

**ROYAL CIVIL SERVICE COMMISSION  
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2022  
EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALISATION PAPER FOR FOOD SCIENCE**

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<b>Date</b>	: October 9, 2022
<b>Total Marks</b>	: 100
<b>Writing Time</b>	: 150 minutes (2.5 hours)
<b>Reading Time</b>	: 15 Minutes (prior to examination time)

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**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. Bitterness in peach is due to:
  - a) Malic acid
  - b) Tartric acid
  - c) Prunasin acid
  - d) Tannic acid
  
2. Which of the following is **NOT** a food preservative?
  - a) Potassium metabisulphite
  - b) Sodium Benzoate
  - c) Sodium Chloride
  - d) Chloroethylene
  
3. Which of the following is **NOT** a fat-soluble vitamin?
  - a) Vitamin A
  - b) Vitamin D
  - c) Vitamin C
  - d) Vitamin E
  
4. Hedonic rating test is used to measure:
  - a) Sensitivity
  - b) Preference
  - c) Difference
  - d) Quality
  
5. Non-alcoholic beverage which contains 25% fruit juice/pulp, 40-50% TSS and 1.0% acid commercially is known as:
  - a) Squash
  - b) Cordial
  - c) Nectar
  - d) Syrup
  
6. After maturing, tomatoes are usually red in colour. What is the pigment responsible for red colour in tomatoes?
  - a) Lycopene
  - b) Anthocyanin
  - c) Chlorophyll
  - d) Carotene

7. Storage of food materials at reduced atmospheric pressure is called as \_\_\_\_\_ storage.
- controlled atmospheric
  - modified atmospheric
  - hypobaric
  - None of the above
8. \_\_\_\_\_ is a food that has extra nutrient added to it or has nutrients added that are not normally there.
- Fortified food
  - Reinforced food
  - Consolidated food
  - Special food
9. Type of fat which is in liquid form at room temperature is:
- Saturated fats
  - Unsaturated fats
  - Triglycerides
  - Trans fats
10. Mycotoxins are produced as secondary metabolites of fungi. Which one of the following is the type of mycotoxins?
- Aflatoxin
  - Patulin
  - Penicillic acid
  - All of the above
11. Which one of the following bacteria can grow in alkaline pH?
- Salmonella
  - Lactobacilli
  - Vibrio Cholera
  - Staphylococcus
12. Natural peanut butter often has a little liquid oil on top after storing it for few days. In order to prevent the oil from separating out from the butter, which food additive should we add?
- Coagulant
  - Anti-oxidants
  - Emulsifiers
  - Thickening agents
13. Oil/Lemon/Vinegar + Spices applied to meat is called \_\_\_\_\_.
- marinating
  - emulsifying
  - fermenting
  - coating

14. Coated meat products require \_\_\_\_\_.
- breeding
  - pre-dusting
  - battering
  - all three are methods of making coated meat products
15. The enzyme used in wine and beer industry to avoid haze formation is \_\_\_\_\_.
- Protease
  - Amylase
  - Raffinase
  - Isomerase
16. The product of enzymatic browning is \_\_\_\_\_.
- Melanoidins
  - Caramel
  - Melanin
  - All of the above
17. Which of the given reason is **NOT** a valid reason for packaging of food items?
- Security and portion control
  - Marketing and convenience
  - Protection and information transmission
  - None of the mentioned
18. Which of the following is a food adulteration?
- Iodine in salt
  - Vitamin D in milk
  - Iron filings in tea
  - Vitamin B in grains
19. State true or false for the two statements.
- Statement 1:** the governing principle in jams and jellies are high acidity and high sugar content. Both these points are used to preserve them longer.
- Statement 2:** Ginger is sometimes added to marmalade
- True, false
  - True, true
  - False, false
  - False, true
20. Coagulation of milk proteins by heat consists of:
- Denaturation
  - Agglutination
  - Denaturation and agglutination
  - None

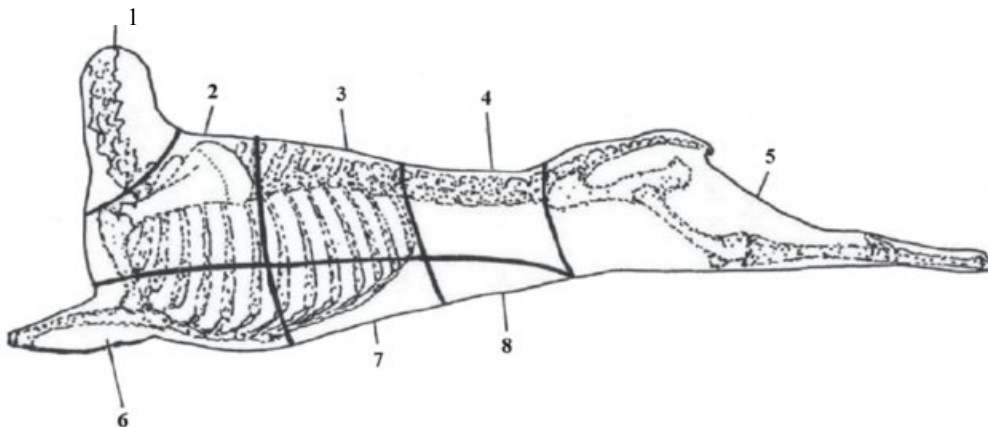
21. Fresh foods have water activity ( $a_w$ ) of \_\_\_\_\_.
- 0.99
  - 1.0
  - 1.6
  - 2.0
22. BHA and BHT are examples of:
- Anti-sprouting
  - Anti-ripening agent
  - Antioxidants
  - Antimicrobial
23. Churning is a process of phase reversal in which
- water-in-oil type emulsion is changed to oil-in-water type emulsion type.
  - oil-in-water type emulsion is changed to water-in-oil type emulsion.
  - oil-in-water type emulsion is changed to colloidal suspension.
  - None of the above
24. Which of the following instrument is used in food technology to measure food colour?
- Spectrophotometer
  - Nanometer
  - Sphygmomanometer
  - Refractometer
25. Which of the following is an example of a climacteric fruit?
- Grapes
  - Avocado
  - Watermelon
  - Orange
26. In general, there is an inverse relationship between respiration rate and postharvest life of fresh vegetables. From the given vegetables, which one has the highest respiration rate?
- Carrot
  - Cabbage
  - Radish
  - Asparagus
27. \_\_\_\_\_ is the oldest form of food preservation.
- Canning
  - Drying
  - Irradiation
  - Freezing

28. While packaging chips, the package is filled with nitrogen gas and reduces oxygen content to 3% or less. This type of packaging is known as
- air fill packaging.
  - controlled atmospheric packaging.
  - modified atmospheric packaging.
  - atmospheric packaging.
29. Peeling of fruits and vegetable using alkaline solution is known as \_\_\_\_\_.
- abrasive peeling
  - lye peeling
  - brine peeling
  - oil peeling
30. Nitrate and nitrite are helpful in meat processing as it
- increases tenderness.
  - increases juiciness.
  - improves colour.
  - prevent from microbial deterioration.

**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. Explain lamp cutting method. The diagram given below shows the half lamp carcass with individual cuts. Name the parts correctly. **(3+2 Marks)**



2. What is packaging? Describe four criteria for the selection of packaging materials. **(1+4 Marks)**
3. What are food additives? Describe antioxidants and flavor enhancers with an example each. **(1+4 Marks)**
4. Explain product life cycle with a diagram and its 4 stages. **(3+2 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**

“Food processing requires a knowledge of the chemistry, microbiology, and physical composition of foods. Early types of food processing included cooking, smoking, fermentation, and drying. These methods have been refined but are still in use today. New technologies have been developed, including irradiation, high-pressure, extrusion, and freeze-drying, that have generated new products and enhanced food safety and quality.”

1. Explain the general juice processing procedure with all the steps involved. Draw a flow chart for processing of an apple juice. What is a juice concentrate and list the advantages of juice concentrate? **(10+5+ 5 Marks)**
2. What is pickling and explain in detail how lactic acid forming bacteria ferments the pickle. Describe 4 methods of pickling, also describe problems associated with pickling. **(10+5+5 Marks)**
3. While processing potato into value added products, it is said that peeling was the most labor-intensive activity but now it has become very easy with improvement in technology. Describe different methods of peeling potatoes in modern food technology. Draw a flow chart for processing frozen French fries. **(6+4 Marks)**

**CASE II**

Plant design is an integral part of food technology when it comes to establishing your own enterprise. Plant design refers to the overall design of a manufacturing enterprise/facility. It moves through several stages before it is completed. The stages involved are: identification and selection of the product to be manufactured, feasibility analysis and appraisal, design, economic evaluation, design report preparation, procurement of materials including plant and machinery construction, installation and commissioning.

1. Explain what feasibility study is and its importance? Describe and discuss the stages involved while conducting a feasibility study in detail. Also draw a flow chart to the steps involved in designing a processing plant. **(5+10+5 Marks)**
2. What are the factors involved in a plant location decision? What is plant layout? Describe and explain the basic types of plant layout with diagram. **(8+2+10 Marks)**
3. After commissioning a processing plant, you start your production. While in production we use HACCP as the quality assurance tool. What is HACCP? What is hazard? What are three categories of hazard? Explain the principles of HACCP. **(1+1+3+5 Marks)**

**TASHI DELEK**