



Post Graduate School
Indian Agricultural Research Institute, New Delhi
Examination for Admission to Ph.D. Programme 2013-2014

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

Discipline Code : 20, Sub code : 01

Roll No.

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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. Who is the present Chairman of Protection of Plant Varieties and Farmers' Right Authority (PPV&FRA)?
 - a) Dr. R.R. Hanchinal
 - b) Dr. P.L. Gautam
 - c) Dr. S. Nagarajan
 - d) Dr. Swapan K. Datta
2. Which among the following is another name for vitamin B₁₂?
 - a) Niacin
 - b) Pyridoxal phosphate
 - c) Cobalamin
 - d) Riboflavin
3. The largest share in India's farm export earning in the year 2011-12 was from
 - a) Basmati rice
 - b) Non-basmati rice
 - c) Sugar
 - d) Guar gum
4. The National Bureau of Agriculturally Important Insects was established by ICAR in _____, was earlier known as _____.
 - a) Bangalore; PDBC
 - b) New Delhi; National Pusa Collection
 - c) Ranchi; Indian Lac Research Institute
 - d) New Delhi; NCIPM
5. The most important sucking pests of cotton and rice are respectively
 - a) *Nilaparvata lugens* and *Aphis gossypii*
 - b) *Aphis gossypii* and *Thrips oryzae*
 - c) *Amrasca biguttula biguttula* and *Scirtothrips dorsalis*
 - d) *Thrips gossypii* and *Orseolia oryzae*
6. Which of the following microorganism causes fatal poisoning in canned fruits and vegetables?
 - a) *Aspergillus flavus*
 - b) *Penicillium digitatum*
 - c) *Clostridium botulinum*
 - d) *Rhizoctonia solani*
7. The cause of the great Bengal Famine was
 - a) Blast of rice
 - b) Brown spot of rice
 - c) Rust of wheat
 - d) Karnal bunt of wheat
8. Actinomycetes belong to
 - a) The fungi
 - b) Eukaryote
 - c) *Mycelia sterilia*
 - d) None of the above
9. A virus-free clone from a virus infected plant can be obtained by
 - a) Cotyledonary leaf culture
 - b) Axenic culture
 - c) Stem culture
 - d) Meristem tip culture
10. Which of the following is not an objective of the National Food Security Mission?
 - a) Sustainable increase in production of rice, wheat and pulses
 - b) Restoring soil fertility and productivity at individual farm level
 - c) Promoting use of bio-pesticides and organic fertilizers
 - d) Creation of employment opportunities

11. Agmarknet, a portal for the dissemination of agricultural marketing information, is a joint endeavour of
 - a) DMI and NIC
 - b) DMI and Ministry of Agriculture
 - c) NIC and Ministry of Agriculture
 - d) DMI and Directorate of Economics and Statistics
12. The share of agriculture and allied activities in India's GDP at constant prices in 2011-12 was
 - a) 14.1%
 - b) 14.7%
 - c) 15.6%
 - d) 17.0%
13. The average size of land holding in India according to Agricultural Census 2005-06 is
 - a) 0.38 ha
 - b) 1.23 ha
 - c) 1.49 ha
 - d) 1.70 ha
14. 'Farmers First' concept was proposed by
 - a) Paul Leagans
 - b) Neils Rolling
 - c) Robert Chamber
 - d) Indira Gandhi
15. In the year 2012, GM crops were cultivated in an area of
 - a) 150 million hectare in 18 countries
 - b) 170 million hectare in 28 countries
 - c) 200 million hectare in 18 countries
 - d) 1.70 million hectare in 28 countries
16. The broad-spectrum systematic herbicide glyphosate kills the weeds by inhibiting the biosynthesis of
 - a) Phenylalanine
 - b) Alanine
 - c) Glutamine
 - d) Cysteine
17. At harvest, the above ground straw (leaf, sheath and stem) weight and grain weight of paddy crop are 5.5 and 4.5 tonnes per hectare, respectively. What is the harvest index of paddy?
 - a) 45%
 - b) 50%
 - c) 55%
 - d) 100%
18. Crossing over between non-sister chromatids of homologous chromosomes takes place during
 - a) Leptotene
 - b) Pachytene
 - c) Diplotene
 - d) Zygotene
19. The term 'Heterosis' was coined by
 - a) G.H. Shull
 - b) W. Bateson
 - c) T.H. Morgan
 - d) E.M. East
20. When a transgenic plant is crossed with a non-transgenic, what would be the zygosity status of the F₁ plant?
 - a) Homozygous
 - b) Heterozygous
 - c) Hemizygous
 - d) Nullizygous
21. The highest per capita consumption of flowers in the world is in
 - a) The USA
 - b) India
 - c) Switzerland
 - d) The Netherlands
22. Which of the following is a very rich source of betalain pigment?
 - a) Radish
 - b) Beet root
 - c) Carrot
 - d) Red cabbage
23. Dog ridge is
 - a) Salt tolerant rootstocks of mango
 - b) Salt tolerant rootstocks of guava
 - c) Salt tolerant rootstocks of grape
 - d) Salt tolerant rootstocks of citrus
24. Which of the following micronutrients are most widely deficient in Indian soils?
 - a) Zinc and boron
 - b) Zinc and iron
 - c) Zinc and manganese
 - d) Zinc and copper
25. Which of the following fertilizers is not produced in India?
 - a) DAP
 - b) Urea
 - c) Muriate of potash
 - d) TSP
26. What is the estimated extent of salt affected soils in India?
 - a) 5.42 mha
 - b) 7.42 mha
 - c) 11.42 mha
 - d) 17.42 mha
27. Which of the following is not a feature of watershed?
 - a) Hydrological unit
 - b) Biophysical unit
 - c) Socio-economic unit
 - d) Production unit

28. Correlation coefficient 'r' lies between
a) 0 and 1
b) -1 and 1
c) -1 and 0
d) 0 and ∞
29. For the data 1, -2, 4, geometric mean is
a) 2
b) 4
c) $-\frac{7}{3}$
d) -2
30. The relationship between Arithmetic mean (A), Harmonic mean (H) and Geometric mean (G) is
a) $G^2=AH$
b) $G=\sqrt{A+H}$
c) $H^2=GA$
d) $A^2=GH$
31. Hot water dip treatment for insect pest infestation of mangoes (~500 g fruit weight) involve the following temperature-time regime
a) 48°C for 60 min.
b) 48°C for 30 min.
c) 48°C for 15 min.
d) 48°C for 5 min.
32. Pericarp browning in litchi can be delayed by
a) Modified atmosphere packaging
b) 1-methylcyclopropene fumigation
c) Weak acid treatment
d) All of the above
33. Individual shrink wrapping for packaging is generally most suitable for
a) Climacteric commodities
b) Semi-climacteric commodities
c) Non-climacteric commodities
d) Both a) and b)
34. The gas liberated during ripening as a result of calcium carbide application is
a) Butylene
b) Ethylene
c) Acetylene
d) Propylene
35. The optimum concentration of ethylene (shot system) for banana fruit ripening
a) 1000 ppm
b) 500 ppm
c) 250 ppm
d) 100 ppm
36. Which of the following is the most ethylene sensitive commodity?
a) Guava
b) Apple
c) Kiwifruit
d) Strawberry
37. The most reliable maturity index for several fruit is
a) Dry matter
b) Soluble solid concentration
c) Skin color
d) Specific gravity
38. Hot water brushing technology was developed by
a) United States Department of Agriculture (USDA)
b) Indian Agricultural Research Institute (IARI)
c) Council of Scientific and Industrial Research (CSIR)
d) Agricultural Research Organization (Israel)

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. Pallet packaging is most suitable for
a) Apple
b) Mango
c) Strawberry
d) Potatoes
32. The oxygen concentration at which the anaerobic respiration commences is
a) Critical point
b) Extinction point
c) Danger point
d) Falling point
33. The surface coatings for mango fruit mainly contains
a) Bee wax
b) Paraffin
c) Carnauba wax
d) None of the above
34. Post harvest vapour heat treatment is an accepted phytosanitary treatment for Indian mangoes in the following country(ies)
a) Japan
b) Australia
c) New Zealand
d) All of the above

43. The major aroma volatiles in mango fruit are
a) Terpenes
b) Esters
c) Lactone
d) Acetone
44. Which of the following is an ethylene scavenger?
a) Zeolite
b) Potassium permanganate
c) b) only
d) Both a) and b)
45. Sprouting of potato and onions can be inhibited due to the presence of small amounts of _____ in the storage atmosphere.
a) Carbon dioxide
b) Ethylene
c) Propylene
d) None of the above
46. The post-harvest treatment of which of the following chemicals is found to improve shelf-life of fruits?
a) Ethanol
b) Hexanal
c) Propanol
d) Butanol
47. Post-harvest nitric oxide fumigation of fresh and fresh-cut fruits is useful in
a) Delaying fruit ripening and browning inhibitor
b) Disease control and insect infestation
c) Improving sensory quality
d) All of the above
48. The minimum dose of gamma-irradiation approved by the USDA-APHIS for importing Indian mangoes in the USA
a) 1000 GY
b) 400 GY
c) 250 GY
d) 100 GY
49. Which of the following countries has minimum quarantine restrictions for Indian fresh produce?
a) United Kingdom
b) United States of America
c) Japan
d) Iran
50. The sale and application of calcium carbide for fruit ripening is
a) Allowed in few states in India
b) Prohibited in India
c) Not regulated in India
d) Allowed in India
51. 1-MCP fumigant is the most commonly used for the following commodity(ies)
a) Apple
b) Pear
c) Plum
d) All of the above
52. A box containing unripe raw mangoes ripens faster, if few ripe mangoes are placed in it. This is due to
a) Stimulatory effect of ethylene
b) Autocatalytic effect of ethylene
c) Pro-catalytic effect of ethylene
d) Both a) and c)
53. The drained weight of canned whole tomato is
a) 40%
b) 50%
c) 60%
d) 70%
54. Pernicious anemia occurs due to deficiency of
a) Vitamin B₁₂
b) Vitamin B₁
c) Vitamin B₂
d) Vitamin B₅
55. 'Oroblanco' citrus is variety of
a) Pummelo
b) Grapefruit
c) Pummelo × grapefruit
d) Grapefruit × pummelo
56. Black spot development of mango is due to
a) *Alternaria alternata*
b) *Botrytis* sp.
c) *Colletotrichicene*
d) *Penicillium*
57. The correct sequence of major post-harvest handling operations in banana include
a) Harvesting, grading, fungicide treatment, ripening, market
b) Harvesting, grading, ripening, fungicide treatment, market
c) Harvesting, grading, ripening, storage, market
d) Harvesting, waxing, precooling, ripening, market
58. Which of the following is not true for cleaning in place?
a) Primarily used for enclosed equipment
b) Uses pumps to circulate the detergent solution
c) Employs low-foaming detergents
d) Employs high-foaming detergents

59. Optimum storage condition for CA storage of apples are
- CO₂ - 1.5%; O₂ - 1.5%; temp. 0-2°C
 - CO₂ - 1.5%; O₂ - 1.5%; temp. 15°C
 - CO₂ - 1.5%; O₂ - 10%; temp. 10°C
 - CO₂ - 10%; O₂ - 5%; temp. 5°C
60. Which of the following microorganisms is of serious concern in reduced oxygen packaging conditions?
- E. coli*
 - Bacillus* sp.
 - Penicillium* sp.
 - Listeria monocytogenes*
61. Anti-browning action of potassium bisulphate is due to
- Prevention of formation of quinones
 - Prevention of formation of furosine
 - Formation of quinones
 - Formation of melanin
62. The target organism for commercial sterility is
- Clostridium botulinum*
 - Clostridium sporogenes*
 - Clostridium perfringens*
 - Bacillus cereus*
63. The main microbiological hazard in unpasteurized citrus juice is
- Salmonella* sp.
 - Clostridium* sp. and *Salmonella* sp.
 - E. coli* 0157 : 47 and *Salmonella* sp.
 - E. coli* 0157 : 47 and *Clostridium* sp.
64. Tetrapak packaging material is
- 6 layers, contain layers of polyethylene and aluminium
 - 6 layers, contain layers of polyethylene only
 - 4 layers, contain layers of polyethylene only
 - 4 layers, contain layers of polyethylene and aluminium
65. A can of a liquid food contains 1000 spores of an organism with decimal reduction time $D_{121,1}=0.7$ min. After sterilization, only 1 can per 1,00,000 could get spoiled. The F-value is
- 5.0 min
 - 5.6 min
 - 7.0 min
 - 7.6 min
66. Which of the following represents an acceptable 'desirable change' during processing of fruits?
- Pink-colouration in canned litchi
 - Black neck in tomato ketchup
 - Syneresis in jellies
 - Cloudiness in orange juice
67. The limiting amino-acids in the cereal is
- Phenylalanine
 - Tryptophan
 - Methionine
 - Lysine
68. Commercially accepted technology for debittering of citrus juices employs
- Lactocalamine
 - Maltodextrin
 - Trehalose
 - Cyclodextrin
69. For a new product development, the needs of target segment should be considered at
- Feasibility study
 - Prototype testing
 - Idea generation
 - Process development
70. Which of the following produce is being preserved by modified atmosphere packaging?
- Canned tomatoes
 - Flavoured milk
 - Prepackaged salad
 - Probiotic milk
71. The major unit operations involved in manufacture of tomato juice in correct sequence are
- Washing → sorting and trimming → crushing → extraction → deaeration → homogenization → acidification → thermal processing
 - Washing → sorting and trimming → extraction → crushing → deaeration → thermal processing
 - Washing → sorting and trimming → extraction → acidification → thermal processing
 - Washing → sorting and trimming → crushing → extraction → deaeration → homogenization → thermal processing
72. At international platform, the most commonly employed harvesting index for litchi is
- Flatness of tubercles
 - Change in pericarp colour
 - TSS : acid ratio
 - Days after full bloom
73. Clarification of apple juice ensures
- Inactivation of enzymes
 - Cloud stability
 - Debitting of juice
 - Removal of fine suspended particles

74. *Bacillus thermoacidurans* causes characteristics spoilage in canned tomato products. The spoilage is known as
- Flat sour
 - Leakage
 - Sulphide spoilage
 - Swells
75. Development of new products such as soups being add in microwavable cups has been due to
- Promoting brand image of product
 - Niche product development
 - Technological development
 - Marketing strategy
76. A can in which the vacuum is low that mechanical shock will produce distortion of one or both ends is a
- Flat can
 - Springer can
 - Swelled can
 - Flipper can
77. An appropriate instrument used to measure consistency of mango juice is
- Brookfield viscometer
 - Instron
 - Magness-Taylor tester
 - Bostwick consistometer
78. Which enzyme is used as a biochemical marker for ripening of strawberry?
- Phenyl alanine ammonia lyase
 - Ascorbic oxidase
 - Carbonic anhydrase
 - Iso-citrate dehydrogenase
79. Banana is seedless because
- It reproduces asexually
 - It is polyploid
 - It is hexaploid
 - Both b) & c)
80. Leaf fall in deciduous fruits occurs when
- Auxin content is more in lamina than in stem
 - Auxin content is low in lamina than in stem
 - Abscisic acid is formed
 - Morphactins are formed
81. The permissible content of sodium benzoate allowed in tomato ketchup is
- 250 ppm
 - 400 ppm
 - 600 ppm
 - 750 ppm
82. Oxidation product of ascorbic acid is
- α -ketoglutonic acid
 - α -ketoglutaric acid
 - α -ketoglutamic acid
 - Succinyl-CoA
83. Fixation of green color in vegetables through 'veri-green' process, involves the use of
- Copper salts
 - Sodium salts
 - Calcium salts
 - Zinc salts
84. 'Glycemic index' refers to
- Measure of protein levels in blood
 - Measure of glucose levels in blood
 - Measure of glucose levels in urine
 - Both b) and c)
85. The density that distinguishes HDPE from LDPE is
- 0.94
 - 0.87
 - 0.67
 - 0.58
86. Identify the commodity which is free from goiter causing 'goitrogens':
- Cabbage
 - Turnip
 - Soybean
 - Peas
87. Optimum ripening temperatures are
- 10-12°C
 - 15-17°C
 - 20-25°C
 - 30-32°C
88. Oil-cakes are rich source of
- Phosphorus
 - Nitrogen
 - Potassium
 - Calcium
89. Epicotyl grafting in mango is also known as
- Inarching
 - Veneer grafting
 - Bridge grafting
 - Stone grafting
90. Which of the following institutes is not associated with subject of food technology?
- NIFTEM
 - NABI
 - CFTRI
 - CBRI
91. Which of the following plays important role in jelly making?
- Phenols
 - Pectin
 - Pigments
 - Essence

92. In any chromatography two things are common in all
- Solvent and column
 - Solvent and detector
 - Stationary and mobile phase
 - Detector and Injector
93. Deaeration in orange juice ensures
- Oxidation of ascorbic acid
 - Oxidation of carbohydrates
 - Prevention of oxidation of ascorbic acid
 - Both b) & c)
94. Randomization is essential for obtaining
- Precision data
 - Unbiased data
 - Biased data
 - Accurate data
95. Undesirable darkening in fruits and vegetables during frozen storage is primarily due to
- Proteolytic reactions
 - Hydrolytic reactions
 - Fermentation
 - Oxidative reactions
96. Pre-harvest fertigation of which of the following minerals can result in increased levels of vitamin C in fruits?
- K, Ca, Fe
 - K, Zn, Mg
 - Fe, Zn, Mg
 - F and Zn
97. In high density planting of mango orchard, the plant population is approximately
- 1000 plants/ha
 - 1200 plants/ha
 - 1600 plants/ha
 - 2000 plants/ha
98. Quality of tomato puree is dependent on
- Tomato solids, lycopene content and inactivation of PME
 - Tomato solids and activity of PG
 - Tomato solids, activity of PME and lycopene content
 - Tomato solids, lycopene content and inactivation of PPO
99. 'Panelling' in large sized cans is due to
- Leakage in cans
 - Hydrogen swells
 - High vacuum
 - Carbon dioxide swells
100. Commercial benefits of ethylene application can be obtained by applying ethylene at
- 'Post-climacteric' stage in non-climacteric fruits
 - 'Pre-climacteric' stage in non-climacteric fruits
 - 'Post-climacteric' stage in climacteric fruits
 - 'Pre-climacteric' stage in climacteric fruits
101. The most appropriate PPO substrate is
- DOPA
 - Succinate
 - Fumarate
 - Quercetin
102. The vitamin destroyed by sulphur treatment is
- Ascorbic acid
 - Vitamin A
 - Thiamin
 - Carotene
103. Consumption of folic acid during pregnancy is recommended, as its deficiency is associated with
- Anemia
 - Rickets
 - Spina-bifida
 - Beri-beri
104. 'Singrin' is a potential anticarcinogenic compound found in
- Apple
 - Peach
 - Cauliflower
 - Marigold
105. A promising nitrogen containing edible film is
- Chitosan
 - Bees wax
 - Glucono-lactone
 - Carnauba wax
106. Standard unit of expressing refrigeration capacity is
- Calorie
 - Ampere
 - Tons
 - Joule
107. The common 'maturity index' for persimmon is
- Sugar content
 - Dry matter content
 - Specific gravity
 - Fruit tannins

108. 'Raffinose' is
a) Polysaccharide
b) Monosaccharide
c) Disaccharide
d) Trisaccharide
109. Which of the following fruits has the highest calorific value?
a) Banana
b) Dates
c) Strawberry
d) Avocado
110. α -D(+)-Glucose and β -D(+)-Glucose are
a) Anomers
b) Enantiomers
c) Conformers
d) Epimers
111. Which of the following processed products is high in trans fats?
a) Mayonnaise
b) Muffins
c) Tomato sauce
d) Butter milk
112. Which of the following is not a function of a hydrocolloid?
a) Hydrocolloids are soluble in water
b) Hydrocolloids are capable of forming gels
c) Hydrocolloids increase viscosity
d) Hydrocolloids function as true emulsifiers
113. The correct sequence of operations involving production of clear apple juice are
a) Milling, enzymation, extraction, depectinization, filling
b) Milling, heating, depectinization, extraction, filling
c) Milling, heating, extraction, filling
d) Milling, depectinization, heating, filling
114. In ethanol fermentation process, the end product ethanol is formed from
a) Pyruvate
b) Malate
c) Lactate
d) Succinate
115. Superhot break is a commercial method for processing of
a) Tomato
b) Beans
c) Cabbage
d) Apple
116. Vinegar is produced as a result of action of
a) Anaerobic, *Acetobacter aceti*
b) Aerobic, *Acetobacter aceti*
c) Anaerobic, *Azotobacter*
d) Aerobic, *Azotobacter*
117. 'Syneresis' in jelly is a result of
a) Pectin degradation
b) Pectin formation
c) Pectin polymerization
d) All of the above
118. 'Harvest Watch Technology' is based on the principle of
a) Respiratory quotient
b) Ethylene flux
c) Chlorophyll fluorescence
d) Chemical luminescence
119. Modern concept of quality management focuses on
a) Snap shot testing
b) End product testing
c) Monitoring and corrective action
d) Conforming outputs for internal and external customers
120. The modern concept of quality management flows through
a) HACCP → GMP → ISO → TQM
b) GMP → HACCP → ISO → TQM
c) ISO → GMP → HACCP → TQM
d) Codex → ISO → HACCP → GMP
121. The major disadvantage associated with chlorine sanitizers used in food industries is
a) They dissociate easily
b) Act against variety of microorganisms
c) They leave harmless residue
d) They are not affected by hard water
122. The major pigment of red capsicum is
a) β -carotene
b) Lycopene
c) Lutein
d) Capsanthin
123. Which of the following has pro-vitamin A activity?
a) Lycopene
b) β -carotene
c) Xanthophyll
d) Lutein
124. Which of the following phenomenon is not associated with starch?
a) Retrogradation
b) Gelatinization
c) Plasticization
d) Nixtamalization
125. Following are thermophilic microorganisms associated with the canned food spoilage except
a) *Bacillus stearothermophilus*
b) *Bacillus coagulans*
c) *Bacillus subtilis*
d) *Clostridia thermosaccharolyticum*

126. The concentration of chlorine in drinking water
- 10-21 ppm
 - 2-5 ppm
 - 0.5-10 ppm
 - 0.2 ppm

127. The permissible limit of SO₂ for candy is
- 1500 ppm
 - 350 ppm
 - 200 ppm
 - 70 ppm

128. *Clostridium botulinum* is a obligate anaerobe. This means that *Clostridium botulinum*
- Cannot ferment glucose
 - Dies in presence of oxygen
 - Under certain conditions can survive under aerobic conditions
 - Both a) and b)

129. The discovery of mechanism of ethylene action in fruits through system I & II is credited to
- Dr. A.A. Kader
 - Dr. W.B. Mc Glasson
 - Dr. S.P. Burg
 - Dr. Bruce Whitaker

130. Equilibrium RH of saturated salt solution of potassium sulphate is
- 97%
 - 47%
 - 21%
 - 11%

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) Ochratoxins | a) <i>Penicillin expansum</i> |
| ii) Patulin | b) <i>Aspergillus flavus</i> |
| iii) Aflatoxin | c) <i>Clostridium botulinum</i> |
| iv) Botulin | d) <i>Fusarium gramineum</i> |
| v) Deoxynivalenol | e) <i>Penicillin verrucosum</i> |

- 132.
- | | |
|-------------------|-------------------|
| i) Phytosterol | a) Kale |
| ii) Phylloquinone | b) Wheat germ oil |
| iii) Retinol | c) Corn oil |
| iv) Tocopherol | d) Mushroom |
| v) Ergosterol | e) Papaya |

- 133.
- | | |
|----------------------|-----------------|
| i) Acrylamide | a) Pearl millet |
| ii) Nitrosamines | b) Milk |
| iii) Melamine | c) Meat |
| iv) Phytates | d) Potato |
| v) Trypsin inhibitor | e) Legumes |

- 134.
- | | |
|----------------------|---------------------|
| i) Indophenol | a) Ammonia nitrogen |
| ii) Folin-ciocatteu | b) Starch |
| iii) Phenolphthalein | c) Ascorbic acid |
| iv) Anthrone | d) Phenols |
| v) Nessler | e) Organic acids |

- 135.
- | | |
|----------------|-----------------|
| i) Grapes | a) Genestein |
| ii) Soybean | b) Lutein |
| iii) Marigold | c) Pyridoxine |
| iv) Strawberry | d) Malvidin |
| v) Banana | e) Pelargonidin |

- 136.
- | | |
|-----------------------|-----------------------|
| i) CIPC | a) Sprout inhibitor |
| ii) Semper fresh | b) Fungicide |
| iii) Bavistin | c) Preservative |
| iv) Potassium sorbate | d) Surface coating |
| v) 1-MCP | e) Ethylene inhibitor |

- 137.
- | | |
|----------------------|--------------------------|
| i) Gallic acid | a) Synthetic antioxidant |
| ii) Propyl gallate | b) Anti-browning agent |
| iii) Calcium pectate | c) Hydrocolloid |
| iv) Guar gum | d) Gelling agent |
| v) Hexylrescorinol | e) Antioxidant |

- 138.
- | | |
|------------------------------|----------------------------------|
| i) Chill-haze | a) Food safety |
| ii) Elevated CO ₂ | b) Polyphenols |
| iii) Irradiation | c) Quarantine |
| iv) VHT | d) Cold sterilization |
| v) GMP | e) Controlled atmosphere storage |

- 139.
- | | |
|-----------------------------------|---------------------|
| i) Hurdle concept | a) Dates |
| ii) Aseptic processing | b) Prepacked salads |
| iii) Vacuum packaging | c) Potato chips |
| iv) Modified atmosphere packaging | d) Tetrapak |
| v) Extrusion processing | e) Corn puffs |

- 140.
- | | |
|-------------------------|---------------------------|
| i) Phenolics | a) Methionine |
| ii) Pectin | b) Polygalactouronic acid |
| iii) Sulphur amino acid | c) Dextrin |
| iv) Anthocyanin | d) Flavylum |
| v) Starch | e) Benzene |

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. Strawberries harvested in farm house are required to be exported. Outline the main post-harvest handling system for export. Identify critical operations required to extend shelf-life during transit.

142. Browning in apple and orange juice are caused during processing operations. How are they different? List causes and strategies to minimize browning.

143. What are the commodities most suitable for controlled atmosphere applications in India and why?

144. RTE vegetable curries in laminated bags have replaced the traditional canned foods. Briefly discuss the technology, its key features and advantages.

145. With the help of flow chart, list the various operations involved in production of tomato sauce from raw tomatoes. Critically identify the main control points and critical control points in the HACCP scheme.

146. Fruits and vegetables are called functional foods. Identify the key antioxidant bioactive molecules, their sources and health benefits.