ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2012
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER for FOOD SC. & TECHNOLOGY

Date	: 14 October 2012
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

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 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 or any other materials.

5. 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. Eg. 31(c).

    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.

8. This Paper consists of eight (8) pages including this Instruction page.

SECTION A

PART I - Multiple Choice Questions

Choose the correct answer and write down the letter of the correct answer chosen in the Answer Sheet against the question number. E.g. 31 (c). Each question carries ONE mark.

1. What are the respective polysaccharides that plant and animal used for storage of food energy?
    a. Starch & Glycogen
    b. Maltose & Amylose
    c. Sucrose &Glycogen
    d. Lactose &homoglycans

2. _____ is the complex lipids.
    a. Glycerides
    b. Sterol
    c. Phospholipids
    d. Vitamin A

3. Which is the target microorganism in the food processing industry because of it being the neurotoxin producer?
    a. Salminella
    b. Staphylococcus aureus
    c. Bacillus cereus
    d. Clostridium botulinum

4. _____ is the time dependent non-newtonian fluid
    a. Shear –thickening
    b. Ideal Bingham plastic
    c. Thixotropic
    d. Shear-thinning

5. Which fruit is non-climacteric?
    a. Apple
    b. Orange
    c. Mango
    d. Persimmon

6. Which pairs of fresh products are compatible for storage in terms of ethylene sensitivity?
   a. Apple & Persimmon
   b. Apricot & Lemon
   c. Orange and Mango
   d. Potato and Apple

7. The lipid oxidation is lesser in the water activity(a_w) value range of_____
   a. Less than 0.3 a_w
   b. More than 0.5 a_w
   c. Between 0.3 a_w to 0.5 a_w
   d. None of the above

8. Which enzyme is responsible for the tissue firming of fruits and vegetables?
   a. Amylase
   b. Lipase
   c. Polygalacturonase
   d. Pectin esterase

9. Which is the secondary taste parameter
   a. Sweetness
   b. Bitterness
   c. Sourness
   d. Astringency

10. Which statement is correct in three steps of lipid autoxidation?
    a. Free radical is generated in initiation step
    b. Peroxy radicals is generated in termination step
    c. Non-radical products in propagation step
    d. None of the above

11. The fat soluble vitamins is
    a. Thaimin
    b. Retinol
    c. Folic acid
    d. Niacin

12. Which of the chain in amylopectin cluster model gives amorphous region ?
    a. A chain that contains only $\alpha(1 \to 4)$ linkages
    b. B chain that contains $\alpha(1 \to 4)$ and $\alpha(1 \to 6)$ linkages
    c. C chain that contains $\alpha(1 \to 4)$ and $\alpha(1 \to 6)$ linkages plus a reducing group
    d. None of the above

13. _____ enzyme cause the browning of fruits and vegetables
    a. Peroxidase
    b. Polygalacturonase
    c. Polyphenoloxidase
    d. Myrosinase

14. If 12D process is applied while sterilizing the raw material which contains 1000 spores per container, what will be microbial numbers per container after sterilization?
    a. 10^{-3}
    b. 10^{-6}
    c. 10^{-9}
    d. 10^{-12}

15. Which method is used for determining the nitrogen?
    a. The Soxhelt method
    b. The Gerber method
    c. The Kjedahl method
    d. None of the above

16. In _____, the light absorbance is measured either in a transmission mode for solutions or in a reflectance mode for solids, or even in a combination of both for dispersions.
    a. Infrared spectroscopy
    b. Microwave spectroscopy
    c. Fluorescence spectroscopy
    d. Near infrared spectroscopy

17. Which type of reaction causes food browning by the direct heating of carbohydrates, particularly sugars and sugar syrups?
    a. Maillard reaction
    b. Oxidative browning
    c. Caramelization
    d. Enzymatic browning

18. If the orange juice(10% sugar) is mixed with sugar syrup(60% sugar) to get 50kg of fruit squash(15% sugar), what is the resulting proportion of orange juice and sugar syrup need to be mixed(use Pearson Square)
    a. 10kg of orange juice and 40 kg of sugar syrup
    b. 45 kg of orange juice and 5 kg of sugar syrup
    c. 35kg of orange juice and 15kg of sugar syrup
    d. None of the above

19. _____ is the density of material when packed or stacked
    a. True density
    b. Apparent density
    c. Material density
    d. Bulk density

20. The deficiency caused by lack of vitamin C is_____
    a. Scurvy
    b. Pellagra
    c. Beriberi
    d. Rickets

21. Which order of statement is correct for marketing plan development?
    a. Market targeting, market segmentation and market positioning
    b. Market segmentation, market targeting and marketing positioning
    c. Market positioning, market segmentation and market targeting
    d. None of the above

22. Among the marketing mix variables of product, price, promotion and place, which pair is indented for market positioning?
    a. Price and Product
    b. Price and Promotion
    c. Product and Place
    d. Place and Promotion

23. Which order of statement is correct for food product development process?
    a. Product strategy development , product design & product process development, product commercialization, product launch and post launch
    b. Product design & product process development, product launch and post launch, product commercialization, Product strategy development
    c. Product strategy development, product design & product process development, product launch and post launch, product commercialization
    d. None of the above

24. In water sorption isotherm, which water layer is strongly bounded to the surface of the food.
    a. Monolayer water
    b. Multilayer water
    c. Bulk-phase water
    d. None of the above

25. Cheese is one of the fermented products and it can be classified under which fermentation type?
    a. Alcohol fermentation
    b. Acid fermentation
    c. Bread fermentation
    d. Peptide fermentation

26. _____ is the food type that requires oxygen gain protection, water gain or loss protection and good barrier to volatile organics
    a. Canned milk and flesh foods
    b. Fruit juices and drinks
    c. Jam, jellies, syrups, pickles, olives and vinegars
    d. Dried foods

27. _____is one of the essential amino acids required for the maintenance of nitrogen balance
    a. Alanine
    b. Glycine
    c. Proline
    d. Lysine

28. What is the known bioactive component in fermented milk, yogurt?
    a. Lycopene
    b. Flavonoids
    c. Lactobacillus sp.
    d. Streptococcus sailvarius sp.

29. In food preservation methods, low temperature storage is group under_____
    a. Inactivation
    b. Inhibition
    c. Elimination
    d. None of the above

30. What is the optimum dry matter requirement for processing potato chips?
    a. In the range 18- 20%
    b. In the range 24-28%
    c. In the range 20-24%
    d. None of the above

PART – II : Short Answer Questions (20 marks)

Answer ALL the questions. Each question carries 5 marks. Mark for each sub-question is indicated in the brackets.

1. What are enzymes? List specific enzyme that is used to determine indices of food quality for the following food materials; (i) fruits and vegetables, (ii) milk, diary product and ham, (iii) eggs.

    [2+3=5 marks]

2. Define frying. Explain why the frying temperature is limited to a maximum of $180^{\circ}C$ in food laws of many countries?

    [2+3=5 marks]

3. List three factors that affect the performance of drying? In general, high air temperature is not used for drying, explain?

    [3+2=5 marks]

4. Outline the purpose of the Hazard Analysis and Critical Control Points (HACCP) system, which is required by any food manufacturer to develop before it opens for business.

    [5 marks]

SECTION B : Case Study

Choose either Case 1 or Case 2 from this section. Each Case carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE 1

Cereals such as wheat and oats have a similar structure. They are made up of the three main parts; the outer layer or husk containing fibre, the endosperm containing starch and the germ containing the protein, gluten.

a) The starch from the cereal is a natural component in food preparation and processing. Identify two functional properties of starch and describe their roles in food preparation and processing. For each, name a food item that uses this functional property in its preparation and or processing.

Functional Property of starch	Description of role	Food Item
1.		
2.		

[10+10=20 marks]

b) Gluten can play a very important role in many food products such as bread, pasta and pizza dough. Choose one of these food products and explain the role of gluten in this product.

[10 marks]

c) Cereals undergo primary and secondary processing before they are used to manufacture ingredients and food products. Outline two reasons for the primary processing of cereals such as wheat or oats.

[10 marks]

d) Secondary processing turns primary processed ingredients into other food products. List two benefits to the consumer or manufacturer of secondary processing of wheat or oats.

[10 marks]

CASE 2

The pork (15% protein, 20% fat and 63% water) and backfat (15% water, 80%fat and 30% protein) are mixed to make 100kg of a mixture containing 25% fat.

a) Draw a composition and material flow diagram   [15 marks]

b) Set up the equations representing the total mass balance and the components mass balance for a system

[10+10=20 marks]

c) Determine the quantity of pork and backfat required.

[10+5=15 marks]