

MP RAO Memory Based Paper 18 September 2026 Shift 1

Q1. With reference to the Minimum Support Price (MSP) policy of the Government of India, which of the following correctly describes the prescribed relationship between MSP and the all-India weighted average cost of production for mandated Kharif, Rabi and commercial crops?

- (a) MSP is fixed at a minimum margin of 25% above the cost of production
- (b) MSP is fixed at a minimum margin of 40% above the cost of production
- (c) MSP is fixed at a minimum margin of 50% above the cost of production
- (d) MSP is fixed at a minimum margin of 75% above the cost of production

S1. Ans. (c)

Sol. The correct answer is- (c) MSP is fixed at a minimum margin of 50% above the cost of production.

Since the Union Budget 2018–19, the Government has followed the principle of fixing MSPs at **at least 1.5 times the all-India weighted average cost of production** for the mandated crops. Therefore, the minimum return over the cost of production is **50%**. This principle applies to the mandated **Kharif, Rabi and commercial crops**.

Important Points:

- **1.5 times the cost = 150% of cost = 50% margin over cost.**
- There are **22 mandated MSP crops**: 14 Kharif, 6 Rabi and 2 commercial crops.
- The two mandated commercial crops are **jute and copra**.
- MSP recommendations are made by the **Commission for Agricultural Costs & Prices (CACP)**.

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- **14 Kharif crops:** Paddy, Jowar, Bajra, Maize, Ragi, Tur, Moong, Urad, Groundnut, Soyabean, Sunflower, Sesamum, Nigerseed and Cotton.
- **6 Rabi crops:** Wheat, Barley, Gram, Lentil (Masur), Rapeseed & Mustard and Safflower.
- **2 Commercial crops:** Jute and Copra.
- MSP is announced for **22 mandated crops**, whereas **sugarcane has Fair and Remunerative Price (FRP)** rather than MSP.

Why Other Options Are Incorrect

- **(a):** 25% is not the prescribed minimum margin under the current MSP policy.
- **(b):** 40% is not the prescribed minimum margin.
- **(c):** Correct. The prescribed minimum margin is **50% over the all-India weighted average cost of production**.
- **(d):** 75% is not the prescribed minimum margin. Individual crops may have margins higher than 50%, but 75% is not the general minimum requirement.

Q2. Sooty mould observed on the leaves and other aerial parts of plants is characterized primarily by which of the following combinations of symptoms and causal association?

- (a) Development of a white, superficial powdery growth caused exclusively by *Erysiphe* species on young leaves
- (b) Formation of a black, superficial, powdery to velvety fungal coating, commonly associated with fungi such as *Capnodium* growing on honeydew deposited by sap-sucking insects
- (c) Development of water-soaked lesions followed by rapid tissue necrosis due to systemic infection by *Phytophthora* species
- (d) Formation of yellow-orange pustules containing abundant urediniospores, characteristically produced by obligate rust fungi



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S2. Ans. (b)

Sol. The correct answer is- (b) Formation of a black, superficial, powdery to velvety fungal coating, commonly associated with fungi such as *Capnodium* growing on honeydew deposited by sap-sucking insects.

Sooty mould appears as a **black fungal coating on the surface of leaves, stems, fruits and other plant parts**. Unlike many pathogenic fungi, it is generally **non-parasitic** and grows externally on the honeydew excreted by phloem-feeding insects such as aphids, whiteflies and scale insects. *Capnodium* is one of the important fungal genera associated with sooty mould.

ICAR has also reported that invasive whiteflies produce sticky honeydew on plant surfaces, which promotes the development of **black sooty mould** and can reduce photosynthetic efficiency.

Important Points:

- Sooty mould appears as a **black, superficial coating** on plant surfaces.
- It is generally **non-parasitic** and does not directly invade plant tissues.
- The mould commonly develops on **honeydew secreted by sap-sucking insects**.
- Important associated fungi include *Capnodium* spp. and *Meliola* spp.

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- **Honeydew-producing insects:** Aphids, whiteflies and scale insects.
- Heavy sooty mould growth can interfere with **light interception and photosynthesis**.
- The mould itself is generally not the primary cause of plant injury; the associated insect infestation is often the underlying problem.
- In competitive examinations, remember the association: **Sap-sucking insects → Honeydew → Sooty mould → Black coating**.

Why Other Options Are Incorrect

- **(a):** White superficial powdery growth is characteristic of **powdery mildew**, not sooty mould.
- **(b):** Correct. Sooty mould forms a black superficial growth and commonly develops on honeydew produced by sap-sucking insects.
- **(c):** Water-soaked lesions and tissue necrosis are typical of various pathogenic diseases, not the characteristic presentation of sooty mould.
- **(d):** Yellow-orange pustules containing urediniospores are characteristic of **rust diseases**, not sooty mould.

Q3. What are the minimum germination standards generally prescribed for certified seed of rice and wheat, respectively, under Indian seed certification standards?

- (a) 75% and 80%
- (b) 80% and 85%
- (c) 85% and 90%
- (d) 90% and 95%

S3. Ans. (b)

Sol. The correct answer is- (b) 80% and 85%

Under Indian seed certification standards, the minimum germination requirement is **80% for rice** and **85% for wheat**. These standards are important indicators of the planting quality of certified seed. ICAR-NRRI specifically states that quality rice seed should have a minimum germination of 80%, while ICAR-IWBR literature confirms 85% as the minimum germination standard for wheat.

Important Points:

- Rice — **80% minimum germination**
- Wheat — **85% minimum germination**
- Germination percentage indicates the proportion of seeds capable of producing normal seedlings under prescribed test conditions.
- Higher germination generally contributes to better and more uniform crop establishment.

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- Rice has a lower minimum germination standard than wheat.
- Indian seed standards also specify other quality parameters such as **physical purity, moisture content and genetic purity**.
- For rice, ICAR-NRRI recommends seed with at least **80% germination** and maximum **13% moisture**.

Why Other Options Are Incorrect

- **(a):** These values are lower than the prescribed minimums for rice and wheat.
- **(b):** Correct — rice requires **80%** and wheat **85%** minimum germination.
- **(c):** These values are higher than the prescribed minimum standards.
- **(d):** These are not the prescribed minimum germination standards for rice and wheat.

Q4. What is the general storage temperature range recommended for maintaining the quality and extending the shelf life of fresh horticultural produce?

- (a) 0–10°C
- (b) 15–20°C
- (c) 25–30°C
- (d) 35–40°C

S4. Ans. (a)

Sol. The correct answer is- (a) 0–10°C

Fresh horticultural commodities are generally stored under **low-temperature conditions** to reduce respiration, enzymatic activity, moisture loss and microbial growth, thereby extending their storage life. For many temperate and cool-storing horticultural crops, temperatures within approximately **0–10°C** are suitable. However, the optimum storage temperature is **commodity-specific**, and tropical and subtropical crops may suffer from chilling injury at excessively low temperatures.

Important Points:

- Low temperature generally **reduces respiration rate**.
- It helps slow down **ripening and senescence**.
- Excessively low temperatures can cause **chilling injury** in sensitive crops.
- Optimum temperature varies according to the **commodity and cultivar**.

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- Temperature and relative humidity are two major factors governing the storage life of fresh horticultural produce.
- Tropical fruits such as banana and mango require **higher storage temperatures** than temperate fruits such as apple.
- Therefore, there is **no single optimum storage temperature for all horticultural crops**.

Why Other Options Are Incorrect

- **(a):** Correct. This range is broadly suitable for many refrigerated horticultural commodities.
- **(b):** Higher temperatures generally result in faster respiration and deterioration.
- **(c):** Such temperatures accelerate metabolic activity and reduce storage life for most fresh produce.
- **(d):** Very high temperatures are generally unsuitable for prolonged storage of fresh horticultural produce.

Q5. *Pyricularia oryzae* is most commonly associated with which important disease of rice?

- (a) Sheath blight
- (b) Brown spot
- (c) Rice blast
- (d) Bacterial blight

S5. Ans. (c)

Sol. The correct answer is- (c) Rice blast

Pyricularia oryzae, commonly referred to in modern taxonomy as *Magnaporthe oryzae*, is the causal fungus associated with **rice blast**, one of the major fungal diseases of rice. ICAR identifies *Magnaporthe oryzae* as the pathogen causing rice blast.

Important Points:

- Rice blast is caused by *Magnaporthe oryzae*.
- *Pyricularia oryzae* is a commonly encountered name for the pathogen.
- Blast can affect **leaves, nodes, neck and panicles**.
- The disease can cause serious yield losses under favourable conditions.

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- **Rice blast** → *Magnaporthe oryzae*
- **Bacterial blight** → *Xanthomonas oryzae* pv. *oryzae*
- **Sheath blight** → *Rhizoctonia solani*
- **Brown spot** → *Bipolaris oryzae*

Why Other Options Are Incorrect

- **(a):** Sheath blight is caused by *Rhizoctonia solani*.
- **(b):** Brown spot is caused by *Bipolaris oryzae*.
- **(c):** Correct — *Pyricularia oryzae* / *Magnaporthe oryzae* causes rice blast.
- **(d):** Bacterial blight is caused by *Xanthomonas oryzae* pv. *oryzae*.

Q6. Which amino acid is the primary precursor for the biosynthesis of Indole-3-Acetic Acid (IAA)?

- (a) Methionine
- (b) Tryptophan
- (c) Phenylalanine
- (d) Alanine

S6. Ans. (b)

Sol. The correct answer is- (b) Tryptophan

Tryptophan (Trp) is the principal amino acid precursor for the biosynthesis of **Indole-3-Acetic Acid (IAA)**, the major naturally occurring auxin in plants. The major and highly conserved tryptophan-dependent pathway involves conversion of tryptophan to **indole-3-pyruvic acid (IPyA)** by tryptophan aminotransferases, followed by conversion of IPyA to IAA by **YUCCA (YUC) flavin monooxygenases**.

Important Points:

- **Tryptophan** → primary precursor of IAA.
- Tryptophan is converted into **indole-3-pyruvate (IPyA)**.
- **TAA/TAR aminotransferases** catalyse the conversion of tryptophan to IPyA.
- **YUCCA enzymes** catalyse the subsequent conversion of IPyA to IAA.
- IAA is the principal naturally occurring **auxin** in plants.

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- IAA = **Indole-3-Acetic Acid**
- IAA is involved in **cell elongation, apical dominance, root initiation, vascular differentiation and tropic responses**.
- Besides the tryptophan-dependent pathway, plants can also produce IAA through **tryptophan-independent routes**; however, tryptophan is established as the central precursor in the major Trp-dependent pathway.

Why Other Options Are Incorrect

- **(a) Methionine:** Methionine is an important precursor in the biosynthesis of **ethylene** through the Yang cycle, but it is not the primary amino-acid precursor for IAA biosynthesis.
- **(b) Tryptophan: Correct.** Tryptophan is the principal precursor of IAA in the major tryptophan-dependent auxin biosynthetic pathway.
- **(c) Phenylalanine:** Phenylalanine is primarily associated with the biosynthesis of **phenylpropanoids** and related compounds. Although metabolic interactions between phenylalanine metabolism and auxin biosynthesis have been reported, it is **not the primary precursor of IAA**.
- **(d) Alanine:** Alanine is involved mainly in **amino-acid metabolism and nitrogen/carbon metabolism** and is not the primary precursor of IAA.

Q7. Khaira disease of rice is caused due to the deficiency of which nutrient?

- (a) Zinc
- (b) Iron
- (c) Nitrogen
- (d) Copper

S7. Ans. (a)

Sol. The correct answer is- (a) Zinc

Khaira disease of rice is caused by zinc (Zn) deficiency. It is a well-known nutritional disorder of rice, particularly observed in young rice plants. Zinc deficiency leads to characteristic symptoms such as **yellowing, reddish-brown or rusty spots, bronzing of leaves, stunted growth and poor tillering**. ICAR specifically identifies Khaira as a manifestation of **zinc deficiency in rice** and recommends zinc application for its management.

Important Points:

- **Khaira disease** → **Zinc (Zn) deficiency**
- It is a **nutritional disorder**, not a pathogen-induced disease.
- Symptoms generally appear within the early growth stages of rice.
- Characteristic symptoms include **bronzing/rusty brown discoloration and chlorosis**.
- Zinc deficiency is particularly important in certain **alkaline, calcareous and continuously flooded soils**.
- Zinc deficiency can adversely affect **plant growth, tillering and yield**.

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- **Zinc deficiency in rice → Khaira disease**
- **Zinc deficiency in maize → White bud**
- **Zinc deficiency in citrus → Mottle leaf/Frenching**
- Zinc is involved in several enzymatic processes and also has an important role in **IAA synthesis and plant growth regulation**.

Why Other Options Are Incorrect

- **(a) Zinc: Correct.** Khaira disease is the characteristic zinc-deficiency disorder of rice.
- **(b) Iron:** Incorrect. Iron deficiency in rice primarily produces **interveinal chlorosis of young leaves**, particularly under conditions such as alkaline or calcareous soils.
- **(c) Nitrogen:** Incorrect. Nitrogen deficiency generally causes **general chlorosis/yellowing, stunted growth and poor tillering**, with symptoms appearing first on older leaves.
- **(d) Copper:** Incorrect. Copper deficiency is associated with characteristic chlorotic and necrotic symptoms but is **not the cause of Khaira disease**. TNAU identifies Khaira specifically with zinc deficiency.

Q8. Which of the following is an example of a C_4 plant?

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

S8. Ans. (c)

Sol. The correct answer is- (c) Maize

Maize (*Zea mays*) is a typical C_4 plant that utilizes the C_4 photosynthetic pathway. In C_4 plants, the initial fixation of atmospheric CO_2 occurs in mesophyll cells, producing a four-carbon compound, which is subsequently transported to bundle sheath cells for the release and fixation of CO_2 through the Calvin cycle. ICAR material identifies maize and other warm-season crops as examples associated with C_4 photosynthesis.

Important Points:

- **Maize → C_4 plant**
- C_4 plants possess specialized **Kranz anatomy** in typical cases.
- The primary CO_2 acceptor in C_4 photosynthesis is **phosphoenolpyruvate (PEP)**.
- **PEP carboxylase** initially fixes CO_2 in mesophyll cells.
- C_4 plants generally show higher photosynthetic efficiency under **high temperature and high light intensity**.

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- **C_4 examples:** Maize, Sugarcane, Sorghum, Pearl millet.
- **C_3 examples:** Wheat, Rice, Soybean.
- **CAM examples:** Opuntia, Pineapple, Agave.
- C_4 photosynthesis helps plants reduce the effect of **photorespiration** under high-temperature conditions.

Why Other Options Are Incorrect

- **(a) Wheat:** Wheat is a **C₃ plant** and primarily follows the Calvin cycle directly in its mesophyll cells.
- **(b) Rice:** Rice is also a **C₃ plant**. ICAR material specifically contrasts rice and wheat as C₃ crops with C₄ crops such as millets.
- **(c) Maize: Correct.** Maize is a well-established **C₄ crop** and exhibits the characteristic C₄ photosynthetic pathway.
- **(d) Soybean:** Soybean is a **C₃ plant**, not a C₄ plant.

Q9. Which of the following is considered an anticoagulant rodenticide?

- (a) Bromadiolone
- (b) Zinc phosphide
- (c) Aluminium phosphide
- (d) Malathion

S9. Ans. (a)

Sol. The correct answer is- (a) Bromadiolone

Bromadiolone is a **second-generation anticoagulant rodenticide** used for the control of rats and mice. It acts by interfering with the vitamin K cycle, thereby reducing the synthesis of vitamin K-dependent clotting factors. This results in impaired blood coagulation and, ultimately, internal bleeding in the target rodent.

Important Points:

- **Bromadiolone → Anticoagulant rodenticide**
- It belongs to the **second-generation anticoagulant** group.
- Its action is associated with interference in the **vitamin K-dependent blood-clotting mechanism**.
- Anticoagulant rodenticides generally cause death through **internal haemorrhage** after sufficient exposure.
- Bromadiolone is commonly used in rodent management programmes.

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- **First-generation anticoagulants:** Warfarin, Coumatetralyl, Chlorophacinone.
- **Second-generation anticoagulants:** Bromadiolone, Brodifacoum, Difenacoum, Difethialone.
- **Zinc phosphide:** A non-anticoagulant rodenticide that releases toxic phosphine gas after ingestion.
- **Aluminium phosphide:** Releases phosphine and is primarily used as a fumigant.
- Anticoagulant rodenticides act mainly by disrupting the **recycling of vitamin K**, which is essential for normal blood coagulation.

Why Other Options Are Incorrect

- **(a) Bromadiolone: Correct.** It is a second-generation anticoagulant rodenticide that disrupts the vitamin K-dependent clotting mechanism.
- **(b) Zinc phosphide:** Incorrect. Zinc phosphide is a **non-anticoagulant rodenticide**. It reacts with gastric acid and moisture to release **phosphine gas**, which is highly toxic to rodents.
- **(c) Aluminium phosphide:** Incorrect. Aluminium phosphide is a **phosphide fumigant** that releases phosphine gas in the presence of moisture. It does not act through the anticoagulant mechanism.
- **(d) Malathion:** Incorrect. Malathion is an **organophosphate insecticide** primarily used for insect pest management. It is not classified as an anticoagulant rodenticide.

Q10. Vernalization refers to which of the following physiological processes in plants?

- (a) Promotion of flowering by exposing a plant or its viable seeds to a prolonged period of low temperature
- (b) Induction of flowering by exposing plants to a specific duration of light
- (c) Suppression of seed germination through exposure to high temperature
- (d) Promotion of vegetative growth by increasing the duration of daylight

S10. Ans. (a)

Sol. The correct answer is- (a) Promotion of flowering by exposing a plant or its viable seeds to a prolonged period of low temperature

Vernalization is the process by which flowering is promoted or accelerated through exposure to a suitable period of **low temperature**. It is particularly important in winter cereals and certain biennial plants. The process helps plants overcome their requirement for cold before entering the reproductive phase.

Important Points:

- Vernalization involves **cold-temperature treatment**.
- It promotes or accelerates **flowering** in responsive plants.
- Winter varieties of **wheat and barley** commonly show vernalization requirements.
- The term is associated with the shortening of the vegetative phase through prior cold treatment.

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- **Vernalization → Cold treatment → Promotion of flowering**
- **Devernalization** refers to the reversal or loss of the vernalization effect under certain conditions.
- Vernalization is different from **stratification**, which primarily refers to treatments used to overcome seed dormancy.

Why Other Options Are Incorrect

- **(a) Promotion of flowering by exposing a plant or its viable seeds to a prolonged period of low temperature:** Correct.
- **(b) Induction of flowering by exposing plants to a specific duration of light:** Incorrect. This describes **photoperiodism**, which involves plant responses to the relative duration of light and dark periods.
- **(c) Suppression of seed germination through exposure to high temperature:** Incorrect. High temperature-induced suppression of germination is not the definition of vernalization.
- **(d) Promotion of vegetative growth by increasing the duration of daylight:** Incorrect. Vernalization is related primarily to **cold-induced promotion of reproductive development**, not increased vegetative growth.

Q11. Which of the following best defines photoperiodism in plants?

- (a) The response of plants to changes in the intensity of solar radiation
- (b) The physiological and developmental response of plants to the relative duration of light and dark periods
- (c) The stimulation of flowering exclusively by exposure to low temperature
- (d) The movement of plant organs towards or away from a light source

S11. Ans. (b)

Sol. The correct answer is- **(b) The physiological and developmental response of plants to the relative duration of light and dark periods**

Photoperiodism refers to the physiological and developmental responses of plants to the **relative lengths of light and dark periods**. It is particularly important in the regulation of flowering, although photoperiodic responses can also influence processes such as dormancy, bulb formation and tuberization.

Important Points:

- **Photoperiodism → Response to relative light and dark duration.**
- Flowering is one of the most important photoperiodic responses.
- Plants are commonly classified into **short-day, long-day and day-neutral plants** based on their flowering response.
- The **night/dark period** can be particularly important in determining photoperiodic responses.

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- **Photoperiod → Duration of light exposure during a specified period, commonly 24 hours.**
- **Photoperiodism → Plant response to relative light and dark periods.**
- **Short-day plants → Flower when the critical photoperiodic requirement is associated with sufficiently long nights.**
- **Long-day plants → Flower under sufficiently long days/short nights.**
- **Day-neutral plants → Flowering is not primarily controlled by photoperiod.**

Why Other Options Are Incorrect

- **(a) The response of plants to changes in the intensity of solar radiation:** Incorrect. Photoperiodism concerns the **duration of light and dark periods**, rather than light intensity.
- **(b) The physiological and developmental response of plants to the relative duration of light and dark periods:** **Correct.** This is the standard definition of photoperiodism.
- **(c) The stimulation of flowering exclusively by exposure to low temperature:** Incorrect. This describes **vernalization**, not photoperiodism.
- **(d) The movement of plant organs towards or away from a light source:** Incorrect. This refers to **phototropism**, a directional growth response to light.

Q12. According to the conventional classification of salt-affected soils, which of the following correctly represents the Sodium Adsorption Ratio (SAR) of saline and alkaline (sodic) soils, respectively?

- (a) Saline soil: $SAR > 13$; Alkaline soil: $SAR < 13$
- (b) Saline soil: $SAR < 13$; Alkaline soil: $SAR > 13$
- (c) Saline soil: $SAR > 15$; Alkaline soil: $SAR < 15$
- (d) Saline soil: $SAR < 15$; Alkaline soil: $SAR > 15$

S12. Ans. (b)

Sol. The correct answer is- **(b) Saline soil: $SAR < 13$; Alkaline soil: $SAR > 13$**

Under the conventional classification of salt-affected soils, **saline soils generally have SAR below 13**, whereas **sodic or alkaline soils have SAR above 13**. Sodic/alkaline soils also generally have **ESP > 15%**, while saline soils have **ESP < 15%**.

Important Points:

- Saline soil $\rightarrow$ SAR < 13
- Sodic/alkaline soil $\rightarrow$ SAR > 13
- Saline soil $\rightarrow$ ESP < 15%
- Sodic/alkaline soil $\rightarrow$ ESP > 15%
- SAR $\neq$ percentage; ESP is expressed as percentage.

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- Saline soil: $E_{ce} > 4 \text{ dS m}^{-1}$, SAR < 13, ESP < 15%, generally pH < 8.5.
- Sodic/alkaline soil: $E_{ce} < 4 \text{ dS m}^{-1}$, SAR > 13, ESP > 15%, generally pH > 8.5.
- Saline-sodic soil: $E_{ce} > 4 \text{ dS m}^{-1}$, SAR > 13 and ESP > 15%.
- ICAR-CSSRI notes that conventional Indian classification commonly uses **ESP > 15%** for sodic soils, although alternative thresholds can be used for specific soil types.

Why Other Options Are Incorrect

- (a): Incorrect. The relationship is reversed; saline soils generally have **SAR < 13**, whereas alkaline/sodic soils have **SAR > 13**.
- (b): **Correct**. This follows the conventional classification of saline and sodic/alkaline soils.
- (c): Incorrect. **15** is associated with the conventional **ESP (%) threshold**, not the standard SAR threshold.
- (d): Incorrect. Again, it incorrectly uses **15** as the SAR threshold. The conventional SAR threshold is **13**.

Q13. A rice crop is being examined for disease diagnosis. Consider the following statements regarding three commonly discussed rice disorders/diseases:

1. Rice blast is caused by *Pyricularia oryzae* and may produce characteristic lesions on leaves and neck/panicle tissues.
2. Khaira disease of rice is associated with zinc deficiency rather than a fungal pathogen.
3. Khaira symptoms are particularly associated with zinc-deficient rice conditions.
4. Leaf curling in rice should automatically be diagnosed as rice blast.

Which of the following combinations is scientifically correct?

- (a) 1, 2 and 3 only
- (b) 1 and 4 only
- (c) 2 and 4 only
- (d) 1, 2, 3 and 4

S13. Ans. (a)

Sol. The correct answer is- (a) 1, 2 and 3 only

Rice blast is a major fungal disease caused by *Pyricularia oryzae* (also referred to in modern taxonomy as *Magnaporthe oryzae* in much literature). It can occur as leaf blast and neck blast.

Khaira disease is a well-known zinc-deficiency disorder of rice. ICAR specifically identifies zinc deficiency symptoms in rice as **Khaira disease**.

Statement 4 is incorrect because leaf curling is not a diagnostic characteristic that can automatically be equated with rice blast.

Important Points:

- Rice blast $\rightarrow$ fungal disease.
- Causal organisms traditionally cited $\rightarrow$ *Pyricularia oryzae*.
- Khaira disease $\rightarrow$ Zn deficiency.
- Rice blast may affect leaves, nodes and neck/panicle.
- Disease diagnosis should be based on characteristic symptoms and causal association.

Information Booster

A useful exam distinction is:

- **Blast** → fungal disease.
- **Khaira** → zinc deficiency.
- **Tungro** → viral disease.
- **Bacterial leaf blight** → bacterial disease caused by *Xanthomonas oryzae* pv. *oryzae*.

Why Other Options Are Incorrect

- **(a):** Correct because statements 1, 2 and 3 are scientifically supported.
- **(b):** Incorrect because statement 4 is false.
- **(c):** Incorrect because statement 1 is also correct.
- **(d):** Incorrect because statement 4 is not correct.

Q14. Consider the following statements regarding important institutional developments in Indian agriculture and rural development:

1. NABARD was established on 12 July 1982 by an Act of Parliament.
2. The ATMA approach was pilot-tested under agricultural extension reforms beginning in 1998.
3. ATMA stands for Agricultural Technology Management Agency.
4. NABARD was established before the first Krishi Vigyan Kendra.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 3 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

S14. Ans. (b)

Sol. The correct answer is- (b) 1, 2 and 3 only

NABARD was established on **12 July 1982** by an Act of Parliament and functions as an apex development financial institution for agriculture and rural development.

ATMA stands for **Agricultural Technology Management Agency**. Extension reforms were pilot-tested in 28 districts in seven states during 1998–2005, forming the basis for subsequent extension reforms.

The first KVK was established at Puducherry in **1974**, before NABARD's establishment in 1982.

Important Points:

- First KVK → 1974, Puducherry.
- NABARD → 12 July 1982.
- ATMA → Agricultural Technology Management Agency.
- NATP → launched in 1998.
- Extension reforms were subsequently institutionalised through ATMA-related arrangements.

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The first KVK was established on a pilot basis at **Pondicherry in 1974**, an important chronology question for agriculture examinations.

Why Other Options Are Incorrect

- **(a):** Incomplete because statement 3 is also correct.
- **(b):** Correct.
- **(c):** Incorrect because statement 4 is false.
- **(d):** Incorrect because statement 4 is false.

Q15. Which one of the following combinations correctly represents the photosynthetic pathway and precursor relationship?

- (a) Rice – C₄; maize – C₃; pineapple – CAM; ABA – adenine precursor
- (b) Wheat – C₄; sugarcane – C₃; cactus – CAM; cytokinin – carotenoid precursor
- (c) Rice – C₃; maize – C₄; pineapple – CAM; ABA – carotenoid-derived
- (d) Maize – C₃; sugarcane – CAM; wheat – C₄; gibberellin – carotenoid-derived

S15. Ans. (c)

Sol. The correct answer is- (c) Rice – C₃; maize – C₄; pineapple – CAM; ABA – carotenoid-derived
Rice and wheat are classic **C₃ crops**, whereas maize and sugarcane are important **C₄ crops**. Pineapple and many cacti are examples of **CAM plants**.

Abscissic acid (ABA) is biosynthetically derived from carotenoid precursors; research has identified cis-xanthophylls such as 9'-cis-neoxanthin as important ABA precursors.

Cytokinins are adenine derivatives, while gibberellin biosynthesis proceeds through isoprenoid pathways involving precursors such as mevalonate/IPP and GGPP.

Important Points:

- C₃ → rice, wheat, soybean.
- C₄ → maize, sugarcane, sorghum.
- CAM → pineapple, cactus.
- ABA → carotenoid-derived hormone.
- Cytokinins → adenine-derived compounds.
- Gibberellins → diterpenoid/isoprenoid pathway.

Information Booster

A frequently tested distinction:

C₃ → Calvin cycle directly fixes CO₂ through RuBisCO.

C₄ → initial CO₂ fixation through PEP carboxylase.

CAM → temporal separation of CO₂ fixation and Calvin-cycle activity.

Why Other Options Are Incorrect

- **(a):** Rice is C₃, not C₄; ABA is not an adenine-derived hormone.
- **(b):** Wheat is C₃ and sugarcane is C₄; cytokinins are adenine derivatives.
- **(c):** Correct.
- **(d):** Maize is C₄, not C₃; sugarcane is C₄, not CAM.

Q16. Which important agricultural credit initiative was operationalised during 1998–2000 in the historical development of NABARD?

- (a) Pradhan Mantri Kisan Samman Nidhi
- (b) Kisan Credit Card Scheme
- (c) Pradhan Mantri Krishi Sinchayee Yojana
- (d) PM-Kisan Maandhan Yojana

S16. Ans. (b)

Sol. The correct answer is- (b) Kisan Credit Card Scheme

NABARD's official historical material records the **operationalisation of the Kisan Credit Card (KCC) Scheme during 1998–2000**.

The original memory-based phrase concerning “50 years after establishment” appears to be chronologically inconsistent: NABARD was established in 1982, so 50 years later would be 2032. Therefore, it cannot logically refer to a scheme already launched by the present examination period. The KCC reconstruction is the historically supported NABARD-related credit question.

Important Points:

- NABARD establishment → 12 July 1982.
- KCC → operationalised during 1998–2000.
- PM-KISAN → launched 24 February 2019.
- PM-KMY → launched 12 September 2019.
- PMKSY → launched in 2015.

Information Booster

NABARD was created by transferring agricultural credit functions of RBI and refinance functions of ARDC.

Why Other Options Are Incorrect

- (a): PM-KISAN was launched in 2019.
- (b): Correct; KCC was operationalised during NABARD's historical development period.
- (c): PMKSY was launched in 2015.
- (d): PM-KMY was launched in 2019.

Q17. When the concentration of hydrogen ions and hydroxyl ions in a soil solution is compared to determine whether the reaction is acidic, which of the following statements is correct?

- (a) In an acidic reaction, $[H^+]$ is greater than $[OH^-]$
- (b) In an acidic reaction, $[OH^-]$ is greater than $[H^+]$
- (c) In an acidic reaction, $[H^+]$ and $[OH^-]$ are always equal
- (d) Soil acidity is determined exclusively by the concentration of exchangeable calcium ions

S17. Ans. (a)

Sol. The correct answer is- (a) In an acidic reaction, $[H^+]$ is greater than $[OH^-]$

The acidic or alkaline nature of a soil solution is related to the relative concentration of hydrogen ions and hydroxyl ions.

- Acidic → $[H^+] > [OH^-]$
- Neutral → $[H^+] = [OH^-]$
- Alkaline → $[OH^-] > [H^+]$

Soil pH is a logarithmic measure related to hydrogen-ion activity/concentration.

Important Points:

- $pH < 7$ → acidic condition.
- $pH = 7$ → neutral, under the conventional definition.
- $pH > 7$ → alkaline condition.
- Increasing H^+ activity generally means decreasing pH.
- Soil acidity may involve both active and reserve/exchangeable acidity.

Information Booster

For competitive examinations, remember:

$pH = -\log_{10}(H^+ \text{ activity})$

Therefore, a lower pH represents greater hydrogen-ion activity.

Why Other Options Are Incorrect

- **(a):** Correct.
- **(b):** This represents an alkaline rather than acidic condition.
- **(c):** Equal concentrations characterize neutrality, not acidity.
- **(d):** Soil acidity is not determined exclusively by calcium concentration.

Q18. A soil-testing laboratory obtains the following values for a soil sample:

- $E_{ce} = 3.0 \text{ dS m}^{-1}$
- $ESP = 18\%$
- $pH = 9.1$

Based on the conventional classification of salt-affected soils, this soil would most appropriately be classified as:

- (a) Saline soil
- (b) Normal soil
- (c) Alkali/sodic soil
- (d) Saline-alkali soil

S18. Ans. (c)

Sol. The correct answer is- (c) Alkali/sodic soil

The conventional classification distinguishes saline and sodic/alkali soils using electrical conductivity, exchangeable sodium percentage (ESP), and soil reaction.

A typical alkali/sodic soil has:

- $E_{ce} < 4 \text{ dS m}^{-1}$
- $ESP > 15\%$
- $pH > 8.5$

The given soil has $E_{ce} = 3.0$, $ESP = 18\%$, and $pH = 9.1$, satisfying the conventional alkali/sodic criteria.

Important Points:

- Saline soil $\rightarrow E_{ce}$ traditionally $> 4 \text{ dS m}^{-1}$, $ESP < 15\%$.
- Sodic/alkali soil $\rightarrow E_{ce} < 4 \text{ dS m}^{-1}$, $ESP > 15\%$, $pH > 8.5$.
- Saline-sodic soil $\rightarrow$ high salinity + high sodium.
- ESP is a key indicator of exchangeable sodium status.

Information Booster

Some modern classification systems use slightly different thresholds for salinity, so examination questions should be interpreted according to the classification convention specified in the syllabus/reference. The **15% ESP threshold** remains a highly important exam value.

Why Other Options Are Incorrect

- **(a):** Saline soils generally have high EC but comparatively low ESP.
- **(b):** The ESP and pH clearly indicate a sodic condition.
- **(c):** Correct.
- **(d):** Saline-alkali/saline-sodic soil requires both significant salinity and high sodium; E_{ce} here is below the conventional 4 dS m^{-1} threshold.

Q19. The United Nations observance intended to increase awareness regarding protection of the stratospheric ozone layer and commemorate the Montreal Protocol is observed annually on:

- (a) 5 June
- (b) 16 September
- (c) 22 April
- (d) 23 March

S19. Ans. (b)

Sol. The correct answer is- (b) 16 September

World Ozone Day, formally the International Day for the Preservation of the Ozone Layer, is observed annually on **16 September**. The date commemorates the signing of the Montreal Protocol on Substances that Deplete the Ozone Layer.

Important Points:

- World Ozone Day → **16 September**.
- Montreal Protocol → 1987.
- Vienna Convention → 1985.
- Ozone layer protects Earth from harmful ultraviolet radiation.
- International Day for the Preservation of the Ozone Layer is the formal UN designation.

Information Booster

5 June → World Environment Day

16 September → World Ozone Day

22 April → Earth Day

23 March → World Meteorological Day

Why Other Options Are Incorrect

- **(a):** 5 June is World Environment Day.
- **(b):** Correct.
- **(c):** 22 April is Earth Day.
- **(d):** 23 March is World Meteorological Day.

Q20. Consider the following agricultural-development institutions/schemes and their years of establishment/launch:

1. Krishi Vigyan Kendra – 1974
2. Pradhan Mantri Krishi Sinchayee Yojana – 2015
3. PM-KISAN – 2019
4. Pradhan Mantri Kisan Maandhan Yojana – 2019

Which of the following is the correct chronological sequence?

- (a) PM-KISAN → KVK → PMKSY → PM-KMY
- (b) KVK → PMKSY → PM-KISAN → PM-KMY
- (c) KVK → PM-KISAN → PMKSY → PM-KMY
- (d) PMKSY → KVK → PM-KMY → PM-KISAN

S20. Ans. (b)

Sol. The correct answer is- (b) KVK → PMKSY → PM-KISAN → PM-KMY

The first KVK was established at Puducherry in **1974**.

PMKSY was launched on **1 July 2015**.

PM-KISAN was launched on **24 February 2019**.

PM-KMY was launched on **12 September 2019**.

Important Points:

- KVK → 1974.
- PMKSY → 2015.
- PM-KISAN → 2019.
- PM-KMY → 2019.
- PM-KISAN and PM-KMY are different schemes despite similar names.

Information Booster

Do not confuse:

- **PM-KISAN** → income support.
- **PM-KMY** → pension/social security.
- **PMKSY** → irrigation and water-use efficiency.
- **KVK** → frontline agricultural extension and farmer training.

Why Other Options Are Incorrect

- **(a)**: Places PM-KISAN before KVK and PMKSY.
- **(b)**: Correct chronological sequence.
- **(c)**: PM-KISAN was not launched before PMKSY.
- **(d)**: Reverses the chronology of KVK and PMKSY.

Q21. A field-extension officer observes severe upward curling, distortion and reduction of leaf surface along with stunting in tomato plants. In contrast, rice plants showing viral infection may exhibit leaf twisting/curling along with stunting. Which statement is most appropriate?

- (a) Tomato leaf curl is a zinc-deficiency disorder, whereas rice leaf twisting is caused by *Pyricularia oryzae*.
- (b) Tomato leaf curl is characteristically associated with begomovirus infection, commonly transmitted by whitefly, whereas viral infection in rice can produce leaf twisting/curling and stunting depending on the virus.
- (c) Both symptoms are diagnostic of fungal blast disease.
- (d) Tomato leaf curl and rice viral leaf symptoms are caused by the same pathogen because both belong to the same crop family.

S21. Ans. (b)

Sol. The correct answer is- (b)

Tomato leaf curl disease is associated with **begomoviruses**, with whitefly (*Bemisia tabaci*) playing a major role in transmission. ICAR material describes tomato leaf curl disease symptoms including **upward leaf curling, leaf distortion, shrinking of leaf surface, yellowing and stunting**.

Rice viral diseases can also produce leaf morphological abnormalities. For example, rice ragged stunt virus infection has been associated with **leaf tip curling and serrated margins**, while rice stripe virus can produce twisting and stunting.

Important Points:

- Tomato leaf curl → commonly begomovirus group.
- Major vector → whitefly, *Bemisia tabaci*.
- Typical symptoms → upward curling, distortion, stunting and reduced leaf surface.
- Rice viral diseases are diverse; symptoms depend upon the causal virus.

Information Booster

For examination purposes, never assume that “leaf curl” automatically indicates the same pathogen in different crops. **Disease name, host, vector and causal organism must be matched separately.**

Why Other Options Are Incorrect

- **(a):** Khaira is zinc deficiency of rice, while *Pyricularia* causes blast.
- **(b):** Correct.
- **(c):** Tomato leaf curl is viral, not fungal blast.
- **(d):** The pathogens are not the same merely because symptoms appear similar.

Q22. In agricultural extension education, communication materials such as bulletins and bulletin boards are primarily classified according to their function as:

- (a) Individual-contact methods
- (b) Group-contact methods only
- (c) Mass-contact/mass-media extension methods
- (d) Farm-input distribution methods

S22. Ans. (c)

Sol. The correct answer is- (c) Mass-contact/mass-media extension methods

Bulletins are printed extension publications used for communicating agricultural information to a relatively large number of farmers. Bulletin boards similarly provide information to multiple intended recipients at a common location. Thus, in conventional agricultural-extension classification, these are associated with **mass-contact/mass-media communication**.

Important Points:

- Individual method → farm/home visit, personal contact, farmer's call.
- Group method → group discussion, demonstration, training.
- Mass method → bulletin, newspaper, radio, television, exhibition, poster, etc.
- Mass methods are useful for reaching a large audience.

Information Booster

A useful three-way revision framework:

Individual → personal contact

Group → interaction among a limited group

Mass → communication to a large and dispersed audience

Why Other Options Are Incorrect

- **(a):** Bulletins are not primarily individual-contact methods.
- **(b):** They are not restricted to group-contact communication.
- **(c):** Correct.
- **(d):** They are communication tools, not input-distribution mechanisms.

Q23. When an agricultural extension worker needs to understand a farmer's field situation, discuss the farmer's problems directly, provide personalised advice and observe the farm conditions simultaneously, which extension method is most appropriately described as a highly effective individual-contact method?

- (a) Farm and home visit
- (b) Radio broadcast
- (c) Agricultural exhibition
- (d) Newspaper publication

S23. Ans. (a)

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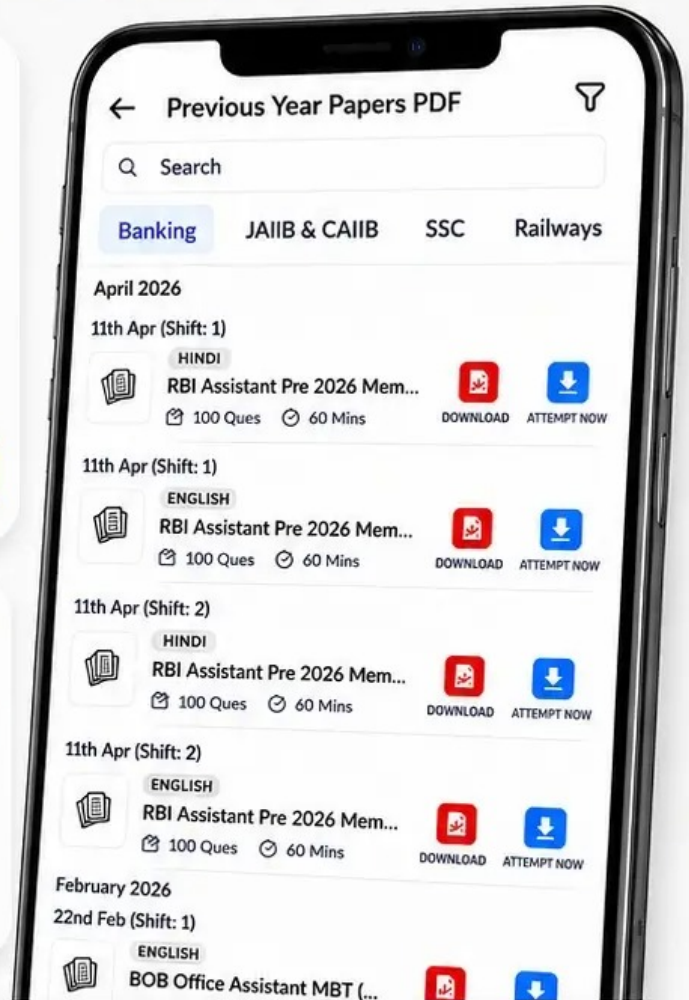
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Sol. The correct answer is- (a) Farm and home visit

A **farm and home visit** is an individual-contact extension method that permits the extension worker to interact directly with the farmer, understand field-level constraints and provide advice in the farmer's actual situation.

Research involving KVK beneficiaries has also reported farm and home visits as the most effective among the individual-contact methods evaluated for changing beneficiaries' attitudes in that particular study.

Important Points:

- Farm and home visit → individual-contact method.
- It allows direct two-way communication.
- The extension worker can observe actual farm conditions.
- It facilitates personalised problem diagnosis and advice.
- Radio/newspaper → mass communication.

