Marking Scheme - 2

AGRICULTURE

Class XII

1	Soil fertility is the inherent capacity of the soil to supply nutrients to plants in adequate amounts and suitable proportions. All productive soils are fertile, but all fertile soils need not be productive. The problems like salinity/ alkalinity, acidity, waterlogging, adverse climatic conditions, etc may cause fertile soils to be unproductive. Soil fertility is an index of available nutrients to plants.	1
2.	Post harvest technology is inter-disciplinary "science and technique" applied to horticultural/agricultural produce immediately after harvest for its protection, conservation, processing (cooling, cleaning, sorting), packaging, distribution, marketing, and utilization to meet the food and nutritional requirements of the people in relation to their needs.	1
3	Spawn is the mycelium of mushrooms growing in its substratum and prepared for the purpose of propagating mushroom production. In other words it is defined as a medium impregnated with mushroom mycelium that serves as the "seed" for mushroom cultivation.	1
4	Cities and metropolis are densely populated. The most common problem is air, dust and noise pollution. Trees with their huge canopy minimize these pollutions by filtering dust and absorption of gaseous pollutants. Parks and tree canopies help reduce noise**,** stress , blood pressure and improves quality of life of people living around it.	1
5	It is the art and science of rearing honey bees, maintaining and manipulating honeybee colonies (hives), which could be for collecting honey and beeswax, or for pollinating crops, or for the purpose of selling bees to other beekeepers.	1
6	The green revolution fulfilled our aspirations by changing India from a food importing to a food exporting nation which involved greater use of synthetic agrochemicals such as fertilizers and pesticides with adoption of nutrient-responsive, high-yielding varieties of crops. However, the achievement was at the expense of soil health and environment and to the harm of the well-being of the people. Hence, a natural balance needs to be maintained at all cost without affecting the soil health as well as getting higher crop yields and quality of products for ever increasing population. Thus, organic farming is a potential alternative to conventional agriculture which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible relies upon crop rotations, crop	2

	residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection.	
7	Blue green algae or cyanobacteria are photosynthetic prokaryotic microorganisms capable of fixing atmospheric nitrogen. They make a substantial contribution in the nitrogen economy of crop production. The predominant genera of nitrogen fixing BGA are Anabaena, Nostoc, Calothrix and Tolypothrix. Blue green algae are recommended for lowland rice. In submerged rice fields, BGA is applied one week after transplanting at rate of 10 Kg /ha and the field is flooded with 2.5 to 5 cm deep water.	1 1
8	Reasons behind the use of thermal processing during food processing and preservation are a) Inactivation of enzymes to check biochemical reaction like ripening. b) To kill microorganism as most of them are killed in the range 82-93°C. Spores are not destroyed even at 100°C for 30 min. Therefore, to ensure sterility (total microbial destruction, including spores), a temperature of 121°C must be maintained for 15 min or longer.	1 x 2 = 2
9	Major factors hampering the growth of food processing sector and holding it back. a) Comprehensive national level policy on food processing sector b) Availability of trained manpower and Cost effective food machinery & packaging technologies	1x2= 2
10	Chemical pesticides have proven harmful to various other species in the ecosystem that could be beneficial. However, plant based biopesticide are devoid of these effects. Example neem leaves , seed kernels and neem extracts Moreover Bio-pesticides are preferred over chemical pesticides for the following reasons: no harmful residues; target specific and safe to beneficial organisms like pollinators, predators, parasites etc.; growth of natural enemies of pests is not affected, environmental friendly and cost effective	2
11	a) Insect pest management or Integrated Pest Management (IPM) is a system that, in the context of associated environment and population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains pest populations at levels below those causing economic injury. b) The cultural control is a key component of Integrated Pest Management. Cultural method of pest control involves use of production and management techniques followed by farmers for crop productivity to manipulate pest	1 2

population. Cultural control consists of introducing minor changes in the farm practices and farm machinery that aids both in agricultural production and pest control.

S.No.	Cropping Techniques	Pest controlled
1	Summer ploughing	Red hairy caterpillar of Groundnut
2	Puddling under lowland condition in paddy cultivation	Rice mealy bug
3	Pest free seed material	Potato tuber moth, Banana rhizome weevil
4	High seed rate	Sorghum shootfly
5	Plant density	Rice Brown planthopper
6	Trap cropping in cabbage and cauliflower. Trap crop is mustard	Diamond back moth
7	Earthing up	Sugarcane early shoot borer
8	Destruction of weed hosts (*Tinosporacordifolia*)	Citrus fruit sucking moth
9	Trimming and plastering	Rice grass hopper

The cropping techniques mentioned above are adopted for the pest control. The cultural control can be effective if practiced at the community level. For example, farm practices like synchronised sowing, crop sanitation, crop rotation have beneficial effect if adopted on a large scale.

c) **Biological control**

The study and utilization of parasitoids, predators and pathogens for the regulation of pest population densities is called as biological pest control. The techniques adopted for biological control are as follows:

1. Conservation and encouragement of indigenous natural enemies
2. Introduction of natural enemies into a new locality
3. Mass culturing and release of natural enemies to increase its population.

2

Parasitoids as a biocontrol:

Parasitoid is an insect parasite of an arthropod which is parasitic in immature stages and adults are free living.

e.g. 1.Trichogrammachilonis on the eggs of sugarcane internode borer, cotton bollworm.

2. Chelonusblackburni on the eggs of cotton spotted bollworm.

	Predators as a biocontrol: Predator is a free living organism throughout its life. Predator kills its prey. The predator is usually larger than its prey. e.g. 1.Lady bird beetle (Coccinellaseptumpunctata) against aphids (pest). 2. Reduviid bug (Rhinocorisfuscipes) against cotton American bollworm (Helicoverpaarmigera) (pest)	
12	**Functions of calcium:** a) Calcium in plants forms Ca-pectate which is an essential constituent of cell wall. b) Calcium increases stiffness of plants. c) It is involved in mitosis. d) It maintains chromosome structure. e) It regulates the meristem growth and functioning of the root tips. f) It protects the root cells against low pH, ion balance and toxic effects of Al, Fe, etc. g) It regulates the activities of enzymes like phospholipase, arginine kinase, amylase, and ATPase. **Deficiency of calcium:** a) Deficiency symptoms are observed on the younger leaves as calcium is immobile in plants. b) Younger leaves in the calcium deficient plants are short and distorted. c) Under severe deficiency condition, the apical meristem dies resulting in the production of tillers from the basal nodes. d) In case of cereal crops, the upper internodes are small and the leaves are crowded exhibiting a rosette appearance. e) The root system is stunted. The flowering and maturity is delayed due to calcium deficiency. f) Calcium deficiency syndromes in apples is bitter pit and in tomatoes blossom end rot. **Functions of magnesium:** a) Magnesium is an essential constituent of chlorophyll and so it is important for photosynthesis process.	½ x 3 (any three) ½ x2 (any two) ½ x 3

b) It regulates the activities of enzymes involved in the nucleic acids synthesis and metabolism of carbohydrates.

c) Magnesium aids in the movement of sugars and translocation of phosphorus in the plants.

Deficiency of magnesium:

a) Deficiency symptoms are observed in the plants with less than 0.1 % Mg.

b) Magnesium deficient plants lack vigour and they are normally stunted.

c) The older leaves exhibit the deficiency symptoms as magnesium is mobile in plants. Inter-veinal chlorosis followed by purple lesions within the chlorotic tissues is observed. As deficiency advances, the veins too become chlorotic and the leaves develop pale colour. The purple lesions turn brown or red.

d) Premature leaf abscission is observed in the deficient plants.

e) In cotton, the lower leaves develop reddish purple color and finally necrosis occurs (Reddening of leaves).

f) In Brassica, the lower leaves exhibit chlorosis with inter-veinal mottling. This condition is called puckering.

½ x2 (any two)

13 (a)

Categories of fruit processing units

According to Fruit Products Order (1955) of the Govt. of India, the fruit processing units are categorized as under depending upon the installed capacity and requirement of minimum area for processing (Table 1).

Table 1: Categorization of fruit processing units and requirement of area.

Sr.No	Category	Annual Production (tones)	Minimum manufacturing area required (m^2)
1.	Home scale(B)	25	25
2	Cottage scale	10-50	60
3.	Small Scale(A)	50-100	100
4.	Small Scale(B)	100-250	150
5.	Large Scale	□ 250	300

3

	Source: www.mofpi.nic.in (b) Cold Chain Scheme:- Launched by Govt. of India to provide integrated cold chain and preservation infrastructure facilities without any break from the farmer's field to the consumer. It covers pre-cooling facilities at production sites, reefer vans, mobile cooling units as well as value addition centres which includes infrastructural facilities like Processing, Multi-line Processing or Collection Centres, etc. for horticulture and other allied agricultural produce.	2
14	(a) Various value addition from cereals 1) Milled product a) Wheat powder/flour b) Maida flour c) Sooji/rava 2) Processed products a) Malted wheat b) Puffed wheat c) Wheat flakes 3) Bakery products a) Bread b) Bun c) Cakes/ Pasteries d) Rusk/soup stick e) Cookies / Biscuits f) Pizza **(b)** Steps in production of wheat flakes • Raw Material: a) The most important raw material is grain. b) Other ingredients, such as salt, yeast, sweeteners, flavoring agents, coloring agents, vitamins, minerals, and preservatives are also used. c) A wide variety of flavors like chocolate, cinnamon and other spices, and fruit flavors may be added. d) Vitamins and minerals are often added to wheat flakes to replace those lost during cooking.	2 3

	e) The antioxidants BHA and BHT are the preservatives most often added to prevent them from becoming stale and rancid. • Preparing the grain: Grain is received at the factory, inspected, and thoroughly cleaned. • Making wheat flakes: Cleaned grains are tempered in bins and subsequently steamed at atmospheric pressure until they attain moisture of 21%. The steamed wheat is passed through steam rollers which ruptures the bran coat and flatten the whole grain thus making the kernels more permeable to moisture during the cooking step. The flattened kernels are then cooked in rotating retorts along with malt, salt, sugar etc. for 90 min at 20 psi steam pressure. The resulting flakes are conveyed to ovens where they are tossed in a blast of very hot air to remove remaining moisture and to toast them to a desirable color and flavor with less than 3% moisture. • Adding coatings: After shaping, the wheat flakes may be coated with vitamins, minerals, sweeteners, flavors, food colors, or preservatives. Packaging and storage: Prepared flakes are packed in suitable moisture proof container of suitable size. Later they stored in cool and dry place.	
15	(a) 1. Mother Plants: Area fixed for mother plants is an important part for developing a nursery. The mother plants must be true to the type and true to the variety. 2. **Pot Nursery**: Are where pots are kept and sored. 3. **Poly bag nursery**: The propagated plants are planted in nursery beds for better growth or hardening the plants. In general, this type of nursery bed is prepared under partial shade 4. Ball Nursery including beds: Ball Nursery including beds of 100 m x 55 m dimension with smaller seed beds. 5. **Workshed**: The workshed of 6 m x 4.5 m with thatch roofs and locally available materials like bamboo, wood, etc. may be constructed. 6. **Polyhouse**: The polyhouse of 9 m x 4 m dimension with 90 cm, brick wall, 3.6 m tall rhombus netting with expanded metal and polythene roof supported by local materials like bamboo, wood and planks, may be constructed. 7. **Store-cum-office**: A store-cum-office of 6.0 m x 4.5 m constructed with locally available materials may serve the purpose.	3

Space allotment	Sq. m.
Mother Plants	560
Pot Nursery	200
Polybag Nursery	350
Ball Nursery including beds	550
Workshed	27
Polyhouse	36
Store cum office	27
Total	1750
15% additional for passage, drainage, etc.	260
Grand Total	2010

(b)

While packing plants the container is neither over-packed nor loose enough allowing the contents to move about. All space should be filled up by some packing materials like straw, dried grass, etc. For long distance destinations, the ball of earth should be soaked in water and covered with a thick layer of wet moss. Only plants having a well-developed root system should be selected for such destinations.

Marketing of plants and planting materials is the most crucial and important part of the nursery business. The production of high quality true to the type and attractive planting materials is absolutely necessary. They must be free from pests and diseases and vigorously growing.

2

16 **(a)**

Field capacity: The field capacity of soil describes the maximum amount of water that a soil will retain after free drainage. This situation usually exists one to three days after the soil has been thoroughly wetted by irrigation or rain. The field capacity is the upper limit of available moisture range in soil moisture and plant relations. The soil moisture tension at field capacity varies from soil to soil, but it generally ranges from 1/10 to 1/3 atmospheres. At field capacity, the micro pores are filled with water and the large soil pores are filled with air.

Permanent wilting point: The permanent wilting point is the soil water content at which plants can no longer obtain enough moisture to meet transpiration requirements and remain wilted unless water is added to the soil. At the permanent wilting point, the water film is held tightly around the soil particles so much so that the roots in contact with the soil cannot remove the water at a sufficiently rapid rate to prevent wilting of the plant leaves. It is considered equivalent to the water held by the soil against an applied pressure of 15 bars.

2 ½

(b)

Explain irrigation scheduling using critical crop growth stages? 2 ½

Irrigation scheduling is defined as the frequency with which water is to be applied based on needs of the crop and nature of the soil. Irrigation scheduling is a decision making process involving when to irrigate and how much of water to apply? Irrigation scheduling may also be defined as scientific management techniques of allocating irrigation water based on the individual crop water requirement under different soil and climatic condition, with an aim to achieve maximum crop production per unit of water applied over a unit area in unit time.

The objectives of irrigation scheduling are as follows:

1. High water – use efficiency
2. High crop productivity
3. Low irrigation cost
4. Minimal damage to soil ecosystem
5. Minimal weed menace
6. High fertilizer-use efficiency

Critical stage approach

The approaches to irrigation scheduling include direct and indirect approach. Critical stage approach is an indirect approach to irrigation scheduling. Irrigation may be scheduled according to the physiological stages. The growth period of an annual crop can be divided into four growth stages.

Initial stage	: Sowing to 10% ground cover
Crop development stage	: 10 to 70% ground cover
Mid-season stage	: Flowering to grain setting stage
Late season stage	: Ripening to harvesting stage

Certain physiological stages are critical at which there should not be moisture stress. These stages are called as critical stages of crop growth. Water supply should be ensured at these stages to get high yield. The critical crop growth stages of few crops are as follows:

S.No.	Crop	Critical stages
1	Wheat	Crown root initiation and flowering
2	Paddy	Early tillering and flowering
3	Maize	Tasselling and silking

4	Potato	Sprouting and tuberization

(c)

Drip irrigation is one of the latest methods of irrigation. Drip irrigation involves application of water near the plant roots at short intervals through a network of piping system. It allows an irrigator to limit watering closely to the consumptive use of the plants. The crop yields are higher by adopting this method on account of increased water use efficiency. The water conveyance and application losses are minimized in this irrigation method. It is suitable for water scarcity and salt affected soils. Drip irrigation is highly suitable to wide spaced and high value crops like coconut, grapes, lime, banana, vegetables, mango, pomegranate, etc. 3

Components of drip irrigation system:

1. A drip irrigation system consists of a pump or overhead tank, main line, sub-mains, laterals and emitters. The mains, sub-mains and laterals are usually made of black PVC (poly vinyl chloride) tubing.
2. The main line delivers water to the sub-mains and the sub-mains to the laterals.
3. The emitters which are attached to the laterals distribute water for irrigation.
4. Other components include pressure regulator, filters, valves, water meter, fertilizer application components, etc.,

Pump

The pump creates the pressure necessary to force water through the components of the system. Centrifugal pump operated by engines or electric motors are commonly used. The laterals may be designed to operate under pressures as low as 0.15 to 0.2 kg/cm^2 and as large as 1 to 1.75 kg/cm^2.

Chemical tank

A tank may be provided at the head of the drip irrigation systems for applying fertilizers, herbicides and other chemicals in solution directly to the field along with irrigation water.

Filter

It is an essential part of drip irrigation system. It prevents the blockage of pipes and drippers/emitters. The filter system consists of valves and a pressure gauge for regulation and control.

Emitters

	Drippers are provided at regular intervals on the laterals. The drippers allow water to trickle out at very low rates. The amount of water dripping out of each emitter in a unit time will depend on the pressure and size of the opening. The water coming out of the emitters is almost at atmospheric pressure. Diagram or drip irrigation	2
17	(a) A jelly is a semi-solid product prepared by boiling a clear, strained solution of pectin containing fruit extract, free from pulp, after the addition of sugar and acid. (b) Raw material, ingredients, machinery required 1. Fresh ripe guava, 2. Sugar, Citric acid 3. Guava: Sugar: Citric acid :: 1kg : 750gm: 3.0 gm 4. Stainless steel knives, ladle utensils for cooking and mixing, wide mouthed glass bottles, sterilization tank, juicer/basket press, bhatti/LPG stove/boiler, Thermometer, Jelmeter or Refractometer, etc. <u>Preparation of guava jelly</u> 1) Select sound, mature fruits, wash thoroughly and cut them in small pieces along with peel (peel contains maximum pectin). 2) Add sufficient water so that the pieces are dipped in water and add citric acid 1.5 to 2 g/kg fruits. 3) Boil the mass gently so as to enable release of pectin. 4) Repeat the process 2-3 times for complete extraction of pectin. 5) Strain the mass through a muslin cloth to separate the extract. Do not squeeze, only strain all the extracts. 6) Collect only the supernatant. 7) Determination of pectin content: The pectin content of the strained extract is usually determined by one of the following two methods. a) Alcohol test: b) Jelmeter test The reading of the *level* of extract in the jelmeter is noted. This figure indicates how many parts of sugar are to be added to one part of juice. 8) If the pectin contents are poor, concentrate the extract till it gives test of high	1 6

pectin or if required add the pectin externally.

9) Cooking is carried till end point reaches. The end-point of a jelly can be judged by using any of the following methods:
   a) Cold plate test
   b) Sheet or flake test
   c) Temperature of boiling mixture: At end point the temperature of boiling jelly is around 105.5^0C.

10) Pour the finished jelly into clean, dry, pre-sterilized jars.

11) Allow the product to cool and seal the jar air-tight with a layer of molten paraffin wax.

12) Label and store in a cool and dry place.

(c)

FPO specifications for jelly

1.	Fruit contents	Not less than 45%
2.	Total soluble solids	Not less than 65% (w/w)
3.	Preservatives	Sulphur dioxide (Not more than 40 ppm) Benzoic acid (Not more than 200 ppm)
4.	Synthetic sweetening agents	Not permitted
5.	Fermentation test	Negative
6.	Organoleptic test	Retain flavour of original fruit and free from burnt or other objectionable flavour
7.	Crystallization	Absent

½ x 6 (any six)

18

a) **Agro climatic requirement**: In India, button mushrooms are grown seasonally and in environment controlled cropping houses. White button mushroom requires 20-28 ^{0}C for vegetative growth (spawn run) and 12-18 ^{0}C for reproductive growth; relative humidity of 80-90% and enough ventilation during cropping. Seasonally, it is grown during the winter months in the north-west plains of India and for 8-10 months in a year on the hills. However, with the advent of modern cultivation technology it is now possible to cultivate this mushroom anywhere in India. — 2

b) **Varieties / Strains:** The strains which are mostly cultivated in India are S-11, TM-79 , Horst H3, Ooty 1 and Ooty (BM) 2. — 2

c) **Casing**: The compost beds after complete spawn run should be covered with a layer of soil (casing) about 3-4 cm. thick to induce fruiting. The casing material should have high porosity, water holding capacity and pH 7-7.5. Mixtures like garden loam soil and sand (4:1); decomposed cowdung and loam soil (1:1) and — 2

	spent compost (2-3 years old); sand and lime are commonly used as casing. The casing soil before application should be either pasteurized (at 66-70 ^{0}C for 7-8 hours), treated with formaldehyde (2%) or steam sterilized. The treatment needs to be done at least 15 days before the material is used for casing. After casing is done the temperature of the room is again maintained at 23-28 ^{0}C and relative humidity of 85-90% for another 8-10 days.	
	d) **Harvesting**: It is done at button stage and caps measuring 2.5 to 4 cm. across are ideal for the purpose. The first crop appears about three weeks after casing. Mushrooms need to be harvested by light twisting without disturbing the casing soil. Once the harvesting is complete, the gaps in the beds should be filled with fresh sterilized casing material and then watered. About 10-14 kg. fresh mushrooms per 100 kg. fresh compost can be obtained in two months crop.	2
	Important pest and disease: The insect pests mostly observed are nematodes and mites. Many diseases like Dry Bubble (brown spot), Wet Bubble (White Mould), Cobweb, Green Mould, False truffle (Truffle disease), Olive green mould, and Bacterial blotch affect mushroom cultivation. Adopt appropriate and timely control measures against pests & diseases to avoid failure of crop.	2