Model Answer Paper

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEOR EXAMINATION
B.Sc. (Hons.) Agriculture

Semester	:	IV (NEW)	Term	:	Second	Academic Year	: 2022-23
Course No	:	AGRO-246	Title	:	Crop Production Technology-II (*Rabi* Crops)		
Credits	:	2(1+1)					
Day & Date	:		Time	:	2hrs	Total Marks	: 40

Note: 1. Solve **ANY EIGHT** questions from **SECTION 'A'**.
2. All questions from **SECTION 'B'** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION 'A'

Q.1	**State the dry land technologies adopted while cultivating *rabi* Sorghum. under rainfed condition**	Marking Scheme
Ans.	**Dry land technology for rainfed *rabi* sorghum (Any Eight points)** **1. Tillage:** Surface soil should be kept open for the entry of water through the soil. In heavy soil deep ploughing once in 2 to 3 years. In light to medium soil every year ploughing is essential. Tillage is major component of storage efficiency in soils with high water holding capacity. **2. Use of two bowl seed drill for sowing.** **3. Hoeing**: - Three hoeing are essential for controlling weeds and conserve the moisture into the soil. Due to hoeing breaking the capillaries at soil and hence avoids cracking of soil surface. Minimize evaporation. **4. Mulching:-** Evaporation can be reduce by covering the soil surface with organic residues, straw, grass, stalks of red gram. Apply 5 t/ha organic mulch in between two crop lines 15 DAS. Due to use of mulch saving of 25 to 30mm soil moisture and increase 30 to 40% crop yield. **5. Protective Irrigation**: - i) If one irrigation-at flag leaf stage i.e. at 60 DAS. (ii) If two irrigations -1st at grand growth stage (28-30DAS) & 2nd at flag leaf stage. **6. Foliar application of fertilizer:-** Spraying of 2% urea fertilizer on crop leaves. Increases the function of leaves and helps for absorption of moisture from soil. **7. Use of anti transpirants**: - decrease water loss from leaves by reducing the size or number of stomatal openings leading to decreased rate of water vapor diffusion from leaf surfaces. e.g. Kaolin, white color, chalk dust @ 8% **8. Reduce plant population/ha: -** If drought period increase the plants compete for moisture and nutrient. Due to this condition yield of crop reduced. To overcome this problem reduce the plant population/ha and maintain plant population up to 90,000 to 1, 00,000/ha.	4

	9. Reduce No. of leaves/plant: - In drought situation there is loss of water through leaves by transpiration. For decreasing transpiration, reduce number of leaves from lower site of plant and keep 4 to5 leaves upper site of plant. **10.Crop rotation and mixed cropping:-** *Kharif* *Rabi* Green gram - Sorghum Black Gram - Sorghum Soybean - Sorghum Groundnut - Sorghum **Mixed Cropping**:- Sorghum + Safflower Sorghum + Gram Sorghum + Sunflower **Intercropping:-** (i) Sorghum + Sunflower (ii) Sorghum + Linseed In different row proportion.	
Q.2	**Explain the package of practices of Irrigated Wheat on following points** **a) Soil and climatic requirements b)Varieties** **c) Irrigation scheduling d) Harvesting and yield**	
Ans.	**a) Soil and climatic requirements : Soil:-** 1. Medium to heavy fertility and with good moisture retentive capacity, Well-drained loams, clayey loams, Sandy loams and black soils. 2. Soil pH 6.5 to 7.5 **Climate: -** 1. It is a temperate crop grown in tropical and Sub-tropical Zone. 2. Requires cool, dry & clear weather. Average annual rainfall between 750-1600mm 3. Optimum temperature as low as 5-7°C, as high as 26-28°C. 4. Optimum temperature required at different stages of growth. a. Germination : 22 - 25°C. b. Tillering : 16-20°C. c. Grain development : Less than 25°C. 5. Dry sunny days and cool nights result in dew formation very helpful for crop 6. Hot and humid weather is harmful - encourages rapid spread of fungus diseases like – rusts. 7. Extreme low temperature Cold waves during grain filling stage cause damage	1
	b)Varieties (Any Four) HD-2189, NIAW-301 (Tymbak), NIDW-295, (Godawari), MACS-6122 , NIAW-917 (Tapovan),NIAW-1994 (Samadhan)	1
	c) Irrigation scheduling : No. of irrigations -5 to 6. First irrigation should be given 18 to 21 DAS. Irrigation interval should be kept 18-20 days i.e. 3 weeks in medium black soils. Two to three extra irrigations are required for light soils.	1

	Critical growth stages — **Days after sowing** 1. Crown root initiation (CRI) (Most critical stage for irrigation). — 18-21 2. Tillering — 40-42 3. Flowering — 60-65 4. Early dough / grain formation stage — 90-95 **Total water requirement = 40 ha cm.** **IW: CPE** ratio between 0.7 and 0.9.	
	d) Harvesting and yield: Duration/Stage/Maturity Signs 1. crop matures 110-120 days after sowing 2. should be harvested before it is dead ripe 3. The proper stage for harvesting is when about 15% moisture in grains **Method**: Manually -by cutting the plant close to the ground with serrate edged sickles and tied in small bundles. Bundles are dried for 3-4 days. OR Mechanically- Combine harvester machine is used for harvesting wheat crop. With this machine harvesting, threshing and winnowing is carried out at a time. **Threshing Winnowing and Drying:-** Trampling wheat plants under the feet of bullocks or mechanical thresher. Winnowing to clean the grains. Grains are dried in hot and bright sunlight about 2-3 days and stored it properly. **Yield:-** Grain Yield :45-50 Q/ha	1
Q.3	**Write the package of practices of Deshi(Brown) Chick pea on following points** **a). Seeds and sowing** — **b)Varieties** **c) Manures and fertilizers** — **d) Harvesting and yield**	
Ans.	**a) Seeds and sowing :** 1. **Time of Sowing:-** i. Rainfed Conditions: last week of September. ii. Irrigated conditions: Mid October to mid November (i.e. 20th October to 10th November) 2. **Method of sowing:-** **Drilling method-** with two bowl and four coulter seed drill or by **dropping the seeds behind plough furrow**, particularly after the harvest of the previous paddy crop. **Dibbling:** dibbled two seeds, on ridges and furrows at both the sides of ridges. 3. **Seed rate: - 60-100kg/ha**. Varies with the test weight (seed size) of the seed. a. For medium size seeds -65 to 70 kg/ha, b. Large sized seeds -85 kg/ha. Bold seeds-100kg/ha 4. **Spacing:-** 30cmx10cm i. In heavy soil, (90cmx10cm) 5. **Depth of sowing:-** 8-10cm	1

6. **Seed Treatment**
   a. Seed is treated with Thiram @ 2g/kg of seed + Bavistin @ 2g/kg of seed OR with **Tricoderma@5gm/kg** of seed to control seed born fungal diseases (wilt).
   b. The seed should be treated with *Rhizobium* and PSB each of culture @ 250g/10kg of seed for increasing nitrogen fixation

b) Varieties :(Any four varieties) — 1

1. **Rainfed:-** Vijay,PhuleG – 12, Digvijay, Vishal ,BDNG-797(Aakash), Phule Vikram, PDKV (Kanchan)
2. **Irrigated:-** Vikas (PG-1) Vishwas (PG-5), Phule G-12, Vijay, Vishal, Digvijay, Rajas, Saki -9596,Phule vikram, Phule vikrant, PDKV(Kanchan)
3. **Old varieties of Gram:-**Chafa, N-59, N-31, Warangal, Halwa, Gulab,D-8, BDN-9-3, Annegiri.

c) Manures and fertilizers:- — 1

a) Manures:- Well decomposed FYM/compost@ 6 to 7 t /ha

(b) Fertilizers:-

Crop Conditions	Fertilizers (Kg/ha)		
	N	P	K
Dry land (Rainfed)	12.5	25	00
Assured Rainfall	20	40	00
Irrigated	25	50	30
	OR 125Kg DAP/hand 50kg MOP		

Entire quantity of fertilizer should be given at the time sowing with two bowl seed drill. 2% Urea spraying is given at pod filling stage. :

d)Harvesting and yield:- — 1

1. **Duration/Stage/Maturity Signs:** Rainfed chickpea-at 90-95DAS. Irrigated chickpea requires 100-110days to harvest after sowing.
2. **Method:** Cutting the plant close to the ground level with sharp sickle during morning hours. The crop is dry in sunlight on threshing floor for 4-6 days.
3. **Threshing/Winnowing/Cleaning:-**Either by beating the plants with sticks or by trampling under the feet of bullocks. Also done with mechanical thresher.
4. **Yield:** -1. Rainfed: - 10-12 q/ha 2. Irrigated: - 25-30 q/ha.

Q.4 **State the cultivation of Sunflower on following points**

a) Field preparation **b) Seeds and sowing**

c) Varieties **d) Irrigation management**

Ans. **a) Field preparation**: Well-pulverized, weed free land with adequate moisture supply. Ploughing followed by planking and 2-3disc harrowing. If the problem of white grub add linden powder@ 40kg/ha. Add well decomposed FYM/compost @5 to 6 t/ha before last harrowing. — 1

b) Seeds and sowing: 1.Seeds and Sowing: select seed from last year stock should be well developed of improved genotype. — 1

	1. Time of sowing: 1. *Rabi*-First fortnight of October to first fortnight of November. 2. Summer- last week of January to 15th February. **2. Seed Rate**: Variety: - 8-10kg/ha, Hybrid variety:- 5-6kg/ha **3. Spacing**: Medium-Heavy soils: 45cm x30cm, Heavy soils-60x30cm, Hybrid variety - 60cm x30cm. **4. Depth of sowing**: - 5-6 cm. **5. Method of sowing:** Drilling and Dibbling (most appropriate for hybrids). **6. Seed treatment:-** a. **For better germination and plant stand under Dryland conditions,** pre-soaking of seeds in water for 12 hours and subsequent drying in shade b. To **control of seed born fungal diseases** Seed should be treated with Brassicol or Thirum @2-2.5g/kg of the seed like wilt. c. For control of yellow mosaic disease seed should be treated with Apron 35 S.D @ 6 g/kg seed. d. Seed should be treated with Emidachloprid 70 W.A. gauch @ 5 g/kg seed for the control of narcosis disease. e. **For 'N' fixation** *Azotobactor* seed treatment @ 25 g/kg seed.	
	c) Varieties : (Any Four Varieties) **1.Improved Varieties:** Phule Bhaskar, Modern, S.S. 56, Bhanu, EC-69874 **2.Hybrid varieties:** K.B.S.H.-1, L.S.F.H.171,L.S.F.H-35, L.S.F.H-08, K.B.S.H-44,Phule Raviraj,M.S.F.H.-17	1
	d) Irrigation management: Water requirement =30 to 35 ha cm. Sunflower crop is highly sensitive to water stress between flowering to seed filling stage. **Critical growth stages** of sunflower for irrigation *viz.*, Seedling stage (15-20 DAS), Capitulum initiation (30-35DAS Flowering (45-50DAS) and Grain filling (60-65 DAS).	1
Q.5	**Write the cultivation practices of Mustard on following points** **a) Climatic requirement b) Seeds and sowing** **c) Varieties d) Harvesting and yield**	
Ans.	**a) Climatic requirement** : Mustard is a *rabi* season crop Requires relatively cool temperatures for satisfactory growth and dry period at harvest. Temperature: 18°C-25°C. It is grown in medium to high rainfall areas. Rainfall, high humidity and cloudy weather not good for this crop during winter	1
	b) Seeds and sowing : 1. **Sowing Time**: Optimum time: first fortnight of October to mid November.Whenever, inadequate, moisture in the field the seed is mixed with moist soil and kept overnight. For distributing evenly, the seeds usually mixed with fine sand.	1

	2. **Method of sowing**: line sowing broadcasting in the main crop i. Or mixed with the main crop. 3. **Spacing**: 45cm X 15cm 4. **Seed Rate:** Pure crop- 5kg/ha i. Mixed crop – 2 to 2.5 kg/ha 5. **Depth of Sowing**: (Shallow depth) 2.5 to 3 cm. 6. **Seed treatment:** - Seed are treated with Bavistin @ 2 g/kg of seed or dithane m-45 @ 3 g/kg of seed or Brassicol or capton @ 4 g/kg of seed to protect from root rot and sclerotia disease.	
	c)Varieties:- (Any Four Varieties) Varuna, Sita, Pusa bold, T.M-4, T.M-2, Prakash, T.M – 21, TPM-1,GM- 1 &2, Laxmi, Narendra rai, Agrni(SET-2).Durgamani, Bhagirathi,RLM-619,RH-30,81&819.	1
	d)Harvesting and yield: **Duration/Stage/Maturity Signs**: Mustard is ready to harvest in 110-160 days. Harvesting is done as soon as the crop begins to turn yellow. Harvesting is done in morning hours. To avoid losses from shattering of seeds. **Method:** The crop is cut close to the ground with the help of sickle and it is brought to threshing yard and allowed to dry. The **threshing** is done with the help of sticks or *mogri.* Being small seeds may be drifted with the high air; the **winnowing** is done with gentle natural air current. **Yield: -** **a) Rainfed**:- 8-10 q/ha **b) Irrigated**:- 12-15 q/ha	1
Q.6	**State package of practices of *Suru* Sugarcane on following points** **a) Planting** **b) Fertilizer requirement** **c) Varieties** **d) Irrigation management**	
Ans.	**a) Planting :** **1.Time of planting** :is governed mainly by weather conditions. In Northern India-February-March, Peninsular India January – February. In Gujarat & A.P. M.S. – 15th December – 15th February. In Maharashtra for *suru* sugarcane January is the optimum time for planting. 2. **Spacing:-** i) Heavy soil: - 120cm ii) Light soil:- 90 to 100cm iii) Paired row/patta method:- 75 to 150cm OR 90 to 180cm 3. **Seed rate:-** i) One eye bud setts:- 30,000/ha Distance between two setts:- 30cm ii) Two eye bud setts:- 25,000/ha. Distance between two setts:- 15-20cm iii) Three eye budded setts:- 25,000/ha	1

4. Method of Planting

i). Heavy Soil: - Dry method on ridges and furrow.

ii) Light Soil: - Wet method on ridges and furrow.

iii) Paired row/patta method.

5. Depth of planting:- 2.5 – 7.5cm depending on soil type and method of planting. More depth of planting on light to medium soil than in heavy soils.

b) Fertilizer requirement :

FYM: 25 t/ha 15 days before planting.

S N	Time	Suru (kg/ha)		
		N	P	K
1	At Planting	25	60	60
2.	6-8 weeks after planting	100	-	-
3.	12-16 Weeks after planting (light earthing up)	25	-	-
4.	20-24 weeks after planting (final earthing up)	100	55	55
	Total	**250**	**115**	**115**

1

c) Varieties : (Any Four Varieties) CO-86032 (Nira) – 1996 ,CO – 94012 (Phule savitri) – 2002, COM-0265 (Phule – 265) – 2006,CO-419, CO-740, CO-7219 (Sanjivani), COM-7125 (Sampada), CO-7527,COM-88121 (Krishna),
COM – 7714.CO-8014 (Mahalaxmi),COVSI - 9805 (Good for ratoon), C0-92005 (Suru and good for jaggery)

1

d) Irrigation management : Judicious use of water is one of the main factors which governs the cane yields and sugar recovery.

1

***Suru* sugarcane – Total WR**= 280 ha cm and No. of irrigations 32.

CGS and water depth	Months after Planting
1. Germination(5cm)	1.5-2
2. Tillering Stage	2-4
3. Initial growth Stage	4-6
4. Grand growth Stage(7.5 cm)	6-10
5. Maturity– (5.6 cm)	10-12

Irrigation should be ceased at 20-25 days before harvesting.

Now a days, micro irrigation/drip irrigation /Fertigation is adopted on large scale.

Q.7 Write the cultivation practices of Tobacco on following points

a) Soil requirement **b)Time of transplanting**

c)Preparation of field **d) Fertilizer requirement**

Ans.

a) Soil requirement: Quality of tobacco is greatly influenced by the soil conditions. Tobacco does not tolerate waterlogged soil. It requires well drained soil. Tobacco is grown in light to medium loams poor in humus content but with more of potash, phosphoric acid and iron.

pH ranging from 5.5 to 6.5.

Heavy and naturally fertile soils are preferred for cigar, pipe, hookah and

1

	chewing type tobacco. While light sandy and somewhat less fertile soils for cigarettes, *bidi,* cigar wrappers and high grade pipe tobacco.	
	b)Time of transplanting: the period for transplanting is varies from place to place keeping in view the varieties to be planted, soil and climatic conditions. The time of raising the seedlings in nursery is adjusted accordingly. There should be a intermittent rains at the time of transplanting. 1. Andhra Pradesh. -Cigarette tobacco – Mid October 2. Tamil Nadu -*Bidi* and chewing tobacco – Mid October with onset of monsoon 3. North India- Mid September to Mid October 4. Maharashtra, Gujarat-*Bidi* tobacco – Second or third week of August.	1
	c) Preparation of field: A clean and well-pulverized seedbed of fine tilth is needed for transplanting of tobacco seedlings. Land should be well prepared by ploughing followed by 3 to 4 cross harrowing. Each harrowing should be followed by planking so that the soil is well pulverized and leveled. Add 10 to 12 tonnes of F.Y.M./ compost/ha in the soil at the time of last harrowing.	1
	d) Fertilizer requirement: Well decomposed F.Y.M./compost @10 to 12 t / ha in the soil at the time of last harrowing. Quality in tobacco, particularly in the smoking types depends on the balance of the nutrients in the leaf. **In Maharashtra,** RDF(NPK Kg/ha)=100 :60 :40 After establishment of seedlings (10 days after transplanting) 50kg N + ¾ 60kg P_2O_5 40kg K_2O/ha be applied by making a ring around the plants. The remaining ½ quantity of N is applied 1 to 1 ½ month after transplanting. The fertilizers should be placed 10 to 15 cm away and 5 to 10 cm deep. **RDF (NPK Kg/ha):**Cigarette type of tobacco:80:60:30 *Bidi* type of tobacco: 160:80:30 *Hookah*:100-150:80:40	1
Q.8	**State the cultivation of Lentil on following points** **a) Seeds and sowing** **b) Varieties** **c)Disease management** **d)Harvesting and yield**	
Ans.	**a) Seeds and sowing:** 1. **Sowing Time:** October to November. 2. **Seed rate:** For sole crop: depending upon seed size. 1.Small seeded variety-30-40kg/ha 2. Bold seeded variety- 50-60 kg/ha. For mix crop : - 10-12 kg/ha 3. **Method of sowing:** drilling (line sowing) or Broadcasting. 4. **Spacing: 30cm** between rows and 10cm plant to plant. 5. Sowing depth: 3 – 4cm(shallow depth)	1

	6. Seed treatment: 1. Thiram +Carbendazim (1:1) @ 2.5g/kg of seed. 2. *Rhizobium* culture @ 250 g/ 10 kg of seed at the time of sowing.	
	b) Varieties: Improved varieties are T-36, L 9-12, Pusa-1, Pusa-6, B-77, W. B. – 94, Pant – 209 and pant – 406. Wilt resistant/ tolerant – RV L - 31, IPL81 (Noori), IPL - 316, Sekhar masoor – 2. Rust resistant/ tolerant – IPL - 406, WBL - 77, Pant L - 6, Pant L - 7, IPL –316, Sekhar masoor – 2.	
	c) Disease management: The major diseases of lentil are rust in Northern plain and wilt in Central zone. Use of resistant varieties is helpful in controlling the disease.	1
	d)Harvesting and yield: Duration/Stage/Maturity Signs Mature within three and half months. Harvesting before it is dead ripe or fully matured. **Method** Either by uprooting the plants or cutting with sickle. Drying, threshing and winnowing. **Yield**: Rainfed – 4-5 q/ha and Irrigated 8-9 q/ha. Well managed crop - up to 10-12q/ha.	1
Q.9	**Prepare a leaflet on the cultivation of Lucerne.**	
Ans.	**Lucerne (Alfalfa) (Major Points of Cultivation)** 1. **Botanical Name :** *Medicago sativa, Linn.* 2. **Family**:- *Leguminaceae/Fabaceae* 3. **Origin:** Southwest Asia 4. **Nutritive Value:** Crude Protein (CP)-19-22% CF-25.7% Fat/Ether Extract(EE)-3.1%, Ash-14.8% and Nitrogen Free Extract(NFE)-37.7% 5. **Soil:** - wide range of soils from sandy loam to clay. Best on well-drained fertile medium deep loam soils. 6. **Climate**- cool and dry climate. High temperature accompanied with high humidity, crops suffers badly. 7. **Land preparation**: a fine, firm and well-leveled seedbed with adequate moisture. Plough the field once with the mould board ploughs and 3-4 times with local wooden plough or 2-3 harrowing followed by planking each time. 8. **Time of sowing-** Mid October-Mid November 9. **Seed rate:** 25kg/ha for drilling 10. **Spacing:** The seed may be drilled in lines 30 cm apart with seed drill. 11. **Method of sowing:** line sowing or broadcasting. 12. **Seed Treatment**: Just before sowing seed treatment with *Rhizobium melilotti* culture @250g/10kg of seeds. 13. **Varieties**: Sirsa-9, Anand-2, Anand-3, Sirsa-8, CO-1, NDRI-selection NO .1, Rambler IGPIRIS-244. IGFRIS-54, Chetak (IL-244) SS-627, RL-88, Ahmednagar local. 14. **Manures and Fertilizers**: a. FYM- 10 t/ha. b. Fertilizers- RDF-100:280:40 kg NPK/ha c. Basal dose-20:80:40 Kg NPK/ha at the time of sowing.	4

	d. Apply – 20:50:00KgNPK/ha after every fourth cutting. 15. **Water management:**-It is a perennial forage crop. WR= 225ha·cm /year. Pre-sowing irrigation. Frequent irrigations at an interval of 7-10 days are required. a. Irrigation interval- 6-7 days during summer, 10-12 days during winter. The crop required about 20-25 irrigations in a year. 16. **Weed control:** First weeding at 20-25DAS .Subsequent weeding after each cutting or hoeing after every three cuttings. a. Pre sowing application of herbicide Diuron (Carmex) @ 2.0 kg a.i./ha or EPTC @ 3.0 kg a.i/ha 30 DAS or MCPB @ 0.75kg a.i./ha, 30 DAS us effective. 17. **Plant Protection**-Care should be taken that doesn't feed the fodder to the animals for a period of 20-25 days after spray of insecticides. Use Biological control method. a. On incidence of semilooper, and pod borer follow spraying of HANPV@500ml/ha at the time of evening. b. Release *Trichoderma chilonis* @1,00,000/ha. Release second time after eight days. c. Randomly place T shaped bird perches @15/ha. 18. **Disease management- 1.Bacterial blight-** **a.** Grow resistant varieties, Adopt long duration crop rotation. b. **Leaf spot**: Diseased plants turn yellow and leave drop off. c. **Control measures**-Early cutting can cure the crop to some extent. 2. Spray 0.2% solution of Dithane M-45. But don't feed the fodder to animals for a month. **19. Harvesting- Foliage cutting management** a. **First cutting** at 50 DAS (at half bloom stage). **Subsequent cuttings** at 21-25days interval. Generally in Lucerne, foliage cutting takes place for one and half year and then crop left for seed production. On an average 10-12 cuttings per year. 20. **Yield :** Green fodder- 1000-1200q/ha	
Q.10	**Write short notes on (Any Two)**	**4**
Ans.	**Malting in Barley**	**2**
a)	**Malting** is the process of controlling the germination of cereal grains under certain controlled conditions favorable for sprouting and drying in huge kilns for the desired color and specification. **Malted grain is used** to make brew, beverages, beer, malted milk, malt vinegar, confections such as flavored drinks, some baked goods, biscuits and sweet meals. **Three stages involved in malting barley.** 1. **Steeping (Soaking):** Steeping has two sub-stages, wet steeping and air rests.Wet steeping -seeds are soaked in water to begin sprouting and has taken about 42-46% moisture by weight. Soaking :24-48 hrs. Water is drained and the grains are put to an air rest. The more the moisture	

	content the darker is the extraction of the malt. **2. Germination**: seeds are on malting beds and allowed to germinate. It is controlled by a specific temperature and maintaining the moisture content. The germination stage takes 3-5 days and inspected to ensure that all the seeds are sprouting and modifying uniformly. **3. Drying and Kilning (Drying and roasting)**: Once the seeds are uniformly germinated, immediately dried to restrict the sprouting process further. Drying stops the sprouting process and further enzymatic activities. Drying with hot air 20 ^{0}C for 20hrs and moisture content is 4-5%. The grain at this point of time is called "green malt". The entire drying process takes 1-2days. Kilning is the final process that roasting the green malt to develop its final desired character and flavor. It involves regular stirring for a more uniform final product. Passed through deculmer to remove small rootlets emerged during germination. The final product varies -pale to amber, to chocolate brown. It is stored in a cool and dry place until it is actually used for brewing or other uses.	
b)	**Sowing and varieties of Oat**	2
	Seeds and sowing: 1.Time of Sowing-Early October to end of November. 2. Seed rate- 100kgs/ha. 3. Method of sowing-Line sowing (drilling) 4. Spacing- 30cm row to row spacing. 5. Seed treatment- Before sowing seed treatment with *Azatobacter*@250g/10kg of seed. **Varieties**- Phule Harita, Kent, Phule Surbhi, Weston-11, OS-6, OS-7, JHO-822, 855, 851, IGFRI- 2688, UPO-212, 222, OL-9, Pusa oat – 1, 2,3.	
c)	**Processing of sugar beet for sugar manufacturing**	2
	Sugar beet processed in sugar mills within 48 hrs of its harvesting (delayed spoiled sugar beets). Washing of topped beets in a flume of rapidly flowing water. Mechanical Slicing into thin angular strips. The sugar is extracted from slices by the diffusion process after the separation of juice from the pulp. Lime is added to the juice to precipitate impurities & to neutralize oxalic acid & the organic acids. The juice then filtered, clarified, decolorized with sulphur and again filtered. Juice is concentrated to syrup under reduced pressure in steam heated vacuum pans or evaporators. The syrup is treated with Sulphur-di-oxide, filtered & evaporation is continued until the sugar crystallizes. The mixture of sugar crystals and molasses is separated in a centrifuge and dried in a granulator.	

	SECTION 'B'	
Q.11	**Do as directed**	
1)	Why it is essential to cover the potato tubers with soil at interculturing operations?	1
Ans.	Potato tubers if exposed to sunlight **synthesize anthocyanin and chlorophyll.** With chlorophyll formation, the tubers **stop accumulating starch & remain smaller.** The Solanin formation in **green tubers results into bitter taste of tubers which is harmful if consumed.** Hence, it is essential to cover the potato tubers with soil at interculturing operations	
2)	Essential oil of *Mentha arvensis* is used in food and flavor industry and pharmaceutical preparations. **State True or False.**	1
Ans.	**True**	
3)	..... is use as oilseed and fiber crop. **Fill in the blank.**	1
Ans.	**Linseed**	
4)	The chief constituent of Lemongrass /Citronella oil is the citral imparts strong lemon-like aroma. **Choose the correct word.**	1
Ans.	**Lemongrass**	
Q.12	**Match the Pairs**	
	A **B**	
1)	French bean a) Topping	1
2)	Safflower b) Vine Cuttings /slips	1
3)	Sweet potato c) *Zea mays Saccharata*	1
4)	Sweet corn d) *Pisum Sativum L.*	1
	e) *Fabaceae*	
Ans.	**A** **B (Answer)**	
1)	**French bean** **e) *Fabaceae***	
2)	**Safflower** **a) Topping**	
3)	**Sweet potato** **b) Vine Cuttings /slips**	
4)	**Sweet corn** **c) *Zea mays Saccharata***	
	*******	

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