



PROGRAM : NATIONAL DIPLOMA
FOOD TECHNOLOGY

SUBJECT : FOOD BIOCHEMISTRY 3

CODE : FTN2ABC

DATE : WINTER EXAMINATION
7 JUNE 2018

DURATION : (X-PAPER) 11:30 - 14:30

WEIGHT : 50 : 50

TOTAL MARKS : 183 (180 = 100%)

EXAMINER : DR S DE KOCK Sanso Number

MODERATOR : DR G LOMBARD File Number

NUMBER OF PAGES : 5 PAGES

REQUIREMENTS : 2 ANSWER SHEETS PER STUDENT.

INSTRUCTIONS:**ANSWER ALL QUESTIONS**

QUESTIONS MAY BE ANSWERED IN ANY ORDER, BUT SUB-SECTIONS OF QUESTIONS MUST BE ANSWERED TOGETHER

QUESTION 1

Use one term (word) that would fit the description of the following:

- 1.1 The swelling of starch with the addition of water and heat.
- 1.2 A method used to determine protein.
- 1.3 Staling of bread.
- 1.4 A pigment that is formed during caramelisation.
- 1.5 The part of the refining process of oils where free fatty acids are removed.
- 1.6 A plant protein type that can be spun to imitate meat fibres.
- 1.7 The bond keeping the primary structure of proteins together.
- 1.8 The amino acid that cereals lack.
- 1.9 The milk component responsible for sandiness in ice-cream.
- 1.10 The pigment responsible for green colour in food products.

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QUESTION 2

The following information was found on the label of ***Steri Stumpie Chocolate Flavoured Sterilised Milk***:

Ingredients: Low fat milk, Sucrose, Cocoa Powder, Stabilisers, Starch, Aspartame, Permitted Flavourants and Colourants

- 2.1 Write a few notes on sucrose as a food ingredient. (3)
- 2.2 What is Aspartame? Name 2 other compounds used in the food industry that fall in the same category as Aspartame. (3)
- 2.3 What type of starch would you recommend for this product and why? How is it manufactured? What other properties does it have? (Hint: this product is heated at high temperatures to make it commercially sterile) (7)
- 2.4 Xanthan gum could be used for this product. Explain why and describe the structure and properties of this gum. (8)

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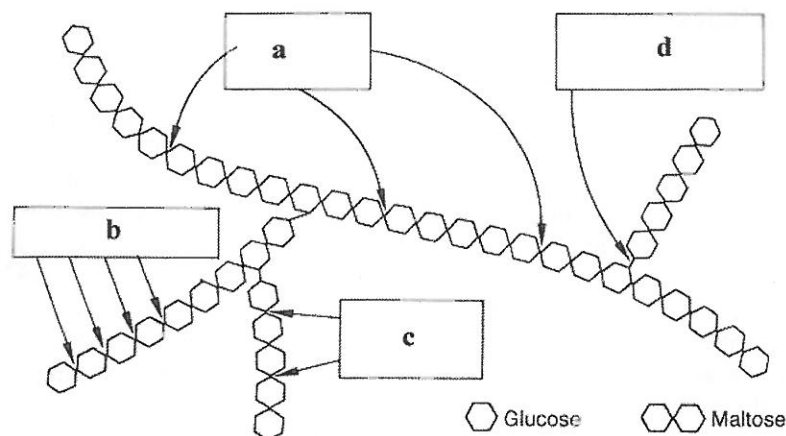
QUESTION 3

3.1 The abbreviation DE is used in the industry with different meanings.

- 3.1.1 Define the DE value with regards to corn syrups. (3)
- 3.1.2 Would you use a high or low DE syrup to enhance browning in a baked product? Motivate your answer. (2)
- 3.1.3 Define the DE value with regards to pectin and show the chemical structure to help illustrate your answer. (3)

3.1.4 Define low-methoxyl pectin and describe the conditions under which this type of pectin will form a gel. (4)

3.2 In the figure, identify the different enzymes (a, b, c and d) which act on different positions in starch and give a short description of each. (8)



3.3 What is the similarity and difference in structure between locust bean gum and guar gum? Give one property difference between the two that would be affected by that. (6)

3.4 Show the chemical structure of the following:

3.4.1 β -1,4 bond in a disaccharide (1)

3.4.2 Anhydro bond in a sugar (1)

3.4.3 Sorbitol (2)

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QUESTION 4

4.1 For each of the following proteins, a) briefly describe it, b) state its functional property in food and c) explain how that functional property is obtained in the food.

4.1.1 Casein (5)

4.1.2 Gluten (5)

4.1.3 Egg white protein (4)

4.2.1 Name the two meat proteins (muscle proteins) (2)

4.2.2 Explain why meat will be tough after slaughtering (2)

4.2.3 Explain the role of protease in making the meat tender. (2)

4.3.1 List two beneficial and one detrimental function of alpha-amylase (3)

4.3.2 How would you go about enhancing the activity of alpha-amylase? (6)

4.4.1 Why would fruit salad go brown? Show chemical reactions. (7)

4.4.2 Why would lemon juice prevent that from happening? (2)

4.5 List 4 physical agents that could denature proteins (1/2 mark each). (2)

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QUESTION 5

- 5.1 Briefly discuss the factors which will influence lipid oxidation in a food product. (9)
- 5.2 Oxidation can be divided into 3 parts. Name them and briefly describe what happens in each part (no chemical reactions necessary). (7)
- 5.3 Explain the HLB system is with regards to emulsifiers. (5)
- 5.4 Show the isomeric hydroperoxides which are expected to form from *linoleic acid* during prolonged exposure to oxygen. (6)
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QUESTION 6

- 6.1 Explain the presence of colour in carotenoids. (4)
- 6.2 Name the four groups that pigments can be divided into and give an example of each. (8)
- 6.3 Show the dynamic system of three pigments that occur in fresh meat (with their colours). (3)
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QUESTION 7

State whether the following statements are true or false **AND** motivate your answer every time (1/2 mark for true or false, 1 mark for motivation. Motivations should be just one sentence).

- 7.1 It is healthy to drink one glass of red wine a day.
- 7.2 Marine oils are more stable to oxidation than animal fats.
- 7.3 The amount of emulsifier required to produce a stable emulsion increases with decreasing particle size of the oil.
- 7.4 Vitamin C prevents scurvy.
- 7.5 A homopolysaccharide has only one sugar unit.
- 7.6 Removal of the colouring components in refining of oil is called deoderisation.
- 7.7 Collagen is made of protein chains in a triple helix.
- 7.8 Maltose will undergo more browning than glucose in the Maillard reaction.
- 7.9 There is no optimum amount of antioxidant. The more, the better it will work.
- 7.10 Animal proteins are more nutritious than plant proteins.

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(Question 8 on the next page)

QUESTION 8

Match column B with column A (e.g 1.F).

A	B
<ol style="list-style-type: none"> 1. Tannin 2. Lipoprotein 3. Melanoidin 4. Histones 5. Hydroperoxide 6. Prolamins 7. Anthocyanidin 8. Carrageenan 9. Cholesterol 10. Phytase 11. Alginate 12. Ovalbumin 13. Lycopene 14. α-lactalbumin 15. Cellulose 16. Sorbitol 17. Fructose 18. Raffinose 19. Linolenic acid 20. Triglyceride 21. Sucrose 22. Quorn 23. Glucose 24. Amylopectin 25. Methionine 	<ol style="list-style-type: none"> A. Mannuronic and guluronic acid B. Violet colour C. Pigment in enzymic browning D. Mycoprotein (protein from fungi) E. Non-reducing F. Oxidation G. 18 carbons, two double bonds H. Slowly absorbed, can be used in diabetic products I. Unsaponifiable J. Glycerol plus three fatty acids K. Contains α (1,4) bond (linear starch molecule) L. Causes flatulence (produces gas in intestines) M. Sweetest sugar N. Green colour O. Ripe tomatoes P. Sulphate esters and anhydro bonds Q. α-1,4 and α-1,6 glycosidic bonds (branched starch molecule) R. High % of basic amino acids S. Pigment in non-enzymic browning (Maillard) T. Galactose:mannose = 2:1 U. Breaks down phytate V. Contains β (1,4) bond W. 18 carbons, three double bonds X. Dextrose Y. Whey protein Z. Soya beans are deficient in this AA. Astringency in tea and wine BB. Lecithin CC. Soluble in 50-80% alcohol DD. Egg protein

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