

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES
 BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS
 DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

THEORY: FOOD CHEMISTRY SBB 2107

DECEMBER 2002

3 HOURS (100 marks)

INSTRUCTIONS

Answer Four (4) Questions. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets. Illustrate your answer where appropriate with large, clearly labelled diagrams.

1. Discuss how metal contamination and the presence of free fatty acids reduce the shelf-life of cooking oil. Your answer should include chemical reactions and changes that take place.

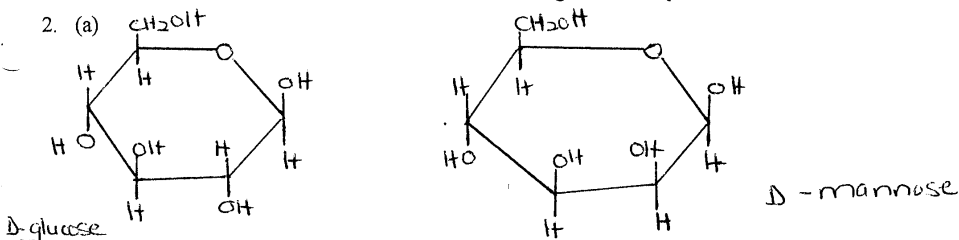


Fig.1: Structures of D-glucose and D-mannose

- (i) Write down the structural formulae of the two sugars shown in Fig. 1. (2 marks)
 (ii) Describe the relationship between D-glucose and D-mannose. (2 marks)
2. (b) Give an outline of the conditions and chemical reactions that result in the formation of hydroxymethyl fural (HMF). (5 marks)

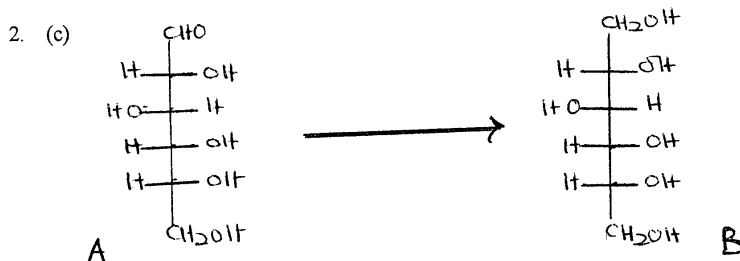


Fig.2: Reaction of compound A to form B

What type of reaction is taking place in Fig 2. Identify the reactant A and the product B. Briefly discuss the significance of this reaction in the food industry. (8 marks)

- (d) Describe the process of retrogradation in bakery products. Explain how retrogradation can be minimized in these products, and how it can be reversed in some instances. (8 marks)
3. (a) Describe the chemical basis of odour and flavour changes that take place when a piece of meat is cooked by frying or roasting. (13 marks)
- (b) Explain the principles involved in flavour development during the ripening of cheese. (12 marks)
4. (a) Discuss the importance to the food industry of polyphenolase catalysed reactions. Explain how these reactions may contribute to nutritional changes of food. Where appropriate, give specific examples and chemical reactions involved. (13 marks)
- (b) Describe the three important chemical reactions of chlorophyll that may take place during the cooking process of green leafy vegetables. How do these reactions influence the colour of the vegetables. (10 marks)
- (c) Explain how use of sulphur dioxide may contribute to loss of colour in strawberries. (2 marks)
5. (a) Discuss how vitamin A activity occurs in the plant and animal kingdoms. How are the different forms of vitamin A absorbed and transported in the body. (10 marks)
- (b) (i) Which property of ascorbic acid (vitamin C) is used when it is assayed for using the dye 2,6-dichlorophenolindophenol (DCPIP). What problems are associated with this method of determining vitamin C activity. (5 marks)
- (ii) What is the role played by oxygen and heavy metals in the loss of ascorbic acid and vitamin C activity. Give chemical structures in your answer. (3 marks)
- (c) Describe the mechanism involved in the loss of riboflavin (vitamin B2) from food. How does the loss of this vitamin affect other nutrients? (7 marks)
6. (a) Discuss the role of protein interaction in the production of cheese and dough used for making bread. Describe the main factors involved in the interaction of protein in these foods. (15 marks)
- (b) Describe the mechanisms of the Maillard reactions and explain how these reactions may contribute to reduction in protein quality of food. (10 marks)

END OF QUESTION PAPER