

ROYAL CIVIL SERVICE COMMISSION  
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2011  
EXAMINATION CATEGORY: TECHNICAL

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

<b>Date</b>	<b>:30<sup>th</sup> October 2011</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 **eight 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** 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 questions under your choice. Each case study carries fifty (50) marks in total.

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

**[30 marks]**

1. Which of the following will minimize deterioration of fats and oils during storage?
  - a. Anti caking agents
  - b. Antioxidants
  - c. Emulsifiers
  - d. Preservatives
2. Why is quality assurance systems used in food production?
  - a. To promote a product
  - b. To increase production
  - c. To increase market share
  - d. To achieve consistency of products
3. Which one of the following carbohydrates would need to be malted during the fermentation process of making beer?
  - a. A monosaccharide such as glucose
  - b. A disaccharide such as maltose
  - c. A polysaccharide such as starch
  - d. A yeast to start the fermentation process
4. Which of the following is most affected by high levels of ethylene?
  - a. Ripening of fruit
  - b. Rancidity of cheese
  - c. Colour change of meat
  - d. Microbial spoilage of bread
5. Which of the food below constitute the best choice when one attempts carbohydrate loading before endurance events?
  - a. Potato chips
  - b. Rice
  - c. French fries
  - d. All bran(high fiber) cereal
6. Which additive is essential for the manufacturing of whole-egg mayonnaise?
  - a. Emulsifier
  - b. Humectants
  - c. Antioxidant
  - d. Bleaching agent
7. \_\_\_\_\_ is the original source of all our energy
  - a. Plants
  - b. Sunlight
  - c. Oxygen
  - d. Carbon dioxide
8. Which statement is NOT correct
  - a. Food spoilage is a major problem in all societies, occurring primarily during transport.
  - b. Fermentation by some microorganisms can lead to food preservation instead of food spoilage.
  - c. Microorganisms can be eliminated from, or reduced by, ethylene oxide sterilization.
  - d. All food-borne diseases are associated with poor hygienic practices.

9. Which of the following best describes the role of food additives?
- To enhance food quality
  - To disguise inferior ingredients
  - To reduce risk of food allergies
  - To reduce the wastage of raw materials
10. Which of the following is NOT an intrinsic factor in food spoilage?
- pH
  - Temperature
  - Moisture content
  - Available nutrients
11. Which is NOT true about aflatoxins?
- Are carcinogenic
  - Are alkaloids
  - Have been found in beer
  - Cause frame shift mutations
12. \_\_\_\_\_ is the mineral that is part of the green pigment, chlorophyll, is:
- Magnesium
  - Calcium
  - Iron
  - Selenium
13. Which of the following terms describes organisms that thrive in cold?
- Mesophiles
  - Thermophiles
  - Psychrophiles
  - Aerophiles
14. Plant oils are excellent sources of \_\_\_\_\_ and liver is an excellent source of \_\_\_\_\_.
- Vitamin K; Vitamin A
  - Vitamin E; Vitamin D
  - Vitamin E; Vitamin A
  - Vitamin D; Vitamin K
15. Sodium nitrite is responsible for
- Protecting against botulism
  - Reducing rate of spoilage
  - Maintenance of red colour in meat
  - All of the above
16. Sodium bicarbonate is commonly used in cooking as:
- Alum
  - Baking soda
  - Baking powder
  - Cream of tartar
17. \_\_\_\_\_ method is used for protein determination
- Gerber method
  - Kjeldahl method
  - Soxhlet method
  - Phenol-sulfuric acid method

18. \_\_\_\_\_ is used for measuring the flour quality?
- Farinograph
  - Extensigraph
  - Alveograph
  - All of the above
19. When glucose is split in glycolysis, it eventually forms two molecules of:
- Acetate
  - Pyruvate
  - Glycerol
  - water
20. Yogurt is tolerated better than milk by lactase deficient people because:
- Yogurt has no lactose
  - Lactase from bacteria in yogurt helps digest the lactose
  - It has thicker consistency
  - The lactose is broken down during processing
21. The essential fatty acids includes:
- Lecithin and choline
  - Eicosonoids and prostaglandins
  - Alpha-linolenic acid and lineleic acid
  - eicosapentoenoic acid and doxosaheaxenoic acid
22. Hydrogenation of fat does NOT:
- Increase shelf life.
  - Make it harder.
  - Make it more unsaturated.
  - Reduce the tendency for oxidation.
23. \_\_\_\_\_ is the most commonly used methods of thermal analysis in food science
- Tristimulus colorimetry
  - Differential scanning calorimetry
  - Mass spectrometry
  - Gas chromatography
24. Peptide bonds are formed:
- By excluding water molecules.
  - By exluding hydrogen atoms
  - By making esters
  - When developing tertiary structure
25. Which is NOT true about kwashiorkor?
- Protein needs are generally not met
  - The child appears plump due to edema
  - The child is at a high risk for infections
  - The affected person is usually a very young infant
26. A biological method of food preservation is:
- Drying
  - Freezing
  - Fermentation
  - Adding salt

27. \_\_\_\_\_ is not an attribute of human milk?
- High lactose content
  - Presence of bifidus factor
  - Antibody content
  - High mineral content
28. How many calories would be provided in a 5 ounce glass of wine given the following information: alcohol - 13 grams, carbohydrate - 3 grams, fat - 0 grams, and protein - 0 grams?
- 64 kcals
  - 129 kcals
  - 91 kcals
  - 103 kcals
29. Normally only class II apples of Bhutan are exported to Bangladesh and the inspectors of Bhutan Agriculture and Food Regulatory Authority (BAFRA) monitor and certify the quality standards. As per the standard, the minimum size of the apple for export is \_\_\_\_\_ and the tolerance is \_\_\_\_\_ by the number or weight of apples not satisfying the requirement.
- 30 mm; 5%
  - 50 mm; 10%
  - 55mm; 10%
  - 55mm ; 5%
30. Solanine is:
- Not known to be harmful to human
  - A naturally occurring toxin found in green potatoes
  - A naturally occurring toxin found in shellfish
  - A toxin that grows on peanuts and corn products

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

**[20 marks]**

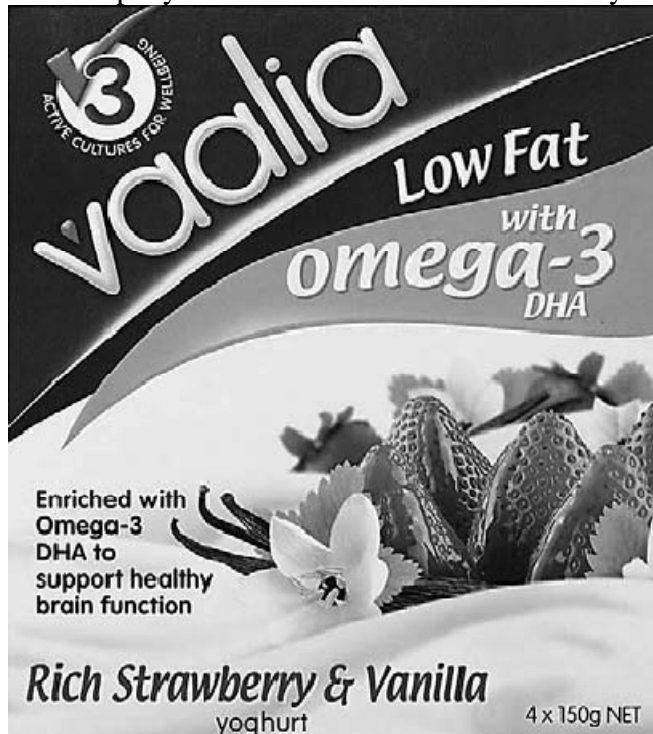
- What is *Pearson Square*? Construct a Pearson square diagram for producing light cream containing 10% fat from the mixture of homogenized milk(3.5% fat) and cream(20%fat).  
[2+3=5 marks]
- What is Modified Atmosphere Packaging (MAP) ? Mention three potential advantages and limitations of MAP.  
[2+3=5 marks]
- List five main differences between the freeze drying and conventional hot air drying.  
[ 5 marks]
- What is water activity ( $a_w$ )? What are the critical  $a_w$  values for inhibiting the growth of most bacteria, most yeast, most fungi and all most all microbial activity.  
[1+4=5 marks]

SECTION B: Answer only one question

[50 marks]

Question 1 [50 marks]

The company Vaalia has launched a new variety of low fat yoghurt.



- Any food manufacturer can make a nutrient content claim about their product, but there are restrictions to making a health claim according to national or international food law. Explain what is meant by the term 'health claim'. [ 5 marks]
- This new Vaalia yoghurt has been developed to fulfill the market demands for functional foods. Explain the meaning of the term 'functional foods' and why this low fat yoghurt with omega-3 is considered a functional food. [5+5=10 marks]
- Identify **one** target market for yoghurt with omega-3 **and** explain why this product will meet the demands of the identified target market. [ 5+ 5=10 marks]
- The development of a prototypes and product evaluation were two key steps in the development of this yoghurt with omega-3. Explain the importance of each of these steps in the process of product development. Use an example to support your answer. [10+10=20 marks]
- Vaalia has recently produced a pomegranate and raspberry version of their yoghurt with omega-3. Identify this type of product development. [5 marks]

**Question 2 [50 marks]**

Using the given psychrometric chart, calculate the following:

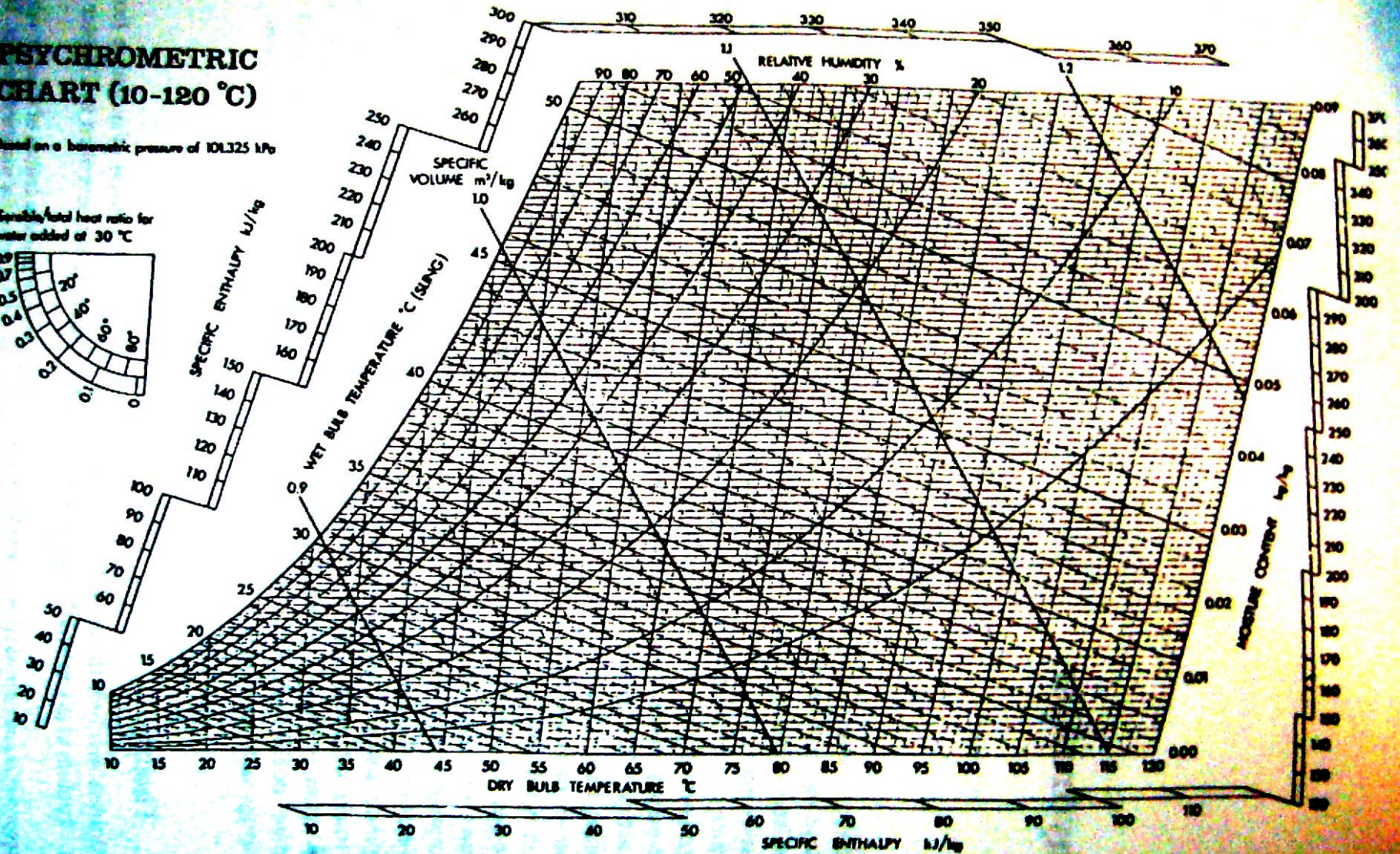
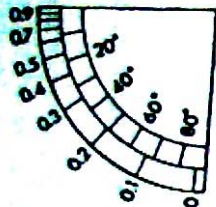
- a. The absolute humidity and wet bulb temperature of air which has 50% RH and a dry-bulb temperature of 60°C. [5+5=10 marks]
- b. The RH of air having a wet bulb temperature of 45°C and a dry-bulb temperature of 75°C. [5 marks]
- c. The dew point of air cooled adiabatically from a dry-bulb temperature of 55°C and 30%RH [5 marks]
- d. The change in RH of air with a wet-bulb temperature of 39°C, heated from a dry-bulb temperature of 50°C to a dry-bulb temperature of 86°C. Give a reason for less humid air. [5 +10=15 marks]
- e. The change in RH of air with a wet-bulb temperature of 35°C, cooled adiabatically from a dry-bulb temperature of 70°C to 40°C. Give a reason for more humid air. [5+10=15marks]



# PSYCHROMETRIC CHART (10-120 °C)

Based on a barometric pressure of 101.325 kPa

Specific/total heat ratio for water added at 30 °C



15.1 Psychrometric chart (10–120°C) based on barometric pressure of 101.325 kPa. (Courtesy of Chartered Institution of Building Services Engineers.)