ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2023
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR FOOD SCIENCE

Date	: October 7, 2023
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 Questions

     All 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. The primary function of an anti-oxidant is
   a) to prevent absorption of moisture.
   b) to inhibit growth of microbes.
   c) retard rancidity in food and prevents browning in food by limiting the accessibility of oxygen.
   d) to stabilize an emulsion.

2. Which of the following is **NOT** a food preservative?
   a) Potassium metabisulphite
   b) Sodium Benzoate
   c) Sodium Chloride
   d) Pectin

3. Which of the following is a biological leavening agent used in baking?
   a) Rhizopus
   b) Lactic Acid Bacteria
   c) Yeast
   d) Baking Powder

4. The acronym HACCP stands for
   a) Health Assessment and Critical Control Point
   b) Hazard Analysis and Critical Control Point
   c) Hazard Assessment and Critical Control Point
   d) Health Analysis and Critical Control Point

5. Deficiency which results in a condition known as Beriberi which was suspected to be the cause of death for 2 school children in Samdrup Jongkhar:
   a) Thiamin
   b) Riboflavin
   c) Niacin
   d) Folate

6. Coagulation of this component of milk is the basis of cheese making resulting in insoluble network of non-degradable structure that makes up the body of the cheese.
   a) Whey
   b) Lactose
   c) Casein
   d) Carotene

7. Storage of food materials at reduced atmospheric pressure is called as_____storage.
   a) controlled atmospheric
   b) modified atmospheric
   c) hypobaric
   d) None of the above

8. _____is a bacteria which causes food poisoning especially in low acid canned food which are not processing using correct time, pressure and temperature combination.
   a) Salmonella
   b) Campylobacter
   c) Clostridium Botulinum
   d) Lactobacillus

9. The enzyme responsible for enzymatic browning of cut apples and potato when exposed to air is
   a) Polyphenol oxidase
   b) Amylase
   c) Lipoxygenase
   d) Chlorophyllase

10. Which one of the following is a characteristic of unsaturated fatty acid?
    a) They have double bonds in their chemical structure
    b) They have low melting point compared to saturated fatty acid
    c) Mostly liquid state at room temperature.
    d) All of the above

11. Which one of the following is an inert gas which is used to prevent oxidation in packaged chip?
    a) Neon
    b) Nitrogen
    c) Carbon dioxide
    d) Ammonia

12. Sauerkraut is sour fermented cabbage. Fermentation in sauerkraut is due to
    a) Yeast
    b) Lactic Acid Bacteria
    c) Leuconostoc
    d) Propionibacterium

13. This chemical reaction between amino acid and reducing sugar resulting in a non-enzymatic browning and distinct flavor development in baked and fried food is _____.
    a) Caramelization
    b) Maillard reaction
    c) Pyrolysis
    d) Roasting

14. This process transforms vegetable oil into trans fat which gives the same desired characteristic of butter with longer shelf life at a cheaper price:
    a) Oxidation
    b) Hydrogenation
    c) Winterization
    d) Neutralization

15. The water activity of pure water is equal to
    a) 0.1
    b) 10
    c) 100
    d) 1

16. Vinegar is a sour mixture of an organic acid and water. The organic acid is:
    a) Citric acid
    b) Acetic acid
    c) Malic acid
    d) Lactic acid

17. Which of the following is a naturally occurring coloring pigment responsible for the yellow color in turmeric?
    a) Anthocyanin
    b) Carmine
    c) Curcumin
    d) Carotene

18. Which of the following is not an example of fortification?
    a) Iodine in salt
    b) Vitamin D in milk
    c) Artificial sugar in beverages
    d) Vitamin B in grains

19. Micro-organism that easily grow & tolerate high temperature are known as
    a) Thermophiles
    b) Mesophiles
    c) Osmophiles
    d) Halophiles

20. Iodine test is used to detect _____as an adulterant in milk and milk products:
    a) Formaldehyde
    b) Sodium Bicarbonate
    c) Starch
    d) Water

21. Which of the following is a non-climacteric fruit?
    a) Papaya
    b) Apple
    c) Banana
    d) Grape

22. Which of the following is a gas used for artificial ripening of fruits?
    a) Ethylene
    b) Oxygen
    c) Nitrogen
    d) Carbon dioxide

23. What happens when starch is heated with water?
    a) Gelatinization
    b) Denaturation
    c) Caramelization
    d) Maillard Reaction

24. Which of the following is vitamin is most commonly used to control enzymatic browning in fruits?
    a) Vitamin A
    b) Vitamin D
    c) Vitamin C
    d) Vitamin K

25. The process used for preparation of malt from cereal and legume is
    a) Roasting
    b) Parboiling
    c) Controlled germination
    d) Soaking and drying

26. In which of the following foods is solanine considered a toxin?
    a) Potato
    b) Tomato
    c) Coffee
    d) Tea

27. A food preservation method that does not completely destroys the microorganism in food is
    a) Pressure Canning
    b) Freezing
    c) Irradiation
    d) Freezing

28. The measure of number of hydrogen and hydroxide ions in a food system is known as measuring the_____ of the food.
    a) Water activity
    b) brix
    c) pH
    d) Sodium concentration

29. _____ is an alternative name for baking soda.
    a) Sodium bicarbonate
    b) Aspartame
    c) Potassium Bitartrate
    d) Calcium carbonate

30. The protein in meat that is primarily responsible for meat color is _____ increases tenderness.
    a) Myosin
    b) Hemoglobin
    c) Myoglobin
    d) Actin

PART II – Short Answer Questions [20 marks]

Answer ALL the questions. Each question carries 4 marks.

1. Define blanching with 2 advantages of blanching. **(2+2=4 marks)**

2. Explain the 2 key differences between conventional dehydration and freeze dehydration. (**2+2=4 marks)**

3. List down 1 ingredient and 1 process parameter in canning of tuna in brine which prolongs the shelf life of the canned food. **(2+2=4 marks)**

4. What are the most probable bacteria or its spore that is most likely to survive in the anaerobic condition in the cans? How does acid nature of the food affect the retorting temperature with respect to prevention of this particular bacteria? **(2+2=4 marks)**

5. Explain why commercial ready to drink milk without addition of any preservative have a longer shelf life as compared to fresh pasteurized milk bottled at home? **(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

Knowledge of food components and the processing parameters is critical in food processing and value addition. Both the process and ingredient have specific functions which affect the quality of food and safety of the consumer. This information is critical in prototype development, formulation and marketing of the product.

1. As a food technologist, what 2 properties of yoghurt would you use to promote the product and why. What step in yoghurt processing is integral to ensure that the milk is safe for human consumption. Explain the technical parameters for this step and what test method is used to confirm that this step is adequately done with brief explanation of the test method **(4+2+4+4=14 marks)**
2. List 3 major ingredients used in bread and the purpose of each in breadmaking. Identify 2 process parameter and explain their importance on the eating quality and or the safety of the bread for consumption. Give 2 key differences between microbial spoilage and staling in bread **(6+4+4=14 marks)**

3. For product diversification what would be the first step to determine which new product to add to the existing line and why would you start with this step. Give 2 examples of the methodology and tools that you would be using for this first step with brief explanation of each**.** Define and explain the role of sensory analysis in product development. List 2 sensory analysis method with description and its pros and cons. **(2+4+2+4 = 12 marks)**
4. You wish to produce a juice with a final sugar content of 15% using apple juice with 10% sugar content and sugar syrup with 60% sugar content. What portion of apple juice and sugar syrup would you use to produce a final sugar content of 15%. **(10 marks)**

CASE II

Food packaging is an integral part of food processing. Compatible packaging material adds numerous values to the finished product.

1. List down and elaborate with examples 4 vital role of packaging. Explain the difference between primary, secondary and tertiary packaging material with suitable examples. **(8+6=14 marks)**

2. List down 4 key factors that you need to consider whilst selecting the packaging material. Explain with examples. **(4*3=12 marks)**

3. What is OTR and WTR in packaging technology? Explain whether a high or a low OTR and WTR value is preferred in food packaging. For a highly hygroscopic product that is prone to oxidation which packaging technology would be most appropriate? Justify with 2 reasons? **(4+4+2+4=14 marks)**

4. Plastic materials are one of the most widely used packaging material in the food industry despite its impact on the environment. Explain why plastic packaging material is preferred over other packaging material with 3 justifications. If at all plastic packaging material is to be used, list down 2 ways to sustainable manage the use of plastic packaging material by the food processor **(6+4= 10 marks)**

TASHI DELEK