



Post Graduate School  
Indian Agricultural Research Institute, New Delhi  
Examination for Admission to Ph.D. Programme 2011-2012

Discipline : Post Harvest Technology (*Post Harvest Technology of Horticultural Crops*)

Discipline Code : 19, Sub code : 01

Roll No. 19005

**Please Note:**

- (i) This question paper contains 12 pages. **Please check whether all the pages are printed in this set.** Report discrepancy, if any, **immediately** to the invigilator.
- (ii) *There shall be NEGATIVE marking for WRONG answers in the Multiple Choice type questions (No. 1 to 130) which carry one mark each. For every wrong answer 0.25 mark will be deducted.*

**PART – I (General Agriculture)**

**Multiple choice questions (No. 1 to 30). Choose the correct answer (a, b, c or d) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.**

1. Which of the following crops have been approved for commercial cultivation in India?
  - a) Bt cotton and Bt brinjal
  - b) Bt cotton and Golden Rice
  - c) Bt maize and Bt cotton
  - d) Bt cotton only
2. This year (2010-11) the expected food grain production in India is
  - a) 212 million tonnes
  - b) 220 million tonnes
  - c) 235 million tonnes
  - d) 250 million tonnes
3. The genome of which of the following crops is still not completely sequenced?
  - a) Rice
  - b) Soybean
  - c) Sorghum
  - d) Wheat
4. According to the Approach Paper to the 12<sup>th</sup> Five Year Plan, the basic objective of the 12<sup>th</sup> Plan is
  - a) Inclusive growth
  - b) Sustainable growth
  - c) Faster, more inclusive and sustainable growth
  - d) Inclusive and sustainable growth
5. To address the problems of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood system approaches, the Government of India has set up the
  - a) National Rainfed Area Authority
  - b) National Watershed Development Project for Rainfed Areas
  - c) National Mission on Rainfed Areas
  - d) Command Area Development and Water Management Authority
6. Which of the following sub-schemes are not covered under the Rashtriya Krishi Vikas Yojana?
  - a) Extending the Green Revolution to eastern India
  - b) Development of 60,000 pulses and oilseeds villages in identified watersheds
  - c) National Mission on Saffron
  - d) National Mission on Bamboo
7. The minimum support price for the common variety of paddy announced by the Government of India for the year 2010-11 was
  - a) ₹ 1030
  - b) ₹ 1000
  - c) ₹ 980
  - d) ₹ 950
8. According to the Human Development Report 2010 of the United Nations, India's rank in terms of the human development index is
  - a) 119
  - b) 134
  - c) 169
  - d) 182

9. Which of the following does not apply to SRI method of paddy cultivation?
- Reduced water application
  - Reduced plant density
  - Increased application of chemical fertilizers
  - Reduced age of seedlings
10. Which organic acid, often used as a preservative, occurs naturally in cranberries, prunes, cinnamon and cloves?
- Citric acid
  - Benzoic acid
  - Tartaric acid
  - Lactic acid
11. Cotton belongs to the family
- Cruciferae
  - Anacardiaceae
  - Malvaceae
  - Solanaceae
12. Photoperiodism is
- Bending of shoot towards source of light
  - Effect of light/dark durations on physiological processes
  - Movement of chloroplast in cell in response to light
  - Effect of light on chlorophyll synthesis
13. Ergot disease is caused by which pathogen on which host?
- Claviceps purpurea* on rye
  - Puccinia recondita* on wheat
  - Drechlera sorokiniana* on wheat
  - Albugo candida* on mustard
14. Rocks are the chief sources of parent materials over which soils are developed. Granite, an important rock, is classified as
- Igneous rock
  - Metamorphic rock
  - Sedimentary rock
  - Hybrid rock
15. Which one of the following is a *Kharif* crop?
- Pearl millet
  - Lentil
  - Mustard
  - Wheat
16. The coefficient of variation (C.V.) is calculated by the formula
- $(\text{Mean}/\text{S.D.}) \times 100$
  - $(\text{S.D.}/\text{Mean}) \times 100$
  - $\text{S.D.}/\text{Mean}$
  - $\text{Mean}/\text{S.D.}$
17. Which of the following is commonly referred to as muriate of potash?
- Potassium nitrate
  - Potassium chloride
  - Potassium sulphate
  - Potassium silicate
18. Inbred lines that have same genetic constitution but differ only at one locus are called
- Multi lines
  - Monohybrid
  - Isogenic lines
  - Pure lines
19. For applying 100 kg of nitrogen, how much urea would one use?
- 45 kg
  - 111 kg
  - 222 kg
  - 333 kg
20. The devastating impact of plant disease on human suffering and survival was first realized by epidemic of
- Brown spot of rice in Bengal
  - Late blight of potato in USA
  - Late blight of potato in Europe
  - Rust of wheat in India
21. The species of rice (*Oryza*) other than *O. sativa* that is cultivated is
- O. rufipogon*
  - O. longisteminata*
  - O. glaberrima*
  - O. nivara*
22. The enzyme responsible for the fixation of CO<sub>2</sub> in mesophyll cells of C-4 plants is
- Malic enzyme
  - Phosphoenol pyruvate carboxylase
  - Phosphoenol pyruvate carboxykinase
  - RuBP carboxylase
23. Which one of the following is a 'Vertisol'?
- Black cotton soil
  - Red sandy loam soil
  - Sandy loam sodic soil
  - Submontane (Tarai) soil
24. What is the most visible physical characteristic of cells in metaphase?
- Elongated chromosomes
  - Nucleus visible but chromosomes not
  - Fragile double stranded loose chromosomes
  - Condensed paired chromosomes on the cell plate

25. All weather phenomena like rain, fog and mist occur in
- Troposphere
  - Mesosphere
  - Ionosphere
  - Ozonosphere
26. Which of the following elements is common to all proteins and nucleic acids?
- Sulphur
  - Magnesium
  - Nitrogen
  - Phosphorous
27. Silt has intermediate characteristics between
- Sand and loam
  - Clay and loam
  - Loam and gravel
  - Sand and clay
28. Certified seed is produced from
- Nucleus seed
  - Breeder seed
  - Foundation seed
  - Truthful seed
29. Seedless banana is an
- Autotriploid
  - Autotetraploid
  - Allotriploid
  - Allotetraploid
30. Which one of the following is used to test the goodness-of-fit of a distribution?
- Normal test
  - t-test
  - Chi-square test
  - F-test
33. Optimum R.H. for storage of onion and garlic is
- 50-60%
  - 61-70%
  - 71-80%
  - 81-90%
34. Father of Quick freezing is
- Kidd and West
  - S.P. Burg
  - S. Ranganna
  - Clarence Birdseye
35. Proteolytic enzyme in pineapple is
- Bromelin
  - Ficin
  - Diastase
  - Papain
36. Black neck in tomato ketchup is due to the formation of
- Ferric tannate
  - Sodium benzoate
  - Ferric sulphate
  - Acetic acid
37. Acidic fruit juices are sterilized under
- Low pressure
  - High pressure
  - Normal atmospheric pressure
  - Vacuum
38. Folic acid rich vegetable is
- Spinach
  - Lettuce
  - Pulses
  - Brussels's sprouts
39. Most important pathogenic bacteria causing spoilage of food is
- Clostridium botulinum*
  - Bacillus cereus*
  - Streptococcus aureus*
  - Salmonella typhimurium*
40. Blanching is done to
- Inactivate enzymes
  - Remove the peel
  - Remove moisture
  - Remove microorganisms
41. Vinegar is
- 1% acetic acid
  - 10% acetic acid
  - 40 grain acetic acid
  - 80 grain acetic acid
42. Potassium permanganate is used in sealed packets to
- Create an inert atmosphere
  - Reduce the level of CO<sub>2</sub>
  - Reduce the level of ethylene
  - Increase O<sub>2</sub> level

### PART – II (Subject Paper)

**Multiple choice questions (No. 31 to 130). Choose the correct answer (a, b, c or d) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.**

31. Important tree vegetable of perennial nature is
- Murraya keonigii*
  - Capsicum annum*
  - Vigna unguiculata*
  - Phaseolus vulgaris*
32. Kwashiorkor is due to the deficiency of
- Vitamin A
  - Vitamin B-complex
  - Protein
  - Minerals

43. Freezing preservation involves the principle of
- Addition of cold
  - Removal of heat
  - Addition of heat
  - Addition of ice
44. Which of the following organism produces single cell protein?
- Methylophilus methylotrophus*
  - Salmonella* sp.
  - Trichinella* sp.
  - E. coli*
45. The ideal conditions for ripening of mango are
- 0-2°C and 80-95% R.H.
  - 2-4°C and 80-90% R.H.
  - 18-25°C and 85-90% R.H.
  - 30-35°C and 80-85% R.H.
46. The important quality parameter for export of dehydrated onion is
- Red colour with low pungency
  - White colour with low pungency
  - Brownish yellow colour
  - Reddish brown colour
47. Spectrophotometer with visible wavelength should have range between
- 300 to 500 nm
  - 380 to 760 nm
  - 480 to 900 nm
  - 500 to 960 nm
48. The number of ATP molecules synthesized on complete oxidation of a hexose sugar would be
- 20
  - 32
  - 38
  - 56
49. For canning factory analysis is important for
- Sensory quality of food material
  - Storage quality of food material
  - Packaging of raw material
  - Bacteriological quality of water
50. Waxing of fruits is done mainly to reduce
- Transpiration
  - Respiration
  - Ripening
  - Transpiration and respiration
51. The major indicator and a useful guide to predict the potential storage life of the fruits and vegetables is
- Water uptake rate
  - Rate of ascorbic acid loss
  - Rate of mineral uptake
  - Respiration rate
52. The most accepted pathway of ethylene biosynthesis is
- $\beta$ -alanine pathway
  - Ethanol pathway
  - Linolenic acid pathway
  - Methionine pathway
53. Conversion of glucose to pyruvate by EMP pathway takes place in
- Mitochondria
  - Cytoplasm
  - Nucleolus
  - Vacuoles
54. Enzyme responsible for conversion of sucrose to glucose and fructose during respiration is
- Hexokinase
  - Maltase
  - Dehydrogenase
  - Invertase
55. The energy production per mole of glucose in anaerobic respiration is
- Equal to aerobic respiration.
  - Less than aerobic respiration
  - Greater than aerobic respiration
  - (a) or (b)
56. Optimum harvest maturity of Gerbera flower is decided
- When the flower is fully open
  - When centre of the oldest floret opens
  - When the flower is half open
  - When outer rows show pollens
57. In general, longevity of cut flowers is increased with
- Increased lipid level
  - Decreased lipid level
  - Increased carbohydrate level
  - Decreased carbohydrate level
58. For better post harvest quality, the cut flowers should be harvested during
- Evening hours
  - Early morning hours
  - Noon time
  - Late in the night
59. Planting system of fruit trees should be such that
- Intercept minimum lunar energy
  - Intercept maximum solar energy
  - Intercept moderate solar energy
  - Intercept little solar energy
60. 'Meadow' orchard stands for
- High density orchard
  - Ultra high density orchard
  - Ultra low density orchard
  - Low density orchard

61. A visible shrinkage of freshly harvested fruits and vegetables appear when the moisture loss is around
- 1-2%
  - 2-3%
  - 3-5%
  - 10-15%
62. Lye peeling is a technique of peeling of fruits and vegetables using
- 1-2% HCL
  - 1-2%  $H_2SO_4$
  - 1-2% NaOH
  - 1-2% KOH
63. 'Exhausting' a term in canning is associated with
- Removal of microbes
  - Removal of air
  - Removal of flavour
  - Removal of colour
64. A dividing line of pH between acid and non-acid foods is
- pH = 3.5
  - pH = 4.5
  - pH = 5.0
  - pH = 5.5
65. The time-temperature combination which has been received by a food during sterilization is usually expressed as
- D-value
  - F-value
  - Z-value
  - All of the above
66. Water activity in a processed food usually denotes
- Actual water content
  - The availability of water for microbial growth
  - The availability of water for enzyme activity, browning and oxidation
  - Both b) and c)
67. Which one of the following driers takes least time for drying?
- Hot air drier
  - Heated surface drier
  - Infra-red drier
  - Microwave drier
68. 'Hedonic scale' is used to determine
- Physical quality
  - Chemical quality
  - Sensory quality
  - Microbiological quality
69. In food preservation most commonly used irradiation is
- X-rays
  - $\alpha$ -rays
  - $\beta$ -rays
  - $\gamma$ -rays
70. The natural red colour pigment which changes its colour with pH is
- Carotene
  - Xanthophyll
  - Betalain
  - Anthocyanin
71. Fruit juices may be clarified to get rid of very minute particles and colloidal materials by
- Filtration
  - Enzymes
  - Centrifugation
  - Boiling
72. Deaeration in orange juice is done primarily to prevent
- Destruction of Vitamin A
  - Destruction of Vitamin C
  - Destruction of Vitamin E
  - All of the above
73. In any chromatography two things are common in all
- Solvent and column
  - Solvent and detector
  - Stationary and mobile phase
  - Detector and injector
74. Two treatments are significantly different at 5% level of significance means
- They are similar
  - They are dissimilar
  - They are 95% similar
  - They are 95% dissimilar
75. The t-test is used for testing the significance of
- Difference between the means of two related lots
  - Difference between the means of two unrelated lots
  - Difference between the frequencies
  - Differences between both related and unrelated lots
76. Acid resistant tin cans are also called
- C-enamel
  - L-enamel
  - R-enamel
  - S-R enamel
77. Sauerkraut means
- Acid cabbage
  - Sweet cabbage
  - Blanched cabbage
  - Dehydrated cabbage

78. For preparing fruit jelly, quantity of sugar to be added depends upon
- Protopectin
  - Starch
  - Pectin
  - Pectin acid
79. Oxidation of fats in potato chips is prevented by
- Preservative
  - N<sub>2</sub> gas packaging
  - Citric acid
  - Colouring agent
80. The browning of fresh potato cut surface is due to
- Non-enzymatic browning
  - Mallard reaction
  - Fermentation
  - Enzymatic browning
81. Formation of brown mass due to burning of dry sugar is called as
- Charcoal
  - Caramel
  - Anthrax
  - Browning
82. Mixing of 1 kg of sugar in 1 kg of water gives sugar syrup of °Brix
- 25
  - 50
  - 75
  - 100
83. The most important commercial product prepared from the grapes is
- Pickle
  - Marmalade
  - Wine
  - Raisins
84. The Food Safety Act was issued by the MOFPI in the year
- 2001
  - 2003
  - 2005
  - 2006
85. Specific gravity is the ratio of
- Weight/Volume
  - Volume/Weight
  - Weight/Volume × 100
  - Volume/weight × 100
86. Covering of candied fruits with a thin transparent coating of sugar which imparts them glossy appearance is known as
- Blending
  - Baking
  - Glazing
  - Syruping
87. T.S.S. is maximum in
- RTS drink
  - Squash
  - Natural fruit juices
  - Jam
88. Spongy tissue in mango fruit is due to
- Disease
  - Physiological disorder
  - Mechanical damage
  - Chilling injury
89. Which of the following fruits is rich in riboflavin?
- Apple
  - Banana
  - Guava
  - Bael fruit
90. Vacuum cooling is ideally suitable for
- Root vegetables
  - Temperate fruit
  - Leafy vegetables
  - Fruit type vegetables
91. Which of the following fruits belongs to climacteric group?
- Pomegranate
  - Passion fruit
  - Litchi
  - Loquat
92. Which of the following fruits is stored commercially under CA condition?
- Papaya
  - Apple
  - Lemon
  - Pineapple
93. Who is considered as the 'Father of the canning industry'?
- Peter Durand
  - Metalmikoft
  - Nicholas Appert
  - Thomas Saddittington
94. Albedo of citrus fruits is rich in
- Acid
  - Sugar
  - Pectin
  - Colour
95. The 'Flat sour' spoilage causing bacteria of canned foods are
- Mesophilic
  - Psychrophilic
  - Thermophilic
  - Halophilic

96. Green portion of potato is undesirable as it may contain harmful substances like
- Chlorophyll
  - Amylase
  - Solanin
  - Lipoproteins
97. Name the lowest  $a_w$  value for permitting the growth of osmophilic yeasts.
- 0.91
  - 0.88
  - 0.75
  - 0.60
98. Degreening of citrus fruit is done by the application of
- O<sub>2</sub>
  - CO<sub>2</sub>
  - Ethylene
  - Nitrogen
99. Easily useful fermentable component in food is
- Fibre
  - Carbohydrate
  - Lipid
  - Protein
100. Under commercial practice, the recommended ethylene dose for ripening of banana is
- 1000 ppm
  - 100 ppm
  - 10 ppm
  - <10 ppm
101. Chlorine compounds are the most popular sanitizers used in the food processing factories because of the following characteristics except
- Activity against a wide variety of microorganisms
  - Harmless residue left over
  - Easily dissociation
  - Stability in the presence of hard water salts
102. Symptoms associated with chilling injury are
- Freezing injury and burn
  - Freeze burn and discoloration
  - Internal discoloration and electrolyte leakage
  - Electrolyte leakage and burning
103. Laminated film with lowest water vapour and oxygen transmission rates is
- Saran
  - OPP
  - PE
  - CPP
104. Pro-Vitamin A activity is found in
- Lycopene
  - $\beta$ -carotene
  - Xanthophyll
  - Lutein
105. The compound which is common in *Aonla*, *Jamun* and Tea is
- Ascorbic acid
  - Organic acid
  - Amino acids
  - Phenols
106. Lemon squash is generally preserved by
- Acetic acid
  - Citric acid
  - Sugar
  - KMS
107. The major constituents of Aspire, a bioproduct used commercially for the control of PH disease is
- Candida oleophila*
  - Pseudomonas syringae*
  - Bacillus subtilis*
  - Debaryomyces hansenii*
108. The first example of the use of bioagent for controlling post harvest disease is the use of
- Candida oleophila*
  - Pseudomonas syringae*
  - Bacillus subtilis*
  - Trichoderma harzianum*
109. The moisture content of dried cashewnuts should be
- Nearly 2%
  - Nearly 5%
  - Nearly 8%
  - Nearly 12%
110. Button mushrooms are harvested when the size of their cap is between
- 10-20 mm
  - 20-30 mm
  - 30-40 mm
  - 50-60 mm
111. Blue mold of apple is caused by
- Penicillium expansum*
  - Penicillium digitatum*
  - Penicillium italicum*
  - Botrytis cinerea*
112. Strawberry fruit is derived from which plant tissue?
- Pericarp
  - Receptacle
  - Pedicle
  - Peduncle

113. Carotenoids in plant cell are stored in
- Amyloplasts
  - Chloroplasts
  - Chromoplasts
  - Ribosomes
114. Distinctive flavour in *Jamun* is due to the presence of
- Methyl propionate
  - Methyl isothiocyanate
  - Methyl anthranilate
  - Hexal
115. AH, B theory of sweet taste reception was proposed by
- Solms (1971)
  - Shallenberger and Acree (1969)
  - Marse (1981)
  - Ikeda (1909)
116. Which food contains nearly 800 volatile compounds?
- White wine
  - Beer
  - Grape
  - Coffee
117. Flavour enhancing property of Monosodium glucamate was discovered by
- Flaming (1899)
  - Sudds (1928)
  - Ikeda (1909)
  - Acree (1940)
118. Umami is related to
- Glutamic acid
  - Tartaric acid
  - Gymnemic acid
  - Ascorbic acid
119. Strawberry contains a acid, which has anticancerous properties
- Gallic acid
  - Ellagic acid
  - Phytic acid
  - Citric acid
120. 'Celiac' disease is associated with consumption of
- Gluten enriched foods
  - Non-glutenous foods
  - Phenol rich foods
  - Low gluten foods
121. Which salt has sweet taste?
- Sodium bicarbonate
  - Barium chloride
  - Potassium iodide
  - Lead acetate
122. Which protein contains highest glutamic acid?
- Wheat gluten
  - Casein
  - Corn gluten
  - Egg albumen
123. Waxy flavour is a characteristic of
- Palmitic acid
  - Acetic acid
  - Lauric acid
  - Decanoic acid
124. Hesperidin is primarily isolated from
- Lemon
  - Grapefruit
  - Pummelo
  - Mandarin
125. Taste buds for bitterness are located at the \_\_\_\_\_ of tongue.
- Sides
  - Tip
  - Base
  - Both at tip and base
126. Which preservative is mainly used in baked products?
- Sorbic acid
  - SO<sub>2</sub>
  - Sodium benzoate
  - Sugar
127. Which grape variety is commercially used for champagne making in the world?
- White Riesling
  - Thompson Seedless
  - Sundekhani
  - Pearl of Casaba
128. For apple cider making, the TSS of apple variety should be
- 8-9
  - 12-13
  - 15-16
  - 18-20
129. The DFFB, a maturity index used commercially for Delicious group of apples under Indian conditions is
- 88 ± 4 days
  - 126 ± 4 days
  - 150 ± 4 days
  - 180 ± 4 days
130. Which chilli has maximum SHU units in the world?
- Red Sabina
  - Bhut Jaulokia
  - Shimla Mirch
  - Pusa Sadabahar



**Matching type questions (No. 131 to 140); all questions carry equal marks. Choose the correct answer (a, b, c, d or e) for each sub-question (i, ii, iii, iv and v) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.**

131.

- |                    |             |
|--------------------|-------------|
| i) Beauty Seedless | a) Mango    |
| ii) Himsagar       | b) Capsicum |
| iii) Bosrai        | c) Banana   |
| iv) L-49           | d) Grapes   |
| v) Pusa Deepti     | e) Guava    |

132.

- |                       |                                      |
|-----------------------|--------------------------------------|
| i) Dehydration        | a) Pectin                            |
| ii) Climacteric fruit | b) Storage structure                 |
| iii) Jelly            | c) Pigment                           |
| iv) Cool chamber      | d) Drying under controlled condition |
| v) Chlorophyll        | e) Mango                             |

133.

- |              |              |
|--------------|--------------|
| i) Invertase | a) Pineapple |
| ii) Papain   | b) Starch    |
| iii) Lipase  | c) Sugar     |
| iv) Diastase | d) Fat       |
| v) Bromoljin | e) Papaya    |

134.

- |                        |                    |
|------------------------|--------------------|
| i) Tomato ketchup      | a) Ascorbic acid   |
| ii) Antibrowning agent | b) Osmosis         |
| iii) Cell shrinkage    | c) Sodium benzoate |
| iv) Heat unit          | d) Citrus fruits   |
| v) Dieback             | e) Peas            |

135.

- |                 |           |
|-----------------|-----------|
| i) Malformation | a) Banana |
| ii) Granulation | b) Potato |
| iii) Bunchy top | c) Tomato |
| iv) Leaf curl   | d) Mango  |
| v) Black heart  | e) Citrus |

136.

- |                              |                        |
|------------------------------|------------------------|
| i) SEM $\pm$                 | a) ANOVA               |
| ii) RBD                      | b) Critical difference |
| iii) Correlation coefficient | c) KGy                 |
| iv) Rehydration ratio        | d) Positive/Negative   |
| v) Irradiation               | e) Drying              |

137.

- | <u>Chemical</u>          | <u>Crop</u>    |
|--------------------------|----------------|
| i) Tubercles             | a) Mustard     |
| ii) Cysteine sulphoxide  | b) Onion       |
| iii) Butyl acetate       | c) Raspberries |
| iv) Allyl isothiocyanate | d) Litchi      |
| v) Cis-3-hexen-1-01      | e) Tomato      |

138.

- |                              |                                  |
|------------------------------|----------------------------------|
| i) Evaporative cooling       | a) Cold sterilization            |
| ii) Elevated CO <sub>2</sub> | b) Food safety                   |
| iii) Irradiation             | c) Controlled atmosphere         |
| iv) VHT                      | d) Quarantine                    |
| v) HACCP                     | e) Pusa zero-energy cool chamber |

139.

- |                    |                        |
|--------------------|------------------------|
| i) Stem-end rot    | a) Banana              |
| ii) Anthracnose    | b) Grapes              |
| iii) Cigar end rot | c) Citrus              |
| iv) Botrytis rot   | d) Mango               |
| v) Blue mold       | e) <i>Diplodia</i> sp. |

140.

- |                   |               |
|-------------------|---------------|
| i) Pasteur effect | a) LP storage |
| ii) Bitter pit    | b) Mango      |
| iii) Jelly seed   | c) Citrus     |
| iv) Oleocellosis  | d) CA-storage |
| v) Burg, S.P.     | e) Apple      |

**Short questions (No. 141 to 146); each question carries FIVE marks. Write answers, including computation / mathematical calculations if any, in the space provided for each question on the question paper itself.**

141. "Fruit ripening is considered both as biosynthetic as well as bio-degradative process" – justify the statement.

142. What do you mean by CA-storage? Write down the details of essential requirements to establish a commercial CA-store.

143. Define water activity. Mention water activity limits for various microbial growth and quality retention of food.

144. What is pre-cooling? Name the various methods of pre-cooling of fruits and vegetables. Mention four most important advantages of pre-cooling.

145. Draw a flow diagram of a model pack-house operation for long distant marketing of kinnow.

146. What do you mean by critical difference at 5% level ( $CD_{0.05}$ )? Write down all the components of ANOVA table of an experiment planned using RBD-Factorial layout. Suppose, there are 4 treatments in an experiment; what would be the minimum no. of replications required to draw statistically valid conclusion on the results if the experiment is to be conducted as RBD layout?