

UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
DISCIPLINE OF DIETETICS AND HUMAN NUTRITION
EXAMINATION: MAY 2014
SUBJECT, COURSE & CODE: NUTR 224 – MICRONUTRIENTS, NUTRITIONAL
ASSESSMENT, SA

DURATION: 3 HOURS

TOTAL MARKS: 160

External Examiner: Dr N Wiles

Internal Examiner: Dr K Pillay

NOTE: THIS EXAM PAPER CONSISTS OF FIVE (5) PAGES PLUS AN ANSWER BOOKLET (11 PAGES), WHICH MUST BE HANDED IN. PLEASE MAKE SURE THAT YOU HAVE ALL PAGES. PLEASE ANSWER SECTIONS A, B AND C. PLEASE WRITE LEGIBLY AND ANSWER ALL QUESTIONS IN INK. ANSWERS WRITTEN IN PENCIL WILL NOT BE MARKED.

SECTION A	50 MARKS	Questions 1-2
SECTION B	80 MARKS	Questions 3-6
SECTION C	30 MARKS	Question 7

**PLEASE ANSWER ALL OF THE QUESTIONS BELOW.
START EACH QUESTION ON A NEW PAGE**

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SECTION A

MULTIPLE CHOICE QUESTIONS

1 X 30 = 30 MARKS

QUESTION 1

Indicate your answer to each question by placing a circle over the appropriate letter.

Mark allocation as follows:

0 marks if no answer is given

1 mark for each correct answer

- ½ mark for each incorrect answer

Vitamins (1 X 10)

1. The risk of heart disease can be reduced with the use of _____.
 - A. Folic acid
 - B. Nicotinic acid
 - C. Homocysteine
 - D. Ascorbic acid

2. In the citric acid cycle the oxidation of succinate to fumarate requires an enzyme which contains _____.
 - A. Riboflavin
 - B. Thiamin
 - C. Niacin
 - D. Vitamin B6

3. Coenzyme A forms when pantothenic acid combines with a derivative of ADP and part of the amino acid _____.
 - A. Cysteine
 - B. Homocysteine
 - C. Tryptophan
 - D. Methionine

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4. The carboxylation of pyruvate to form oxaloacetate is dependent on ____.
- A. Pantothenic acid
 - B. Vitamin A
 - C. Riboflavin
 - D. Biotin
5. An alternative name for folic acid is ____.
- A. Tetrahydrofolate
 - B. Pteridine
 - C. Folate monoglutamate
 - D. Folate polyglutamate
6. Researchers won six Nobel Prizes between 1934-1965 for the discovery of ____.
- A. Niacin
 - B. Vitamin B12
 - C. Vitamin B6
 - D. Folate
7. Identify the correct statement:
- A. Ascorbic acid is absorbed by facilitated diffusion.
 - B. Vitamin C can be synthesised by guinea pigs.
 - C. Vitamin C is the most stable water soluble vitamin.
 - D. Vitamin C is needed for the conversion of cholesterol to bile acids.

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8. Which enzyme is involved in the formation of calcitriol?
- A. Dioxygenase
 - B. Carboxylase
 - C. Hydroxylase
 - D. Catalase
9. Which stage in the development of xerophthalmia is associated with the development of grey spots of hardened epithelium?
- A. Conjunctival xerosis
 - B. Bitot's spots
 - C. Corneal xerosis
 - D. Corneal ulceration
10. Which of the following requires phosphorus in order to form the active co-enzyme?
- A. Vitamin B6
 - B. Folate
 - C. Pantothenic acid
 - D. Vitamin B12

Water & Minerals (1 X 10)

11. Through which route does the least amount of insensible fluid losses take place?
- A. Faeces
 - B. Lungs
 - C. Urine
 - D. Skin

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12. According to a general household survey in South Africa _____ of people had access to piped water?
- A. 84.5%
 - B. 79.8%
 - C. 71.3%
 - D. 89.5%
13. What is the approximate volume of blood plasma in the human body?
- A. 14 litres
 - B. 17 litres
 - C. 3 litres
 - D. 7 litres
14. Which of the following conditions is treated with a binding agent e.g. penicillamine?
- A. Haemosiderosis
 - B. Fluorosis
 - C. Haemochromatosis
 - D. Wilson's disease
15. Which of the following statements is true?
- A. Copper homeostasis is achieved by regulating excretion rather than absorption
 - B. Metallothionein binds and regulates the release of iron
 - C. Copper helps to metabolise zinc stores
 - D. A deficiency of copper can cause cardiomyopathy

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16. What amount of fluoride is found in 1 cup of fluoridated water?
- A. 0.5 mg
 - B. 0.1 mg
 - C. 0.2 mg
 - D. 0.3 mg
17. Which of the following statements on Type 1 osteoporosis is true?
- A. Affects women aged 50 to 70 years and involves both cortical and trabecular bone.
 - B. Affects women 70 years and older and involves trabecular bone only.
 - C. Affects women 70 years and older and involves both trabecular bone and cortical bone.
 - D. Affects women 50 to 70 years old and involves trabecular bone only.
18. Which of the following statements on temperature regulation is incorrect?
- A. Water has a high specific heat or heat capacity
 - B. More energy is needed to heat fat than water
 - C. Water is the ideal medium for removing heat from the body
 - D. Perspiration prevents a rise in body temperature
19. Which is the major extracellular cation?
- A. Phosphorus
 - B. Sodium
 - C. Potassium
 - D. Chloride

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20. Frequent, prolonged vomiting is most likely to cause a deficiency of_____?
- A. Sodium
 - B. Potassium
 - C. Chloride
 - D. Magnesium

Nutritional assessment (1 X 5)

21. _____ is an example of a laboratory method used to estimate body fat.
- A. Imaging techniques
 - B. Near infrared interactance
 - C. Whole body resistance
 - D. Total body potassium
22. Which of the following components of nutritional assessment is the least subjective?
- A. Anthropometry
 - B. Biochemical assessment
 - C. Clinical assessment
 - D. Dietary assessment
23. Identify the correct statement on the food record or food diary.
- A. Accuracy with recording usually decreases as the number of days in the reporting period increases
 - B. May be recorded over 2, 4, 6 or 8 days
 - C. Only the quantity of food or drink that was consumed needs to be recorded
 - D. The weight of all foods eaten must be recorded

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24. Which of the following factors is likely to have the greatest influence on weight measurements during the day?
- A. Time of day
 - B. Menstruation
 - C. Genetics
 - D. Hydration status
25. Which of the following dietary assessment methods does not involve using a recall?
- A. 24 hour recall
 - B. Food frequency questionnaire
 - C. Food record
 - D. Diet history

Nutrition in South Africa (1 X 5)

26. According to the National Food Consumption Survey (NFCS) of 1999 ____ children were underweight.
- A. 1 in 10
 - B. 1 in 3
 - C. 1 in 6
 - D. 1 in 5
27. According to the South African National Health and Nutrition Examination Survey (SANHANES-1) 2013 the prevalence of vitamin A deficiency amongst adults was highest in the _____ province.
- A. Western Cape
 - B. KwaZulu-Natal
 - C. Mpumalanga
 - D. Gauteng

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28. According to the South African Vitamin A Consultative Study (SAVACG) of 1994, ____ one year old children had an immunisation card.
- A. 9 out of 10
 - B. 6 out of 10
 - C. 5 out of 10
 - D. 8 out of 10
29. According to the NFCS Fortification Baseline 2005 ____ households were at risk of hunger.
- A. 1 out of 2
 - B. 1 out of 3
 - C. 1 out of 4
 - D. 1 out of 5
30. In the South African Vitamin A Consultative Study (SAVACG) of 1994 what was the age group of the children studied?
- A. 6-71 months
 - B. 1-9 years
 - C. 6-23 months
 - D. 2-6 years

END OF MULTIPLE CHOICE QUESTIONS

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SHORT QUESTIONS

20 MARKS

QUESTION 2

2.1 Give the name of the principal ingredient found in Roaccutane/Accutane. [1]

.....

2.2 Which form of vitamin D is found in vitamin D supplements? [1]

.....

2.3 List four (4) sources of thiaminase. [$\frac{1}{2} \times 4=2$]

.....

.....

2.4 Give the name of the sugar that is found in the riboflavin structure. [1]

.....

2.5 Name two (2) alkaline substances that can be used to treat grain products in order to free niacin. [$\frac{1}{2} \times 2=1$]

.....

2.6 Calculate the amount of vitamin A in RAE that can be obtained from 8 μg retinol, 60 μg of beta-carotene and 48 μg of alpha-carotene. *Please show working.* [2]

.....

.....

.....

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2.7 Define **heat capacity** or **specific heat**. [2]

.....

.....

.....

.....

2.8 Name two (2) thyroid hormones that are synthesised from iodine. [$\frac{1}{2} \times 2=1$]

.....

.....

2.9 List four (4) factors that inhibit the absorption of calcium. [$\frac{1}{2} \times 4=2$]

.....

.....

2.10 Name the condition in which there is an inherited inability to absorb zinc. [1]

.....

2.11 Which type of study is a classic method for studying the functions of nutrients and estimating the requirements of a nutrient? [1]

.....

2.12 According to the South African National Nutrition Survey Study of 1995 which group consumed the least alcohol? [1]

.....

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2.13 Which dietary questionnaire showed seasonality effects in the National Food Consumption Survey of 1999? [1]

.....

2.14 According to the National Food Consumption Survey of 1999 which foods were the most frequently and consistently consumed? [$\frac{1}{2} \times 6=3$]

.....

.....

END OF SHORT QUESTIONS

END OF SECTION A

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SECTION B

QUESTION 3

- 3.1 Discuss the role of vitamin D in regulating blood calcium levels. [9]
- 3.2 Explain why a high intake of animal protein increases the risk for osteoporosis. [4]
- 3.3 List five (5) limitations of using the diet history method of dietary assessment. [1 X 5 = 5]
- 3.4 Explain what a placebo is and why it is sometimes used in research. [2]

TOTAL = 20 MARKS

QUESTION 4

- 4.1 Discuss the factors which affect the absorption of vitamin B12. [11]
- 4.2 Discuss the findings of the South African National Nutrition Survey Study of 1995 in terms of energy, protein and fat only. [9]

TOTAL = 20 MARKS

QUESTION 5

- 5.1 You are given the following hypothesis on magnesium:

When magnesium is removed from the diet it causes a lack of muscle coordination. This suggests that magnesium is needed for muscle contraction. When enough magnesium is added to the diet again, muscle control returns. The requirement for magnesium is determined to be the amount of magnesium needed to return muscle control to normal.

- 5.1.1 What type of study can be used to test this hypothesis? [1]

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- 5.1.2 Explain how this type of study is conducted. [5]
- 5.2 Discuss the diurnal variation in weight. [7]
- 5.3 Explain the difference between the 24 hour recall and the diet history as methods of dietary assessment. [3]
- 5.4 List four (4) functions of pantothenic acid. [1 X 4 = 4]

TOTAL = 20 MARKS

QUESTION 6

- 6.1 A businessman has just boarded a flight with an anticipated flying time of 12 hours. He has a fear of using the bathroom on the aircraft and to avoid having to use the bathroom he has decided that he will not drink any fluids for the duration of the flight.
- 6.1.1 Explain how the brain will respond to him deciding not to drink any fluids. [10]
- 6.1.2 What additional dietary changes besides reducing his fluid intake could he make to reduce his urine output and explain why? [2]
- 6.1.3 Explain why being on the aircraft for this length of time increases the risk for dehydration. [4]
- 6.2 For each of the following nutrients listed below, indicate one laboratory test that could be used to assess nutritional status. [1 X 4 = 4]
- Thiamin
 - Iodine
 - Niacin
 - Vitamin B6

TOTAL = 20 MARKS

END OF SECTION B

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SECTION C

30 MARKS

QUESTION 7

Mr X is a 72 year old male patient who was admitted into hospital complaining of stomach pain, loss of appetite, nausea and weight loss. At a hospital visit 3 months ago he weighed 76 kg while his current weight is 58 kg.

His biochemical tests revealed the following:

Haemoglobin	10.2 g/dl	(12.3-17 g/dl)
Haematocrit (Hct)	30%	(36-50%)
Red Blood Cells (RBC)	$2.0 \times 10^{12}/L$	$(4-5.7 \times 10^{12}/L)$

After thorough medical investigations Mr X was diagnosed with cancer of the stomach and iron deficiency anaemia.

- 7.1 Carry out an anthropometric assessment on Mr X using the information that you have been given. [6]
- 7.2 Identify all possible nutritional risk factors in this case. [$\frac{1}{2} \times 8 = 4$]
- 7.3 The doctors have decided to give Mr X an iron supplement but it is not to be administered orally. Explain what other route could be used to administer the iron and explain why this route should be used. [5]
- 7.4 Mr X has been taking a calcium supplement for the past 2 years and he has heard that this may be a problem as the doctor has prescribed the iron supplement (as mentioned in 7.3)
 - 7.4.1 Is it necessary for Mr X to stop his calcium supplement? [1]
 - 7.4.2 Justify your answer. [2]
- 7.5 Complete a diet plan for Mr X using the dietary prescription given below. Make use of all of the exchanges on the next page when doing the diet plan. [12]

Total energy = 8450 kJ

Carbohydrate = 55 % of total energy (TE)

Fat = 30 % of TE

Protein = 15 % of TE

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Please make use of all of the following exchanges:

- Low fat milk
- Vegetables
- Fruit
- Starch
- Medium fat meat
- Fat
- Sugar

END OF SECTION C