

ROYAL CIVIL SERVICE COMMISSION  
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2010  
EXAMINATION CATEGORY: TECHNICAL

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

<b>Date</b>	<b>:24<sup>th</sup> November 2010</b>
<b>Total Marks</b>	<b>:100</b>
<b>Examination Time</b>	<b>:2.5 Hours</b>
<b>Reading Time</b>	<b>:15 Minutes</b>

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**INSTRUCTIONS**

1. Write your Roll Number clearly on the answer booklet in the space provided.
2. The first 15 minutes is being provided to check the numbers of pages, printing errors, clarify doubts and to read the instructions. You are **NOT PERMITTED TO WRITE** during this time.
3. Use either **Blue** or **Black** ink pen or ball point pen for the written part and **H.B. Pencils** for the sketches and drawings.
4. All answers should be written on the Answer Booklet provided. Candidates are not allowed to write anything on the question paper.
5. This Questions Booklet consists of **seven pages**. It is divided into two sections-namely SECTION A and SECTION B
6. **SECTION A** consists of two parts. **Part I** and **Part II**.

**Part I** consists of 30 multiple-choice questions carrying one (1) mark each and is **compulsory**. The answer of your choice should be clearly written **in whole** along with the question and option number on your answer booklet.

**Part II** consist of four (4) short answer questions of five (5) marks each and all questions are compulsory.

7. **SECTION B** consists of two **Case Studies**. Choose only **ONE** case study and answer the questions under your choice. Each case study carries fifty (50) marks in total.

**SECTION A: Part I (Answer all questions)**

**[30 marks]**

1. In which of the following groups are all foods produced using fermentation?
  - a. Jam, Honey, Milk
  - b. Cheese, Jam, Pickles
  - c. Honey, Salami, Pickles
  - d. Cheese, Yogurt, Salami
2. \_\_\_\_\_ is the most heat resistance enzyme
  - a. Catalase
  - b. Peroxydase
  - c. Lipoxygenase
  - d. None of the above
3. Which enzyme is responsible for softening of fruits and vegetables?
  - a. Pectin esterase
  - b. Polygalacturonase
  - c. Lipoxygenase
  - d. All of the above
4. \_\_\_\_\_ is the time necessary to obtain 12 times a log cycle reduction in the population of a given micro-organism at a give temperature
  - a. Z value
  - b. D value
  - c. TDT value
  - d. None of the above
5. Which statement is correct?
  - a. There is negligible surface resistant to heat transfer if Biot number is greater than 40
  - b. There is negligible internal resistant to heat transfer if Biot Number is less than 0.1
  - c. There is finite internal and external resistance to heat transfer if Biot Number is between 0.1 and 40
  - d. All of the above
6. \_\_\_\_\_ is the target microorganism in the food processing industry
  - a. *Clostridium botulinum*
  - b. *Listeria monocytogenes*
  - c. *Salmonella*
  - d. All of the above
7. Which of the following characteristics are essential when a food is to be used by soldiers on active duty?
  - a. Light weight and shelf-stable
  - b. High in energy and dietary fibre
  - c. Low-cost and easily transportable
  - d. Biodegradable packaging and energy-dense

8. What is the principle carbohydrate storage product in animals?
  - a. Cellulose
  - b. Protein
  - c. Starch
  - d. Glycogen
9. What is the purpose of nutritional panel on a food label?
  - a. To show the additives included
  - b. To inform consumers of nutritional content
  - c. To show quantity of ingredients in the products
  - d. To inform consumers of nutrient function in the body
10. \_\_\_\_\_ is the sugar that is a product of starch hydrolysis
  - a. Sucrose
  - b. Lactose
  - c. Maltose
  - d. Fructose
11. A food that has 10g fat, 20g carbohydrates and 10g protein has \_\_\_\_\_ calories.
  - a. 480
  - b. 380
  - c. 330
  - d. 210
12. The effectiveness of many chemical preservatives depends primarily on the food
  - a. Temperature
  - b. pH
  - c. Acidity
  - d. All of the above
13. The enzyme present in saliva is \_\_\_\_\_
  - a. Pepsin
  - b. Papain
  - c. Lactase
  - d. Amylase
14. What is the role of an oxygen scavenger sachet in active packaging?
  - a. To absorb moisture, thus preventing mould growth
  - b. To replace nitrogen content, thus preventing flavor changes
  - c. To add carbon dioxide that extend product shelf life
  - d. To absorb undesirable gases that reduce product shelf life
15. \_\_\_\_\_ is the disease caused by the deficiency of Vitamin B<sub>1</sub>
  - a. Rickets
  - b. Beriberi
  - c. Scurvy
  - d. None of the above

16. Food manufacturers have responded to concerns about environmental issues by increasing the use of which of the following?
- Food additives
  - Fresh ingredients
  - Organic fertilizer
  - Biodegradable packaging
17. Each of the following is an essential nutrient except
- Glucose
  - Vitamin12
  - Calcium
  - Methionine
18. The starter culture consisting of a mixture of *Streptococcus thermophilus* and *Lactobacillus bulgricus* are used for making
- Dry sausage
  - Yogurt
  - Sauerkraut
  - all of the above
19. \_\_\_\_\_ is a thin layer of unstable forms of cocoa fat that crystallize at the surface of a coating to produce dullness or white specks
- Entrainment
  - Bloom
  - Enrobing
  - None of the above
20. Which of the following aspects of food processing would be similar in both the domestic and industrial setting?
- Equipment and distribution
  - Equipment and storage conditions
  - Processing techniques and distribution
  - Storage conditions and processing techniques
21. Several major brands of beer are \_\_\_\_\_ rather than pasteurized to better preserve the flavor and aroma of the original product
- Centrifuged
  - Precipitated
  - Filtered
  - All of the above
22. Of what elements are carbohydrates composed?
- C, H, O & N
  - C, H, O & S
  - C, H & N
  - C, H & O

23. What is the main function of ascorbic acid when it is added to orange juice?
- To enhance flavor
  - To extend shelf life
  - To replace nutrient loss
  - To act as an oxidant
24. Peptide bonds are formed by \_\_\_\_\_
- Condensation
  - Hydrolysis
  - Oxidation
  - Hydrogen
25. \_\_\_\_\_ is the critical water activity ( $a_w$ ) below which no microorganism can grow
- 0.8
  - 0.6
  - 0.5
  - None of the above
26. Which enzyme is responsible for milk coagulation?
- Lipases
  - Proteases
  - Chymosin
  - None of the above
27. \_\_\_\_\_ is climacteric fruit
- Orange
  - Apple
  - Pomegranate
  - None of the above
28. Which of the following is an example of a line extension?
- A simulation of an existing food
  - A new flavor for an existing food
  - A food manufactured using new technology
  - A genetically modified food
29. When you chop onions, your eyes can burn because a chemical reaction produces
- Acetic acid
  - Hydrochloric acid
  - Nitric acid
  - Sulfuric acid
30. \_\_\_\_\_ is systematic and preventive approach to safety of foods
- GMP
  - GAP
  - HACCP
  - QCS

**SECTION A: Part II (Answer all questions)**

**[20 marks]**

1. What are the difference between amylose and amylopectin? [5 marks]
2. What is blanching and list its advantages and disadvantages? [5 marks]
3. Why breastfeeding is good for babies? [5 marks]
4. Outline factors that determine the microbial growth in food? [5 marks]

**SECTION B: Answer only one question**

**[50 marks]**

**Question 1 [50 marks]**

Cupcakes are small cakes which are often decorated and are a popular treat for people of all ages. Below is a photograph of decorated cupcakes and a recipe for the cakes.



**Cupcakes**

110 grams plain flour  
½ teaspoon baking powder  
65 grams butter  
65 grams caster sugar  
1/2 teaspoon vanilla essence  
1 egg  
60 ml milk

1. Preheat the oven to 200°C.
2. Place paper cases into the cupcake tin.
3. Sift the flour and baking powder.
4. Cream the butter and sugar.
5. Mix in the vanilla essence.
6. Add the egg gradually; mix well.
7. Fold in the flour and milk alternately, about 1/3 at a time.
8. Spoon the mixture into the paper cases.
9. Bake in the preheated oven for 12 to 15 minutes.
10. Turn onto a wire rack to cool.

Butter, egg and plain flour are all key ingredients in the preparation of the cupcakes.

a. Complete the following table for each of these ingredients. [7+7+7=21 marks]

Ingredient	Identify the natural food component in the ingredient.	Explain one main function of each natural food component in the preparation of the cupcakes.
Butter		
Egg		
Plain flour		

The creaming of the butter and sugar and the baking of the cakes are two of the complex processes involved in making the cupcakes.

b. Select one of these complex processes and outline **two** important steps which are necessary to maximize the quality of the food item. [3+6=9 marks]

During the baking of the cupcakes, the mixture changes color and the cakes brown.

c. Name **one** process which can cause the cakes to brown and outline how this process browns the cakes. [5+5=10 marks]

Decorated cupcakes have become a popular product sold at community and farmers' markets.

d. Identify the food manufacturing system which would be used by a cake stall owner to produce the cakes for sale at a community or farmers' market. [5 marks]

e. Outline **two** features of this food manufacturing system which makes it a suitable system to produce the cupcakes for a community or farmers' market. [5 marks]

**OR**

**Question 2 [50 marks]**

A blend of sorghum syrup is to be produced by mixing pure syrup with corn syrup and semi-syrup to produce 100 kg of blended product. Properties of the three syrups are shown in the following table. All percentages are by mass.

Component	% Water	% Sugar	% Flavor	Kg
Sorghum syrup(S)	23.0	75.5	1.5	.....
Corn syrup(C)	20.0	80.0	0.0	.....
Semi-syrup(P)	40.0	59.0	1.0	.....
Desired blend	24.0	75.0	1.0	100.00

a. Determine the mass of Sorghum syrup(S), Corn syrup(C) and Semi-syrup (P). [20+10+10=40 marks]

If the Corn syrup of the above problem contains 1.1% flavor level, the solution of mass balance equations results in a negative value for at least one ingredient.

b. What does this indicate on the state of achieving flavor level to desired blend? [10 marks]