



**SOLOMON ISLANDS NATIONAL UNIVERSITY**  
**School of Nursing and Allied Health Sciences**  
**Diploma of Public Health (Nutrition and Dietetics)**

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**ND 615 - NUTRITION**  
**BIOCHEMISTRY**

**FINAL EXAMINATION**

**SEMESTER 1, 2017**



**SOLOMON ISLANDS NATIONAL UNIVERSITY**  
**SCHOOL OF NURSING & ALLIED HEALTH SCIENCES**  
**DIPLOMA OF NUTRITION AND DIETETICS**

**ND 615 NUTRITIONAL BIOCHEMISTRY**  
**FINAL EXAM**

**TIME ALLOWED** : 9.00 - 12.00 PM (3 HOURS)  
**DATE** : WEDNESDAY 14<sup>TH</sup> JUNE 2017  
**STARTING TIME** : 9.00 AM

**STUDENT NAME** : \_\_\_\_\_  
**STUDENT ID** : \_\_\_\_\_

**TEST INSTRUCTIONS:**

1. You will be given 10 minutes to read the paper.
2. All questions are compulsory, and therefore you must attempt to answer them all.
3. For Short answer questions, write your answers on the space provided.
4. Make sure to write clearly in pen or biro and not in pencil.
5. Write your full name & student ID in the spaces provided above.
6. This test is worth 50% of your total assessment.

<b>Section</b>	<b>Marks Allocated</b>
Section A: Multiple Choice Questions	/30 Marks
Section B: Short Answer Questions	/42 marks
Section C: Long Answer Questions	/33 Marks
<b>Total Marks</b>	<b>/105 marks</b>

*GOOD LUCK*

**SECTION A: MULTIPLE CHOICE QUESTIONS****(30 MARKS)***Circle the Correct Answer*

1. **Nutrition biochemistry is the study of**
  - a) Effects of food component in terms of metabolism, health and disease in human beings
  - b) Application of Dietary Reference Intake at the population level
  - c) Lifestyle diseases and nutrition guidelines
  - d) Importance of nutrition throughout the lifecycle
2. **Glycolysis is a process that produces energy (ATP) during carbohydrate metabolism. Where does glycolysis occur in a cell?**
  - a) Matrix
  - b) Mitochondria
  - c) Cytoplasm
  - d) Cytoplasmic reticulum
3. **People who cannot tolerate milk or milk products often experience gastrointestinal problems. The inability to digest and absorb the main sugar in milk is known as;**
  - a) Galactose intolerance
  - b) Lactose intolerance
  - c) Fructose intolerance
  - d) None of the above
4. **Citric acid cycle is a process that occurs during metabolism of carbohydrate. How many ATP's are produced in a single cycle?**
  - a) 12 ATP
  - b) 24 ATP
  - c) 10 ATP
  - d) 30 ATP
5. **Which of the following is an ethanol metabolic pathway that can be activated during excessive alcohol intake; and an increase use of it may lead to retinal degradation causing vitamin A deficiency?**
  - a) Microsomal ethanol oxidizing system (MEOS).
  - b) Catalase
  - c) Alcohol dehydrogenase
  - d) Aldehyde dehydrogenase
6. **Which of the following is NOT a factor that inhibits Alcohol dehydrogenase (ADH) activity during alcohol metabolism?**
  - a) Chronic EtOH abuse
  - b) Antihistamine drugs
  - c) Lactic acidosis
  - d) Aging
7. **During alcohol metabolism ethanol is broken down to reach a harmless product called acetate. Which of the following is a product from the metabolism reaction that is highly toxic and can damage tissue when accumulates?**
  - a) Acetyl-CoA
  - b) Acetate
  - c) Acetaldehyde
  - d) All of the above
8. **Excessive alcohol intake leads to high concentration of NADH which favors the conversion of pyruvate to lactate. This conversion may lead to ;**
  - a) Hypoglycemia
  - b) Wernicke disease
  - c) Lactic acidosis
  - d) Addiction
9. **Which of the following is a brush border enzyme that breaks down sucrose making it available for absorption in the small intestine?**
  - a) Maltase
  - b) Sucrose
  - c) Lactase
  - d) Isomerase
10. **Which of the following is INCORRECT about the role of glycemic Index;**
  - a) Compares equal quantities of available carbohydrate in foods and provides a measure of carbohydrate quality.
  - b) A rating on carbohydrate-containing foods and their impact on blood sugar.
  - c) Measures how fast and how much a food raises blood glucose levels.
  - d) A rating on polyol-containing foods and their

11. Which of the following is **CORRECT** about the uses of polyols?

- a) Add sweetness
- b) Add bulkiness
- c) Replacing sugar- (1:1) ratio
- d) All of the above

12. Which of the following is **NOT** a benefit of a resistant starch?

- a) Prevents cancer
- b) Prevents diabetes
- c) Prevents weight loss
- d) Prevents hyperlipidemia

13. Alcohol is 100% absorbed without digestion. High amounts of alcohol are absorbed in ;

- a) Brain
- b) Small intestine
- c) Lungs
- d) Stomach

14. Ketone is the final source of energy during starvation. Which of the following is a ketone body?

- a) Ketosis
- b) Hydroxyl group
- c) Acetyl CoA
- d) Acetone

15. In the Electron Transport Chain, the electron donors (NADH/FADH) transfer their electrons to the receiver such as;

- a) ADP
- b) Oxygen
- c) Water
- d) Matrix

16. During the starvation state, ketones are produced from ;

- a) Glycogen
- b) Acetyl CoA
- c) Pyruvate
- d) Glucose

impact on blood sugar

17. Gluconeogenesis is simply the process when ;

- a) Glucose is made from the simple sugars such as fructose and galactose
- b) Glucose is made from lactate and protein
- c) Glucose is made from oxidation of fatty acids
- d) Glucose is made from non-carbohydrate such as acetyl coa

18. Short chain CHOs are not easily digested and absorbed in the small intestine. All of these are reasons for short-chain CHOs poor absorption , **EXCEPT:**

- a) With reduced activity of brush border enzyme lactase.
- b) Slow, low-capacity transport mechanism across epithelium.
- c) too large for passive diffusion
- d) humans lack digestive enzymes for lactose, sucrose, and maltose

19. Which of the following is a mechanism that contributes to an increase in hepatic metabolism of glucose during the absorptive state?

- a) Increased phosphorylation of glucose
- b) Decreased glycogen synthesis
- c) Increased glycolysis
- d) Increased gluconeogenesis

20. During the absorptive state all tissue use \_\_\_\_\_ as fuel

- a) Glucose
- b) Amino acid
- c) Fatty acid
- d) Starch

21. During the absorptive state there is an increase in fatty acid synthesis. The primary tissue for de novo fatty acid synthesis is;

- a) Liver
- b) Pancreas
- c) Adipose tissue
- d) Muscle

**22. Which type of dietary fibre blocks bile reabsorption and promotes dietary cholesterol excretion?**

- a) Insoluble fibre
- b) Soluble fibre
- c) Dilutional fibre
- d) Nutritional fibre

**23. Soluble fibre is shown to be effective in all of the following EXCEPT ;**

- a) Reducing the risk of cardiovascular disease.
- b) Reducing the risk for osteoporosis
- c) Reducing the risk of colon cancer
- d) Reducing total blood cholesterol

**24. Which of the following are substances in plant foods that are not digested in the stomach or small intestine?**

- a) Dietary Fibre
- b) Dextros
- c) Disaccharides
- d) Simple Sugars

**25. Nutritionists classify fibre in 2 main types. One type is soluble. How is soluble fibre defined?**

- a) It is broken down completely in milk
- b) It dissolves in water
- c) It does not dissolve in orange juice
- d) None of the above

**26. Which statement about vitamins is true?**

- a) Are inorganic
- b) Directly supply energy
- c) Help Regulate Chemical Reactions in the Body
- d) Can be synthesised by the body

**27. The B-group vitamins generally function as:**

- a) Emulsifiers
- b) Co-enzymes
- c) Reducing agents
- d) Antioxidants

**28. This vitamin, when consumed during pregnancy, can help prevent neural tube defects.**

- a) B6
- b) Niacin
- c) Riboflavin
- d) Folate/Folic Acid

**29. Vitamin E functions as a(an)**

- a) Antioxidant
- b) Hormone
- c) Co-enzyme
- d) Enzyme

**30. Which of the following are fat-soluble vitamins;**

- a) Vitamin B1 and Niacin
- b) Vitamin A, Vitamin D, and Vitamin B2
- c) Vitamin A, Vitamin D, Vitamin E, and Vitamin K
- d) Thiamine, Riboflavin, Niacin and Folate

**SECTION B: SHORT ANSWER QUESTIONS****42 MARKS****Question 1****(4 Marks)**

Oligosaccharides can either be a trisaccharides or Tetrasaccharides.

Give an example of each and state the monosaccharide and the number of molecules your examples are composed of.

**a. Tetrasaccharides**

Example: \_\_\_\_\_

Monosaccharide \_\_\_\_\_

Number of molecules \_\_\_\_\_

**b. Trisaccharides**

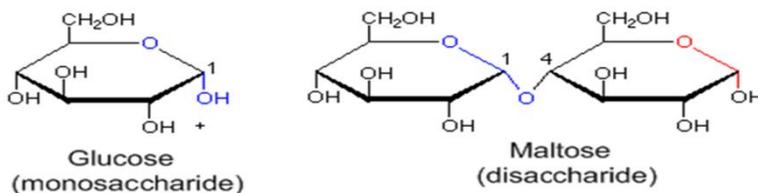
Example: \_\_\_\_\_

Monosaccharide \_\_\_\_\_

Number of molecules \_\_\_\_\_

**Question 2****(3 Marks)**

Study the structure below carefully and answer questions a- c

**a. State the configuration of the molecules**

Configuration: \_\_\_\_\_

**b. Name the bond or linkage in relation to the carbon atoms**

Bond name: \_\_\_\_\_

**c. Name the process that formed the bonds**

Process or Reaction of forming bond: \_\_\_\_\_

**Question 3**

**(3 Marks)**

Name a homo-polysaccharide that presents in plants wall that humans cannot digest and explain why it resists digestion in terms of its structure.

Name: \_\_\_\_\_

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**Question 4**

**(3 Marks)**

Explain the metabolism process of triglycerides to produce energy?

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**Question 5**

**(6 Marks)**

List and explain the roles of the three (3) main lipids that form the components of a cell membrane?

1. \_\_\_\_\_  
\_\_\_\_\_
  
2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
3. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 6**

**(4 Marks)**

List and explain any 2 essentiality groups of amino acids

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 7**

**(3 Marks)**

Explain limiting amino acid and give 2 examples of protein sources with limiting amino acids

- \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
1. \_\_\_\_\_
  2. \_\_\_\_\_

**Question 8**

**(3 Marks)**

Explain how chylomicron transport fats to tissue cells until its conversion to Very Low Density Lipoprotein (VLDL)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 9**

**(3 Marks)**

Differentiate between Low Density lipoprotein and High Density Lipoprotein

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 10**

**(1 Mark)**

Name the enzyme that first initiates the breakdown of protein in the stomach

\_\_\_\_\_

**Question 11**

**(4 Marks)**

List and explain the two main function of HCL in the stomach

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 12**

**(1 Mark)**

Name the polypeptide hormone that stimulate the release of bi-carbonate

\_\_\_\_\_

**Questions 13**

**(3 Marks)**

List the active forms of the following inactive zymogens

Trypsin \_\_\_\_\_

Chymotrypsin \_\_\_\_\_

Elastase \_\_\_\_\_

Carboxypeptidase \_\_\_\_\_

Pepsin \_\_\_\_\_

**Question 14**

**(1 Mark)**

Name the transporter that transport amino acids from outside the small intestine into the enterocyte

\_\_\_\_\_

**Question 1****(13 Marks)**

Carbohydrate is made up of many units of glucose. There are 3 main classes of carbohydrate including; monosaccharides, disaccharide and polysaccharides. Each classes of carbohydrate have different types of carbohydrates with distinctive chemical structures and functions. These different forms of carbohydrate play significant roles in the body.

**A. Glycogen is the storage form of glucose in animals and humans.**

Name two storage form of glucose in plants and differentiate in terms of their structure.

**(3 Marks)**

Storage forms of glucose in plant

1. \_\_\_\_\_

2. \_\_\_\_\_

Differences:

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**B. The main site for digestion of carbohydrates (starch) is in the duodenum of the small intestine. Explain the hydrolysis process of starch.****(3 Marks)**

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**C. After hydrolysis of starch in the lumen a transporter known as the Sodium Glucose Linked Transporter (SGLUT) transports glucose into the cells. Where does the transporter located? What is its function in absorption?****(4 Marks)**

1. Transporter Location \_\_\_\_\_

2. Absorption function

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D. Explain the importance of dietary fiber in preventing obesity. (NB: You can use dot points)

(3 Marks)

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**Question 2**

(10 Marks)

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**Protein molecules are enzymes, immune antibodies, antigens, regulator and some hormones and cells. Proteins are formed from coded amino acids sub units, covalently bonded by peptide bonds**

A. Draw and label the basic amino acid structure. What is the component that differentiates amino acids from another?

(3 Marks)

B. There are 5 groups/classes of amino acids. List any 2 group of amino acid.

(2 Marks)

1. \_\_\_\_\_

2. \_\_\_\_\_

C. Secretion of pancreatic enzymes happens in the pancreas when partially digested protein and HCL enters the duodenum from the stomach. Briefly explain how the process happened. In your answer, include the hormone that involved and name of the inactive and active enzymes.

(5 Marks)

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The fed /fast cycle refers to the chain of events occur after ingestion of a meal. The first part of the cycle is the absorptive state which last 0-4 hours. The post-absorptive state refers to the period after 4 hours leading up to several weeks. This is when the body is in fasting to starvation state.

- A. During the absorptive state amino acids are metabolized and become available more than the liver can use in protein synthesis and other nitrogen containing molecules. The surplus amino acid cannot be stored in the body.

Give 2 ways the body can use the surplus amino acids

(4 Marks)

i. \_\_\_\_\_

ii. \_\_\_\_\_

- B. The liver has a limited capacity to degrade branched chain amino acids therefore these amino acids pass through the hepatic system unchanged

List 2 branch chain amino acids that cannot be degraded.

(1 Mark)

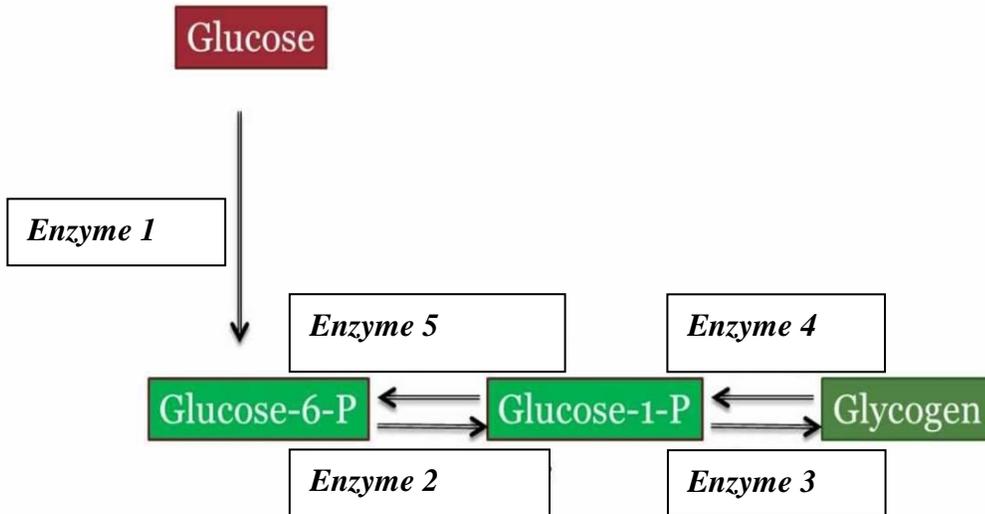
i. \_\_\_\_\_

ii. \_\_\_\_\_

C. Study the diagram below carefully and answer the questions.

(5 Marks)

Glycogen Metabolism Diagram



i. List all the enzymes from the diagram in order

Enzyme 1: \_\_\_\_\_

Enzyme 2: \_\_\_\_\_

Enzyme 3: \_\_\_\_\_

Enzyme 4: \_\_\_\_\_

Enzyme 5: \_\_\_\_\_



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