ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2021
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR FOOD SCIENCE

Date : October 31, 2021
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 - 4 Short Answer Questions

     All questions under SECTION A are COMPULSORY.
   - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
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. What percent of man body is protein?
   a) 15 %
   b) 17 %
   c) 19 %
   d) 21 %

2. Hypertension in human is classified as a chronic disease possibly linked due to excess of
   a) Fats
   b) Water
   c) Salt
   d) Alcohol

3. Macro nutrients which exists in the body at a level greater than
   a) 0.005 %
   b) 0.015 %
   c) 0.0005 %
   d) 0.05 %

4. Which one of the following bacteria causes the greatest number of cases of food poisoning?
   a) *Clostridium perfringens*
   b) *Listeria Spp*
   c) *Staphylococcus aureus*
   d) *Salmonella Spp*

5. The food hygiene regulations state that food that is to be kept hot before serving must be stored at a temperature above
   a) 5°C
   b) 10°C
   c) 37°C
   d) 63°C

6. Omega-3 fatty acids are naturally high in salmon. Therefore, salmon can be classified as which one of the following type of food?
   a) A nutraceutical
   b) A functional food
   c) A dietary supplement
   d) A fortified food

7. Vitamins aid the body in obtaining _____ from food.
   a) water
   b) energy
   c) minerals
   d) protein

8. Fresh, uncooked pork can be safely stored in a freezer for
   a) 6 days
   b) 6 months
   c) 6 weeks
   d) 6 years

9. At the temperature of a domestic refrigerator, most food poisoning bacteria
   a) Die
   b) multiply rapidly
   c) form spores
   d) are dormant

10. Which cooking method would be recommended for a less tender cut of meat?
    a) Broiling
    b) Panfrying
    c) Roasting
    d) Braising

11. Meat is basted during roasting to
    a) tenderize the meat.
    b) speed up the cooking process.
    c) prevent it from drying out.
    d) make it brown.

12. Docking is a term best related to which one of the following method of cookery?
    a) Roasting
    b) Microwave
    c) Baking
    d) Poêlé

13. In extrusion cooking, restructuring of the melt into lamellar or fibrous form is known as
    a) Texturization
    b) Thawing
    c) Tempering
    d) Gelatinization

14. Which one of the following product is manufactured using cold extrusion process?
    a) Corn flakes
    b) Pasta
    c) Bread
    d) Texturized soy protein

15. Destruction of which enzyme is used as index of super – HTST pasteurization
    a) Catalase
    b) Lipase
    c) Lactoperoxidase
    d) All of the above

16. The process to increase in volume caused by whipping air into the ice cream mix during freezing is called
    a) Homogenization
    b) Aging
    c) Overrun
    d) Hardening

17. Acetic acid bacteria_____.
    a) convert ethanol to acetic acid
    b) convert acetic acid to ethanol
    c) convert acetic acid to vinegar
    d) convert raw vinegar to distilled vinegar

18. The incomplete oxidation and reduction of glucose is
    a) Metabolism
    b) Respiration
    c) Fermentation
    d) digestion

19. The basic operations done in the food process engineering are called as
    a) Unit operations
    b) Processing
    c) Process management
    d) Unit process

20. What are the properties to be considered for designing a unit operation equipment?
    a) Only Physical properties and mechanical properties
    b) Only Chemical properties and mechanical properties
    c) Only Physical properties and chemical properties
    d) Physical, chemical, mechanical properties

21. What is the minimum temperature to which ground beef should be cooked to make sure it is free from harmful bacteria?
    a) 104°C
    b) 60°C
    c) 74°C
    d) 71°C

22. A substance intentionally added that affects the nature and quality of food is called
    a) Food poison
    b) Food adulterant
    c) Food contaminant
    d) Food material

23. Food Authenticity means
    a) The food should match the description
    b) The food should taste good
    c) It should be cheap
    d) None of the mentioned

24. Which of the following is used for microwave ovenable trays?
    a) PVC
    b) HDPE
    c) PET
    d) PS

25. Twist wrapping is used in which of the following products?
    a) Biscuit
    b) Toffees
    c) Bread
    d) Cookies

26. Which one of the following statements best describes the effect that food poisoning bacteria usually have on food?
    a) It appears normal but it tastes horrible.
    b) It appears stale and dry and it has an 'off' taste.
    c) It tastes, smells and looks normal.
    d) It appears and tastes normal but it has an unpleasant smell.

27. Cholesterol is used to synthesize
    a) Essential amino acids
    b) B vitamins
    c) Essential fatty acids
    d) Vitamin D

28. Which of the following is NOT one of the seven principles of HACCP?
    a) Notify the public when a violation is found
    b) Establish corrective actions
    c) Conduct a hazard analysis
    d) Establish record keeping procedures

29. A consumer found an off-flavor in milk packaged in transparent plastic and exposed to high intensity fluorescent light. The off-flavor probably was
    a) High acid
    b) Bitter
    c) Oxidized
    d) Rancid (lipolyzed)

30. Which of the following nutrients are lost in all steps of food engineering (including packaging and freezing)?
    a) Minerals
    b) Vitamins
    c) Fats
    d) Proteins

PART II – Short Answer Questions [20 marks]

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks. Mark for each sub-question is indicated in the brackets.

1. List the nutrients present in the food and explain physiological function of food. (2+3 marks)

2. Name three conditions which bacteria need to grow/multiply. Why should food not be refrozen once it has thawed? (1.5+3.5 marks)

3. What are nutraceuticals? Explain any 4 phytochemicals with examples. (1+4 marks)

4. What are the basic steps in milk processing? Explain pasteurization/ heat treatment of milk in detail. (2+3 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

In recent years, food preservation and food security have become an important factor of concern. In modern era of food processing, the demand for fresh and good quality food products has led to the emergence of hurdle technology. Hurdle technology is an efficient technique for improving the quality of food and to enhance its shelf life. The main objective of this technology is food preservation, storage of food products and enhancement of their shelf life thereby giving us good quality products.

1. What are the basic objectives of food preservation? Explain the fundamental aspects of hurdle technology for preservation of food. (3+12=15 marks)

2. Describe any five current food preservation technologies in detail with examples.
   (5x3=15 marks)

3. Explain hurdle technology that are used in the following food products. (3x2=6 marks)
   a) Dairy based products
   b) Fruits and vegetables
   c) Meat and meat products

4. Complete the following table, indicating the symbol, parameter and application where ever appropriate to define the most important hurdles for food preservation. (10 marks)

Symbol	**Parameter**	**Application**
(1)	High Temperature	Heating
t	(2)	(3)
(4)	Reduced water activity	Drying, curing, conserving
(5)	(6)	Acid addition or formation
Eh	Reduced redox potential	(7)
(8)	Preservatives	(9)
c.f	(10)	Microbial fermentations

Note: answer against each number

5. Explain the challenges and future prospects of hurdle technology and its application in food preservation. (4 marks)

CASE II

1. Explain any five major constituents of milk. (5x2=10 marks)
2. Name any five enzymes in milk and explain their role. (5x2=10 marks)
3. Describe various factors affecting the composition of milk. (10x1=10 marks)
4. Define the following terms: (10x1=10 marks)
   a) Condensed milk
   b) Dried milk
   c) Pasteurized
   d) Sterilized milk
   e) Homogenized milk
   f) Flavored milk
   g) Mineralized milk
   h) Fermented milk
   i) Toned milk
   j) Recombined milk
5. Draw a flow chart indicating the basic steps in the processing of yogurt. Describe the batch processing of yogurt. (5+5=10 marks)

TASHI DELEK