

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

**PAPER III: SUBJECT SPECIALISATION PAPER for DAIRY TECHNOLOGY**

<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 number 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 Question Booklet consists of **9 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 question carrying one (1) mark each and is **compulsory**. The answer of your choice should be clearly written **in whole** along with the question number and option number on your answer booklet.

**Part II** consists 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 question of your choice. Each case study carries fifty (50) marks in total.

**SECTION A: Part I**

**Each question carries one (1) mark (30 x 1 = 30 marks). Answer all questions.**

**Choose the correct answer. The answer of your choice along with the option number should be clearly written in whole along with the question number on your answer booklet (e.g. Q1: c. butyric acid).**

1. The average composition of cow's milk is:
  - a. 4.4% fat, 3.4% protein and 4.6% lactose
  - b. 2.4% fat, 3.4% protein and 4.6% lactose
  - c. 5.0% fat, 3.4% protein and 4.6% lactose
  - d. 4.4% fat, 3.4% protein and 3.6% lactose
  
2. The % casein present in milk is:
  - a. 2.0%
  - b. 3.0%
  - c. 2.7%
  - d. 3.5%
  
3. Which is the most common exotic breed of cattle that exists in Bhutan?
  - a. Holstein Friesian
  - b. Jersey
  - c. Brown Swiss
  - d. Abondance
  
4. Which breed of cattle is considered to be native to Bhutan?
  - a. Nublang
  - b. Mithun
  - c. Sindhi
  - d. All of the above
  
5. The milk fat globule is considered to be present as
  - a. Colloidal Solution
  - b. Fine Dispersion
  - c. Emulsion
  - d. Aggregates

6. The freezing point depression of milk can be used to measure the amount of added water to the milk. What is the average freezing point of milk?
- 450°C
  - 650°C
  - 0°C
  - 522°C
7. “Late blowing” in Swiss and Dutch type cheese is caused by
- Salmonella
  - Clostridium tyrobutyricum*
  - Bacillus cereus*
  - Staphylococcus aureus*
8. The principal protein present in milk is
- Whey Proteins
  - Sodium Caseinate
  - $\beta$  – lactoglobulin
  - Caseins
9. In the manufacture of yoghurt, two different bacteria are used for the coagulation of milk, which of the following are the bacteria that forms the starter culture used in yoghurt manufacture
- Streptococcus thermophilus* and *Lactobacillus bulgaricus*
  - Streptococcus thermophilus* and *Lactobacillus diacetylactis*
  - Lactococcus cremoris* and *Lactobacillus helveticus*
  - Lactobacillus acidophilus* and *Leuconostoc cremoris*
10. Which enzyme is responsible for causing lipolysis of milk
- Alkaline phosphatase
  - Proteases
  - Lactoperoxidase
  - Lipase

11. The Thimphu Peri Urban Dairy Farmers Groups performs a number of platform tests during the collection of milk. One of these tests is the lactometer test that is used to determine the specific gravity of milk as a measure for added water. What is an acceptable lactometer reading at 15°C to permit the collection of milk?
- 1.020
  - 1.015
  - 1.045
  - 1.032
12. Mesophiles have an optimum growth temperature of
- 10 - 20°C
  - 55 - 60°C
  - 30 - 40°C
  - 07 - 10°C
13. The manufacture of butter involves a ripening stage during which the fermentation process occurs to give butter its characteristic flavor. The manufacture of local Bhutanese butter makes use of bacteria through the natural souring of milk whereas manufacture of commercial butter makes use of specific starters. Which starter culture is commonly used for this purpose in the commercial manufacture of butter?
- Streptococcus thermophilus* and *Leuconostoc cremoris*
  - Streptococcus cremoris* and *Streptococcus diacetylactis*
  - Lactobacillus bulgaricus* and *Lactobacillus helveticus*
  - Leuconostoc cremoris* and *Lactobacillus helveticus*
14. Phosphorus in milk is distributed in various forms. Which of the following represents the distribution of phosphorus in milk?
- Esterified to casein
  - Esterified in phospholipids
  - Inorganic colloidal
  - All of the above

15. Which of the following caseins are the most hydrophobic?
- a.  $\alpha$ s1 – casein
  - b.  $\alpha$ s2 – casein
  - c.  $\beta$  – casein
  - d.  $\kappa$  – casein
16. The breakdown or disruption of the secondary and tertiary structures of proteins is known as:
- a. Denaturation
  - b. Coagulation
  - c. Aggregation
  - d. Hydration
17. The resultant low pH in yoghurt is caused by
- a. Formic acid
  - b. Citric acid
  - c. Lactic acid
  - d. Acetic acid
18. Duyul and Zimdra milk are examples of:
- a. Low temperature pasteurized milk
  - b. High temperature pasteurized milk
  - c. UHT milk
  - d. None of the above
19. Which of the following is **not** a type of heat exchanger:
- a. Plate Heat Exchanger
  - b. Tubular Heat Exchanger
  - c. Fluid Bed Heat Exchanger
  - d. Scraped Surface Heat exchanger

20. The production of certain cheese varieties uses bacteria for the production of “eyes” that forms an important characteristic of the particular cheese variety. Which bacteria is responsible for the formation of the “eyes” in these cheese varieties?
- Lactic acid bacteria
  - Brevibacterium linens
  - Clostridium tyrobutyricum
  - Propionic bacteria
21. The ripening of cheese occurs through the action of the starter bacteria and in some varieties with the additional action of either surface or internal moulds. Which of the following cheese varieties is **not** a mould ripened cheese?
- Camembert
  - Brie
  - Cheddar
  - Roquefort
22. Which of the following is **not** an effect of homogenization
- Inactivates enzymes
  - Incorporates fat in protein network
  - Whiter color of milk
  - Improves stability towards partial coalescence
23. What enzyme is most commonly used for coagulation of milk during cheese manufacture
- Pepsin
  - Chymosin
  - Chymotrypsin
  - Amylases

24. How much cream testing 35% fat must be added to 500kgs of milk testing 4% fat to obtain cream testing 10% fat?
- a. 100kgs
  - b. 80kgs
  - c. 120kgs
  - d. 130kgs
25. The pH of milk at 25°C varies from
- a. 6.5 – 6.7
  - b. 6.0 – 6.3
  - c. 5.5 – 6.0
  - d. 6.5 – 7.0
26. Lactose is composed of
- a. Galactose and fructose
  - b. Glucose and sucrose
  - c. Xylose and fructose
  - d. Glucose and galactose
27. Hetero-fermentative cultures produce
- a. Lactic acid only
  - b. Lactic acid and CO<sub>2</sub>
  - c. Citric acid and CO<sub>2</sub>
  - d. Lactic acid, CO<sub>2</sub> and flavor compounds
28. Which of the following is a sanitizer used in the dairy industry
- a. Caustic soda
  - b. Sodium hypochlorite
  - c. Caustic potash
  - d. Iodine

29. The doubling of cell population within a generation time is known as
- Logarithmic phase
  - Death phase
  - Stationary phase
  - Reproductive phase
30. A potential bacterial contaminant in milk and milk products that is tolerant to salt and has the ability to grow in refrigeration conditions is
- Salmonella*
  - Staphylococcus aureus*
  - Listeria monocytogenes*
  - E. coli*

**SECTION A: Part II**

**Part II consists of four (4) questions. All questions must be answered and each question carries five (5) mark (5 x 4 = 20 marks).**

**Be as concise and precise as possible.**

- Describe 3 mechanisms by which the aggregation of casein micelles can be induced?
- Describe in detail the Geber test for analysis of fat content in milk.
- What is the purpose of the Phosphatase test? Describe in detail the procedures for conducting the Phosphatase test.
- What effect might milk Ultrafiltration or fortification with dried skim milk powder have on yoghurt viscosity? Why?



## **SECTION B**

**SECTION B consists of two questions. Choose ONLY ONE question and answer the question of your choice. (50 marks)**

The yoghurt plant in Thimphu produces set yoghurt of various sizes that is marketed in Thimphu town. During the manufacture of yoghurt, the milk undergoes various changes in its chemical composition and physical attributes due to interaction with milk components and starter bacteria.

Describe in detail the manufacturing process of yoghurt and explain in detail the physical and chemical changes/interactions that occur in milk during the manufacturing process.

**OR**

Define Probiotics and Prebiotics? What basic requirements have to be met for a strain of bacteria to be regarded as probiotic? Give examples of probiotic bacteria currently in use.

Are there strains of yeast that are also considered to be probiotic, if so provide an example of such a strain.

**END OF PAPER**

**GOOD LUCK**