

# Rajasthan JET Agriculture Sample Paper-9

Duration: 40 Minutes

Maximum Marks: 160

## Instructions

- This paper contains **40** Multiple Choice Questions (Single Correct).
- Each correct answer carries **+4 marks**.
- Each incorrect answer carries: **–1 marks**.
- Use of mobile phones, smartwatches, calculators, or any electronic gadgets is strictly prohibited.

**Q1.** Which amendment is most commonly used to reclaim sodic soils (ESP > 15)?

- (A) Lime ( $\text{CaCO}_3$ )
- (B) Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ )
- (C) Muriate of potash
- (D) Zinc sulphate

**Q2.** Which group of microorganisms is known as phosphate-solubilizing bacteria (PSB) and helps make phosphorus available to plants?

- (A) *Bacillus* and *Pseudomonas* species
- (B) *Rhizobium* and *Frankia*
- (C) *Aspergillus niger* and *Fusarium*
- (D) *Nostoc* and *Anabaena*

**Q3.** Grey speck disease in oats is caused by the deficiency of which micronutrient?

- (A) Zinc (Zn)
- (B) Iron (Fe)



(C) Manganese (Mn)

(D) Boron (B)

**Q4.** Excessive tillage in agricultural soils primarily leads to which of the following negative effects?

(A) Increased water retention in macropores

(B) Reduction in soil temperature

(C) Improved soil microbial biomass carbon

(D) Destruction of soil aggregates and structural degradation

**Q5.** A traditional water harvesting structure in Rajasthan used to store runoff from fields for supplemental irrigation is locally known as:

(A) Johad

(B) Khet talai (farm pond)

(C) Tanka

(D) Kund

**Q6.** Border strip irrigation method is most suitable for which type of crops?

(A) Close-growing cereal crops like wheat and sorghum

(B) Widely spaced row crops like sugarcane

(C) Orchard crops on hilly terrain

(D) Flooded paddy in flat fields

**Q7.** *Phalaris minor* reduces germination and early growth of wheat by releasing toxic chemical compounds into the soil. This phenomenon is called:

(A) Parasitism

(B) Competition

(C) Allelopathy



(D) Amensalism

**Q8.** Cover crops such as cowpea and daincha are grown between main crop seasons primarily to:

(A) Increase soil pH

(B) Control insect pests biologically

(C) Improve grain quality of the next crop

(D) Prevent soil erosion, add organic matter, and fix atmospheric nitrogen

**Q9.** Wheat is classified as which type of plant with respect to photoperiod requirement for heading?

(A) Short-day plant (requires <12 hours of light)

(B) Long-day plant (requires >14 hours of light)

(C) Day-neutral plant

(D) Quantitative short-day plant

**Q10.** In direct seeding of rice (DSR), which method involves broadcasting pre-germinated seeds in flooded or wet fields?

(A) Direct seeding wet (DSW)

(B) Transplanting (TPR)

(C) Dibbling

(D) Direct seeding dry (DSD)

**Q11.** Baby corn is harvested at which stage of maize development?

(A) Grain maturity (physiological maturity)

(B) Dough stage

(C) Before pollination, when silks are freshly emerged



(D) Blister stage

**Q12.** The recommended seed rate for bajra (pearl millet) when sown by line sowing/drilling method is approximately:

(A) 1–2 kg/ha

(B) 4–5 kg/ha

(C) 8–10 kg/ha

(D) 15–20 kg/ha

**Q13.** Late sowing of chickpea (after November 15 in Rajasthan) compared to normal sowing (October 25 – November 5) generally results in:

(A) Higher number of pods per plant

(B) Better seed filling due to cooler temperatures

(C) Reduced incidence of Fusarium wilt

(D) Reduced yield due to shorter vegetative phase and lower pod set

**Q14.** The mustard aphid *Lipaphis erysimi* causes maximum damage to the mustard crop during which period?

(A) December to January

(B) March to April

(C) September to October

(D) May to June

**Q15.** Moong (mungbean, *Vigna radiata*) is primarily cultivated as a zaid (summer) crop after wheat harvest because of its:

(A) High water requirement and long duration

(B) Tolerance to waterlogging

(C) Short duration (60–65 days) and heat tolerance



(D) Shade tolerance under wheat stubble

**Q16.** Moth bean (*Vigna aconitifolia*) is an important pulse crop in Rajasthan districts like Barmer, Jodhpur, and Nagaur because it:

(A) Requires heavy irrigation and rich clayey soil

(B) Is extremely drought-tolerant and adapted to sandy/desert soils

(C) Has the highest protein content among all pulses

(D) Fixes the highest amount of atmospheric nitrogen

**Q17.** The mango variety 'Langra' is primarily associated with which geographical region of India?

(A) Konkan coast (Maharashtra/Goa)

(B) Saurashtra (Gujarat)

(C) Malihabad (Uttar Pradesh)

(D) Varanasi (Uttar Pradesh) and Bihar

**Q18.** Which lemon variety is most commonly grown in the plains of Rajasthan and is known for its thin rind and high acidity?

(A) Kagzi Nimboo (*Citrus aurantifolia*)

(B) Eureka lemon (*Citrus limon*)

(C) Lisbon lemon

(D) Sweet lime (Mosambi)

**Q19.** Bael (*Aegle marmelos*) is valued as a fruit tree in arid zones of India primarily because of:

(A) Its requirement for high rainfall and humidity

(B) Shallow root system making it ideal for water-logged areas

(C) Extreme drought tolerance and medicinal value of the hard-shelled fruit for digestive disorders



(D) Succulent stem for water storage

**Q20.** Which insulin-like compound present in bitter gourd (*Momordica charantia*) makes it beneficial for diabetic patients?

(A) Momordicin

(B) Polypeptide-P (plant insulin)

(C) Cucurbitacin

(D) Charantin glycoside only

**Q21.** Patch budding involves removal of a rectangular patch of bark from the rootstock and replacing it with a similar patch from the scion. This method is commonly used in which crop?

(A) Mango

(B) Citrus

(C) Guava

(D) Rubber and cashew

**Q22.** The button mushroom (*Agaricus bisporus*) is cultivated on pasteurized wheat straw substrate. The optimal temperature range for its fruiting body development is:

(A) 15–20°C

(B) 25–30°C

(C) 30–35°C

(D) 10–12°C

**Q23.** In wide hybridization between distantly related species, the  $F_1$  hybrid seed often fails to develop normally after fertilization due to endosperm failure. Which technique is used to rescue such embryos?

(A) Somatic hybridization (protoplast fusion)



- (B) Doubled haploid method
- (C) Embryo rescue (embryo culture on artificial medium)
- (D) Recurrent backcrossing

**Q24.** In-vitro fertilization in plants is used to overcome which type of barrier in wide/distant hybridization?

- (A) Post-fertilization barrier (embryo abortion)
- (B) Pre-fertilization barrier (pollen tube fails to reach ovule)
- (C) Post-zygotic chromosomal incompatibility
- (D) Heterosis suppression

**Q25.** The State Seed Certification Agency (SSCA) inspects seed production fields at various stages. The minimum germination percentage required for certification of foundation seed of wheat is:

- (A) 75%
- (B) 80%
- (C) 82%
- (D) 85%

**Q26.** When treating legume seeds with both Rhizobium bio-inoculant and a chemical fungicide, the correct sequence of application is:

- (A) Apply fungicide first, allow to dry, then apply Rhizobium
- (B) Apply Rhizobium first, then immediately apply fungicide
- (C) Mix fungicide and Rhizobium together for simultaneous application
- (D) Apply Rhizobium only after field sowing, not as seed treatment

**Q27.** The rice leaf folder (*Cnaphalocrocis medinalis*) larva causes damage by:

- (A) Boring into the stem, causing dead hearts



- (B) Sucking sap from leaf veins, causing hopperburn
- (C) Folding leaf margins and feeding on green leaf tissue, producing silver-coloured streaks
- (D) Mining inside the leaf tissue between upper and lower epidermis

**Q28.** Thrips (*Thrips tabaci*) infesting onion crops causes a symptom known as:

- (A) Bunchy top
- (B) Mosaic pattern on leaves
- (C) Gall formation on leaf margins
- (D) Silver-top (tip whitening and distortion of leaves)

**Q29.** Late leaf spot of groundnut (Tikka disease) is caused by which pathogen?

- (A) *Cercospora arachidicola*
- (B) *Phakopsora pachyrhizi*
- (C) *Colletotrichum destructivum*
- (D) *Cercosporidium personatum*

**Q30.** In ergot disease of bajra caused by *Claviceps fusiformis*, the initial symptom visible in the field is the production of:

- (A) Honeydew (sugary, sticky secretion) from infected florets
- (B) Dark purple sclerotia visible on ears
- (C) White powdery coating on leaves
- (D) Water-soaked lesions at the base of the stem

**Q31.** Spinosad is a bio-pesticide derived from the fermentation of which microorganism?

- (A) *Bacillus thuringiensis* (Bt)
- (B) *Beauveria bassiana*



- (C) *Trichoderma viride*
- (D) *Saccharopolyspora spinosa* (an actinomycete)

**Q32.** Which of the following is the most important personal protective equipment (PPE) recommended while applying pesticides in the field?

- (A) Only rubber boots
- (B) Gloves, face mask/respirator, goggles, and full-sleeve clothing worn together
- (C) Only a cloth mask tied over the nose
- (D) Safety goggles only

**Q33.** Gir cattle produce A2 type milk. The A2 milk differs from A1 milk based on:

- (A) Fat content – A2 milk has higher fat percentage
- (B) Lactose content – A2 milk is lactose-free
- (C) Amino acid at position 67 of beta-casein protein – A2 has proline, A1 has histidine
- (D) Calcium content – A2 milk has twice the calcium of A1 milk

**Q34.** The Mehsana buffalo breed is characterized by which of the following features?

- (A) Greyish-black colour, upturned horns, milk yield of 1800–2200 litres per lactation
- (B) Black colour, tightly curled horns, highest milk yield among Indian buffaloes
- (C) Light grey colour, long straight horns, mainly used as a draft animal
- (D) Brown colour, medium horns, primarily a meat breed

**Q35.** Pugal sheep, found in the Bikaner region of Rajasthan, is best described as:



- (A) A fine-wool breed producing Pashmina-quality wool
- (B) A specialized dairy sheep with high milk yield
- (C) A sheep breed used exclusively for carpet wool
- (D) A dual-purpose arid-zone breed valued for both meat and coarse wool, adapted to desert conditions

**Q36.** The National Research Centre (NRC) for ostrich farming in India is located at:

- (A) Bikaner, Rajasthan
- (B) Rajkot, Gujarat
- (C) Hyderabad, Telangana
- (D) Anand, Gujarat

**Q37.** The law of diminishing returns in agriculture states that as successive units of a variable input (e.g., fertilizer) are added to a fixed input (land), the marginal product:

- (A) Increases continuously
- (B) Remains constant throughout
- (C) Eventually decreases after a certain point
- (D) First decreases then increases

**Q38.** Under Weather-Based Crop Insurance Scheme (WBCIS), insurance payout to farmers is triggered by:

- (A) Adverse weather indices (deficit/excess rainfall, temperature deviations) recorded at reference weather stations
- (B) Actual crop yield loss assessed by field survey teams
- (C) Market price fall below minimum support price
- (D) Soil moisture readings below critical threshold



- Q39.** Agricultural extension education primarily aims to:
- (A) Replace traditional farming practices entirely with modern technology
  - (B) Conduct research experiments at farmers' fields
  - (C) Bridge the gap between agricultural research institutions and farmers by transferring useful technologies
  - (D) Provide formal university education to rural youth
- Q40.** Krishi Vigyan Kendras (KVKs) functioning under the Indian Council of Agricultural Research (ICAR) are mandated to conduct which of the following activities?
- (A) Seed production and export
  - (B) On-farm testing (OFT), frontline demonstrations (FLD), and training of farmers and extension workers
  - (C) Administration of agricultural loans and credit
  - (D) Inspection and certification of seed lots



## Detailed Solutions

Q1.

## Solution

Sodic soils are characterised by an Exchangeable Sodium Percentage (ESP) greater than 15.

High ESP causes soil particles to disperse, destroying structure and reducing water infiltration.

The reclamation principle: replace exchangeable  $\text{Na}^+$  with  $\text{Ca}^{2+}$ .

Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) is the most practical amendment because:

- It is sparingly soluble and releases  $\text{Ca}^{2+}$  gradually.
- $\text{Ca}^{2+}$  displaces  $\text{Na}^+$  from the cation exchange sites.
- The displaced  $\text{Na}^+$  combines with  $\text{SO}_4^{2-}$  to form  $\text{Na}_2\text{SO}_4$  (soluble).
- $\text{Na}_2\text{SO}_4$  is then removed by leaching with irrigation water.

Reaction:  $\text{Na-clay} + \text{CaSO}_4 \rightarrow \text{Ca-clay} + \text{Na}_2\text{SO}_4$  (leached away).

Lime ( $\text{CaCO}_3$ ) is effective only in acid soils; it is insoluble at alkaline pH of sodic soils.

Muriate of potash and zinc sulphate do not supply  $\text{Ca}^{2+}$  in sufficient quantities for reclamation.

**Final Answer:** Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) is the most effective amendment for reclaiming sodic soils ( $\text{ESP} > 15$ ) because  $\text{Ca}^{2+}$  replaces  $\text{Na}^+$  on exchange sites, and the displaced  $\text{Na}_2\text{SO}_4$  is removed by leaching.

**Answer: (B)** [Go Back to Q1](#)

Q2.

## Solution

Phosphorus (P) exists largely as insoluble forms in soil (Ca-phosphates at high pH; Fe/Al-phosphates at low pH).

Phosphate-Solubilizing Bacteria (PSB) make P available by:

- Secreting organic acids (citric, gluconic, oxalic) that dissolve mineral phosphates.
- Producing phosphatase enzymes that mineralise organic P compounds.
- Lowering the rhizosphere pH, increasing P solubility.



The most important PSB genera are *Bacillus* (e.g., *B. megaterium*) and *Pseudomonas* (e.g., *P. fluorescens*).

*Rhizobium* and *Frankia* fix atmospheric  $N_2$ , not P.

*Aspergillus niger* is a fungal PSB (not bacterial), though it can solubilise P.

*Nostoc* and *Anabaena* are cyanobacteria that fix  $N_2$  in paddy fields.

**Final Answer:** *Bacillus* (e.g., *B. megaterium*) and *Pseudomonas* (e.g., *P. fluorescens*) are the principal phosphate-solubilizing bacteria (PSB) that mobilise insoluble soil phosphorus by secreting organic acids and phosphatase enzymes.

**Answer: (A)** [Go Back to Q2](#)

Q3.

### Solution

Grey speck disease is the classic deficiency symptom of Manganese (Mn) in oats (*Avena sativa*).

Mn is required for:

- Photosynthesis (water-splitting complex of Photosystem II).
- Enzyme activation (Mn-superoxide dismutase).
- Chlorophyll biosynthesis.

Deficiency symptoms:

- In oats: grey or brown speck on basal parts of young leaves.
- In other crops: interveinal chlorosis of young leaves (similar to Fe deficiency but Mn affects younger leaves first).
- Occurs mainly in alkaline and poorly-drained soils where Mn is oxidised to unavailable  $MnO_2$ .

Correction: foliar spray of  $MnSO_4$  at 0.5% solution.

Zn deficiency causes white bud (maize) or khaira (paddy). Fe deficiency causes interveinal chlorosis in alkaline soils. B deficiency causes hollow heart and death of growing points.

**Final Answer:** Grey speck disease in oats is a classic symptom of Manganese (Mn) deficiency, occurring mainly in alkaline soils where Mn is oxidised to the unavailable  $MnO_2$  form.

**Answer: (C)** [Go Back to Q3](#)



Q4.

**Solution**

Tillage, when done appropriately, breaks hardpan, improves aeration, and enhances moisture infiltration.

However, **excessive tillage** causes:

- Breakdown of macro-aggregates into micro-aggregates and fine particles.
- Destruction of soil organic matter (accelerated oxidation) which is the binding agent for aggregates.
- Reduction in soil pore space and infiltration capacity.
- Increased surface crusting and runoff.
- Disruption of soil microbial communities and earthworm channels.

Repeated tillage also increases fuel/energy cost per unit area.

Options (A), (B), and (C) are incorrect because:

- Excessive tillage destroys macropores, thus reducing water retention and infiltration.
- Tillage temporarily increases (not reduces) soil temperature by exposing soil to sunlight.
- Soil microbial biomass decreases with excessive tillage due to habitat disruption.

**Final Answer:** Excessive tillage breaks down soil macro-aggregates, destroys organic matter that binds them, and disrupts the pore structure, leading to surface crusting, reduced infiltration, and structural degradation.

**Answer: (D)** [Go Back to Q4](#)

Q5.

**Solution**

Rajasthan has a rich tradition of rainwater harvesting due to its arid and semi-arid climate.

**Khet talai** (literally “field pond”) is a farm-level water harvesting structure:

- Built at the lowest corner of a field to collect surface runoff.
- Water stored is used for life-saving supplemental irrigation of rabi crops.



- It also helps recharge shallow groundwater tables locally.
- Typical capacity: 500–2000 m<sup>3</sup> depending on field size.

Other Rajasthan water structures:

- **Johad:** community pond built across drainage lines, mainly for livestock and drinking.
- **Tanka:** underground cylindrical cistern (5000–15000 litres) for drinking water, common in Barmer/Jaisalmer.
- **Kund:** circular underground storage structure with a catchment area, used for drinking water.

Khet talai is the answer as it specifically stores runoff from the field for *supplemental irrigation*.

**Final Answer:** Khet talai (farm pond) is the traditional Rajasthan structure built at the lowest corner of a field to collect runoff for supplemental irrigation of rabi crops, distinguishing it from community structures like johad or drinking-water structures like tanka.

**Answer: (B)** [Go Back to Q5](#)

Q6.

### Solution

Border strip irrigation method:

- Field is levelled into long rectangular strips (borders), separated by low earthen ridges (bunds).
- Width: 3–15 m; Length: 60–300 m depending on slope and soil texture.
- Water is released at the upper end and flows by gravity down the strip.
- Uniform wetting occurs across the strip as water advances.

Why suitable for close-growing cereal crops:

- Dense crop canopy uniformly covers the strip, ensuring even water spread.
- Crops like wheat, barley, sorghum, fodder grasses have uniform, close plant spacing.
- Does not require individual furrows between rows.

Why not suitable for other options:



- Widely spaced row crops (sugarcane) use furrow irrigation, not border strips.
- Orchard crops on hilly terrain use drip or contour irrigation.
- Flooded paddy uses banded field (basin) irrigation.

**Final Answer:** Border strip irrigation is most suitable for close-growing cereal crops like wheat and sorghum because their dense, uniform canopy ensures even lateral water distribution across the strip without requiring individual furrows.

**Answer: (A)** [Go Back to Q6](#)

Q7.

### Solution

Allelopathy is defined as the direct or indirect effect of one plant on another through the release of chemical compounds (allelochemicals) into the environment.

*Phalaris minor* (little seed canary grass) is a major weed in wheat fields of Rajasthan and Punjab:

- It releases water-soluble allelochemicals from its roots, shoots, and decaying residues.
- These compounds inhibit wheat seed germination and early seedling growth.
- The allelochemicals include phenolic acids, alkaloids, and terpenoids.

Distinction from other terms:

- **Parasitism:** direct physical attachment of one organism to another for nutrition (e.g., *Cuscuta* on wheat).
- **Competition:** plants compete for the same resources (light, water, nutrients) without chemical release.
- **Amensalism:** one organism is harmed while the other is unaffected; allelopathy is a specific mechanism of amensalism.

The question specifies chemical compound release, so the correct term is allelopathy.

**Final Answer:** The inhibition of wheat germination and growth by *Phalaris minor* through toxic phenolic acids, alkaloids, and terpenoids released into the soil is termed allelopathy, a specific chemical interference mechanism distinct from competition.

**Answer: (C)** [Go Back to Q7](#)



Q8.

**Solution**

Cover crops are crops grown during the off-season (between main crops) to cover bare soil.

Benefits of cover crops like cowpea (*Vigna unguiculata*) and daincha (*Sesbania aculeata*):

- **Erosion control:** Canopy cover reduces raindrop impact; roots bind soil particles.
- **Organic matter addition:** Biomass incorporated as green manure improves soil structure, water retention, and microbial activity.
- **Nitrogen fixation:** Both are legumes with root nodules containing *Rhizobium* bacteria that fix atmospheric  $N_2$ .
- **Weed suppression:** Dense canopy smothers weed germination.
- **Soil moisture conservation:** Reduces evaporation from the soil surface.

Options (A), (B), (C) are incorrect:

- Cover crops do not primarily increase soil pH (some may slightly acidify through organic acid release).
- They do not directly control insect pests (though they may support beneficial insects).
- They improve soil health for subsequent crops but do not improve grain quality of the next crop directly.

**Final Answer:** Leguminous cover crops like cowpea and daincha are grown between main crop seasons primarily to prevent soil erosion, add organic matter as green manure, and fix atmospheric nitrogen through *Rhizobium* symbiosis.

**Answer: (D)** [Go Back to Q8](#)



Q9.

**Solution**

Photoperiodism in crops:

- **Long-day plants (LDP):** Flower/head when day length exceeds a critical minimum (usually >12–14 hours).
- **Short-day plants (SDP):** Flower when day length is below a critical maximum.
- **Day-neutral plants:** Flower regardless of day length.

Wheat (*Triticum aestivum*) is a **long-day plant**:

- Heading (ear emergence) is promoted by day lengths exceeding 14 hours.
- This is why wheat is grown in Rabi season (sown Oct–Nov; heads in Feb–Mar when days lengthen).
- Temperature response (vernalisation) is separate from photoperiod response.

Comparison with paddy:

- Paddy (*Oryza sativa*) is a short-day plant; it flowers when days shorten in the Kharif season.

Option (D) “quantitative short-day” is incorrect; wheat is a quantitative long-day plant (heading is accelerated but not absolutely required by long days in some varieties).

**Final Answer:** Wheat (*Triticum aestivum*) is a long-day plant that requires day lengths exceeding 14 hours to promote heading, which is why it is sown in Rabi season and heads in February–March when days lengthen.

**Answer: (B)** [Go Back to Q9](#)



Q10.

**Solution**

Methods of rice establishment:

- (a) **Transplanting (TPR)**: Seedlings raised in nursery (25–30 days) and transplanted to puddled field. High yield but labour-intensive.
- (b) **Direct Seeding Wet (DSW)**: Pre-germinated seeds broadcast or drilled into flooded/wet puddled field. Saves nursery stage labour; earlier crop establishment.
- (c) **Direct Seeding Dry (DSD)**: Dry seeds sown directly into non-puddled field before monsoon. Saves water, suitable for water-scarce areas.
- (d) **Dibbling**: Seeds placed at specific spacing in small holes; more uniform plant stand than broadcasting.

The question asks specifically about broadcasting pre-germinated seeds in flooded/wet fields – this is **DSW** (Direct Seeding Wet).

DSW saves 30–35% water compared to TPR, requires less labour for transplanting, but needs careful water management.

**Final Answer:** Direct Seeding Wet (DSW) involves broadcasting pre-germinated rice seeds into a flooded or wet puddled field, bypassing the nursery-transplanting stage and saving 30–35% water compared to transplanted rice.

**Answer: (A)** [Go Back to Q10](#)

Q11.

**Solution**

Baby corn is a specialised product of maize:

- Harvested 2–3 days after silk emergence, **before pollination occurs**.
- At this stage, the ear (cob) is tiny (7–10 cm), tender, and has not yet developed starch in the kernels.
- Detasseling (removal of the tassel) is done to prevent self-pollination.
- The harvested ear with husk is a premium vegetable used in Chinese and Thai cuisine.

Other maize types for comparison:

- **Sweet corn**: Harvested at milk stage (R3); sugary gene (su) prevents starch conversion.



- **Popcorn:** Harvested at full maturity; hard endosperm explodes when heated.
- **Flour corn:** Soft endosperm; harvested at full maturity for flour making.

Dough stage and blister stage are intermediate grain fill stages – not the harvest stage for baby corn.

**Final Answer:** Baby corn is harvested 2–3 days after silk emergence, before pollination occurs, when the tender unpollinated cob (7–10 cm) has no starch in the kernels and is used as a premium vegetable.

**Answer: (C)** [Go Back to Q11](#)

Q12.

### Solution

Bajra (Pearl millet, *Pennisetum glaucum*) sowing details:

- **Broadcasting:** Seed rate is higher (5–6 kg/ha) due to poor placement and uneven germination.
- **Line sowing / Drilling:** Recommended seed rate is **4–5 kg/ha**.
- Row spacing: 45 cm × 15 cm (kharif dryland) to 45 cm × 10 cm (irrigated).

Why line sowing is preferred:

- Better plant population per unit area.
- Uniform seed depth ensures even germination.
- Facilitates inter-cultivation and weeding.
- Higher and more stable yield compared to broadcasting.

1–2 kg/ha is too low (used for some fine-seeded grasses). 8–10 kg/ha is the range for wheat. 15–20 kg/ha is for sorghum hybrid seed under some conditions.

**Final Answer:** The recommended seed rate for bajra by line sowing/drilling is 4–5 kg/ha, which ensures optimal plant population with uniform depth placement and facilitates inter-cultivation compared to broadcasting.

**Answer: (B)** [Go Back to Q12](#)



Q13.

**Solution**

Sowing windows for chickpea (*Cicer arietinum*) in Rajasthan:

- **Early sowing** (October 15): Higher vegetative growth but risk of insect pests (pod borer) and Botrytis blight.
- **Normal sowing** (October 25 – November 5): Optimal for yield; full vegetative phase, adequate cooling during flowering.
- **Late sowing** (after November 15): Progressively reduced yields.

Effects of late sowing:

- Shorter vegetative phase – fewer branches, fewer nodes bearing pods.
- Flowering occurs in colder/shorter days, reducing pollination efficiency.
- Fewer pods per plant and lower seed weight.
- Crop maturity rushes due to rising spring temperatures.
- Reduction in yield can be 15–40% compared to normal sowing.

Options (A), (B), (C) are incorrect for late sowing – late sowing reduces pod number, not increases it; cooler temperatures in mid-season are available at normal sowing; Fusarium wilt incidence is less affected by sowing date.

**Final Answer:** Late sowing of chickpea after November 15 in Rajasthan results in a shortened vegetative phase, fewer branches and pods per plant, and yield losses of 15–40% compared to normal sowing (October 25 – November 5).

**Answer: (D)** [Go Back to Q13](#)

Q14.

**Solution**

Mustard aphid (*Lipaphis erysimi*, Family: Aphididae) is the most destructive pest of mustard (*Brassica* spp.):

**Seasonal occurrence:**

- First infestation appears around late November to December.
- Peak infestation and maximum damage occurs during **December to January**.
- Decline occurs as temperatures rise above 25°C in February–March.



**Nature of damage:**

- Both nymphs and adults suck phloem sap from tender shoots, inflorescences, and pods.
- Infested plant parts become yellow, crinkled, and dry up.
- Honeydew secreted by aphids promotes sooty mould growth.
- Yield losses of 30–70% have been reported in severe infestations.

**Management:** Dimethoate 30 EC at 1 L/ha or imidacloprid as a systemic insecticide; natural enemies (ladybird beetles, syrphid flies) as biological control.

March–April is too late (aphid population already declining); September–October and May–June are before/after crop season.

**Final Answer:** Mustard aphid (*Lipaphis erysimi*) causes maximum damage during December to January when cool temperatures (below 25°C) favour rapid colony multiplication on tender shoots and inflorescences, causing yield losses of 30–70%.

**Answer: (A)** [Go Back to Q14](#)

Q15.

**Solution**

Moong/Mungbean (*Vigna radiata*) as a zaid/summer crop:

- Sown in March–April after wheat harvest in Rajasthan and northwestern India.
- Harvested in May–June before the kharif sowing window.

Key characteristics making it suitable for the zaid season:

- **Short duration:** Matures in 60–65 days, fitting the narrow window between rabi and kharif seasons.
- **Heat tolerance:** Can tolerate temperatures of 28–35°C during the summer season.
- **Low water requirement:** 3–4 irrigations sufficient; fits limited canal water availability in summer.

Additional benefits:

- Fixes atmospheric N<sub>2</sub> via *Rhizobium* symbiosis, benefiting the next crop.



- Provides high-protein food (22–24% protein).
- Acts as a break crop reducing disease buildup.

Options (A), (B), (D) are incorrect: moong has moderate (not high) water requirement; it is susceptible to waterlogging; it is not shade-tolerant.

**Final Answer:** Mungbean (*Vigna radiata*) is the preferred zaid crop after wheat harvest because its short 60–65-day duration and heat tolerance (28–35°C) allow it to fit the narrow window between rabi and kharif seasons while also fixing atmospheric nitrogen.

**Answer:** (C) [Go Back to Q15](#)

Q16.

### Solution

Moth bean (*Vigna aconitifolia*, also called mat bean or Turkish gram):

- Grown extensively in the arid districts of Rajasthan: Barmer, Jodhpur, Nagaur, Jaisalmer, Pali.
- **Drought tolerance:** Has deep root system and small leaves (reduced transpiration) enabling survival on 200–400 mm rainfall.
- **Sandy soil adaptation:** Thrives in light, sandy to sandy loam soils with poor water-holding capacity where other crops fail.
- Requires no irrigation in traditional dryland farming.

Additional attributes:

- Seed protein content: 22–23% (comparable to other pulses but not the highest).
- Fixes N<sub>2</sub> via *Rhizobium* symbiosis – enriches soil.
- Plays a vital role in food security and nutrition for subsistence farming communities.

Options (A), (C), (D) are incorrect: Moth bean needs minimal water; its protein content is good but not the highest; it fixes moderate N, not the highest among legumes.

**Final Answer:** Moth bean (*Vigna aconitifolia*) is the dominant pulse in Rajasthan's arid districts (Barmer, Jodhpur, Nagaur) because its deep root system and small leaves enable survival on just 200–400 mm rainfall in sandy desert soils where other crops fail.



**Answer: (B)** [Go Back to Q16](#)

Q17.

### Solution

Major mango varieties and their geographic origins:

- **Alphonso (Hapus):** Konkan coast, Ratnagiri and Devgad (Maharashtra/Goa). GI tag holder. Known for rich flavour and bright orange colour.
- **Kesar:** Gir Somnath, Junagarh (Saurashtra, Gujarat). GI tag. Known as “Queen of Mangoes”; saffron-coloured pulp.
- **Langra:** Primarily associated with **Varanasi (UP) and Bihar**. Named after a lame saint in Varanasi. Green skin even when ripe; fibreless, sweet pulp.
- **Chausa:** Hardoi, UP and Bihar; eaten in July–August; golden yellow, very sweet, low fibre.

Malihabad (UP) is famous for **Dussehri** mango, not Langra.

The question specifically asks about Langra – which is Varanasi (UP) and Bihar, making option (D) correct.

**Final Answer:** The ‘Langra’ mango variety originated in Varanasi (Uttar Pradesh) and Bihar, named after a lame saint in Varanasi, and is distinguished by its green skin even at full ripeness and fibreless, sweet pulp.

**Answer: (D)** [Go Back to Q17](#)

Q18.

### Solution

Lemon varieties in India:

- **Kagzi Nimboo** (*Citrus aurantifolia*, acid lime / Key lime):
  - Most widely grown lemon in Rajasthan, Andhra Pradesh, and Maharashtra.
  - **Thin rind**, high juice content (50–60%), **high acidity** (citric acid 7–8%).
  - Small round fruit, 3–5 cm diameter.
  - Highly valued for lime pickle, juice, and lemonade.
  - Suited to hot, dry plains climate of Rajasthan.



- **Eureka** (*Citrus limon*): Mediterranean origin, thick rind, less acidic, grown mainly in hills.
- **Lisbon**: Similar to Eureka, grown in cooler climates.
- **Sweet lime (Mosambi, *Citrus limetta*)**: Low acid, sweet flavour – grown mainly in Maharashtra and AP; botanically different.

Kagzi Nimboo is synonymous with lemon cultivation in Rajasthan.

**Final Answer:** Kagzi Nimboo (*Citrus aurantifolia*), the acid lime, is the most commonly grown lemon in Rajasthan's hot dry plains due to its thin rind, high juice content (50–60%), and high citric acid content (7–8%).

**Answer: (A)** [Go Back to Q18](#)

Q19.

### Solution

Bael (*Aegle marmelos*, Rutaceae family – Wood apple):

- **Drought tolerance:** Deep taproot system; survives on 500–600 mm rainfall; adapted to dry deciduous forests and arid zones.
- **Hard-shelled fruit:** Woody pericarp (shell) with sweet-aromatic mucilaginous pulp inside.
- **Medicinal value:** Used since Vedic times for digestive health.
  - Pulp contains *marmelosin*, *tannins*, *alkaloids*, *pectin*.
  - Raw fruit: astringent, useful for chronic diarrhoea and dysentery.
  - Ripe fruit: laxative, used for constipation.
  - Leaves, bark, root: antidiabetic, anti-inflammatory properties.

Sacred significance: associated with Lord Shiva; found near temples across India.

Option (A) is incorrect – bael does not require high rainfall; it is an arid-zone tree.

Option (B) is incorrect – it has a deep taproot, not shallow roots. Option (D) is incorrect – bael does not have succulent stems (that is a feature of cacti/succulents).

Option (C) is correct – bael is valued in arid zones for its extreme drought tolerance (deep taproot, survives on 500–600 mm rainfall) and the medicinal hard-shelled fruit whose pulp (raw = astringent for diarrhoea; ripe = laxative) has been used since Vedic times.

**Final Answer:** Bael (*Aegle marmelos*) is valued in arid zones for its extreme drought tolerance (deep taproot, survives on 500–600 mm rainfall) and the medicinal hard-shelled fruit whose pulp (raw = astringent for diarrhoea; ripe = laxative) has been used since Vedic times.

**Answer: (C)** [Go Back to Q19](#)



Q20.

**Solution**

Bitter gourd (*Momordica charantia*) contains several bioactive compounds:

- **Polypeptide-P (plant insulin):** A peptide structurally similar to bovine insulin that can lower blood glucose in Type 1 diabetic patients when injected or consumed.
- **Charantin:** A steroidal glycoside mixture that has hypoglycaemic activity; stimulates insulin release and enhances glucose uptake.
- **Momordicin:** The bitter compound (a triterpenoid glycoside) responsible for the bitter taste; has some anti-inflammatory properties but is not the primary antidiabetic agent.
- **Cucurbitacin:** A tetracyclic triterpenoid with anti-tumour properties found in many cucurbits, not specific to bitter gourd's antidiabetic effect.

The question asks specifically for the **insulin-like compound** – this is **Polypeptide-P**, also called “plant insulin” because of its structural and functional similarity to animal insulin.

Bitter gourd is also rich in iron, Vitamin C, Vitamin A, and dietary fibre, all contributing to its nutritional value.

**Final Answer:** Polypeptide-P (plant insulin), a peptide structurally similar to bovine insulin found in bitter gourd (*Momordica charantia*), lowers blood glucose in diabetic patients and is specifically termed “plant insulin” due to its functional similarity to animal insulin.

**Answer: (B)** [Go Back to Q20](#)

Q21.

**Solution**

Patch budding technique:

- A **rectangular** or square patch of bark (with/without wood) is removed from the rootstock.
- A matching patch from the scion (desired variety) is fitted exactly into the cut area.
- The patch is held in place with budding tape, leaving the bud eye exposed.

Crops where patch budding is specifically recommended:



- **Rubber** (*Hevea brasiliensis*): Standard commercial method; bud from selected clones is patch-budded onto seedling rootstock.
- **Cashew** (*Anacardium occidentale*): Patch budding is preferred because the bark is thin and peels easily in patches.
- Also used in walnut and chestnut where T-budding is difficult.

Other crops:

- **Mango**: T-budding, veneer grafting, stone grafting are preferred; patch budding less common.
- **Citrus**: Shield (T) budding is standard.
- **Guava**: Air layering and stooling are more common; budding less practised.

**Final Answer:** Patch budding – transferring a rectangular bark patch carrying a bud from scion to rootstock – is the standard commercial propagation method for rubber (*Hevea brasiliensis*) and cashew (*Anacardium occidentale*) because their thin bark peels cleanly in matching patches.

**Answer: (D)** [Go Back to Q21](#)

Q22.

### Solution

Button mushroom (*Agaricus bisporus*) cultivation:

- **Substrate:** Pasteurized compost of wheat straw + poultry manure or horse dung; pH 6.5–7.5.
- **Casing soil:** A layer of peat moss or coco peat applied after spawn run to trigger pinhead formation.
- **Temperature requirements:**
  - Spawn running (mycelium colonisation): 22–25°C.
  - Fruiting body (pin/mushroom) development: 15–20°C.

This is why button mushroom is a **winter crop** in plains of India (November–February), and grown year-round in the hills.

At temperatures above 25°C, fruiting bodies do not form or become deformed (stipes elongate, caps do not open properly).

Comparison with oyster mushroom (*Pleurotus* spp.): fruiting temperature 20–28°C; suitable for warmer seasons.



Options (B), (C) are too warm for button mushroom fruiting. Option (D) at 10–12°C is below the optimal range (fruiting slows significantly below 12°C).

**Final Answer:** Button mushroom (*Agaricus bisporus*) requires 15–20°C for fruiting body development, which is why it is a winter crop in Indian plains (November–February), with spawn running conducted at the higher temperature of 22–25°C.

**Answer: (A)** [Go Back to Q22](#)

Q23.

### Solution

Wide hybridization between distantly related species often fails at the post-fertilization stage:

- Fertilization may occur, but the embryo fails to develop normally.
- Cause: **endosperm failure** – the endosperm (nutritive tissue for embryo development) does not form properly because of interspecific incompatibility between maternal tissue and hybrid embryo.
- Without endosperm nutrition, the embryo aborts (dies) before seed maturity.

**Embryo rescue** technique:

- Immature hybrid embryo is dissected from the seed 7–14 days after pollination (before it aborts).
- Embryo is placed on a sterile artificial nutrient medium (Murashige & Skoog medium) in a test tube.
- Embryo grows into a complete plant in culture (totipotency).
- The resulting plantlet is acclimatized and transferred to field.

Applications: interspecific hybridization in potato, cotton, Brassica, barley, and many ornamentals.

Somatic hybridization (option A) is for overcoming pre-fertilization barriers. Doubled haploid (option B) is for haploid production. Recurrent backcrossing (option D) is for gene introgression after hybridization.

**Final Answer:** Embryo rescue – dissecting the immature hybrid embryo (7–14 days after pollination) and culturing it on MS medium – is used to prevent embryo abortion caused by endosperm failure in wide interspecific hybridization.

**Answer: (C)** [Go Back to Q23](#)



Q24.

**Solution**

Hybridization barriers in plants:

- **Pre-fertilization barriers:** Prevent fertilization from occurring.
  - Pollen cannot germinate on the stigma.
  - Pollen tube grows slowly or stops before reaching the ovule.
  - Stylar incompatibility proteins block pollen tube growth.
- **Post-fertilization barriers:** Fertilization occurs but the zygote/embryo fails to develop.

**In-vitro fertilization (IVF)** in plants:

- Isolated ovules (or ovaries) and pollen are brought together in culture medium outside the plant.
- This bypasses the entire stigma-style-pollen tube pathway.
- Fertilization occurs directly in the culture medium.
- Used to overcome pre-fertilization incompatibility in distant hybridization.

Applications: ornamental breeding (roses, lilies), cereals, legumes where pollen tube growth is blocked by style proteins.

Post-fertilization barriers (option A) are overcome by embryo rescue, not IVF. Option (C) post-zygotic chromosomal incompatibility is addressed by amphidiploidy/chromosome doubling. Option (D) heterosis suppression is not a hybridization barrier.

**Final Answer:** In-vitro fertilization in plants overcomes pre-fertilization barriers – particularly stylar incompatibility that blocks pollen tube growth – by bringing isolated ovules and pollen together directly in culture medium, bypassing the stigma-style pathway entirely.

**Answer: (B)** [Go Back to Q24](#)



Q25.

**Solution**

Seed Certification standards for wheat (*Triticum aestivum*) in India (as per IMSCS – Indian Minimum Seed Certification Standards):

Seed Class	Min. Germination (%)	Min. Physical Purity (%)
Breeder Seed	85	99
Foundation Seed	85	98
Certified Seed	85	98

For wheat, all classes (Breeder, Foundation, Certified) require a minimum germination of **85%**.

Role of SSCA:

- Inspects seed production fields at: pre-sowing, seedling, flowering, and pre-harvest stages.
- Tests seed lots for: germination, physical purity, moisture content, varietal purity.
- Issues certificate if all standards are met; the seed lot can then be tagged and sold as certified seed.

Options (A) 75%, (B) 80%, (C) 82% are below the actual standard of 85% for wheat.

**Final Answer:** As per Indian Minimum Seed Certification Standards (IMSCS), the minimum germination percentage required for foundation seed of wheat is 85%, applicable equally to breeder and certified seed classes.

**Answer: (D)** [Go Back to Q25](#)

Q26.

**Solution**

When using both chemical fungicide and bio-inoculant (Rhizobium) for seed treatment, the sequence matters because:

- Chemical fungicides are toxic to *Rhizobium* bacteria (living organisms).
- Direct contact of fungicide with Rhizobium inoculant kills or reduces bacterial viability.

**Correct sequence:**



- (a) Apply chemical fungicide (e.g., Thiram or Carbendazim) to the seeds first.
- (b) Allow treated seeds to air-dry in shade for 20–30 minutes.
- (c) Then apply Rhizobium inoculant (mixed with jaggery/adhesive solution).
- (d) Allow to dry again in shade before sowing.

This ensures:

- The fungicide protects the seed from soil-borne pathogens.
- The Rhizobium bacteria remain viable on the seed surface at sowing.
- Effective nodulation in the field.

Options (B) and (C) are incorrect – applying Rhizobium before or alongside fungicide kills the bacteria. Option (D) is incorrect – Rhizobium as seed treatment is the standard and effective method.

**Final Answer:** When treating legume seeds with both fungicide and Rhizobium, fungicide must be applied first and allowed to dry (20–30 min in shade) before applying Rhizobium, to prevent the chemical from killing the living bacterial inoculant.

**Answer: (A)** [Go Back to Q26](#)

Q27.

### Solution

Rice leaf folder (*Cnaphalocrocis medinalis*, Order: Lepidoptera, Family: Crambidae):

**Damage mechanism:**

- Early instar larva: scrapes green tissue from the leaf surface, creating white or transparent streaks.
- Later instars: fold the leaf longitudinally by webbing the margins together with silk.
- The larva lives inside the folded leaf tube and feeds on the enclosed green tissue (mesophyll).
- Characteristic symptom: **silvery, longitudinal streaks** on leaves; leaves appear scorched and white.

Life cycle: Egg → larva (5 instars, 15–20 days) → pupa → adult moth.



**Management:**

- Chemical: chlorpyrifos 20 EC, monocrotophos, or quinalphos sprays.
- Biological: Bt spray (*B. thuringiensis* var. *kurstaki*); parasitoids (*Apanteles* species).

**Elimination of distractors:**

- Option (A) describes stem borer (*Chilo suppressalis*) which causes dead heart.
- Option (B) describes rice brown planthopper (*Nilaparvata lugens*) causing hopperburn.
- Option (D) describes a leaf miner, not leaf folder.

**Final Answer:** The rice leaf folder (*Cnaphalocrocis medinalis*) larva folds rice leaf margins longitudinally with silk and feeds on the enclosed mesophyll tissue, producing characteristic silvery longitudinal streaks on leaves.

**Answer: (C)** [Go Back to Q27](#)

**Q28.**

### Solution

Onion thrips (*Thrips tabaci*, Order: Thysanoptera):

**Nature of damage:**

- Both adults and nymphs are rasping-sucking feeders.
- They puncture cells on the leaf surface and suck out the sap.
- This causes characteristic **silvery-white patches or streaks** on leaves, progressing to leaf tip whitening (“silver-top”).
- Severe infestation causes leaf curling, distortion, and drying.
- Infested bulb plants show stunted growth and reduced bulb size.

**Vector role:**

- *T. tabaci* also vectors **Tomato Spotted Wilt Virus (TSWV)** on groundnut and other crops.

Management: imidacloprid, fipronil, spinosad foliar sprays; blue sticky traps.

**Elimination of distractors:**

- Bunchy top (option A) is a viral disease of banana.
- Mosaic (option B) is a virus symptom, not thrips damage.
- Gall formation (option C) is caused by nematodes or gall midges.

**Final Answer:** Onion thrips (*Thrips tabaci*) damage onion leaves by rasping-sucking feeding, producing silvery-white patches that progress to leaf tip whitening and distortion (“silver-top”), with severe infestations also stunting bulb development.

**Answer: (D)** [Go Back to Q28](#)

Q29.

### Solution

Tikka disease (leaf spot) of groundnut (*Arachis hypogaea*) is caused by two different fungi:

Type	Pathogen	Symptom
Early leaf spot	<i>Cercospora arachidicola</i>	Lighter brown spots, yellow halo
Late leaf spot	<i>Cercosporidium personatum</i>	Darker spots, little/no halo

The question asks specifically for the causal organism of **late leaf spot**:

- Pathogen: *Cercosporidium personatum* (also known as *Phaeoisariopsis personata*).
- Spots appear darker (dark brown to black) than early leaf spot.
- Appears later in the season (after 40–50 days of crop age).
- Causes more severe defoliation than early leaf spot.

Management: mancozeb 75 WP (2.5 g/L) or chlorothalonil sprays at 10-day intervals.

Options (A) *C. arachidicola* causes early leaf spot. Options (B) and (C) are pathogens of soybean rust and anthracnose respectively.

**Final Answer:** Late leaf spot (Tikka disease) of groundnut is caused by *Cercosporidium personatum* (syn. *Phaeoisariopsis personata*), which produces darker spots with little or no yellow halo and appears later in the season (after 40–50 days), causing more severe defoliation than early leaf spot.

**Answer: (D)** [Go Back to Q29](#)



Q30.

**Solution**

Ergot disease of bajra (pearl millet) caused by *Claviceps fusiformis*:

**Disease cycle and symptoms in sequence:**

- (a) Ascospores or conidia infect the ovary of florets at flowering stage.
- (b) **First visible symptom:** Infected florets exude a **honeydew** – a sugary, sticky, pinkish to whitish secretion – within 5–7 days of infection.
- (c) Insects attracted to honeydew spread the conidia to healthy flowers (secondary spread).
- (d) Later, the honeydew dries and the ovary is replaced by a hard, dark purple **sclerotium** (ergot body).
- (e) Sclerotia fall to soil and overwinter; germinate to produce ascospores the next season.

**Economic importance:**

- Ergot sclerotia contain toxic alkaloids (ergotamine, ergocristine) – cause ergotism in humans and animals.
- Must be removed before milling.

Management: rogue out infected earheads; seed treatment; use resistant varieties; spray Mancozeb at 50% flowering.

Option (B) – sclerotia are the later stage, not the initial symptom. Options (C) and (D) are not ergot symptoms.

**Final Answer:** The first visible field symptom of ergot disease of bajra (*Claviceps fusiformis*) is the honeydew – a sugary, sticky, pinkish secretion from infected florets within 5–7 days of infection – which attracts insects that spread conidia to healthy flowers before sclerotia form later.

**Answer: (A)** [Go Back to Q30](#)



Q31.

**Solution**

Spinosad is a naturally derived insecticide:

- Produced by aerobic fermentation of the soil actinomycete *Saccharopolyspora spinosa*.
- Active components: **Spinosyn A** and **Spinosyn D** (macrocyclic lactones).

**Mode of action:**

- Activates **nicotinic acetylcholine receptors** (nAChR) in insect nervous system – distinct from imidacloprid's binding site.
- Also acts on GABA-gated chloride channels.
- Causes rapid paralysis, tremors, and death of insects.

**Spectrum and uses:**

- Effective against Lepidoptera (bollworms, leaf folders), Diptera (fruit flies), Thysanoptera (thrips).
- Approved for use in **organic farming** by NPOP (National Programme for Organic Production) in India.
- Low toxicity to mammals and beneficial insects (predators/parasitoids).

Elimination of distractors:

- *Bacillus thuringiensis* (option A) produces Cry proteins for lepidoptera.
- *Beauveria bassiana* (option B) is an entomopathogenic fungus.
- *Trichoderma viride* (option C) is a biocontrol fungus against soil pathogens.

**Final Answer:** Spinosad is produced by fermentation of the soil actinomycete *Saccharopolyspora spinosa*; its active components (Spinosyn A and D) act on nicotinic acetylcholine receptors and GABA channels in insects, causing paralysis and death, and are approved for organic farming.

**Answer: (D)** [Go Back to Q31](#)



Q32.

**Solution**

Personal Protective Equipment (PPE) for pesticide application:

- **Gloves:** Prevent dermal absorption through hands (the most common route of pesticide poisoning).
- **Face mask/respirator:** Prevents inhalation of pesticide vapours, mists, and dusts.
- **Goggles:** Protects eyes from splashes and aerosol drift.
- **Full-sleeve clothing** (long-sleeved shirt, long trousers): Prevents skin contact on arms and legs.
- **Rubber boots:** Prevents entry of pesticide through feet.

All PPE components must be used **together** for comprehensive protection, not individually.

Other safety precautions:

- Spray in morning or evening; avoid spraying during windy conditions.
- Wash hands, face, and exposed body parts thoroughly with soap and water after spraying.
- Do not eat, drink, or smoke during spraying.
- Store pesticides in original containers, locked away from children.

Options (A), (C), (D) provide only partial protection and are individually insufficient.

**Final Answer:** Comprehensive pesticide safety requires wearing all PPE components together – gloves (dermal protection), face mask/respirator (inhalation), goggles (eyes), and full-sleeve clothing – because partial protection leaves critical exposure routes open.

**Answer: (B)** [Go Back to Q32](#)



Q33.

**Solution**

A1 vs A2 milk distinction:

- Milk contains about 80% casein proteins; of these, **beta-casein** is the most abundant.
- **Beta-casein** has 209 amino acids in its chain.
- The difference between A1 and A2 milk lies at **position 67** of the beta-casein chain:
  - **A2 milk:** Position 67 = **Proline** (Pro).
  - **A1 milk:** Position 67 = **Histidine** (His).

Significance:

- When A1 beta-casein is digested, the histidine at position 67 allows cleavage, releasing the peptide **beta-casomorphin-7 (BCM-7)**.
- BCM-7 is an opioid peptide that may cause digestive discomfort in some people.
- A2 milk with proline at position 67 resists this cleavage; BCM-7 is not released.

**A2 milk breeds:** Gir, Sahiwal, Red Sindhi, Tharparkar (Indian breeds with humps).

**A1 milk breeds:** Holstein Friesian, Jersey (European/exotic breeds).

Options (A), (B), (D) are incorrect – fat, lactose, and calcium contents are not the differentiating factors between A1 and A2 milk.

**Final Answer:** A2 milk (produced by Indian breeds like Gir and Sahiwal) differs from A1 milk at position 67 of the beta-casein protein – A2 has proline, which prevents release of the opioid peptide BCM-7, while A1 has histidine, which allows its release during digestion.

**Answer: (C)** [Go Back to Q33](#)



Q34.

**Solution**

Mehsana buffalo breed:

- **Origin:** Mehsana district, Gujarat (also found in Banaskantha, Sabarkantha).
- **Body colour:** Greyish-black to slate black; lighter than Murrah.
- **Horns:** Uprturned, less tightly curled than Murrah; sickle-shaped.
- **Milk yield:** 1800–2200 litres per lactation (305 days).
- **Fat content:** 6–7%.
- **Body conformation:** Medium to large size; intermediate between Murrah and Surti.

Position among Indian buffaloes:

- **Murrah** (Haryana): Highest milk yield (2500–3000 L), tightly curled horns, jet black.
- **Mehsana** (Gujarat): Second tier in milk (1800–2200 L), upturned horns.
- **Surti** (Gujarat): Lower milk yield (1200–1500 L), brown colour.

Option (B) describes Murrah. Option (C) is a draft breed description. Option (D) is incorrect – buffaloes are primarily dairy/draft animals.

**Final Answer:** The Mehsana buffalo, originating from Mehsana district, Gujarat, is characterised by greyish-black colour, upturned sickle-shaped horns (unlike Murrah’s tightly curled horns), and a milk yield of 1800–2200 litres per lactation with 6–7% fat.

**Answer: (A)** [Go Back to Q34](#)

Q35.

**Solution**

Pugal sheep:

- **Origin and distribution:** Pugal tehsil of Bikaner district, Rajasthan; also found in northern Bikaner and parts of Hanumangarh and Ganganagar.
- **Type:** Dual-purpose – valued for both **meat** (primary) and **coarse wool**.
- **Wool:** Coarse, hairy fleece; used for making blankets and carpets (not



fine/Pashmina quality).

- **Body characteristics:** Medium to large body, white with black spots on face and legs in some individuals; pendulous ears; adapted to arid desert conditions.
- **Adaptability:** Excellent resistance to drought, heat stress, and sparse desert vegetation; thrives on scanty shrub and bush grazing.

Comparison with other Rajasthan sheep breeds:

- **Malpura:** Mutton breed (Tonk, Sawai Madhopur); white body, medium wool.
- **Chokla:** Fine wool carpet breed (Churu, Sikar, Jhunjhunu); known as “Merino of India”.
- **Nali:** Carpet wool breed (Churu, Nagaur); medium to coarse wool.

Options (A) Pashmina quality wool, (B) dairy purpose, and (C) exclusively carpet wool are all incorrect for Pugal sheep.

**Final Answer:** Pugal sheep from Bikaner’s Pugal tehsil is a dual-purpose desert breed prized for both meat (primary) and coarse wool, with excellent adaptation to Rajasthan’s arid conditions through heat resistance and ability to thrive on sparse desert vegetation.

**Answer: (D)** [Go Back to Q35](#)

Q36.

### Solution

Ostrich farming in India:

- Ostrich (*Struthio camelus*) is the world’s largest living bird; native to Africa.
- Commercial production in India for meat (low-fat, low-cholesterol), leather (high-value), eggs (1 egg  $\approx$  1–1.5 kg), and feathers.

**National Research Centre on Equines (NRCE) and Ostrich:**

- The **National Research Centre on Ostrich** is located at **Rajkot, Gujarat**, under ICAR.
- It conducts research on ostrich breeding, nutrition, health, and production systems for Indian conditions.



Other ICAR institutes for reference:

- NRC on Camel: Bikaner, Rajasthan.
- NRC on Equines: Hisar, Haryana.
- NDRI (National Dairy Research Institute): Karnal, Haryana.
- NRC on Meat: Hyderabad, Telangana.

Option (A) Bikaner is the NRC for camel, not ostrich. Option (C) Hyderabad has NRC on Meat. Option (D) Anand (Gujarat) is known for NDDB and the White Revolution, not ostrich research.

**Final Answer:** The ICAR National Research Centre on Ostrich is located at Rajkot, Gujarat, where it conducts research on ostrich breeding, nutrition, and production systems for Indian conditions, distinct from the NRC on Camel at Bikaner.

**Answer: (B)** [Go Back to Q36](#)

Q37.

### Solution

The **Law of Diminishing Returns** (also called Law of Variable Proportions):

- States: as more and more units of a variable input (e.g., fertilizer, irrigation, labour) are added to a fixed input (e.g., land), holding all other inputs constant, the **marginal product (MP)** of the variable input will eventually decline.

Three stages of production:

- (a) **Stage I:** Increasing returns – MP increases (inputs are still below optimal).
- (b) **Stage II:** Diminishing returns – MP decreases but remains positive (optimal production zone).
- (c) **Stage III:** Negative returns – MP becomes negative (excessive inputs cause harm).

Agricultural application (fertilizer example):

- First 20 kg N/ha may increase yield by 10 q/ha.
- Next 20 kg N/ha adds only 7 q/ha (MP falling).
- Further additions add less and less incremental yield.



- This forms the basis for **economic optimum fertilizer dose** calculation.

The law does not say MP increases continuously (option A), remains constant (option B), or first decreases then increases (option D).

**Final Answer:** The Law of Diminishing Returns states that when successive units of a variable input (e.g., fertilizer) are added to a fixed input (land), the marginal product eventually decreases after a certain point, which forms the scientific basis for calculating the economic optimum fertilizer dose.

**Answer: (C)** [Go Back to Q37](#)

**Q38.**

### Solution

Weather-Based Crop Insurance Scheme (WBCIS):

- Introduced by the Government of India as an alternative to yield-based crop insurance.
- **Principle:** Insurance payout is triggered by **weather indices** (predetermined thresholds), not by actual yield loss measured in the field.

**Trigger parameters:**

- **Rainfall:** Deficit (drought) below threshold or excess (flood) above threshold.
- **Temperature:** Below critical minimum (frost) or above critical maximum (heat stress).
- **Humidity:** Excess relative humidity triggering disease.
- **Wind speed:** Excess wind causing lodging/crop damage.

**Advantages over yield-based insurance:**

- Faster payout – no field-level crop cutting experiments required.
- Objective and transparent – based on instrument readings from Automatic Weather Stations (AWS).
- Reduces moral hazard and disputes.

Option (B) describes the traditional PMFBY yield-based insurance method. Options (C) and (D) describe other schemes (price support, soil moisture monitoring) unrelated to WBCIS payouts.



**Final Answer:** Under WBCIS, insurance payouts are triggered automatically by adverse weather indices – deficit/excess rainfall, temperature deviations, or humidity thresholds – recorded at Automatic Weather Stations, enabling faster and objective settlement without field-level crop-cutting surveys.

**Answer: (A)** [Go Back to Q38](#)

Q39.

### Solution

Agricultural Extension Education:

- **Definition:** A process of disseminating agricultural knowledge and technology from research institutions to farmers to improve their farming practices and livelihoods.
- **Core objective:** Act as a **bridge** between the research station and the farmer's field – ensuring that laboratory-developed technologies reach practical application.

Functions of agricultural extension:

- Technology transfer (new varieties, fertilizer recommendations, IPM).
- Training and skill development of farmers.
- Providing technical guidance and advisory services.
- Facilitating market linkage and institutional credit access.
- Collecting field feedback and channelling farmer needs back to researchers.

**Samastipur model:** A participatory agricultural development model from Samastipur, Bihar where extension workers actively facilitated farmer-researcher dialogue.

Elimination of distractors:

- Option (A): Extension does not replace traditional practices entirely; it adapts and improves them.
- Option (B): Conducting research is the role of scientists at research stations, not extension workers.
- Option (D): Providing formal university education is the role of agricultural universities, not extension.



**Final Answer:** Agricultural extension education primarily bridges the gap between research institutions and farmers by transferring improved varieties, fertilizer recommendations, and IPM technologies to the field, while also channelling farmer feedback back to researchers.

**Answer: (C)** [Go Back to Q39](#)

Q40.

### Solution

Krishi Vigyan Kendra (KVK) – Farm Science Centre:

- Established by **ICAR** (Indian Council of Agricultural Research) at the **district level** across India.
- Currently: 731 KVKs operational covering all districts.

**Mandated activities** of KVKs:

- On-Farm Testing (OFT):** Testing and fine-tuning of technologies under actual farm conditions with farmer participation. This identifies location-specific gaps and refines recommendations.
- Frontline Demonstrations (FLD):** Large-scale demonstrations of proven technologies on farmers' fields to show productivity gains and build confidence.
- Training of Farmers:** Short-term vocational training (2–5 days) on improved crop production, plant protection, soil health, and farm enterprises.
- Training of Extension Workers:** Capacity building of block-level agricultural officers and paravets.
- Farm Advisory Services:** Technical advice and consultancy to farmers.

Elimination of distractors:

- Option (A): Seed production and export is handled by seed corporations (NSC, RSSC), not KVKs.
- Option (C): Agricultural loans and credit are administered by banks (RRBs, PACS, NABARD), not KVKs.
- Option (D): Seed certification is conducted by State Seed Certification Agencies (SSCA), not KVKs.



**Final Answer:** KVKs, established by ICAR at the district level across India, are mandated to conduct on-farm testing (OFT), frontline demonstrations (FLD), and training of farmers and extension workers to translate research outputs into practical farm-level productivity gains.

**Answer: (B)** [Go Back to Q40](#)



## Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	C	4	D	5	B
6	A	7	C	8	D	9	B	10	A
11	C	12	B	13	D	14	A	15	C
16	B	17	D	18	A	19	C	20	B
21	D	22	A	23	C	24	B	25	D
26	A	27	C	28	D	29	D	30	A
31	D	32	B	33	C	34	A	35	D
36	B	37	C	38	A	39	C	40	B

