

EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR FOOD SCIENCE

Date : October 11, 2025
Total Marks : 100
Writing Time : 150 minutes (2.5 hours)
Reading Time : 15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
 Part II - 5 Short Answer QuestionsAll questions under SECTION A are COMPULSORY.
 - **SECTION B** consists of case I and Case II. Choose **ONE CASE** and answer the questions.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the correct Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. Aseptic packaging can be defined as
 - a) The filling of a commercial sterile product into a sterile containers under aseptic conditions and hermetically sealing of the containers
 - b) The filling of commercial sterile product into containers under aseptic conditions and hermetically sealing of the containers
 - c) The filling of a commercial sterile product into sterile containers under aseptic conditions and sealing of the containers
 - d) The filling of commercial sterile product into sterile containers and hermetically sealing of the containers
2. Monosodium glutamide is used as
 - a) Artificial sweetener
 - b) Flavour enhancer
 - c) Anticaking agent
 - d) Cleaning agent
3. Quick bread is
 - a) A bread leavened with air, steam, and/ or CO₂ from baking soda or baking powder
 - b) A cereal product made from rye flour and mimic wheat flour bread
 - c) A bread which is prepared very quickly- ready to eat bread
 - d) A bread which is easily digested
4. Water content of apple and _____ are similar
 - a) Wheat
 - b) Maize
 - c) Milk
 - d) Cucumber
5. Sauerkraut is the _____
 - a) Fermented radish.
 - b) Fermented cabbage.
 - c) Fermented carrot.
 - d) All of the above.
6. Which of the following statement is/are correct?
 - a) Class I preservatives are those which are prepared under hygienic conditions
 - b) Class I preservatives are those which are used for preservation of foods served in five-star hotels
 - c) Class I preservatives are those which are used prior to other ingredients
 - d) Class I preservatives are those which have no limit quantity to be added

7. Psychrophiles would be expected to grow
 - a) In hot springs
 - b) On the human body
 - c) At refrigeration temperature
 - d) At low pH
8. Bread mold is
 - a) *Rhizopus stolonifer*
 - b) *Penicillium notatum*
 - c) *Aspergillus niger*
 - d) *Monilla sitophilla*
9. _____ are most common causes of spoilage of fruits and vegetables
 - a) Yeasts
 - b) Molds
 - c) Viruses
 - d) Bacteria
10. Egg quality is manually checked by seeing it through a lamp, it is called
 - a) Lightening
 - b) Candling
 - c) Lamping
 - d) Viewing
11. The milk is generally pasteurized at 62.8°C for 30 minutes to eliminate
 - a) *Mycobacterium tuberculosis*
 - b) *Listeria monocytogens*
 - c) *Coxiella burnetti*
 - d) All of above
12. Preservation of foods in sealed containers and which usually implies heat treatment as the principal factor in prevention of spoilage is called
 - a) Cold sterilization
 - b) Aseptic packaging
 - c) Simmering
 - d) Canning
13. The separation of solids from suspension in liquid by gravity alone is called as
 - a) Flocculation
 - b) Sedimentation
 - c) Centrifugation
 - d) None of the above
14. In crystallization
 - a) Mass transfer occurs from solid to liquid phase
 - b) Mass transfer occurs from solid to solid phase
 - c) Mass transfer occurs from liquid to liquid phase
 - d) Mass transfer occurs from liquid to solid phase

15. Which dryer is commonly used for wet filter cakes and wet lumpy solids
- Spray dryer
 - Roller dryer
 - Tray dryer
 - Drum dryer
16. In case of oil in water emulsion, oil acts as
- Dispersed phase
 - Emulsifier
 - Stabilizer
 - Dispersing medium
17. We can call a steam generator, a boiler
- When it is done only in open pan
 - When it is only under high pressure
 - When is done only under reduced pressure
 - Under any circumstances, only criteria is that it must generate steam
18. A good refrigerant should have
- High specific volume
 - Low conductivity
 - Low boiling point
 - High coefficient of performance
19. Hurdle technology consists of
- Mixture of different ingredients to form a uniform quality product
 - Mixture of different preservation technique
 - Using irradiation for increasing shelf life of meat
 - None of above
20. Sterilization of high acid food is generally done in
- Boiling water
 - Supercooled water
 - Superheated steam
 - Retort
21. Phosphatase test is for the detection of
- Adequacy of sterilization
 - Adequacy of pasteurization
 - Adequacy of churning
 - Degree of adulteration of milk by calcium phosphate
22. Which of the following statement is correct on rigor mortis
- There is no effect of rigor mortis on the texture of meat
 - The greater the degree of rigor mortis, the softer the meat
 - The lesser the degree of rigor mortis, the tougher the meat
 - The greater degree of rigor mortis, the tougher the meat

23. Saffron is obtained from
- Seed
 - Root
 - Fruit
 - Flower
24. In food packaging, lamination is
- The method of wrapping the food article with certain packaging material and sorting them at ambient temperature
 - Combination of two or more materials into a single homogeneous packaging web by means of adhesive, solvent or heat
 - A type of packaging where the material used for packaging is made from substance obtained from the middle of lamella of cell wall
 - Coating of zinc on the surface of iron to prevent it from rusting
25. Which of these is NOT considered a food quality attribute?
- Appearance (Size, shape, Colour)
 - Texture
 - Nutritional content
 - Packaging design
26. HACCP defined as codex:
- Identifies and evaluates hazards
 - Identifies and controls hazards
 - Identifies, evaluates and controls hazards
 - Identifies and controls hazards after verification
27. Safety precaution and environment safety guideline is given under?
- ISO 9001
 - ISO 14001
 - ISO 18000
 - ISO 23000
28. The Codex Alimentarius covers food standards for
- Only raw foods
 - Only processed foods
 - Processed, semi-processed, and raw foods
 - Only foods that are traded internationally
29. _____ are code of good practices that comprises the fundamental principles, procedures, and means needed for safe food production
- GMP
 - PRP
 - HACCP
 - None of these

30. Basic objective of Consumer Act is

- a) To provide the consumers their right to choose their products of their choice
- b) To provide the consumers their right to file a complaint against any trader who is charging them more than the price displayed on the package of goods
- c) To provide the consumers their right to buy the goods anywhere in Bhutan
- d) All of the above

PART II – Short Answer Questions [20 marks]

Answer ALL the questions. Each question carries 5 marks. Mark for each sub-question is indicated in the brackets.

- 1. Define enzymatic browning reactions in fruits and vegetables. What are the ways to prevent enzymatic browning in fruits and vegetables? **(2+2= 4marks)**
- 2. Define amylose and amylopectin. What is the difference between amylose and amylopectin? **(2+2= 4 marks)**
- 3. Explain the effect of temperature on the rate of enzyme catalyzed activity with a graphical representation. **(2+2= 4 marks)**
- 4. Define Jelly and Marmalades. List down the differences between these two products. **(2+2= 4 marks)**
- 5. What are four core principles of canning? **(4 marks)**

SECTION B: CASE STUDY [50 marks]

Choose either Case I OR Case II from this Section. Each case carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

1. Write the differences of following from the perspective of food science and technology (**5x3= 15 marks**)
 - 1.1 Thermoplastics and thermosets in food industry
 - 1.2 Climacteric and non-climacteric fruits
 - 1.3 Maillard reaction and caramelization
 - 1.4 Lye peeling and brining
 - 1.5 Drying and dehydration
2. What is fruit jam? What are the common problems during jam processing? Mention the name of test to ensure the quality of finished jam? (**2+4+4= 10 marks**)
3. By product technology in food industry play a significant role in food losses. List down the byproducts and their uses of following fruits (**5x2= 10 marks**)
 - 3.1 Apple
 - 3.2 Mango
 - 3.3 Pineapple
 - 3.4 Banana
 - 3.5 Grape
4. Define sensory evaluation. What are the criteria for selection of panel of judges? How do you prepare food samples for sensory evaluation? List down and explain the types of sensory tests? (**2+4+3+6=15 marks**)

CASE II

1. In the preparation of baking products, the dough and batter are to be leavened. List down the leavening agents employed in the baked products and explain their step-by-step mechanisms of leavening of the baked products. (**10 marks**)
2. Processing of pulses is important to eliminate the toxic constituents. List down two groups of thermolabile inhibitors/toxic constituents with examples. Define lathyrism and favism. Explain the step-by-step ways to eliminate the toxic constituents from the pulses. (**4+6+5= 15 marks**)
3. Explain/Define the following (**5x2= 10 marks**)
 - 3.1 Dextrin
 - 3.2 Glycogen
 - 3.3 Cellulose
 - 3.4 Hemicellulose
 - 3.5 Pectic substances
4. What is parboiling of paddy? What are the advantages and disadvantages of parboiling? Elaborate the milling operations, cooking and nutritive value of rice. List down the processed products from rice. (**4+5+4+2= 15 marks**)

TASHI DELEK