

- **(a) Only 1 and 2:** Incorrect because Statements 3 and 4 are also consistent with the ATMA institutional framework.
- **(b) Only 2 and 3:** Incorrect because Statement 1, regarding the district-level functioning of ATMA, is also correct, and Statement 4 is also part of the village-level extension mechanism.
- **(c) 1, 2, 3 and 4: Correct.** All four statements correctly represent the institutional structure and participatory mechanisms associated with the ATMA-based extension system.
- **(d) Only 1, 3 and 4:** Incorrect because Statement 2 is also correct; the **Block Technology Team** includes representatives from relevant line departments and supports coordinated extension activities.

Q16. Which of the following crops is classified as a major Rabi crop in India?

- (a) Rice
- (b) Wheat
- (c) Maize
- (d) Groundnut

S16. Ans. (b)

Sol. The correct answer is- (b) Wheat

Wheat is one of the most important **Rabi crops** of India. Rabi crops are generally sown during the winter season, mainly from October to December, and harvested during the spring or early summer.

Wheat requires a relatively cool growing period during vegetative development and warmer, dry conditions during maturity and harvesting.

Important Points:

- **Wheat → Major Rabi cereal crop.**
- Rabi crops are generally sown after the monsoon season.
- Wheat is mainly cultivated during the **cool winter season**.
- Major Rabi crops include **wheat, barley, gram, lentil, rapeseed and mustard and safflower**.
- Adequate soil moisture and suitable winter temperatures are important for successful wheat production.

Information Booster

- **Rabi → Wheat, Gram, Mustard, Barley, Lentil**
- **Kharif → Rice, Maize, Groundnut, Cotton, Soybean**
- Wheat is a major cereal crop and an important contributor to India's food-grain production.
- The Rabi season generally extends from **October–November sowing to March–April harvesting**, although the exact period varies by crop and region.

Why Other Options Are Incorrect

- **(a) Rice:** Rice is predominantly a **Kharif crop** in India because it is generally cultivated during the monsoon season, although rice can also be grown in other seasons in specific regions.
- **(b) Wheat: Correct.** Wheat is one of the principal Rabi crops cultivated extensively across India.
- **(c) Maize:** Maize is predominantly cultivated as a **Kharif crop**, although Rabi and spring maize are also cultivated in several parts of India.
- **(d) Groundnut:** Groundnut is primarily associated with the **Kharif season** in India, although it can also be cultivated during other seasons under suitable conditions.

Q17. Which one of the following correctly differentiates the Block Technology Team (BTT) from the Block Farmers Advisory Committee (BFAC)?

- (a) BTT consists mainly of farmers, whereas BFAC consists of line-department officers.
- (b) BTT comprises officers from agriculture and allied line departments, whereas BFAC is composed of farmers.
- (c) Both BTT and BFAC consist exclusively of government officials.
- (d) BTT functions at the district level, whereas BFAC functions at the state level.

S17. Ans. (b)

Sol. The correct answer is- (b) BTT comprises officers from agriculture and allied line departments, whereas BFAC is composed of farmers.

The **Block Technology Team (BTT)** and **Block Farmers Advisory Committee (BFAC)** serve different but complementary functions within the ATMA-based extension system. The BTT primarily represents the technical and departmental side of extension at the block level, with officials from agriculture and allied line departments. In contrast, the BFAC provides a **farmer-oriented platform** through which farmers participate in identifying their needs, priorities and extension requirements.

Important Points:

- **BTT → Technical and departmental representatives at block level.**
- **BFAC → Farmer representatives at block level.**
- BTT supports **technical coordination and implementation** of extension activities.
- BFAC helps incorporate **farmers' needs, priorities and feedback** into extension planning.
- Both contribute to the **participatory and decentralized nature** of the ATMA extension system.

Information Booster

- **ATMA → District level**
- **BTT → Block-level technical/departmental coordination**
- **BFAC → Farmer participation and advisory mechanism**

- The ATMA approach emphasizes **bottom-up planning and farmer participation**.

Why Other Options Are Incorrect

- **(a) BTT consists mainly of farmers, whereas BFAC consists of line-department officers:** Incorrect. The roles are reversed. BTT is associated with officials from agriculture and allied departments, while BFAC represents farmers.
- **(b) BTT comprises officers from agriculture and allied line departments, whereas BFAC is composed of farmers: Correct.** This accurately distinguishes the institutional composition and roles of the two bodies.
- **(c) Both BTT and BFAC consist exclusively of government officials:** Incorrect. BFAC is specifically designed to provide **farmer representation and participation**.
- **(d) BTT functions at the district level, whereas BFAC functions at the state level:** Incorrect. Both are associated with the **block-level institutional structure** under the ATMA framework.

Q18. Which of the following sequences best represents the participatory logic of ATMA's district-level extension planning?

- (a) Farmer needs/problem identification → analysis of local resources & farming systems → formulation of research & extension strategies → activity planning
- (b) Central ministry decision → district allocation → farmer selection → technology adoption
- (c) Input subsidy allocation → procurement → distribution → technology demonstration
- (d) Agricultural research → publication → subsidy approval → farmer registration

S18. Ans. (a)

Sol. The correct answer is- (a) Farmer needs/problem identification → analysis of local resources & farming systems → formulation of research & extension strategies → activity planning

The ATMA approach is based on **participatory, decentralized and demand-driven extension planning**. Planning begins with identifying farmers' problems and needs at the local level. These needs are then assessed in relation to available resources and farming systems. Based on this assessment, appropriate research and extension strategies are formulated, followed by preparation of extension activities.

Important Points:

- ATMA promotes a **bottom-up approach** to extension planning.
- Farmer needs and local agricultural problems form the starting point.
- Local resources and farming systems are considered while developing strategies.
- Research and extension priorities are formulated according to identified needs.
- The process ultimately leads to **activity planning and implementation**.

Information Booster

- **Farmer needs → Problem identification → Strategy formulation → Activity planning**
- ATMA promotes **demand-driven extension** rather than purely top-down technology transfer.
- Participatory planning improves the relevance of extension programmes to local farming conditions.
- Farmer participation is an important feature of the ATMA model.

Why Other Options Are Incorrect

- **(a) Farmer needs/problem identification → analysis of local resources & farming systems → formulation of research & extension strategies → activity planning: Correct.** This sequence reflects the participatory and bottom-up planning philosophy of ATMA.
- **(b) Central ministry decision → district allocation → farmer selection → technology adoption:** Incorrect because it represents a predominantly **top-down administrative approach**, whereas ATMA emphasizes decentralized and participatory planning.
- **(c) Input subsidy allocation → procurement → distribution → technology demonstration:** Incorrect because ATMA's fundamental planning process is based on **identification of farmer needs and extension priorities**, not on input-subsidy distribution.

- **(d) Agricultural research → publication → subsidy approval → farmer registration:** Incorrect because it does not represent the **participatory, farmer-needs-based planning process** of ATMA.

Q19. Minimum Support Price (MSP) is currently announced by the Government of India for how many mandated agricultural crops?

- (a) 20 crops
- (b) 22 crops
- (c) 23 crops
- (d) 24 crops

S19. Ans. (b)

Sol. The correct answer is- (b) 22 crops

The Government of India announces **Minimum Support Prices (MSPs)** for **22 mandated agricultural crops** on the basis of recommendations of the **Commission for Agricultural Costs and Prices (CACP)**. These comprise **14 Kharif crops, 6 Rabi crops and 2 other commercial crops**. MSP is intended to provide remunerative prices to farmers and encourage production of important agricultural commodities.

Important Points:

- **Total MSP crops → 22**
- **Kharif crops → 14**
- **Rabi crops → 6**
- **Commercial crops → 2**
- MSP recommendations are made by the **CACP**.
- The Government takes several factors into consideration while determining MSP.

Information Booster

The 22 mandated crops include:

- **14 Kharif crops:** Paddy, Jowar, Bajra, Maize, Ragi, Arhar, Moong, Urad, Groundnut, Sunflower seed, Soybean, Sesamum, Nigerseed and Cotton.
- **6 Rabi crops:** Wheat, Barley, Gram, Masur, Rapeseed & Mustard and Safflower.
- **2 Commercial crops:** Jute and Copra.

Why Other Options Are Incorrect

- **(a) 20 crops:** Incorrect. The Government announces MSP for **22 mandated crops**, not 20.
- **(b) 22 crops: Correct.** MSP is currently announced for 22 mandated crops.
- **(c) 23 crops:** Incorrect. The officially recognized number of mandated MSP crops is **22**.
- **(d) 24 crops:** Incorrect. The number of crops for which MSP is announced is **22**, not 24.

Q20. Tomato Leaf Curl Virus (ToLCV) is primarily transmitted from infected plants to healthy tomato plants by which insect vector?

- (a) Aphid (*Aphis gossypii*)
- (b) Whitefly (*Bemisia tabaci*)
- (c) Thrips (*Thrips tabaci*)
- (d) Leafhopper (*Amrasca biguttula*)

S20. Ans. (b)

Sol. The correct answer is- (b) Whitefly (*Bemisia tabaci*)

Tomato Leaf Curl Virus (ToLCV) is primarily transmitted by the **whitefly, *Bemisia tabaci***. The insect acquires the virus while feeding on an infected tomato plant and subsequently transmits it to healthy plants during feeding. ToLCV belongs to the **begomovirus group**, which is characteristically transmitted by whiteflies.

Important Points:

- **Vector → Whitefly (*Bemisia tabaci*)**

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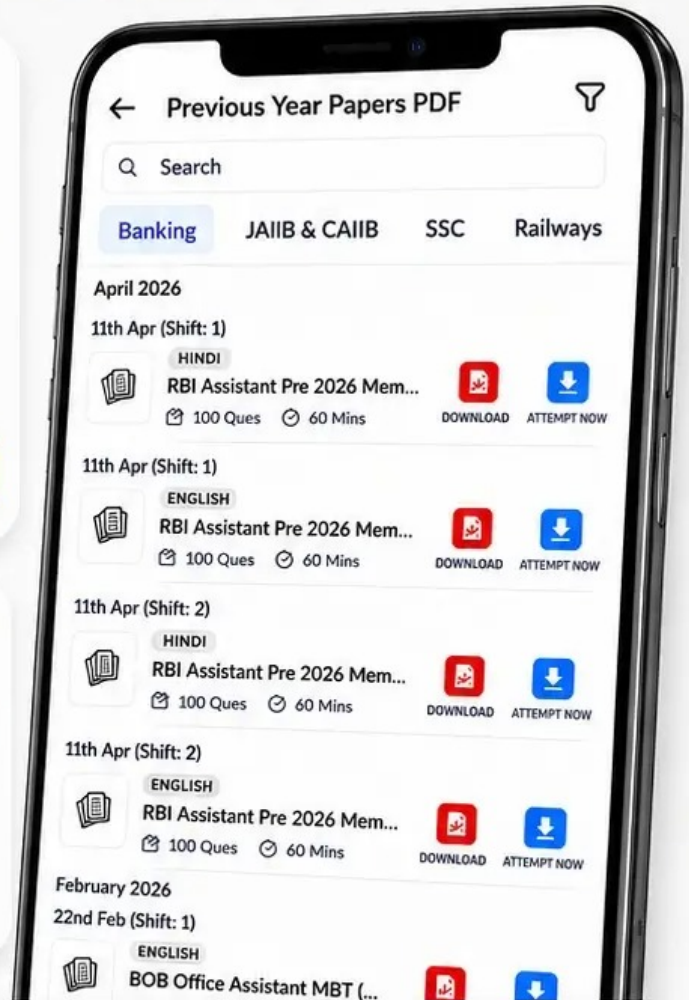
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-
- ToLCV is a major viral disease of tomato.
 - The virus belongs to the **genus Begomovirus**.
 - *Bemisia tabaci* is the principal vector responsible for its transmission.
 - Typical symptoms include **leaf curling, yellowing, stunting and reduced plant growth**.

Information Booster

- **ToLCV → Tomato leaf curl disease**
- **Major vector → *Bemisia tabaci***
- **Vector type → Whitefly**
- Begomoviruses are generally transmitted by **whiteflies in a persistent manner**.
- Management includes controlling the vector and using healthy planting material and resistant/tolerant varieties where available.

Why Other Options Are Incorrect

- **(a) Aphid (*Aphis gossypii*):** Incorrect. Aphids transmit several plant viruses, but *Aphis gossypii* is **not the principal vector of Tomato Leaf Curl Virus**.
- **(b) Whitefly (*Bemisia tabaci*):** **Correct.** *Bemisia tabaci* is the primary insect vector responsible for transmission of tomato leaf curl begomoviruses.
- **(c) Thrips (*Thrips tabaci*):** Incorrect. Thrips are important vectors of several viruses, particularly **tospoviruses/orthotospoviruses**, but they are not the primary vector of ToLCV.
- **(d) Leafhopper (*Amrasca biguttula*):** Incorrect. This leafhopper is an important pest of crops such as **cotton and okra**, but it is not the principal vector of Tomato Leaf Curl Virus.