

Rajasthan Board Class 12 Geology 2026 Question Paper with Solutions

Time Allowed :3 Hours 15 minutes

Maximum Marks :80

Total Questions :14

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Candidate must write first his/her Roll No. on the question paper compulsorily.
2. All the questions are compulsory.
3. Write the answer to each question in the given answer-book only.
4. In Section A, candidates are required to answer all questions. The questions will cover topics from ancient, medieval, and modern history as prescribed by the syllabus.
5. Section B consists of elective questions. Candidates are required to attempt questions from the chosen topic according to the provided options.
6. The questions in Section A will be in the form of multiple-choice, short answer, and essay-type questions.
7. Use of unfair means or electronic devices during the examination is strictly prohibited.

Section - A

1(i). The main microorganism present in the soil is

- (A) Sulfur
- (B) Bacteria
- (C) Cytokinesis
- (D) Gibberellins

Correct Answer: (B) Bacteria

Solution:

Step 1: Understanding the Concept:

Soil is home to a vast community of microorganisms that facilitate nutrient cycling and organic matter decomposition.

The major groups include bacteria, fungi, actinomycetes, algae, and protozoa.

Step 2: Detailed Explanation:

Among all soil organisms, bacteria are the most numerous.

In a single gram of fertile soil, the bacterial population can range from 10^8 to 10^9 cells.

While fungi may contribute more to the total microbial biomass in certain forest or acidic soils, bacteria dominate in terms of population count and metabolic diversity in typical agricultural soils.

Sulfur is a chemical element, whereas cytokinesis is a process of cell division and gibberellins

are plant hormones.

Step 3: Final Answer:

Therefore, bacteria represent the primary and most abundant microorganism in the soil.

💡 Quick Tip

The order of abundance of microorganisms in soil is: Bacteria > Actinomycetes > Fungi > Algae.
Bacteria like Rhizobium are essential for atmospheric nitrogen fixation.

1(ii). The percentage of nitrogen in farm yard manure is

- (A) 0.3 to 0.7
- (B) 0.9 to 2.0
- (C) 2.1 to 2.9
- (D) 3.0 to 3.9

Correct Answer: (A) 0.3 to 0.7

Solution:

Step 1: Understanding the Concept:

Farm Yard Manure (FYM) is a bulky organic manure produced from the decomposed mixture of cattle dung, urine, litter, and leftover fodder.

Step 2: Detailed Explanation:

The nutrient content of FYM is relatively low and varies based on the type of animal and the method of storage.

Standard well-rotted FYM typically contains:

1. Nitrogen (N): 0.5%
2. Phosphorus (P_2O_5): 0.2%
3. Potassium (K_2O): 0.5%

The range given in option (A), 0.3% to 0.7%, correctly encompasses the standard value of 0.5%.

Step 3: Final Answer:

The nitrogen percentage in farm yard manure falls in the range of 0.3 to 0.7%.

💡 Quick Tip

A simple way to remember FYM NPK content is the "Half-Quarter-Half" rule: 0.5% N, 0.25% P, and 0.5% K.

1(iii). The water demand of wheat crop in millimeters is

- (A) 700-1300
- (B) 500-800
- (C) 1500-2500
- (D) 450-650

Correct Answer: (D) 450-650

Solution:

Step 1: Understanding the Concept:

Water demand (or water requirement) refers to the total depth of water needed by a crop during its entire life cycle to meet evapotranspiration and metabolic needs.

Step 2: Detailed Explanation:

Wheat is a major Rabi (winter) crop in India.

Its water requirement depends on the duration of the variety and climatic conditions, generally ranging from 450 mm to 650 mm.

This requirement is usually met through 4 to 6 irrigations at critical growth stages like CRI (Crown Root Initiation).

Other options like 1500-2500 mm refer to high-water-consuming crops like Sugarcane or Rice.

Step 3: Final Answer:

The total water demand for wheat is approximately 450-650 mm.

💡 Quick Tip

The most critical stage for irrigation in wheat is the Crown Root Initiation (CRI) stage, which occurs 21 days after sowing (DAS).

1(iv). An example of a broad-leaved weed is

- (A) Motha
- (B) Doob grass
- (C) Bathua
- (D) Wild oats

Correct Answer: (C) Bathua

Solution:

Step 1: Understanding the Concept:

Weeds are classified based on morphology into narrow-leaved (monocots) and broad-leaved (dicots).

Step 2: Detailed Explanation:

1. **Motha (Cyperus rotundus):** A sedge with narrow, grass-like leaves.
2. **Doob grass (Cynodon dactylon):** A typical narrow-leaved grass.

3. **Bathua (*Chenopodium album*):** A dicotyledonous weed with broad, expanded leaves. It is common in wheat and mustard fields.
4. **Wild oats (*Avena fatua*):** A narrow-leaved grass weed that mimics the wheat plant.

Step 3: Final Answer:

Bathua is the correct example of a broad-leaved weed.

 Quick Tip

Herbicides like 2,4-D are specifically effective for controlling broad-leaved weeds like Bathua in cereal crops.

1(v). *Zea mays* L. is a botanical name of

- (A) Sorghum
- (B) Maize
- (C) Pearl millet
- (D) Wheat

Correct Answer: (B) Maize

Solution:

Step 1: Understanding the Concept:

Botanical names follow the binomial nomenclature system (Genus and Species).

Step 2: Detailed Explanation:

- **Maize:** The scientific name is *Zea mays* L. (Family: Poaceae).
- **Sorghum:** Known as *Sorghum bicolor*.
- **Pearl millet:** Known as *Pennisetum glaucum*.
- **Wheat:** Known as *Triticum aestivum*.

Step 3: Final Answer:

The botanical name for maize is *Zea mays* L.

 Quick Tip

Maize is known as the "Queen of Cereals" because of its highest genetic yield potential among cereals.

1(vi). Durgapura white variety for dry farming is related to

- (A) Guar
- (B) Pigeon pea

- (C) Sorghum
(D) Moth bean

Correct Answer: (A) Guar

Solution:

Step 1: Understanding the Concept:

Selection of drought-tolerant varieties is essential for successful dryland agriculture.

Step 2: Detailed Explanation:

Durgapura White is a prominent variety of Cluster Bean, commonly known as Guar (*Cyamopsis tetragonoloba*).

It was developed at the Agricultural Research Station, Durgapura (Jaipur), Rajasthan, specifically for rainfed/dryland conditions.

Guar is a highly drought-resistant legume used for green manure, fodder, and gum extraction.

Step 3: Final Answer:

Durgapura White is a variety of Guar.

 Quick Tip

Rajasthan accounts for the largest share of Guar production in India due to its drought-tolerant nature.

1(vii). The disease caused by deficiency of Vitamin D is

- (A) Beri-Beri
(B) Scurvy
(C) Rickets
(D) Pellagra

Correct Answer: (C) Rickets

Solution:

Step 1: Understanding the Concept:

Deficiency of essential vitamins in the diet leads to specific nutritional diseases in humans and animals.

Step 2: Detailed Explanation:

- **Vitamin D:** Essential for calcium absorption and bone mineralization. Deficiency causes Rickets in children (bowed legs) and Osteomalacia in adults.
- **Vitamin B1:** Deficiency causes Beri-Beri.
- **Vitamin C:** Deficiency causes Scurvy (bleeding gums).
- **Vitamin B3 (Niacin):** Deficiency causes Pellagra.

Step 3: Final Answer:

Rickets is caused by the deficiency of Vitamin D.

💡 Quick Tip

Vitamin D is also known as the "Sunshine Vitamin" as it can be synthesized by the body in the presence of sunlight.

1(viii). The amount of Vitamin C found in 100 grams of edible part of mango fruit is

- (A) 10 mg
- (B) 13 mg
- (C) 30 mg
- (D) 35 mg

Correct Answer: (B) 13 mg

Solution:**Step 1: Understanding the Concept:**

Mango (*Mangifera indica*) is a nutritious fruit containing significant amounts of Vitamin A and Vitamin C.

Step 2: Detailed Explanation:

The vitamin C (ascorbic acid) content in mango varies by variety and ripeness.

While raw mangoes are very high in Vitamin C, ripe mangoes generally contain about 13 mg to 16 mg per 100 g of pulp.

According to common agricultural datasets used in textbooks, 13 mg is the standard value cited for ripe mango.

Step 3: Final Answer:

The average amount of Vitamin C in 100g of mango is 13 mg.

💡 Quick Tip

Mango is one of the richest fruit sources of Vitamin A (Beta-carotene), containing approximately 4800 IU per 100g.

1(ix). The names of the method adapted for propagation of ber is

- (A) Chip budding
- (B) Patch budding
- (C) Top working
- (D) Shield budding

Correct Answer: (B) Patch budding

Solution:

Step 1: Understanding the Concept:

Asexual propagation methods ensure that the offspring are genetically identical to the parent plant.

Step 2: Detailed Explanation:

In Ber (*Ziziphus mauritiana*), budding is the most successful method of commercial propagation.

Common methods used include Ring budding, T-budding, and Patch budding.

The provided image shows a circle around 'Patch budding', indicating it as the intended correct method for this examination.

Patch budding is particularly effective for thick-barked fruit trees like Ber.

Step 3: Final Answer:

The method used for propagation of ber is Patch budding.

💡 Quick Tip

The best time for budding in Ber is during the rainy season (July to September) when the sap flow is high.

1(x). The size of the pit for planting big fruit trees is kept as

- (A) $50 \times 50 \times 50$ cm
- (B) $75 \times 75 \times 75$ cm
- (C) $1 \times 1 \times 1$ m
- (D) $25 \times 25 \times 25$ cm

Correct Answer: (C) $1 \times 1 \times 1$ m

Solution:

Step 1: Understanding the Concept:

The size of the planting pit depends on the root system and the ultimate size of the fruit tree.

Step 2: Detailed Explanation:

- For small trees like lime or pomegranate: $50 \times 50 \times 50$ cm.
- For medium-sized trees: $75 \times 75 \times 75$ cm.
- For large/big fruit trees like Mango, Jackfruit, or Aonla: A larger pit of $1 \times 1 \times 1$ meter is required.

This large volume allows for better root development and easier incorporation of organic matter.

Step 3: Final Answer:

Big fruit trees require a pit size of $1 \times 1 \times 1$ m.

 Quick Tip

Pits should be filled with a 1:1 mixture of soil and FYM along with 100g of Lindane powder to prevent termite attacks.

1(xi). Dasheri is a variety of

- (A) Ber
- (B) Mango
- (C) Papaya
- (D) Banana

Correct Answer: (B) Mango

Solution:

Step 1: Understanding the Concept:

Different regions of India are famous for specific cultivars of fruit crops.

Step 2: Detailed Explanation:

Dasheri is a premier commercial mango variety originating from the Dasheri village near Lucknow, Uttar Pradesh.

It is prized for its sweet, fiberless pulp and strong aroma.

Step 3: Final Answer:

Dasheri is a variety of Mango.

 Quick Tip

Dasheri is an 'Alternate Bearer', meaning it produces a heavy crop one year and a light crop the next.

1(xii). The total soluble solids content of the prepared jam is checked by

- (A) Lactometer
- (B) Butyrometer
- (C) Refractometer
- (D) Jellymeter

Correct Answer: (C) Refractometer

Solution:

Step 1: Understanding the Concept:

Total Soluble Solids (TSS) represents the concentration of sugars and other soluble substances in a fruit product.

Step 2: Detailed Explanation:

- **Refractometer:** Used to measure the Brix degree (% TSS). A finished jam should have a TSS of 68.5% (or minimum 68%).
- **Lactometer:** Used to measure milk density/purity.
- **Butyrometer:** Used to measure fat content in milk.
- **Jellymeter:** Used to test the pectin content of juice to determine the amount of sugar needed for jelly.

Step 3: Final Answer:

A Refractometer is used to check the TSS of jam.

💡 Quick Tip

High TSS (> 65%) in jam acts as a preservative by reducing water activity and inhibiting microbial growth.

1(xiii). Which of the following is a dual purpose breed of cow?

- (A) Gir
- (B) Rath
- (C) Sindhi
- (D) Haryana

Correct Answer: (D) Haryana

Solution:**Step 1: Understanding the Concept:**

Cattle breeds are classified as Milch (milk-producing), Draught (working), or Dual-purpose (both).

Step 2: Detailed Explanation:

- **Gir and Sindhi:** Primary Milch breeds.
- **Haryana:** This is the best dual-purpose breed in India. The cows are decent milkers, and the bullocks are excellent draft animals used for tilling and transport.

Step 3: Final Answer:

Haryana is a dual-purpose cattle breed.

💡 Quick Tip

Other dual-purpose breeds include Kankrej, Ongole, and Tharparkar.

1(xiv). The percentage of fat in the milk of Bhadawari buffalo is

- (A) 12 - 14
- (B) 7 - 9
- (C) 4 - 5
- (D) 6 - 7

Correct Answer: (A) 12 - 14

Solution:

Step 1: Understanding the Concept:

Buffalo milk generally has a higher fat content than cow milk, and it varies significantly between breeds.

Step 2: Detailed Explanation:

The Bhadawari buffalo (found in UP and MP) is famous for having the highest fat percentage in its milk among all buffalo breeds in the world.

While the average is around 8%, it frequently reaches 12% to 14%, especially during late lactation.

Step 3: Final Answer:

The fat percentage of Bhadawari milk is 12 - 14%.

💡 Quick Tip

Bhadawari buffaloes are easily identified by their unique "Copper" colored body coat.

1(xv). The disease caused by *Bacillus anthracis* bacteria is

- (A) Rinderpest
- (B) Black quarter
- (C) Anthrax
- (D) Foot and mouth disease

Correct Answer: (C) Anthrax

Solution:

Step 1: Understanding the Concept:

Anthrax is a severe infectious disease of livestock caused by spore-forming bacteria.

Step 2: Detailed Explanation:

- **Anthrax:** Caused by *Bacillus anthracis*. It is zoonotic (spreads to humans).
- **Rinderpest:** Viral disease (now eradicated).
- **Black Quarter:** Caused by *Clostridium chauvoei*.
- **FMD:** Caused by a virus.

Step 3: Final Answer:

Anthrax is caused by the bacterium *Bacillus anthracis*.

💡 Quick Tip

Sudden death and bleeding from natural body openings (nose, mouth, anus) are classic signs of Anthrax. Never perform a post-mortem on such carcasses.

1(xvi). The disease which affects the udder and teats of an animal

- (A) Surra
- (B) Mastitis
- (C) Tick fever
- (D) Enterotoxemia

Correct Answer: (B) Mastitis

Solution:**Step 1: Understanding the Concept:**

Mammary gland infections lead to significant economic losses in the dairy industry.

Step 2: Detailed Explanation:

Mastitis (Thanela) is the inflammation of the mammary gland (udder) and teats.

It is usually caused by bacterial pathogens entering the teat canal. It leads to curdled or watery milk and swelling of the udder.

Step 3: Final Answer:

Mastitis is the disease affecting the udder.

💡 Quick Tip

The Strip Cup Test and California Mastitis Test (CMT) are used for early diagnosis of Mastitis.

1(xvii). India's percent share in world milk production is

- (A) 14.5
- (B) 16.5
- (C) 18.5
- (D) 19.5

Correct Answer: (D) 19.5

Solution:**Step 1: Understanding the Concept:**

India is the leading producer of milk globally, and its share has been steadily increasing.

Step 2: Detailed Explanation:

Based on the data pertinent to the time of this exam, India's share was approximately 19% to 20%.

(Note: Recent data puts India's share closer to 24%, but among the provided options, 19.5 reflects the standard historical benchmark).

Step 3: Final Answer:

The share is 19.5%.

 Quick Tip

Operation Flood (White Revolution) played a pivotal role in making India the world's largest milk producer.

1(xviii). National mission on traditional agriculture was launched in the

- (A) Year 2015-16
- (B) Year 2017-18
- (C) Year 2005-06
- (D) Year 2011-12

Correct Answer: (A) Year 2015-16

Solution:

Step 1: Understanding the Concept:

The Paramparagat Krishi Vikas Yojana (PKVY) aims to promote organic farming through a cluster-based approach.

Step 2: Detailed Explanation:

The National Mission on Traditional Agriculture (PKVY) was launched in the year 2015-16. It supports farmers in the certification, production, and marketing of organic produce.

Step 3: Final Answer:

The mission was launched in 2015-16.

 Quick Tip

Sikkim is the first fully organic state in India as a result of these dedicated missions.

2(i). The term “organic farming” was first used by a scientist named _____.

Correct Answer: (B) Lord Northbourne

Solution:

Step 1: Understanding the Concept:

Organic farming is a method of crop and livestock production that involves much more than choosing not to use pesticides, fertilizers, genetically modified organisms, antibiotics, and growth hormones.

It relies on ecological processes, biodiversity, and cycles adapted to local conditions.

Step 2: Detailed Explanation:

The term “organic farming” was first coined by Lord Northbourne in his book *Look to the Land*, published in 1940.

He described the farm as an “organic whole,” emphasizing the interconnection between the soil, plants, and animals.

While Sir Albert Howard is often called the father of modern organic agriculture due to his work on composting, the specific terminology was established by Northbourne.

Step 3: Final Answer:

The term was first used by Lord Northbourne.

 Quick Tip

Remember: Sir Albert Howard → Father of Organic Farming; Lord Northbourne → Coined the term.

The book “Look to the Land” is a key reference for this historical fact.

2(ii). The operations done on the soil before sowing the seeds are called _____ tillage.

Correct Answer: (B) Primary

Solution:

Step 1: Understanding the Concept:

Tillage is the mechanical manipulation of soil to provide a favorable environment for seed germination and plant growth.

It is broadly classified into primary and secondary tillage based on the timing and objective of the operation.

Step 2: Detailed Explanation:

Primary tillage constitutes the initial major soil-working operation.

It is performed after the harvest of the previous crop to open the compact soil, kill weeds, and bury crop residues.

Operations like deep ploughing, subsoiling, and chiseling fall under this category.

Secondary tillage refers to operations performed after primary tillage to create a fine seedbed

(harrowing, leveling).

Step 3: Final Answer:

Operations before sowing are called primary tillage.

💡 Quick Tip

Primary Tillage = Opening of soil.

Secondary Tillage = Seedbed preparation.

Example: MB Plough is for primary tillage, while a Cultivator is typically for secondary tillage.

2(iii). _____ to _____ percent volatile oil is found in cumin.

Correct Answer: (B) 2.5 to 3.5

Solution:

Step 1: Understanding the Concept:

Cumin (*Cuminum cyminum*) is a major seed spice crop.

Its characteristic aroma and medicinal properties are due to the presence of volatile oils, primarily cuminaldehyde.

Step 2: Detailed Explanation:

The quality of cumin is often judged by its essential oil content.

Standard scientific and agricultural data indicate that cumin seeds contain approximately 2.5% to 4.0% volatile oil.

Among the given choices, the range 2.5 to 3.5 percent is the most accurate representation of the average content in commercial varieties.

Step 3: Final Answer:

2.5 to 3.5 percent volatile oil is found in cumin.

💡 Quick Tip

The major constituent of cumin volatile oil is Cuminaldehyde.

India is the world's largest producer and exporter of cumin.

2(iv). The absence of rain or its very small amount is called _____.

Correct Answer: (B) Drought

Solution:**Step 1: Understanding the Concept:**

When an area receives significantly less precipitation than normal over a prolonged period, it affects the hydrological balance.

Step 2: Detailed Explanation:

Drought is a climatic condition where there is a deficiency in precipitation over an extended period.

This leads to a water shortage for some activity, group, or environmental sector.

In agriculture, it is specifically termed as “Agricultural Drought” when soil moisture is insufficient to meet the needs of a particular crop at a particular time.

The Hindi term for this is “सूखा” (Sukha).

Step 3: Final Answer:

The absence of rain or very small amount is called drought.

💡 Quick Tip

Drought is categorized into Meteorological, Hydrological, and Agricultural drought. IMD defines meteorological drought when rainfall deficiency is $> 25\%$ of the long-term average.

2(v). Mango is a plant of the _____ family.

Correct Answer: (C) Anacardiaceae

Solution:**Step 1: Understanding the Concept:**

Every plant is classified into a specific family based on shared botanical characteristics, especially floral structure.

Step 2: Detailed Explanation:

Mango (*Mangifera indica*) belongs to the family Anacardiaceae.

This family is also known as the cashew or sumac family.

Other economically important plants in this family include cashew (*Anacardium occidentale*) and pistachio.

Step 3: Final Answer:

Mango belongs to the Anacardiaceae family.

 Quick Tip

Mnemonic: Mango and Cashew (Kaju) both belong to Anacardiaceae.
Rutaceae is for Citrus fruits; Myrtaceae is for Guava.

2(vi). Sodium benzoate chemical is used as a _____ in fruit preservation.

Correct Answer: (C) Preservative

Solution:

Step 1: Understanding the Concept:

Food preservation involves preventing the growth of bacteria, fungi, or other microorganisms to extend the shelf life of food products.

Step 2: Detailed Explanation:

Sodium benzoate (C_6H_5COONa) is a widely used chemical preservative in the food industry. It is particularly effective in acidic environments ($pH < 4.5$) against yeasts and molds. In fruit preservation, it is commonly used in squashes, juices, and syrups of colored fruits like tomato, jamun, and phalsa.

Step 3: Final Answer:

Sodium benzoate is used as a preservative.

 Quick Tip

Sodium Benzoate is used for colored fruits/products.
Potassium Metabisulphite (KMS) is used for colorless/light-colored fruits to avoid browning.

2(vii). Generally, the direction of length of the cattle shed should be from _____ to _____ direction.

Correct Answer: (B) North to South

Solution:

Step 1: Understanding the Concept:

Proper orientation of a cattle shed is crucial for animal comfort, ventilation, and hygiene.

Step 2: Detailed Explanation:

In tropical countries like India, the length of the cattle shed should ideally be in the North-South direction.

This orientation allows sunlight to reach the long sides of the building (East and West sides) at different times of the day (morning and evening).

Sunlight is a natural disinfectant and helps keep the floor dry, which is essential for preventing diseases like mastitis and hoof rot.

Step 3: Final Answer:

The direction should be North to South.

 Quick Tip

North-South orientation provides maximum sun exposure to the floor during the day. In very cold regions, East-West orientation is sometimes preferred to trap more heat.

2(viii). Vechur breed is also known as _____ cow.

Correct Answer: (B) Dwarf

Solution:

Step 1: Understanding the Concept:

Vechur is a rare breed of *Bos indicus* cattle from Kerala, India.

Step 2: Detailed Explanation:

The Vechur breed is world-famous as the smallest cattle breed in the world.

Due to its extremely small stature (averaging 87 cm in height), it is popularly known as a “Dwarf” or “Miniature” cow.

Despite its small size, it is valued for its high resistance to diseases and the high medicinal value of its milk.

Step 3: Final Answer:

Vechur is known as the dwarf cow.

 Quick Tip

Vechur breed holds the Guinness World Record for the smallest cattle. It is native to the Vechur village in Kottayam district, Kerala.

2(ix). In haemorrhagic septicaemia disease the animal suffers from high fever upto _____ °F.

Correct Answer: (B) 104 – 106

Solution:**Step 1: Understanding the Concept:**

Haemorrhagic Septicaemia (HS), known as “Galghontu” in Hindi, is a severe bacterial disease of cattle and buffaloes caused by *Pasteurella multocida*.

Step 2: Detailed Explanation:

One of the primary clinical signs of HS is a sudden onset of very high body temperature.

The normal body temperature of a cow is around 101.5°F.

In HS-affected animals, the fever rises rapidly to 104°F to 106°F.

Other symptoms include hot painful swelling in the throat region (causing snoring sounds), difficulty in breathing, and high mortality if not treated immediately.

Step 3: Final Answer:

The fever goes upto 104 – 106°F.

💡 Quick Tip

HS is most prevalent during the rainy season. Pre-monsoon vaccination is the best preventive measure.

2(x). The average milk production of an Indian cow in one year is _____ kg.

Correct Answer: (B) 1000 – 1500

Solution:**Step 1: Understanding the Concept:**

Milk productivity varies greatly between indigenous (Desi) breeds, crossbreds, and exotic breeds.

Step 2: Detailed Explanation:

While specific milch breeds like Sahiwal or Gir produce much more, the average production of the general population of indigenous Indian cows (including non-descript ones) is relatively low.

Statistically and academically for examination purposes, the average annual milk yield for an Indian cow is generally estimated in the range of 1000 to 1500 kg per lactation/year.

Crossbred cows in India produce significantly more (average approx. 2500 – 3000 kg).

Step 3: Final Answer:

The average milk production is 1000 – 1500 kg.

 Quick Tip

India is the highest milk producer globally, but the productivity per animal is lower than in many Western countries.
Sahiwal is the highest milk-producing indigenous breed.

3(i). Write the formula to find the germination percentage of seeds.

Correct Answer: Germination % = $\frac{\text{Total number of seeds germinated}}{\text{Total number of seeds sown}} \times 100$

Solution:

Step 1: Understanding the Concept:

Germination percentage is an indicator of seed quality and viability.

It represents the proportion of seeds that are capable of producing a normal seedling under favorable conditions.

Step 2: Key Formula or Approach:

The formula to calculate the germination percentage is:

$$\text{Germination Percentage} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds used for test}} \times 100$$

Step 3: Detailed Explanation:

To find this value, a specific number of seeds (e.g., 100 seeds) are placed in a germination medium (like moist filter paper or soil).

After a specific period, the number of successfully sprouted seeds is counted.

If 90 seeds sprout out of 100, the germination percentage is 90%.

Step 4: Final Answer:

The formula is $\frac{\text{Germinated Seeds}}{\text{Sown Seeds}} \times 100$.

 Quick Tip

High germination percentage reduces the seed rate required per hectare.
Always use seeds with a germination percentage above the minimum certification standard (e.g., 70 – 85% for most crops).

3(ii). Write any one example of biofertilizer.

Correct Answer: Rhizobium

Solution:

Step 1: Understanding the Concept:

Biofertilizers are preparations containing living microorganisms which, when applied to seeds or soil, colonize the rhizosphere and promote growth by increasing the supply of primary nutrients.

Step 2: Detailed Explanation:

There are several types of biofertilizers:

1. **Nitrogen-fixing:** Rhizobium (for legumes), Azotobacter (for cereals), Azospirillum, and Blue-Green Algae.
2. **Phosphate-solubilizing:** Pseudomonas and Bacillus species.
3. **Fungal:** Mycorrhiza (VAM).

Rhizobium is the most common example, forming symbiotic nodules in legume roots.

Step 3: Final Answer:

An example of a biofertilizer is Rhizobium.

 Quick Tip

Rhizobium is crop-specific; for example, *Rhizobium japonicum* is used specifically for Soybean.

3(iii). Write any one example of mixed cropping.

Correct Answer: Wheat + Mustard

Solution:

Step 1: Understanding the Concept:

Mixed cropping involves growing two or more crops simultaneously on the same piece of land to minimize the risk of total crop failure due to uncertain weather.

Step 2: Detailed Explanation:

In mixed cropping, seeds of different crops are often mixed together before sowing.

Common examples in India include:

1. Wheat and Mustard (Rabi season).
2. Chickpea and Mustard.
3. Maize and Urdbean (Kharif season).

Growing Wheat with Mustard is a classic example where Mustard acts as an insurance crop.

Step 3: Final Answer:

An example of mixed cropping is Wheat + Mustard.

 Quick Tip

Mixed cropping is different from Intercropping; in mixed cropping, there is no definite row arrangement.

3(iv). Write any one principle of crop rotation.

Correct Answer: Leguminous crops should be followed by non-leguminous crops.

Solution:

Step 1: Understanding the Concept:

Crop rotation is the practice of growing a series of dissimilar types of crops in the same area in sequential seasons.

Step 2: Detailed Explanation:

The scientific principles of crop rotation include:

1. **Legumes after non-legumes:** Legumes fix atmospheric nitrogen, which benefits the succeeding cereal crop.
2. **Deep-rooted after shallow-rooted:** This ensures nutrients are absorbed from different soil layers.
3. **Exhaustive after restorative:** High-nutrient demanding crops should be followed by crops that restore soil health.
4. **Follow different families:** This breaks the life cycle of pests and diseases.

Step 3: Final Answer:

A primary principle is to include a leguminous crop after a non-leguminous crop to maintain soil fertility.

 Quick Tip

Crop rotation intensity can be calculated as: $\frac{\text{No. of crops in rotation}}{\text{No. of years}} \times 100$.

3(v). Write the botanical name of coriander.

Correct Answer: *Coriandrum sativum*

Solution:

Step 1: Understanding the Concept:

Coriander is an important seed spice crop used for its aromatic leaves and seeds.

Step 2: Detailed Explanation:

Botanical Name: *Coriandrum sativum*.

Family: Apiaceae (previously known as Umbelliferae).

Origin: Mediterranean region.

The plant is grown as an annual herb.

Step 3: Final Answer:

The botanical name is *Coriandrum sativum*.

💡 Quick Tip

To identify Apiaceae family plants, look for the "Umbel" (umbrella-like) flower structure.

3(vi). Based on W.H.O. recommendation, how many grams of fruits should a person consume at least per day?

Correct Answer: 120 grams

Solution:**Step 1: Understanding the Concept:**

Nutritionists and global health organizations set daily intake standards to prevent chronic diseases and micronutrient deficiencies.

Step 2: Detailed Explanation:

The World Health Organization (WHO) and ICMR (Indian Council of Medical Research) recommend a total of 400g of fruits and vegetables daily.

Specifically for fruits, the recommended minimum intake for an average adult is approximately 120 grams per day.

In many agricultural textbooks, this value is standardized as 120g to ensure adequate vitamin and fiber intake.

Step 3: Final Answer:

A person should consume at least 120 grams of fruits per day.

💡 Quick Tip

The total recommended vegetable intake is 300g per day, making the total "F&V" intake 420g as per ICMR standards.

3(vii). Draw a diagram of patch budding.

Correct Answer: [A rectangular patch of bark with a bud is inserted into a matching rectangular slot in the rootstock bark.]

Solution:

Step 1: Understanding the Concept:

Patch budding is a method of asexual propagation used for species with thick bark like Walnut, Pecan, and Ber.

Step 2: Detailed Explanation:

Since this is a textual solution, the components of the diagram are:

1. **Rootstock:** A rectangular piece of bark is removed from the stem.
2. **Scion (Bud):** A similar rectangular "patch" containing a healthy bud is removed from the budwood.
3. **Insertion:** The scion patch is placed perfectly into the slot on the rootstock so that the cambium layers meet.
4. **Wrapping:** The patch is tied firmly with polythene tape, leaving only the bud exposed.

Step 3: Final Answer:

Patch budding involves replacing a rectangular bark section of the rootstock with a matching bud patch from the scion.

💡 Quick Tip

Patch budding is highly successful in trees where the bark "slips" or peels off easily during the active growth season.

3(viii). Write the origin place of papaya.

Correct Answer: Tropical America (Mexico)

Solution:

Step 1: Understanding the Concept:

The center of origin is the geographical area where a group of organisms, either domesticated or wild, first developed its distinctive properties.

Step 2: Detailed Explanation:

Papaya (*Carica papaya*) is native to the tropical regions of the Americas. Specifically, it originated in Southern Mexico and Central America. It was later introduced to India in the 16th century by the Portuguese.

Step 3: Final Answer:

The origin place of papaya is Tropical America (Mexico).

💡 Quick Tip

Papaya contains "Papain," a proteolytic enzyme used in the meat-tenderizing and pharmaceutical industries.

3(ix). Write the names of any two suitable fruits for preparing "Jelly".

Correct Answer: Guava and Apple

Solution:**Step 1: Understanding the Concept:**

A good jelly requires fruits that are rich in both Pectin and Acid.

Step 2: Detailed Explanation:

1. **Guava (*Psidium guajava*):** It is considered the best fruit for jelly making because it naturally contains high levels of pectin and sufficient acid.
2. **Apple:** Another excellent source of pectin.
3. **Other suitable fruits:** Wood apple (Kaitha), Sour plums, and Citrus fruits.

Step 3: Final Answer:

Two suitable fruits are Guava and Apple.

💡 Quick Tip

Guava fruits should be harvested at the "firm-ripe" stage for the highest pectin content; overripe fruits lose pectin.

3(x). Where is the headquarters of National Dairy Development Board located?

Correct Answer: Anand, Gujarat

Solution:**Step 1: Understanding the Concept:**

NDDB is a statutory body of the Government of India that plans and implements programs for dairy development across the country.

Step 2: Detailed Explanation:

The National Dairy Development Board (NDDB) was founded in 1965 by Dr. Verghese Kurien. Its headquarters is located in Anand, Gujarat.

Anand is also known as the "Milk Capital of India" and is the birthplace of the Amul cooperative movement.

Step 3: Final Answer:

The headquarters is located in Anand, Gujarat.

💡 Quick Tip

NDDB was the lead agency for "Operation Flood," the world's largest dairy development program.

Section - B

4. Write any three types of water erosion of soil.

Correct Answer: Splash erosion, Sheet erosion, and Rill erosion.

Solution:**Step 1: Understanding the Concept:**

Water erosion is the process by which soil particles are detached and transported from their original location by water.

It occurs in various stages depending on the intensity of rainfall and the slope of the land.

Step 2: Detailed Explanation:

The three main types of water erosion are:

1. **Splash Erosion:** This is the first stage of water erosion caused by the impact of raindrops hitting the bare soil surface.

The kinetic energy of the raindrops detaches soil particles and splashes them into the air.

2. **Sheet Erosion:** This occurs when a thin layer of topsoil is removed uniformly from a large area by surface runoff.

It is often unnoticed but is very harmful as it removes the most fertile layer of the soil.

3. **Rill Erosion:** As runoff increases, it starts forming small, well-defined channels or finger-like streaks on the soil surface called rills.

These rills can be easily smoothed out by normal tillage operations.

Step 3: Final Answer:

The three types are Splash, Sheet, and Rill erosion.

💡 Quick Tip

Remember the sequence of water erosion: Splash → Sheet → Rill → Gully.
Sheet erosion is also known as "Death of the Farmer" because it is invisible yet highly destructive to soil fertility.

5. Write any three advantages of vermicompost.

Correct Answer: Improves soil structure, provides balanced nutrients, and increases water holding capacity.

Solution:

Step 1: Understanding the Concept:

Vermicompost is a high-quality organic manure produced by the decomposition of organic waste through the digestive action of earthworms.

Step 2: Detailed Explanation:

The advantages of using vermicompost include:

1. **Nutrient Enrichment:** It is richer in essential plant nutrients like Nitrogen (N), Phosphorus (P), and Potassium (K) compared to traditional Farm Yard Manure (FYM).

It also contains micronutrients and plant growth hormones like auxins and cytokinins.

2. **Soil Physical Properties:** It improves the physical structure of the soil by increasing its porosity and aeration.

This leads to better root penetration and growth.

3. **Water Retention:** It significantly enhances the water-holding capacity of the soil, reducing the frequency of irrigation required for crops.

Step 3: Final Answer:

The three advantages are balanced nutrient supply, improved soil structure, and enhanced water retention.

💡 Quick Tip

Eisenia foetida is the most commonly used earthworm species for commercial vermicompost production due to its high degradation rate.

6. Write any three advantages of drip irrigation method.

Correct Answer: High water use efficiency, reduced weed growth, and suitability for saline water.

Solution:**Step 1: Understanding the Concept:**

Drip irrigation, also known as trickle irrigation, is a micro-irrigation system that saves water and nutrients by allowing water to drip slowly to the roots of plants.

Step 2: Detailed Explanation:

1. **Maximum Water Efficiency:** Drip irrigation offers the highest water use efficiency (up to 90 – 95%) as it minimizes evaporation and deep percolation losses.

2. **Reduced Weed Infestation:** Since water is applied only near the root zone of the crop, the surrounding soil remains dry.

This significantly inhibits the growth of weeds in the inter-row spaces.

3. **Fertigation Capability:** Fertilizers can be applied directly through the irrigation water (fertigation).

This ensures uniform distribution of nutrients and reduces fertilizer wastage.

Step 3: Final Answer:

The advantages include high efficiency, weed control, and the possibility of fertigation.

💡 Quick Tip

Drip irrigation is ideal for wide-spaced fruit crops like Mango, Citrus, and Pomegranate.

It is the best method for regions with acute water scarcity.

7. Write the names of any three agronomical methods of weed control.

Correct Answer: Crop rotation, Intercropping, and High seed rate.

Solution:**Step 1: Understanding the Concept:**

Agronomical or cultural methods of weed control involve practices that create an environment favorable for the crop but unfavorable for the weeds.

Step 2: Detailed Explanation:

1. **Crop Rotation:** Growing different types of crops in sequence on the same land breaks the life cycle of weeds associated with a specific crop.

For example, rotating cereals with legumes helps control specific grassy weeds.

2. **Intercropping:** Growing a fast-growing "smother crop" (like cowpea or urdbean) between the rows of a main crop covers the soil quickly.

This shades out the weeds and prevents them from germinating.

3. **High Seed Rate:** Using a slightly higher seed rate than normal ensures a dense crop stand. A thick canopy provides early ground cover, which competes effectively with weeds for light,

space, and nutrients.

Step 3: Final Answer:

Agronomical methods include crop rotation, intercropping, and adjusting seed rates.

💡 Quick Tip

Cultural methods are the most sustainable and cost-effective ways to manage weeds in an Integrated Weed Management (IWM) system.

8. Define grafting and draw a diagram of Veneer grafting.

Correct Answer: Grafting is the union of a scion and a rootstock to grow as a single plant.

Solution:

Step 1: Understanding the Concept:

Grafting is an artificial vegetative propagation method where the tissues of one plant are joined with those of another.

Step 2: Detailed Explanation:

Definition: Grafting is the act of joining two different plant parts (the scion and the rootstock) in such a manner that they unite and continue their growth as one plant.

The upper part that produces the fruits and foliage is called the **scion**, while the lower part providing the root system is called the **rootstock**.

Veneer Grafting Description:

Veneer grafting is a common method used for propagating Mango.

1. A shallow downward cut (about 3 – 5 cm long) is made on the side of the rootstock.
2. A matching slanting cut is made at the base of the scion.
3. The scion is placed against the rootstock so that the cambium layers match, and it is then tied firmly with polythene tape.

Step 3: Final Answer:

Grafting is the fusion of scion and stock. Veneer grafting involves a side cut for joining.

💡 Quick Tip

Success in grafting depends primarily on the proper alignment of the cambium layers of the scion and the rootstock.

9. Write any three points of management of animal housing.

Correct Answer: Proper ventilation, adequate floor space, and efficient drainage.

Solution:

Step 1: Understanding the Concept:

Proper housing is essential to protect livestock from extreme weather, ensure hygiene, and maximize productivity.

Step 2: Detailed Explanation:

1. **Ventilation:** The animal shed should have sufficient windows and open spaces to allow for the free flow of fresh air.

Proper ventilation removes moisture, ammonia, and other foul odors, preventing respiratory diseases.

2. **Floor and Drainage:** The floor should be non-slippery and have a gentle slope (gradient) towards the drainage channel.

Efficient drainage ensures that urine and wash-water are removed quickly, keeping the floor dry and hygienic.

3. **Orientation:** In tropical regions, the long axis of the shed should ideally be North-South. This minimizes direct sun exposure during the hottest parts of the day while allowing sunlight to disinfect the floor.

Step 3: Final Answer:

Key points include ventilation, dry non-slip flooring, and correct shed orientation.

Quick Tip

A dry floor is the best preventive measure against Hoof Rot and Mastitis in dairy animals.

10. Write the place of origin and any two characteristics of “Malvi” breed of cow.

Correct Answer: Origin: Malwa region (MP); Characteristics: Grey color and excellent draft capacity.

Solution:

Step 1: Understanding the Concept:

The Malvi is a popular indigenous draft breed of cattle known for its strength and endurance.

Step 2: Detailed Explanation:

1. **Place of Origin:** The Malvi breed originates from the Malwa plateau of Madhya Pradesh.

It is primarily found in districts like Mandsaur, Ratlam, Shajapur, and Ujjain.

2. Characteristics:

(a) **Physical Appearance:** The animals are medium-sized with a compact body. The coat color varies from white to light grey, becoming darker in males as they age.

(b) **Working Ability:** It is an excellent draft breed. The bullocks are very strong, hardworking, and well-suited for heavy agricultural work and road transport in rocky terrains.

Step 3: Final Answer:

Origin is Madhya Pradesh. Characteristics include grey color and high draft strength.

💡 Quick Tip

Cattle breeds are classified into Milch, Draft, and Dual-purpose. Malvi is a classic example of a "Draft" breed.

11. Write any three general characters of healthy animal.

Correct Answer: Bright eyes, moist muzzle, and normal rumination.

Solution:

Step 1: Understanding the Concept:

Identifying a healthy animal is the first step in successful livestock management and disease prevention.

Step 2: Detailed Explanation:

The general signs of a healthy animal are:

1. **Alertness and Gait:** A healthy animal is alert to its surroundings and has a steady, normal gait.

It stands squarely on all four legs and moves without any signs of lameness.

2. **Muzzle and Skin:** The muzzle (nose) should be moist with clear droplets of water.

The skin should be smooth, shiny, and elastic. A dry muzzle or dull, rough hair coat often indicates illness.

3. **Appetite and Rumination:** A healthy animal has a good appetite and eats its fodder normally.

In ruminants (cows, buffaloes), regular rumination (chewing the cud) is a vital sign of good health.

Step 3: Final Answer:

The three characters are alertness, a moist muzzle, and active rumination.

 Quick Tip

Cessation of rumination is often the very first clinical sign of fever or digestive disorders in cattle.

12. Write any three measures of prevention and treatment of tick fever disease.

Correct Answer: Tick control, use of Berenil, and maintain shed hygiene.

Solution:

Step 1: Understanding the Concept:

Tick fever (Babesiosis) is a protozoal disease transmitted by ticks. It causes high fever and red-colored urine (Hemoglobinuria).

Step 2: Detailed Explanation:

1. **Vector Control:** The most effective prevention is the elimination of ticks. This can be done by spraying animals and sheds with acaricides like Butox or Amitraz.
2. **Medical Treatment:** Affected animals should be treated with specific anti-protozoal drugs. **Berenil** (Diminazene aceturate) or **Imizol** (Imidocarb) are highly effective when administered by a veterinarian.
3. **Supportive Care:** Providing adequate rest and iron-rich tonics helps the animal recover from anemia caused by the destruction of red blood cells.

Step 3: Final Answer:

Measures include tick elimination, veterinary treatment with Berenil, and supportive nutrition.

 Quick Tip

Because the urine turns red or coffee-colored, this disease is also commonly known as "Red Water Fever."

13. Write the age, quantity and place of administering F. M. D. vaccine to animals.

Correct Answer: Age: 4-6 months; Quantity: 2-3 ml; Place: Subcutaneous.

Solution:

Step 1: Understanding the Concept:

Foot and Mouth Disease (FMD) is a highly contagious viral disease. Periodic vaccination is the only way to protect livestock.

Step 2: Detailed Explanation:

1. **Age of Administration:** The first dose (primary vaccination) is usually given when the calf is **4 to 6 months** old.

A booster dose is given 6 months later, followed by regular vaccinations every six months.

2. **Quantity (Dosage):** The standard dose for the polyvalent FMD vaccine is usually **2 to 3 ml** (varies slightly by manufacturer).

3. **Place (Route):** The vaccine is typically administered via the **Subcutaneous (S/C)** route, usually in the neck region where the skin is loose.

Step 3: Final Answer:

Age is 4-6 months, dose is 2-3 ml, and it is given subcutaneously.

💡 Quick Tip

FMD vaccination is usually carried out twice a year, ideally in the pre-monsoon (May-June) and post-monsoon (Nov-Dec) periods.

Section - C

14(i). Write a short note on the following plant growth regulator: **Auxin**.

Correct Answer: Auxins are primary growth-promoting hormones responsible for cell elongation and apical dominance.

Solution:**Step 1: Understanding the Concept:**

Auxins were the first group of plant hormones discovered.

The most common natural auxin is Indole-3-acetic acid (IAA).

They are generally synthesized in the apices of stems and roots.

Step 2: Detailed Explanation:

1. **Cell Elongation:** Auxins promote the elongation of cells in shoots.

2. **Apical Dominance:** The presence of the apical bud inhibits the growth of lateral (axillary) buds.

Removing the shoot tip (decapitation) allows lateral buds to grow.

3. **Root Initiation:** Synthetic auxins like NAA and IBA are used to induce rooting in stem cuttings.

4. **Prevention of Abscission:** They prevent the premature falling of leaves, flowers, and fruits.

Step 3: Final Answer:

Auxins are essential for cell elongation, apical dominance, and root formation in horticultural

practices.

 Quick Tip

2,4-D (2,4-Dichlorophenoxyacetic acid) is a synthetic auxin that acts as a selective herbicide for broad-leaved weeds at high concentrations.

14(ii). Write a short note on the following plant growth regulator: Gibberellins.

Correct Answer: Gibberellins are hormones that promote stem elongation, seed germination, and flowering.

Solution:

Step 1: Understanding the Concept:

There are more than 100 gibberellins identified (GA₁, GA₂, GA₃, etc.), with GA₃ being the most extensively studied.

Step 2: Detailed Explanation:

1. **Stem Elongation:** They cause an extraordinary increase in the length of the axis (internodes).

This is used to increase the length of stalks in grapes.

2. **Bolting:** In rosette plants (like cabbage), they induce sudden internode elongation prior to flowering.

3. **Breaking Dormancy:** They help in breaking seed and bud dormancy to initiate germination.

4. **Malting Industry:** GA₃ is used to speed up the malting process in the brewing industry.

Step 3: Final Answer:

Gibberellins are primarily used for increasing fruit size, stem length, and overcoming seed dormancy.

 Quick Tip

Gibberellins were first isolated from the fungus *Gibberella fujikuroi*, which causes the "foolish seedling" (Bakanae) disease in rice.

14(iii). Write a short note on the following plant growth regulator: Cytokinins.

Correct Answer: Cytokinins are hormones that promote cell division (cytokinesis) and delay senescence.

Solution:

Step 1: Understanding the Concept:

Cytokinins were discovered during work on tobacco pith culture.

Kinetin and Zeatin are common examples of cytokinins.

Step 2: Detailed Explanation:

1. **Cell Division:** They are essential for cytokinesis and are found in regions of rapid cell division like root apices and developing shoot buds.

2. **Overcoming Apical Dominance:** Unlike auxins, cytokinins promote the growth of lateral buds.

3. **Delaying Senescence:** They help in the nutrient mobilization which delays the aging (senescence) of leaves.

This is known as the Richmond-Lang effect.

4. **Morphogenesis:** In tissue culture, the ratio of cytokinin to auxin determines whether roots or shoots will develop.

Step 3: Final Answer:

Cytokinins are vital for cell division, lateral growth, and maintaining the freshness of plant parts.

 Quick Tip

High Cytokinin:Auxin ratio promotes shoot formation, while a low ratio promotes root formation in tissue culture.

14(iv). Write a short note on the following plant growth regulator: Ethylene.

Correct Answer: Ethylene is a gaseous hormone primarily responsible for fruit ripening and abscission.

Solution:

Step 1: Understanding the Concept:

Ethylene is unique because it is the only gaseous plant growth regulator.

It is produced in tissues undergoing senescence and in ripening fruits.

Step 2: Detailed Explanation:

1. **Fruit Ripening:** It triggers the metabolic changes required for ripening (softening, color change, and sugar accumulation).

2. **Abscission and Senescence:** It promotes the falling of leaves and flowers by forming an

abscission layer.

3. **Horizontal Growth:** In seedlings, it causes swelling of the axis and horizontal growth (triple response).

4. **Breaking Seed Dormancy:** It is used to initiate germination in peanut seeds.

Step 3: Final Answer:

Ethylene is commercially used in the form of "Ethrel" or "Ethephon" for the artificial ripening of fruits like mangoes and bananas.

💡 Quick Tip

Ethylene is often called the "ripening hormone".

Storing ripe fruits with unripe ones can speed up the ripening of the latter due to ethylene emission.

15(a). Describe in detail the method of preparing "Jam".

Correct Answer: Jam is prepared by boiling fruit pulp with sugar to a thick consistency where TSS is 68%.

Solution:

Step 1: Understanding the Concept:

Jam is a preserved fruit product made from the whole fruit pulp or pieces.

It relies on the high concentration of sugar and pectin for its jelly-like consistency and preservation.

Step 2: Detailed Explanation:

1. **Selection of Fruit:** Ripe fruits like Apple, Guava, Strawberry, or Mixed fruits are selected.

2. **Pulping:** Fruits are washed, peeled, and the seeds are removed. The flesh is crushed or converted into pulp.

3. **Addition of Sugar:** Sugar is added in a ratio of 1 : 1 or 1 : 0.75 based on the acidity of the fruit.

4. **Cooking:** The mixture is boiled while stirring continuously to prevent charring.

5. **Addition of Citric Acid:** About 2 – 3 grams of citric acid per kg of sugar is added to prevent crystallization and improve flavor.

6. **Judging the End-point:**

(a) **Sheet Test:** When the mixture drops from a spoon as a sheet instead of droplets.

(b) **Refractometer:** The Total Soluble Solids (TSS) should reach 68%.

7. **Bottling:** The hot jam is poured into sterilized dry glass jars and sealed.

Step 3: Final Answer:

A standard jam contains at least 45% fruit pulp and reaches a final TSS of 68%.

 Quick Tip

Always use a heavy-bottomed vessel for cooking jam to ensure uniform heating and to avoid burning the pulp.

15(b). Describe in detail the method of preparing “tomato sauce”.

Correct Answer: Tomato sauce is prepared from tomato pulp by adding sugar, salt, vinegar, and spices, concentrated to at least 25% TSS.

Solution:

Step 1: Understanding the Concept:

Tomato sauce is a concentrated product made from clean, sound, ripe tomatoes with added seasonings.

Step 2: Detailed Explanation:

1. **Selection of Fruit:** Firm, fully ripe, deep red tomatoes are chosen for better color and flavor.
2. **Extraction of Pulp:** Tomatoes are washed, crushed, and heated to soften. The pulp is then passed through a sieve to remove skins and seeds.
3. **Cooking and Seasoning:** The pulp is boiled to reduce volume. A spice bag (containing cloves, cardamom, cinnamon, onion, garlic, etc.) is suspended in the boiling pulp to extract flavor.
4. **Addition of Sugar and Salt:** One-third of the sugar is added initially, and the rest is added towards the end. Salt is added last.
5. **Addition of Vinegar:** Vinegar (acetic acid) is added near the end to preserve the flavor and provide the required acidity.
6. **Preservation:** Sodium Benzoate (750 ppm) is used as a chemical preservative.
7. **Judging the End-point:** The final product should have a minimum of 25% TSS.

Step 3: Final Answer:

Tomato sauce preparation involves pulping, concentration through heating, seasoning with a spice bag, and final preservation using vinegar and sodium benzoate.

 Quick Tip

Tomato Sauce and Ketchup are similar, but Sauce is usually thinner and contains less spice/sugar than Ketchup (which has > 28% TSS).

16(a). Write the place of origin and distribution, characteristics and utility of “chokla” breed of sheep.

Correct Answer: Chokla is a premier carpet-wool breed of Rajasthan, often called the “Indian Merino”.

Solution:

Step 1: Understanding the Concept:

The Chokla is one of the most important sheep breeds in India, known for the high quality of its wool.

Step 2: Detailed Explanation:

1. Origin and Distribution:

Origin: Shekhawati region of Rajasthan.

Distribution: Districts of Sikar, Churu, Jhunjhunu, and parts of Bikaner, Jaipur, and Nagaur.

2. Characteristics:

- (a) It is a medium-sized sheep with a rectangular body.
- (b) The face is generally reddish-brown or dark brown/black.
- (c) The ears are small to medium and tubular.
- (d) Both males and females are usually polled (hornless).

3. Utility:

- (a) It produces the finest carpet wool among all Indian breeds.
- (b) Due to its superior wool quality, it is popularly known as the “Indian Merino”.
- (c) Average annual wool yield is about 1.5 to 2.5 kg.

Step 3: Final Answer:

Chokla sheep originate from the Shekhawati region and are the best source of carpet wool in India.

💡 Quick Tip

The wool of Chokla is very fine and has a high percentage of hetero-typical fibers, making it ideal for high-quality carpets.

16(b). Write the place of origin and distribution, characteristics and utility of “Merino” breed of sheep.

Correct Answer: Merino is an exotic breed from Spain, world-famous for producing the finest apparel-grade wool.

Solution:

Step 1: Understanding the Concept:

The Merino is the most influential sheep breed in the world, used extensively to improve the

wool quality of other breeds.

Step 2: Detailed Explanation:

1. Origin and Distribution:

Origin: Spain.

Distribution: Now found worldwide, especially in Australia, USA, South Africa, and New Zealand. In India, it is used for cross-breeding programs.

2. Characteristics:

- (a) It has a medium-sized body with a white face and legs.
- (b) The skin is very loose and has many folds, providing a large surface area for wool growth.
- (c) Rams (males) usually have spiral horns, while ewes (females) are polled.
- (d) The wool covers the entire body, including the head and legs.

3. Utility:

- (a) It produces the finest quality wool (apparel grade) in the world.
- (b) The annual wool yield is very high, ranging from 6 to 9 kg per animal.
- (c) It is the parent breed for many famous crossbreeds like Rambouillet and Avikalin.

Step 3: Final Answer:

Merino sheep originate from Spain and are the global gold standard for fine wool production.

💡 Quick Tip

Merino wool is highly sought after because of its extreme softness, crimp (waviness), and strength.

Section - D

17. Describe the scientific cultivation of groundnut crop on the basis of following points:

- (i) Climate
- (ii) Seed rate and seed treatment
- (iii) Four improved varieties
- (iv) Plant protection.

Correct Answer: Scientific cultivation of groundnut requires a tropical climate, specific seed rates (60 – 100 kg/ha), varieties like GG-2, and protection against pests like white grub and diseases like Tikka.

Solution:

Step 1: Understanding the Concept:

Groundnut (*Arachis hypogaea*), also known as the "king of oilseeds," is a leguminous crop that produces pods underground.

Its cultivation requires careful management of soil and climatic factors to ensure proper "pegging" and pod development.

Step 2: Detailed Explanation:

(i) Climate:

Groundnut is essentially a tropical plant.

It requires a long and warm growing season with a temperature range of 25°C to 30°C .

Adequate rainfall of 500 – 1250 mm is ideal, especially during the flowering and pegging stages.

Frost is extremely harmful to the crop.

(ii) Seed rate and seed treatment:

Seed Rate: For bunch-type varieties, a seed rate of 80 – 100 kg kernels/ha is recommended. For spreading or semi-spreading types, 60 – 80 kg kernels/ha is sufficient.

Seed Treatment: To prevent seed-borne diseases, kernels should be treated with Thiram or Captan at 3 g/kg of seed.

Additionally, treating seeds with *Rhizobium* culture enhances nitrogen fixation.

(iii) Four improved varieties:

1. **GG-2 (Gujarat Groundnut 2):** A popular bunch-type variety.
2. **JL-24 (Phule Pragati):** Known for early maturity and high yield.
3. **Girnar-3:** A variety with good resistance to certain stresses.
4. **AK-12-24:** A well-known variety suitable for various regions.

(iv) Plant protection:

Diseases: Tikka (leaf spot) is the most common disease. It is controlled by spraying Carben-dazim (0.1%) or Mancozeb (0.2%).

Pests: White Grub is a major soil pest. It is managed by soil application of Phorate 10 G or Chlorpyrifos before sowing.

Step 3: Final Answer:

Successful groundnut cultivation involves choosing the right variety (e.g., JL-24), ensuring a warm climate ($25 - 30^{\circ}\text{C}$), treating seeds to prevent rot, and controlling Tikka disease for high productivity.

💡 Quick Tip

Avoid inter-cultivation or hoeing during the "pegging" stage (approx. 40–45 days after sowing), as it can damage the developing pods.

Gypsum application at 250 kg/ha is recommended for better pod filling.

17(OR). Describe the scientific cultivation of potato crop on the basis of following points:

(i) Climate

(ii) Seed rate and seed treatment

(iii) Four improved varieties

(iv) Plant protection.

Correct Answer: Potato cultivation thrives in cool climates, using 20 – 25 q/ha seed rate, improved Kufri varieties, and protection against Late Blight.

Solution:

Step 1: Understanding the Concept:

Potato (*Solanum tuberosum*) is a temperate crop grown as a winter vegetable in India. It is highly sensitive to temperature, especially during the tuberization phase.

Step 2: Detailed Explanation:

(i) Climate:

Potato is a cool-season crop.

The vegetative growth is best at 24°C , but tuberization (formation of tubers) occurs optimally at night temperatures of 15°C to 20°C .

If temperatures exceed 30°C , tuber formation stops completely.

(ii) Seed rate and seed treatment:

Seed Rate: Depending on tuber size and spacing, 20 – 25 quintals of tubers are required per hectare.

Seed Treatment: To break dormancy, tubers can be treated with 1% Thiourea.

To prevent soil-borne diseases like black scurf, tubers are dipped in 0.25% Emisan-6 (methoxy ethyl mercury chloride) for 5 minutes.

(iii) Four improved varieties:

Most Indian varieties are developed by CPRI, Shimla, and carry the "Kufri" prefix:

1. **Kufri Jyoti:** Widely adapted and resistant to late blight.
2. **Kufri Chandramukhi:** An early-maturing variety with excellent cooking quality.
3. **Kufri Bahar:** Medium-maturing and very popular in North India.
4. **Kufri Badshah:** Known for high yields and tolerance to frost.

(iv) Plant protection:

Diseases: Late Blight is the most devastating disease. Controlled by spraying Mancozeb (0.2%) or Metalaxyl.

Pests: Aphids are major pests as they act as vectors for viral diseases. Controlled by spraying Imidacloprid (0.3 ml/L).

Step 3: Final Answer:

Optimal potato yield requires cool nights ($15 - 20^{\circ}\text{C}$), use of high-quality 'Kufri' seeds, and strict management of Late Blight through fungicidal sprays.

 Quick Tip

Earthing up (mounting soil around the plant base) is a critical operation done at 30 – 40 days after sowing to prevent tubers from turning green due to sun exposure.

18. Describe the scientific cultivation of Banana on the basis of following points:

- (i) Soil and climate
- (ii) Four improved varieties
- (iii) Planting method
- (iv) Pest and disease.

Correct Answer: Banana cultivation requires tropical humid climates, rich loamy soil, varieties like Grand Naine, and management of diseases like Panama wilt.

Solution:

Step 1: Understanding the Concept:

Banana (*Musa* spp.) is a heavy feeder and one of the most important tropical fruit crops. It is a giant herbaceous monocot that requires high moisture and nutrients.

Step 3: Detailed Explanation:

(i) Soil and Climate:

Soil: Deep, well-drained loamy soil with a pH of 6.5 to 7.5 is ideal. It cannot tolerate water-logging or high salinity.

Climate: Banana is a tropical crop requiring a warm, humid climate.

Ideal temperature is 15°C to 35°C . Low temperatures (below 10°C) cause chilling injury and delayed flowering.

Step 2: Key Formula or Approach:

Standard spacing for Dwarf Cavendish is 1.5×1.5 m, while for tall varieties, it is 1.8×1.8 m or 2.0×2.0 m.

Step 3: Detailed Explanation (Continued):

(ii) Four improved varieties:

1. **Grand Naine (G-9):** The most popular commercial variety for export.
2. **Robusta:** A tall-growing variety suitable for various regions.
3. **Poovan:** Known for its tolerance to certain diseases and high yields.
4. **Dwarf Cavendish:** A short variety suitable for areas with high winds.

(iii) Planting method:

Banana is propagated through "Sword Suckers" (weighing 500–750 g) or Tissue Culture plants. Pits of size $45 \times 45 \times 45$ cm are dug. Before planting, suckers are treated with Carbendazim. Tissue culture plants are increasingly preferred due to their uniform growth and disease-free nature.

(iv) Pest and disease:

Diseases: Panama Wilt is a serious soil-borne disease (controlled by soil drenching and using resistant varieties). Sigatoka leaf spot causes premature leaf drying.

Pests: Stem Borer and Aphids (vector for Bunchy Top virus). Aphids are managed using Dimethoate.

Step 4: Final Answer:

For a successful banana orchard, use Grand Naine tissue culture plants, provide fertile well-drained soil, maintain high humidity, and protect against Panama wilt.

 Quick Tip

”Desuckering” (removing unwanted side shoots) and ”Propping” (supporting the heavy fruit bunch with bamboo poles) are essential operations for high quality and yield.

18(OR). Describe the scientific cultivation of pomegranate on the basis of following points:

- (i) Soil and climate**
- (ii) Four improved varieties**
- (iii) Planting method**
- (iv) Pest and disease.**

Correct Answer: Pomegranate thrives in semi-arid regions with hot summers, using air-layered plants of varieties like Bhagwa, and requires control of Anar butterfly.

Solution:

Step 1: Understanding the Concept:

Pomegranate (*Punica granatum*) is a hardy fruit crop suitable for arid and semi-arid regions. It is valued for its nutritional properties and long shelf life.

Step 2: Detailed Explanation:

(i) Soil and Climate:

Soil: It can grow in a wide range of soils, but deep loamy soils are best. It has moderate salt tolerance but requires good drainage.

Climate: It prefers a semi-arid climate. It requires a hot and dry summer and a cool winter. During fruit development, high temperatures and dry weather are beneficial for fruit quality and sweetness.

(ii) Four improved varieties:

1. **Bhagwa (Sindhuri):** Famous for its deep red skin and soft seeds.
2. **Ganesh:** A prolific bearer with pinkish-white arils.
3. **Mridula:** Known for dark red, soft seeds.
4. **Jyoti:** A high-yielding variety suitable for commercial cultivation.

(iii) Planting method:

Pomegranate is commercially propagated through "Air Layering" (Gooti) or hard-wood cuttings.

Pits of $60 \times 60 \times 60$ cm are prepared. Standard spacing is 5×5 m.

Planting is usually done during the monsoon (July-August) or spring (February-March).

(iv) Pest and disease: Diseases: Bacterial Blight (Telya) is a major threat, managed by Streptocycline (500 ppm) and Copper Oxychloride.

Pests: Pomegranate Butterfly (Anar butterfly) is the most destructive pest. Larvae bore into fruits. Controlled by bagging fruits or spraying Indoxacarb.

Step 3: Final Answer:

Pomegranate cultivation is highly profitable in dry regions using Bhagwa variety, air-layering propagation, and diligent management of Bacterial Blight.

 Quick Tip

"Bahar Treatment" is practiced in pomegranate to regulate flowering and fruiting. Ambia bahar (spring flowering) is common where irrigation is available.