THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURE SCIENCE.

2016/2017 ACADEMIC MID YEAR EXAMINATIONS

1.	AGA	3201	PRINCIPLES OF ANIMAL NUTRITION
2.	AGA	3335	PRINCIPLES OF ANIMAL SCIENCES
3.	AGA	4311	PRINICPLES OF GENETICS
4.	AGA	4511	BEEF, SHEEP AND GOAT PRODUCTION
5.	AGA	4531	INTRODUCTION TO AQUACULTURE
6.	AGA	5121	ADVANCES IN ANIMAL NUTRITION
7.	AGA	5321	APPLIED ANIMAL REPRODUCTION
8.	AGC	3121	CROP PRODUCTION
9.	AGC	5331	PRINICIPLES OF WEED SCIENCE
10.	AGC	5421	ADVANCED HORTICULTURE
11.	AGE	2111	FUNDAMENTALS OF MICROECONOMICS
12.	AGE	3381	RESEARCH METHODOLOGY
13.	AGE	4131	PRODUCTION ECONOMICS
14.	AGE	4211	INTRODUCTION AGRIBUSINESS MANAGEMENT

15. AGE	5151	INTERNATIONAL AGRICULTURAL MARKETS, TRADE AND DEVELOPMENT
16. AGE	5241	PRINCIPLES OF FARM MANAGEMENT
17. AGE	5251	AGRICULTURAL PROJECT PLANNING AND APPRAISAL
18. AGF	2015	FUNDAMENTALS OF ORGANIC CHEMISTRY
19. AGF	2401	INTRODUCTION TO INFORMATION COMMUNICATION AND TECHNOLOGY
20. AGF	3021	CHEMICAL TECHNIQUES IN FOOD ANALYSIS (THEORY EXAM)
21. AGF	3031	FOOD CHEMISTRY (THEORY EXAM)
22. AGF	3042	INSTRUMENTAL METHODS IN FOOD ANALYSIS (THEORY EXAM)
23. AGF	3201	TECHNICAL THERMODYNAMICS
24. AGF	4065	NUTRITION
25. AGF	4221	PROCESS CONTROL AND INSTRUMENTATION
26. AGF	5071	FOOD COLLOIDS
27. AGF	5241	PLANT DESIGN AND ENVIRONMENT MANAGEMENT
28. AGF	5321	TECHNOLOGY OF DAIRY AND EGG PRODUCTS

29. AGF	5615	PROCESSING AND PRESERVATION OF PLANT PRODUCTS
30. AGG	3811	RURAL SOCIOLOGY
31. AGG	4851	EXPERIMENTAL DESIGN AND STATISCAL ANALYSIS
32. AGN	2110	ANATOMY AND PHYSIOLOGY
33. AGN	3222	HUMAN NUTRITION
34. AGN	3311	NUTRITION ASSESSMENT
35. AGN	4241	NUTRITION DISORDERS
36. AGN	4321	RESEARCH METHODS AND EPIDEMIOLOGY FOR NUTRITIONSTS
37. AGN	4520	PUBLIC HEALTH NUTRITION
38. AGN	5531	FOOD AND NUTRITION SECURITY
39. AGS	3711	AGRO-CLIMATOLOGY
40. AGS	4221	SOIL AND PLANT ANALYSIS
41. AGS	5121	SOIL GENESIS AND CLASSIFICATION
42. AGS	5131	SOIL SURVEY AND GIS TECHNIQUES
43. AGS	5411	SOIL MICROBIOLOGY
44. AGS	5511	AGRICULCUTRAL HYDRAULICS AND IRRIGATION DEVELOPMENT

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ANIMAL SCIENCE

AGA 3335 (Principles of Animal Science)
2016 FINAL EXAMINATIONS

INSTRUCTIONS TO CANDIDATES:

All questions carry equal marks
Answer any five (5) questions from the six questions provided
Use a separate answer booklet for each section

SECTION A – ANATOMY AND PHYSIOLOGY

QUESTION 1.

With regard to domestic animals;

(a) Briefly explain two mechanisms involved in regulating heat exchange with the environment. [4]
(b) Describe the types of respiration. [4]
(c) State the glands accessory to the male reproductive system. [4]
(d) Using a well labelled diagram, show the main features of a monogastric digestive system. [8]

QUESTION 2.

With regard to domestic animals;

(a) State the body cavities and membranes surrounding these cavities. [10]
(b) Explain what shunts are. [1]
(c) With the aid of an example, describe one portal system. [2]
(d) Using a well labelled diagram, show the main features of a female reproductive system. [7]

SECTION B – BEEF AND DAIRY PRODUCTION

QUESTION 1

(a) State why dairy farmers prefer a spray race over a dip tank for tick control. **[2]**
(b) Briefly explain why a dip tank is more efficient and cost-effective in tick control. **[6]**
(c) Why should a dairy calf have access to colostrum within the first 24 hrs of its life?

[6]

(d). Differentiate the following pairs of terms used in dairy production;

(i) Lactation age and lactation period [2]

(ii) Gestation period and calving interval [2]

(iii) Breed and type [2]

QUESTION 2.

(a) The generally recommended breeding season in Zambia is from 15th December to end of March. Explain at least five (5) advantages associated with bullying the cows during this period of the year [5]

(b) Why should a heifer coming on heat for the first time during this bullying season not be allowed to be serviced? [4]

(c) Write down at least two (2) distinguishing characteristics of the following breeds of beef cattle;

(i) Brahman [2]

(ii) Herefold [2]

(iii) Angoni [2]

(d) State five (5) reasons why you would recommend beef cattle rearing as an enterprise of choice for someone who is not sure about the best farming enterprise to invest money in? [5]

SECTION C – POULTRY AND PIG PRODUCTION

QUESTION 1

(a) Broilers are highly susceptible to diseases. For this reason, a hygiene protocol must followed. Give a detailed hygiene protocol for a poultry house. [10]

(b) What is biosecurity? Give two main objectives of biosecurity. [5]

(c) Dead and culled birds can be a source of infection in poultry houses. They should be collected and disposed off, daily. Briefly describe two methods of bird disposal. [5]

QUESTION 2

(a) Farrowing is an important part of pig production. What is farrowing and what are the signs or indications of farrowing? What are the factors that cause delays in the farrowing process? [10]

(b) There are four major aspects of organic regulations that relate to pig production, they include: source of animals, feed, healthcare, and living conditions. Briefly discuss any two of these four aspects. [10]

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2016/17 ACADEMIC YEAR – MID-YEAR EXAMINATIONS

COURSE AGA 4311 – PRINCIPLES OF GENETICS
TIME ALLOWED: THREE (3) HOURS ONLY
INSTRUCTIONS TO CANDIDATES:

a. Answer Question1 from Section A and any three (3) questions from Section B.
b. All Questions carry equal marks (25).
c. Clearly show all the calculations.

SECTION A

Q.1 Sickle cell anemia is a heritable condition which is believed to be controlled by a locus with two alleles, say W and B. One allele is dominant (W) and the other allele is recessive (B). The homozygous recessive genotype tends to be anemic while the other genotypes are not anemic. In the following population it was found that 80 percent of the homozygous genotype individuals were not producing offspring.

Genotype	WW	WB	BB
Individuals	400	200	200

a. Determine the gene frequency of allele B after one generation of natural selection.

b. Determine the change in gene frequency of allele B in the population after one generation of natural selection.

c. Determine the variance of the alleles at this locus in the base population.

d. If artificial selection is applied in which all homozygous recessive individuals are not allowed to reproduce and assuming that in humans the generation interval is 28 years, determine the number of generations that it would take to reduce the gene frequency of B to 12.5%.

SECTION B

Q.2 a. Assume that in the fruit fly, ***Drosophila melanogaster***, there are three (3) pairs of alleles +/a, +/b and +/c. As shown by the symbols each mutant allele is recessive to its wild type allele. Across between females

that are heterozygous at all three loci and wild type males gives the following results:

+ b +	441
a + c	430
a b c	39
+ + c	32
+ + +	30
a b +	27
+ b c	5
a + +	3

i. Are these genes linked? Justify your answer.
ii. What is the correct order of the genes?
iii. What are the genotypes of the flies involved in the parental cross and the test cross?
iv. What is the map distance between the genes?
v. Calculate the coefficient of coincidence.

b. Write notes on Chromosomal and Point Mutations.

Q. 3 Outline the structure of Deoxyribonucleic Acid (DNA) in relation to its function as a carrier of genetic information. How is this information translated to the sequence of amino acids in proteins?

Q. 4 a. Explain, with the aid of clear examples, the Laws of Inheritance. Under what conditions do the Laws not hold? What are the expected ratios in the F_2 generations when one of the two genes are segregating and behaving independently?

b. Given that the genes R, S and T are linkage group with 15% recombination between R and S, and 25% recombination between S and T; and that the Coefficient of Coincidence is 0.6, what are the expected frequency of phenotypes from a test cross whose progeny are 1000?

Q. 5 With the aid of clear examples, write notes on the following:

a. A test cross and its use;
b. Complementary gene action;
a. Sex determination and linkage;
b. Multiple alleles and co-dominance; and
c. Causes of sterility following the mating of closely related species.

End of Examination

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ANIMAL SCIENCE

2016 Academic Year Mid-Year Examinations
Course: AGA 3201 – Principles of Animal Nutrition

Date: 8th May 2017 (09:00 Hours): Time Allowed: Three (3) Hrs.

INSTRUCTIONS TO CANDIDATES:

Answer any **five (5)** questions and use separate answer booklets for Section A and B. All questions carry 20 equal marks.

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SECTION A

1.0 A). What are the main sources of dietary lipids for non-ruminants and why are lipids important in non-ruminant farm animals **(5 Marks)?**

B). Explain in detail the digestion of lipids in non-ruminants and how the end products are absorbed and mobilized for metabolism in different parts of the body **(15 Marks)?**

2.0 A). Explain the metabolism of glucose through the gylcolysis pathway and explain the limitations of this pathway in the generation of energy from precursors **(10 Marks)**?

B). Apart from Glucose, what are the alternative raw materials or metabolites for glycolysis and how do these metabolites get mobilized in the pathway **(10 Marks)?**

3.0 A). What do you understand by the term "feeding standards" and explain how feeding standards for different types of animals were developed over the years **(8 marks)?**

B). What are the main factors affecting the quality of proteins meant for feeding non-ruminants and how would you go about in determining the quality of these proteins **(12 Marks)?**

SECTION B

4.0 Write short notes on the following:

A). Advantages and disadvantages of post-gastric fermentation when compared with pre-gastric fermentation **(5 marks)?**

B). Biochemical functions of either Sodium or Iodine in farm animals **(5 Marks)?**

C). Roles of either Vitamin A or Vitamin C in farm animals **(5 Marks)?**

D). Major lipid constituents of ruminant diets, dietary sources and the major fatty acid component of each constituent **(5 Marks)?**

5.0 A). What are the main sources of carbohydrates in ruminant diets and what are the major constituents of these carbohydrates **(5 Marks)?**

B). Explain in detail the digestion of carbohydrates in the rumen and how the end-products of digestion are absorbed and metabolized in the animal body **(15 Marks)?**

6.0 A). Discuss the environmental factors that influence feed intake in ruminants **(10 Marks)?**

B). What steps would you take to improve voluntary feed intake in ruminants **(6 Marks)?**

C). Why is it important to determine feed intake in farm animals **(4 Marks)?**

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES

2016 ACADEMIC YEAR
FINAL EXAMINATIONS

AGA 4531: INTRODUCTION TO AQUACULTURE
THEORY PAPER

TIME: THREE HOURS

INSTRUCTIONS: ANSWER **FIVE** QUESTIONS: ANSWER QUESTIONS **1** AND **2** IN **SECTION A** AND QUESTIONS **5** AND **6** FROM **SECTIO B** AND A **FIFTH** QUESTION FROM **EITHER** SECTION. ILLUSTRATE YOUR ANSWERS WHERE NECESSARY. USE **SEPERATE** EXAMINATION ANSWER BOOKS FOR **EACH** SECTION

SECTION A

1. Discuss the following terms and concepts in relation to fish growth and taxonomy:
   (a) Type specimen.
   (b) Clupeidae
   (c) Perciformis.
   (d) Growth coefficient (k).
   (e) Fulton's condition factor.

2. A fish specimen was caught when it had total length of 35.7 cm and scale length of 4.7 cm. Using annual rigs on scales, age was determined to be three (3) years. The first and second annual rings on the scale were 2.2 cm and 3.8 cm. Given that:

$$L_n/L = S_n/S$$

   (a) Estimate total fish lengths at ages of 1 and 2 years.
   (b) Discuss advantages of computing fish growth curves using annual rings compared to the tagging methods.

3. (a) Summarise key identification features and characteristics of the family Cichlidae.
   (b) Name any four Cichlid species and highlight the significance of the family in aquaculture.
   (c) Discuss advantages and difficulties associated with farming Cichlids.

4. (a) Describe prominent characteristics of the family Clariidae.
   (b) Summarise difficulties associated with farming Clarids.

TURN OVER

SECTION B

5. Describe the breeding biology of Tilapiines with reference to *Tilapia rendalli* and *Oreochromis andersonii* emphasizing on their similarities and differences.

6. As an Aquaculture Research Officer attending an aquaculture conference you are requested to present a paper on Tilapia breeding. Summarise your presentation showing how prolific breeding behaviour of Tilapiines can be controlled.

7. Describe the steps that an aquaculturist could follow during induced breeding of carp fish in a hatchery.

8. Explain the important procedures that must be followed in the transportation fingerlings from Chilanga Government fish farm to farmers' ponds in Kasama Farming Block.

END OF THE EXAMINATION

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2016/17 ACADEMIC YEAR – FIRST HALF EXAMINATIONS

COURSE AGA 4511 – Beef, Sheep and Goat Production

TIME ALLOWED: Three (3) hours only

INSTRUCTIONS TO CANDIDATES:

a. Answer any **three (3)** questions from Section A and any **two (2)** others from Section B.
b. All Questions carry equal marks (20).
c. Use different answer books for each Section.

SECTION A – Beef Production

Q. 1 Zambia's ability to capture the potential economic benefits of expanded beef industry is constrained by gaps in productivity and price competitiveness. The beef industry in Zambia has great potential to becoming a major foreign exchange contributor to the national treasury.

a. Give reasons as to why the beef industry has great potential for growth in Zambia.

b. What would it take for the industry to achieve their potential?

Q. 2 a. What is the best time to breed beef cattle under Zambian conditions? Give reasons to support your answer.

b. Mention and explain the types of beef rearing systems in Zambia.

Q. 3 a. Outline the characteristics of local tropical breeds of cattle that make them to be more adapted to the local Zambian environment compared to the temperate breeds.

b. Kraals are an important type of housing of beef cattle among the traditional cattle farmers in Africa. Outline the common problems of kraals used under the traditional sector. What advice can you give to these farmers so that there is better use of the kraals.

c. It is very important to have the correct type of animal species to be used for draft power on the farm. Outline the factors to consider when selecting the correct species. Please give examples. What animal species would you recommend for use by the small scale farmers in Zambia and why these species?

SECTION B – Sheep and Goat Production

Q. 5 In Zambia, especially in the cattle rearing areas of Southern and Western Provinces, sheep and goats have been described as the poor man's cattle:

a. Discuss with a farmer group based in Chongwe District any five (5) constraints associated with sheep and goat production in Zambia; and

b. Good nutrition provides good health, high reproduction, high milk yields, fast growth rate and a profitable enterprise. Discuss the farmer group based in Chongwe District the factors that may affect the dry matter in take in their flocks of Sheep and Goats.

Q. 6 a. Selection is the process of choosing certain individuals as future parents of the next generation in preference to others. Selection is carried out in order to improve the average performance of sheep and goats. What are the factors that should be taken into consideration in the process of selecting of ewes and nannies as breeding stock?

b. An emergent commercial farmer who has just learned that ewes or does should be bred during the last half of the oestrus. Discuss with the emergent commercial farmer any ten (10) signs of oestrus (heat) in ewes or does that he should out for in the 87 flock of sheep and goats.

Q. 7 Having been recently appointed as the Farm Manager of an intensive sheep and goat enterprise at UNZA's Liempe Farm, discuss in detail with the Deputy Vice Chancellor of UNZA, the restricted breeding seasons of sheep and goats that could be adopted for use on the farm, highlighting their advantages and disadvantages. With convincing reasons to the Vice Chancellor recommend the use of any one of the breeding seasons.

End of Examination

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2016/17 Academic Year – First Half Examinations

Course AGA 5121 – Advances in Animal Nutrition

Date: Thursday 11th May 2017 **Time Allowed: Three (3) Hours Only**

Instructions to Candidates:

a. **Answer any five (5) questions.**
b. **Each question carries equal marks (20 Marks).**
c. **Use separate answer books for each section.**

SECTION A (RUMINANT NUTRITION):

Q. 1 The University Farm at Liempe Farm would like to compound a feedlot ration for 304 steers by making use of readily available feedstuffs in order to reduce the costs of production. Tabulated below are the results of the analyses of the various feedstuffs that the Farm Manager obtained from the Animal Science Department Laboratory:

Analyses of available feedstuffs

FEED	DM%	DCP%	TDN%	Ca	P
Rhodes/Silver leaf	92	22.5	58	1.90	0.20
Maize Bran	90	12.5	70	0.07	1.62
Molasses	75	-	85	1.19	0.11
Soyabean Straw	88	25.0	65	0.69	0.06
Other available feedstuffs at Liempe Farm are:					
Maize Meal	89	10.0	88	0.03	0.31
Groundnut Meal	95	43.0	90	0.18	3.62
Groundnut Haulms	87	12.0	62	0.07	0.17
Lucerne Hay	90	15.0	60	0.27	0.03

Formulate a dry season feedlot ration for the beef steers, with the help of the Pearson Square. The feedlot ration must contain 14% DCP and 75% TDN and must include 12% Rhodes Grass and Silver leaf Hay, 10% Maize Bran, 8% Soyabean Straw, 3% Sugarcane Molasses and 1% Mineral Premix, 1% Dicalcium Phosphate and 1% Salt on dry matter basis.

Q. 2 a. How much concentrate mixture consisting of 50% Maize Meal, 30% Cottonseed Cake, 10% Cassava Meal and 10% Cane Molasses should be fed to provide sufficient energy to maintain a 650 kg empty Holstein cow that is losing 0.5 kg

body weight per day two weeks post-partum yet it is consuming 25 kg/day Maize Silage and is producing 25 kg/day milk containing 3.8% butterfat (BF) and 8.6% solids-not-fat (SNF) per kg?

The following may be used to answer the question:

	DM (g/kg)	**ME (MJ/kg DM)**
Star grass	300	9.0
Maize Meal	870	12.5
Cane Molasses	770	14.0
Cottonseed cake	920	13.0
Cassava meal	870	11.0

b. Calculate the anticipated peak milk production of the Holstein cow.

c. If the Holstein cow in Q. 1 a. above was actually in mid-lactation and there was no live-weight change in her body weight, how much concentrate mixture should she be fed?

d. If the Holstein cow in Q. 1 a. above was actually in late lactation and was gaining 0.5 kg per day, how much concentrate mixture should she be fed?

e. Using the Rapid Formulation Method calculate the forage and concentrate dry matter intake of the Holstein cow in Q. 1 a. above?

Q. 3 a. Ruminant animals, unlike monogastric animals, are able to subsist entirely on vegetative materials. Discuss this statement by highlighting the functions of micro-organisms in the ruminant stomach and the symbiotic relationships that exists between the ruminant animal and microbes.

b. The Farm Manager at the University Farm at Liempe Farm is operating a very successful cattle feedlot. How much is are the Brahman steer that weigh on average 385 kg expected to grow if they are fed each on a daily ration consisting of the following feed-stuffs:

10.0 kg Maize Silage (300 g/kg DM, 8.6 MJ ME/kg DM)
5.0 kg Maize Meal (850 g/kg DM, 12.5 MJ ME/kg DM)
2.0 kg Cane Molasses (270 g/kg DM, 13.0 MJ ME/kg DM)

Q. 4 a. Using algebraic expressions, formulate a Layer's Ration to have 17% crude protein using Maize Meal, Sorghum Meal, Soybean Cake, Fish Meal, Limestone, DCP and a Vitamin/Mineral Premix. The inclusion of Sorghum Meal, Fishmeal, Limestone, DCP and the Vitamin/Mineral Premix in the ration are fixed at 16.0, 4.0, 3.0, 1.5 and 0.5%, respectively. What are the Energy, Calcium and Phosphorus contents of this diet? Assuming that the nutritional requirements for laying chickens are set at 3000 kcal/kg of metabolizable energy, 17% Crude

Protein, 3.5% Calcium and 0.7% phosphorus, is this diet suitable for the intended purpose? How would you correct for the deficiency? The nutrient compositions of required ingredients are tabulated in Table 1.

Table 1: Nutrient composition of ingredients required for the formulation of rations.

Ingredient	**Energy (Kcal/kg)**	**Protein (%)**	**Calcium (%)**	**Phosphorus (%)**
Maize	3300	9.0	0.04	0.30
Soy bean Cake	3000	44	0.3	0.65
Sorghum	3200	10	0.05	0.40
Fish Meal	2900	70	3.5	2.50
Limestone	0	0	38	0
Di-calcium Phosphate	0	0	24	18
Vitamin/Mineral Premix	0	0	0	0

b. Using the Pearson Square Method, formulate a ration to have 1.22% Lysine using Maize Meal and Soybean Cake. The ration is also supposed to have DCP and a Vitamin/Mineral Premix fixed at 1.5 and 1.0%, respectively. The content of Lysine in Maize and Soya cake are fixed at 0.8 and 2.6%, respectively. The rest of the nutrients are as indicted in Table 1 above. What are the energy, protein, Calcium and Phosphorus content of the ration?

Q. 5 a. Explain in detail why we need minerals in animal rations?

b. What are the key major differences between minerals and vitamins and why are vitamins and minerals termed to be essential in animal rations?

c. What are the main sources of phosphorus in animal rations and what are the limitations for using feeds of plant and animal origin as sources of phosphorus non-ruminant diets?

Q. 6 a. When formulating animal diets, we strive to match animal nutritional requirements with nutrient composition of feed ingredients. What do you understand by the term animal nutritional requirements?

b. Most of nutritional requirements are based on established feeding standards. What are the advantages and disadvantages of using international feeding standards in preparing feeds for local animals?

c. What steps would you need to take in order to improve palatability of feeds in non-ruminants?

End of Examination

The following may be used to answer the questions:

i. $Ml = \frac{EVl \times 1.05}{0.62}$

ii. $Kg = 0.0435\ M/D$

iii. $MEP = MER - Mm$

iv. $Mm = 8.3 + 0.091\ W$

v. $FD = \frac{DMI\ (MC - M/D)}{(MC - MF)}$

vi. $DMI = 0.025\ W + 0.1\ Y$

vii. $Eg = \frac{MEP \times 0.0435\ M/D}{1.05}$

viii. $Eg = MEP \times 0.0414\ M/D$

ix. $DMI = 0.025\ W + 0.1\ Y - 2.5$

x. $LWG = \frac{Eg}{6.28 + 0.3\ Eg + 0.0188\ W}$.

xi. $Kl = \frac{0.0435\ M/D}{1.05}$ or $0.0414\ M/D$

xii. $EVl = 0.0386\ BF + 0.0205\ SNF - 0.236$

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ANIMAL SCIENCE

FINAL EXAMINATIONS: FIRST HALF-YEAR 2016/17
COURSE: AGA 5321 APPLIED ANIMAL REPRODUCTION
DURATION: THREE (3) HOURS

INSTRUCTIONS:
- **ANSWER EACH SECTION IN A SEPARATE ANSWER BOOKLET**
- **CAREFULLY READ INSTRUCTIONS FOR EACH SECTION**
- **BEGIN EACH QUESTION ON A NEW PAGE, AND,**
- **INDICATE THE NUMBER OF EACH QUESTION ATTEMPTED**

SECTION A

INSTRUCTIONS: **ANSWER QUESTION ONE** AND **EITHER QUESTION TWO** OR **THREE IN THIS SECTION**

QUESTION ONE

A) What is the purpose of the following products or terms in animal reproduction? [20]

i. Atretic follicle
ii. Transgenic animal
iii. Free martin
iv. Estrumate®
v. Zona Reaction

B) Profitable animal production enterprises rely on successful reproduction.
i. State the phases and stages of the oestrous cycle in cattle. [6]
ii. Name two functional structures you would find on the ovary [2]
iii. What are the main products of the structures identified in B (ii) above? [2]

QUESTION TWO

With regard to domestic animals
A) Use a diagram to show the components of an ovarian Graafian follicle. [10]
B) Briefly explain the regulation of follicular development and ovulation. [5]
C) Discuss the factors involved in sperm penetration of an oocyte. [6]
D) Briefly discuss thermoregulation in animal testes. [4]
E) Explain the factors involved in and the timing of bovine luteal regression. [5]

QUESTION THREE

A) With regard to Animal biotechnology;

i. Under the heading agriculture, medical and industrial, discuss the Application of transgenic animals. [12]
ii. Describe one method used to produce sexed semen in cattle. [2]
iii. What one method would you use for positive pregnancy diagnosis? [2]
iv. Explain why you would or would not administer FSH orally. [2]

B) Explain your preferred option in the quest to resolve the following cases;

i. A cow presenting with a retained placenta. [3]
ii. Poor oestrus detection. [3]
iii. Dystocia in heifers? [3]
iv. Milk fever. [3]

SECTION B

INSTRUCTIONS: ANSWER BOTH QUESTIONS IN THIS SECTION

QUESTION ONE (20)

You have been asked to provide technical advice on the setting up an artificial insemination centre for production of boar semen. Write down the contents of a manual that should be used in the Artificial insemination centre under the following headings:

a. Semen collection
b. Semen evaluation
c. Semen processing
d. Semen storage
e. Semen utilisation.

QUESTION TWO (20)

Artificial insemination of farm animals is a very important technique in today's agriculture industry both in the developed and the developing world.

i). Explain how artificial insemination can be used to make quick genetic improvement of our local livestock species (12 marks)

ii). What are some of the challenges of using AI under Zambia conditions and how can these challenges be overcome (8 marks).

END OF EXAMINATION – GOOD LUCK – BOONE CHANCE

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF PLANT SCIENCE
Third Year Examinations for Bachelor of Agricultural Sciences
AGC 3121: CROP PRODUCTION
Final Examination 2016/2017 Academic Year

Date: 9th May 2017 **Time: 9:00 – 12:00 hrs** **Venue: OMNIA 1,2& 3**

Instructions: There are two Sections, A and B.
Use a separate answer booklet for each Section.
Answer all Questions.
Marks are as indicated.

Section A

Question 1

a. Name the family to which cereal crops belong. **(1 mark)**
b. Outline the economic importance of cereal crops. **(7 marks)**
c. Wheat (*Triticumspp*) is grown twice a year by both commercial and small-scale farmers in Zambia. As an Agronomist, what advise would you give for each category of farmers regarding specifications they need to know during the planting operation? **(9 marks)**

Question 2

a. What makes paddy Rice (*Oryzasativa*) production different from the production of other field crops? Explain this difference in terms of land preparation for paddy Rice. **(10 marks)**

b. As a Weed Specialist, you have been requested to give a presentation on weeds to Zambia College of Agriculture (ZCA) students. Taking Cotton (*Gossypium spp*) as an example, what would you include in your presentation? **(13 marks)**

Question 3

a. Maize is the main field crop grown by most farmers in Zambia and its yield is dependent upon timely management practices. Mention two management practices that were employed on the maize crop that was grown at the field station. **(2 marks)**

b. MaizeSeed companies in Zambia offer a wide range of maize varieties on the market. Name the maize variety that was planted at the field station. **(1 mark)**

c. Maize seed varieties come with recommended seed spacing. What seed spacing was employed to the maize variety mentioned in question (3b) above? **2 marks)**

d. In the recent past, insect pest incidences and attacks on field crops has been attributed to climate change, the field station is no exception. Name one insect pest that posed as a challenge on the maize crop that was planted. **(2 marks)**

e. What were the main destructive features that were present on the crop? **(2 marks)**

f. Name the insecticide that was used to reduce the pest damage. **(1 mark)**

g. Pesticides are divided into categories. Name these categories. **(3 marks)**

h. For each category, name the control spectrum. **(3 marks)**

i. Reading the pesticide label carefully is very important.What does the abbreviation "A.I" on most pesticides represent? **(1 mark)**

j. How are the warning signs on the pesticide label presented? **(2 marks)**

k. Name only two colour codings of a pesticide label. For each coding, describe the warning. **(4 marks)**

l. Describe the warning signs on A and B below. **(2 marks)**

Section B

Question 4

You carried out a study on maize field performance at the Field Station of the School of Agricultural Sciences of the University of Zambia. Field data on maize performance on row 5, row 15 and row 30 randomly selected in the maize field is given Table 1. Soil moisture content with depth was measured withthe neutron moisture probe for the same maize rows. Initial soil moisture content was measured in the same area of the study. The moisture content was measured a week later in row 5 and row 15.The results including those of the initial moisture reading are given in Table 2.

Table 1: Plants traits evaluated

Plant	Plant height (cm)			Plant thickness at base (cm)			Chlorophyll Index			Cob thickness (cm)			Colour of silk		
	Row 5	Row 15	Row 30	Row 5	Row 15	Row 30	Row 5	Row 15	Row 30	Row 5	Row 15	Rown30	Row 5	Row 15	Row 30
1	149	190.2	61.0	7.8	8.0	3.4	56.8	62.5	15.4	0.0	3.2	0.0	N/A	Light green	N/A
2	176	190.6	89.0	10.9	8.0	4.4	30.4	33.4	11.7	4.2	3.8	0.0	N/A	N/A	N/A
3	150	190.8	121.0	10.7	8.9	6.0	25.4	27.9	14.4	0.0	5.6	0.0	N/A	N/A	N/A
4	108	190.3	111.0	10.0	7.8	6.0	37.7	41.5	15.8	0.0	4.0	0.0	N/A	N/A	N/A
5	119	190.0	84.0	8.4	8.2	7.4	43.0	47.3	19.8	0.0	4.1	0.0	N/A	Pinkish	N/A
6	117	190.3	100.0	7.6	8.8	6.2	36.7	40.4	15.2	0.0	3.2	0.0	N/A	N/A	N/A
7	151	190.6	82.0	8.0	8.0	7.1	23.8	26.2	4.5	0.0	5.7	0.0	N/A	N/A	N/A
8	138	190.6	91.0	8.4	9.0	9.2	63.6	70.0	7.8	0.0	4.5	0.0	N/A	Light green	N/A
9	150	190.2	98.0	8.5	7.8	8.3	37.8	41.6	13.1	0.0	2.9	0.0	N/A	Light green	N/A
10	136	191.0	111.0	7.9	8.2	6.5	37.4	41.1	14.7	0.0	3.2	0.0	N/A	N/A	N/A

Key:

N/A - Not applicable

Table 2: Soil moisture content with soil depth

	Soil depth (cm)	15	30	45	60	75	90	105	120	135	150
Moisture content (%)	Initial reading	0.49	0.56	5.34	26.33	33.32	35.54	33.84	35.50	35.57	35.85
	Row 5	0.56	0.59	4.69	24.36	32.00	34.31	34.58	34.67	35.79	36.41
	Row 15	1.31	18.40	28.61	31.96	33.47	33.11	33.86	36.08	36.27	37.64

a. Briefly describe the plant management practices you carried out on your row of maize in the maize field up to silking time. **(4 marks)**

b. Explain differences in plant performance in row 5, 15 and 30 with respect to plant height, stem thickness at base, chlorophyll colour index, cob thickness and colour of silk. **(6 marks)**

c. What was the stage of development of the crop? **(2 marks)**

d. Explain differences in soil moisture content with soil depth in row 5 and row 15 and relate it to plant performance. **(6 marks)**

e. In reference to shallow soil depths, why are moisture content values low? **(2 marks)**

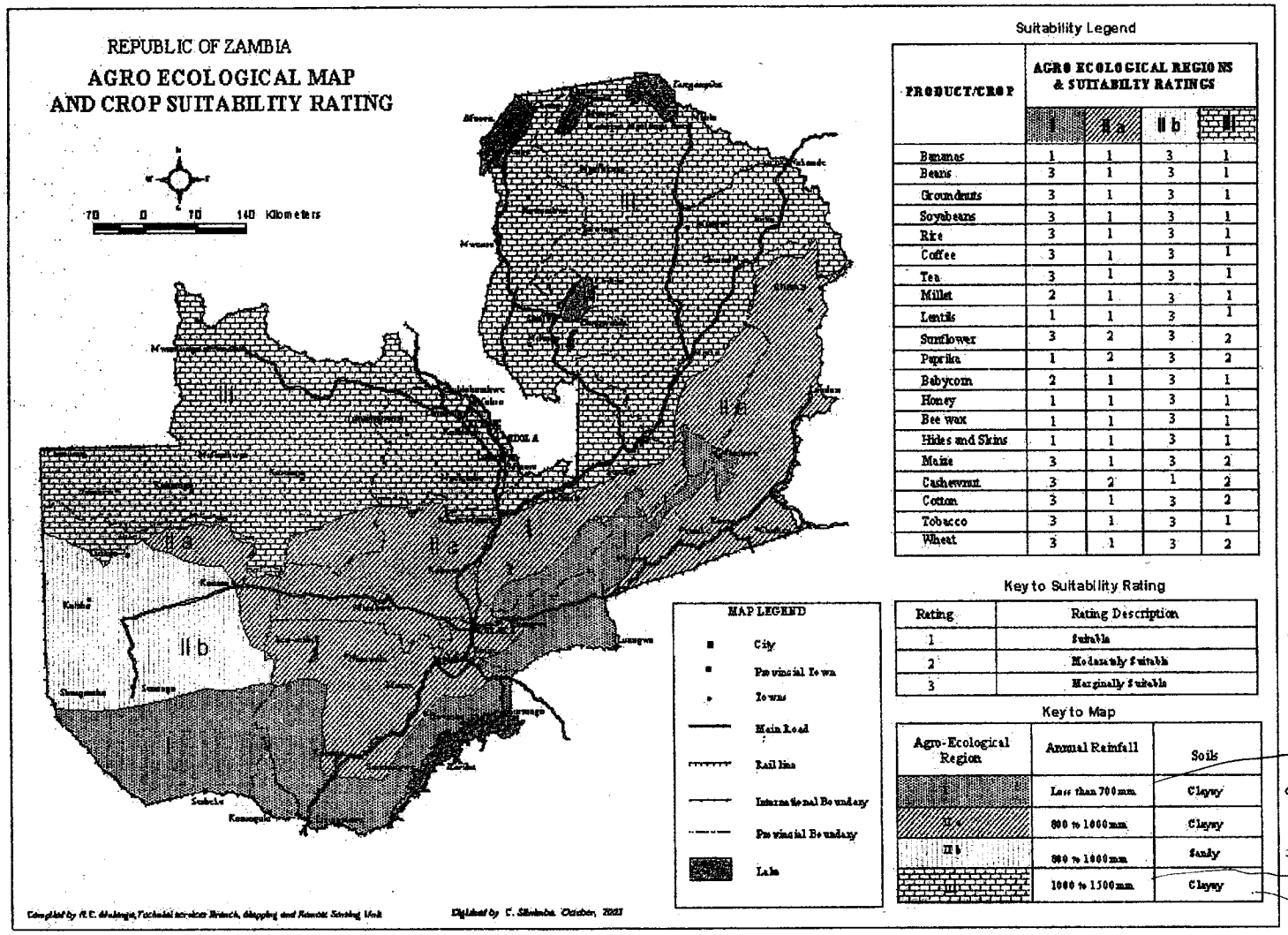
Question 5

The comparative legume production of cowpea, groundnut, mixed beans and soybeans is shown in Table 3. Explain the suitability for production of the given legume crops in the Agro-ecological Regions. Use Agro-ecological map of Zambia and crop suitability rating shown in Figure 1. **(15 marks)**

Table 3: Comparative legume production in Zambia

Crop	Crop production (metric tons)
Cowpea	4143
Groundnut	106791
Mixed beans	56411
Soybeans	261063

End of Exa



Suitability Legend

PRODUCT/CROP	AGRO ECOLOGICAL REGIONS & SUITABILITY RATINGS			
	I	II a	II b	III
Bananas	1	1	3	1
Beans	3	1	3	1
Groundnuts	3	1	3	1
Soyabeans	3	1	3	1
Rice	3	1	3	1
Coffee	3	1	3	1
Tea	3	1	3	1
Millet	2	1	3	1
Lentils	1	1	3	1
Sunflower	3	2	3	2
Paprika	1	2	3	2
Babycorn	2	1	3	1
Honey	1	1	3	1
Bee wax	1	1	3	1
Hides and Skins	1	1	3	1
Maize	3	1	3	2
Cashewnut	3	2	1	2
Cotton	3	1	3	2
Tobacco	3	1	3	1
Wheat	3	1	3	2

Key to Suitability Rating

Rating	Rating Description
1	Suitable
2	Moderately Suitable
3	Marginally Suitable

Key to Map

Agro-Ecological Region	Annual Rainfall	Soils
I	Less than 700 mm	Clayey
II a	800 to 1000 mm	Clayey
II b	800 to 1000 mm	Sandy
III	1000 to 1500 mm	Clayey

Figure 1: Agro-ecological map of Zambia and crop suitability rating

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

FINAL EXAMINATION 2016/17 ACADEMIC YEAR

COURSE NAME:	PRINCIPLES OF WEED SCIENCE (FIFTH YEAR COURSE)
COURSE CODE:	AGC5331
DATE OF EXAMINATION:	THURSDAY 11TH MAY 2017
TIME:	09:00 - 12:00 HOURS, THREE HOURS
VENUE:	OMNIA 2 LECTURE THEATRE

Instructions: The paper consists of two (2) sections. Section I is compulsory, answer all the questions. Section II has optional questions, answer only two. Points for each question are indicated.

SECTION I (COMPULSORY)

Q1 (30 points)

a) How many types of vegetative reproductive organs do weeds possess and why do they make weeds hard to control?
b) What factors determine weed-crop association and what must be known about crop-weed competition to make good weed management decisions?
c) What do herbicides do that other weed control techniques cannot do?

SECTION II (OPTIONAL)

Answer only two questions from this section.

Q2 (15 points)

a) Why are parasitic weeds such a problem?
b) Why is preventing and or eradicating weeds so difficult?

Q3 (15 points)

a) What is the principle of carbohydrate starvation and how does it help weed management?
b) What are the important determinants for herbicide selectivity?

Q4 (15 points)

a) In what situations should soil solarization be used?
b) What taxonomic, biological, morphological and physiological traits do weeds share?

-End of Examination-

UNIVERSITY OF ZAMBIA

School of Agricultural Sciences

DEPARTMENT OF PLANT SCIENCES

Bachelor of Agricultural Science Programme- First term Examinations

AGC 5421 Advanced Horticulture

Date. 9th May 2017

Time 14:00 to 17:00 hrs

INSTRUCTIONS

Answer ANY 5 (FIVE) questions.
Duration- 3 hours

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1) Subtropical horticulture is often classified under 4 different sectors. Using this same classification, describe the Zambian horticulture. For each sector describe its status and interventions that can be adopted to improve sector performance. **[20 marks]**

2) Briefly describe the following:

   a. The Ridge and gutter green house type,

   b. Importance of adopting grid and patterns in landscape design and.

   c. Three key types of records that a Plant Nursery should maintain. **[20 marks]**

3) Describe the Open Centre and Kniffen systems of pruning and training in fruit trees/ vines and topiary in ornamental plants. **[20 marks]**

4) Answer the following:

   a. Give an outline of the 4 sub groups of oranges (*Citrus sinensis*),

   b. Describe 5 factors that limit productivity of indigenous horticultural plants and.

   c. Layering. **[20 marks]**

5) Discuss the production of banana (*Musa spp*) under the following headings:

   a. Commercial cultivars,

b. Propagation and plantation establishment,

c. Common pests and diseases,

d. Ecological requirements and

e. Yields. **[20 marks]**

6) Describe 3 types of materials used for greenhouse frames and 3 types of materials used for glazing. In your answer include the strengths and or weakness of each material.

[20 marks]

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
Department of Agricultural Economics and Extension

2017 Academic year Mid-Year Examination

AGE 2111 Fundamentals of Microeconomics

Duration: Three (3) hours

INSTRUCTIONS: Each question carries 20 Marks. Answer **ALL** the questions.

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1) The supply of cotton is $Q_S = -1000 + 50P - 700P_{SOYA}$ where quantity is in bales per year, p is the price per bale and P_{SOYA} is the price of soya beans in kwacha per kilogram. Initially, the price of a bale of cotton is K500 and the price of a kilogram of soya beans is K8.

   a. Define cross-price elasticity of supply **[4 marks]**
   b. What is the cross-price elasticity of the quantity supplied of cotton with respect to the price of soya beans **[7 marks]**
   c. Is soya beans a complementary good? Explain your answer **[4 marks]**
   d. List the main basic economic questions you learnt in class**[5 marks]**

2) The table below contains information of the quantity demanded and supplied of good X at various prices.

Price	Quantity Demanded	Quantity Supplied
$.90	20	50
$.80	25	40
$.70	30	30
$.60	35	20
$.50	40	10

   a. Calculate the elasticity of demand between $.80 and $.70 **[5 marks]**
   b. Give an interpretation of your answer in a. above and indicate whether it is elastic or inelastic**[2 marks]**
   c. Derive the demand and supply equations using the information provided in the table**[8 marks]**

d. At what price will the market for good X clear? **[5 marks]**

3) Assume Kelvin has K10 to spend on potatoes, ice cream, or some combination of the two. Assume the price of potatoes is K2, and the price of ice cream is K3. The total utility from consuming various quantities of potatoes and ice cream are in the table.

Potatoes	TU^P	MU^P	MU^P/P_P	Ice Cream	TU^I	MU^I	MU^I/P_I
0	0	XX	XX	0	0	XX	XX
1	16			1	21		
2	28			2	39		
3	36			3	48		
4	40			4	54		
5	42			5	57		

a. Fill out the missing figures in the table**[6 marks]**
b. If Kelvin is to maximize his utility, how many units of potatoes and ice cream will he consume? Show how you arrived at your answer**[4 marks]**
c. Draw the budget line faced by Kelvin**[4 marks]**
d. With the help of diagrams *where necessary* explain the properties of indifference curves **[6 marks]**

4) There are four main market structure that include perfect competition, monopolistic competition, monopoly and oligopoly.
   a. What is monopolistic competition? Explain the important features of monopolistic competition. **[4 marks]**
   b. How are price and output determined under monopoly? Show that under monopoly price tend to be higher and output smaller than under perfect competition. **[4 marks]**
   c. Using the kinked demand model explain how the increase and reduction in marginal cost need not lead to any change in price or output**[6 marks]**
   d. What is a cartel? Explain how a cartel determines price and output of a product to maximize joint profits**[6 marks]**

5) Given the following total cost function $TC = 1500 + 15Q - 6Q^2 + Q^3$
   a. Determine the total fixed cost of producing 1000 units of output and 500 units of output**[3 marks]**
   b. What is AFC at 1000 units of output and at 500 units of output? **[4 marks]**
   c. Determine TVC, AVC, MC and AC at 50 units of output**[8 marks]**
   d. List the characteristics of an isoquant. Explain the factors that account for increasing returns to scale in the initial stages of production. **[5 marks]**

The University of Zambia
School of Agricultural Sciences
University First Half Examinations – May 2017

AGE 3381
Research methodology

Time: Three (3) hours
Instructions: There are four questions in this exam. Answer all questions.

1. In research, we find ourselves flitting back and forth between the theory realm and the observation realm and logic is one of the tools used extensively.

   a) Define logic. [2 points]

   b) What is a logical fallacy? List four examples of logical fallacies. [6 points]

   c) What would you do if your facts do not agree with theory? [2 points]

   d) Why is the quality of sampling important in survey research? [5 points]

   e) How many possible samples of students of size $n = 5$ can be obtained from a population of 20 students ($N=20$) [5 points]

2. Research is defined as "a systematic approach to obtaining new & reliable *Knowledge*" (Ethridge, 1995). Answer the following questions about knowledge.

   a) Distinguish between private and public knowledge [2 points]

   b) Knowledge is acquired in many ways. List the six ways discussed in class and, for each, state whether it leads to private or public knowledge. [6 points].

   c) Which of the sources referred to in b) is essential for deriving knowledge of relationships? Explain. [2 points].

3. The research plan is said to be the key to successful research and the research proposal to be the heart of the research plan. Answer the following.

   a) What purpose(s) does the research proposal serve? [4 points]

   b) For each of the following, state what it is and its role in the research process

      i. Problem definition [3 points]

      ii. Objectives [2 points]

      iii. Literature review [2 points]

      iv. Conceptual framework [2 points]

      v. Methods and procedures [2 points]

4. Read the following excerpt from the introduction of a recently published journal article (Tembo et al. 2014) and answer the questions that follow.

"Conventional wisdom contends that productive potential and market access are important ingredients for the development of the smallholder livestock sector. However, there is virtually no empirical evidence on the farmers' responsiveness to both these conditions. Do proximity to markets and abattoirs and/or good roads, for example, motivate farmers to increase their livestock production? This paper uses household data collected from livestock rearing communities in 3 districts in Southern Province of Zambia to measure the effect of the communities' productive potential and market access on livestock production. We also test for the existence of heterogeneous effects across agro-ecological regions, livestock species and poverty status of the household. Unlike most prior studies that use narrow measures of welfare like income or expenditure (Deshingkar et al., 2008, Greeley 1994), we use a more comprehensive participatory wealth ranking exercise to classify the households into wealth strata. To the best of our knowledge, no study has looked at all these issues so comprehensively within a mixed-methods framework.

Our study contributes to the literature in two other important respects. First, the study departs from the usual narrow representation of market access (distance to roads, markets, etc) (Ali and Khan 2013; Rooyen and Tui 2009) and uses knowledgeable key informants to assign market access statuses to study communities. The key informants use not only their knowledge of the distances but also several other factors, including, but not limited to, the state of the roads, and the size and versatility of market opportunities in general. This is much more informative than just distances. Second, our study unravels the differential responsiveness associated with different types of livestock, agro-ecological regions and poverty levels. The findings from this study should help in the design and implementation of effective interventions that aim to strengthen livestock-based livelihood systems in developing country contexts."

In not more than three sentences,

a) What is the specific research problem addressed by this paper? [5 points]

b) State the overall and specific objectives of the study. [5 points]

c) What is the rationale for the study? [5 points]

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2016/2017 ACADEMIC YEAR - FIRST HALF COURSE FINAL EXAMINATIONS
12TH MAY 2017
AGE 4131: PRODUCTION ECONOMICS

TIME: THREE (3) HOURS
INSTRUCTIONS: ANSWER ALL FIVE QUESTIONS. EACH ONE IS WORTH 20%.

Question 1

(a) What is Production Economics? **(2 marks)**

(b) What is a Production Function? **(3 marks)**

(c) Why is the 'Classical Production Function' termed the "classical" production function? **(3 marks)**

(d) Consider the following production function faced by an agro-processing firm;

$$Y = 2X - \frac{1}{30}X^2$$

i. Find the level of X at which Y is a maximum **(2 marks)**
ii. Compute the maximum value of Y that the firm can produce **(2 marks)**
iii. Calculate the Average Physical Product, Marginal Physical Product and Elasticity of production, when X=1, 5, 32 and 35 **(4 marks)**
iv. Based on the Elasticities of Production you have computed in (iii) above, specify the stage of the production function the firm is producing in for each one. **(4marks)**

Question 2

(a) A farm business is divided into three components; Input market, Production process and Output market. Describe each of these components. **(2X3 marks)**

(b) A farm business involved in the production of onion, potatoes and cabbages is considered to be in a purely competitive market. What explanation can you give for classifying a farm business in a purely competitive market? **(6 marks)**

(c) What are variable costs? Why are they important in the computation of the revenue and profits of a farm business? **(4 marks)**

(d) What are fixed costs? What can a farm business do to lower its average fixed costs? **(4 marks)**

Question 3

(a) What is the difference between Total Revenue (TR) and Total Value Product (TVP)? **(5 marks)**

(b) Derive the Marginal Criterion for profit maximization as a function of output and describe the terms in the criterion. **(15 marks)**

Question 4

(a) Find the equation of an Isocost line for two inputs, X_1 and X_2, given that; P_{X1} = \$5 and P_{X2} = \$20 and the Total Variable cost of the Isocost line is \$130. **(10 marks)**

(b) Describe the following and site appropriate examples;

i. Intermediate products

ii. Final products **(2X2.5 marks)**

(c) Fully discuss the concept of Returns to Scale. In your discussion, ensure that you highlight the three different cases of Returns to Scale. **(5 marks)**

Question 5

(a) Depreciation is made up of two components; Time Depreciation and Use Depreciation. Define these two types of depreciation and explain the main difference between the two? **(5 marks)**

(b) What does it mean when an agribusiness firm is said to be 'living off depreciation'? **(5 marks)**

(c) Your grandfather is due for retirement and plans to start his own agribusiness. The company he works for has offered him a lump sum retirement payment of K2,000,000 **or** a life time annual payment of K260,000. He has the option of choosing either. Your grandfather is not in good health and expects to live for an additional 5 years only. Which option should he choose, assuming that a 9% interest rate is appropriate to evaluate the annual payments? Provide an explanation for the choice you have made based on the computations you have conducted. **(10 marks)**

END OF EXAMINATION

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2017 ACADEMIC YEAR FIRST SEMESTER
FINAL EXAMINATIONS
AGE 4211: INTRODUCTION TO AGRIBUSINESS MANAGEMENT
TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER **ALL** QUESTIONS

1. Lusambo Ltd is a newly formed company that processes biofuel gel from sweet sorghum. The company needs to produce a cash budget in order to ensure that there is enough cash within the business to achieve the operational levels set by the functional/ departmental budgets.

i. Consider the following sales figures for Lusambo Ltd.

Month	**June**	**July**	**August**	**September**
Sales (ZMW'000)	300	400	550	600

a) These figures are based on orders that customers have already placed with the company after considerable hard work by the sales team. In order to secure the orders, the sales team had to negotiate payment terms with the customers. Only 10% of customers agreed to pay immediately for the gel. Of the remaining customers, 60% agreed to pay after one month and 40% after two months.

b) Within the biofuel industry it is known that 2% of credit customers never pay (because they go out of business or dispute the invoices), hence the company has made the decision to reduce the budgeted cash inflow from the credit customers who should pay after two months to reflect this fact (making the percentage who pay after two month 38%).

ii. The biofuel company has a labour cost equal to 20% of the sales value.

iii. (a) The materials cost is 25% of the sales value.

(b) The material supplier will not allow the biofuel company any credit since it is a newly formed company, it has no track record of paying its debts. The supplier of materials is also aware that new companies often fail and go out of business thus creating irrecoverable debt. Therefore, the supplier is insisting on cash at time of delivery for all materials purchased. However, Lusambo Ltd has to buy the materials before they can be processed into biofuel (therefore, the material purchase budget differs from the material usage budget). Half of the materials required for production must be purchased and paid for in the month prior to sale, the other 50% can be purchased and paid for in the month that the biofuel is processed and sold.

iv. (a) Overhead costs are estimated at 15% of the sales value, and they are paid for in the month in which they are incurred.

(b). *Note that*, the monthly overhead costs you have calculated in iv (a) include a monthly charge for *depreciation* amounting to ZMW 10,000.

v. At the beginning of June, Lusambo Ltd will have ZMW 150,000 cash in its current account.

Required

i. Prepare a cash flow budget for Lusambo Ltd for the months of June to September **(32 Marks)**

ii. Of what use is the cash flow budget to Lusambo Ltd? (For each use you highlight, support it with an appropriate example from the cash budget you have estimated above **(3 Marks).**

2. (a) Easy-Barrows Ltd, manufactures wheelbarrows. Its costs have been analysed as follows:

Variable costs	
Materials	ZMW 30/unit
Manufacturing labour	3 hours/unit (ZMW 8/hour)
Assembly labour	1 hour/unit (ZMW 8/hour)
Packaging materials	ZMW 3/unit
Packaging labour	20 minutes/unit (ZMW 6/hour)
Transport costs	ZMW 10/unit
Fixed costs	
Overhead labour	ZMW 50,000/ Year
Utilities	ZMW 5,000/year
Plant operation	ZMW 65,000/Year
Selling price	ZMW 100/Unit

Required

i. Calculate the break-even quantity **(3 Marks)**
ii. Calculate the break-even-revenue **(3 Marks)**
iii. What profit will the company make if it sold 8,000 wheel barrows per year **(3 Marks)**

(b) Compare debt financing with equity financing and in the process highlight the advantages and disadvantages of each source of financing **(16 Marks)**

3. A private limited company is significantly different from a sole proprietor or partnership in several key aspects.

Required

Highlight these aspects and in the process, explain the advantages and disadvantages these differences pose to the company owners? **(20 Marks).**

4. a) Outline Maslow's hierarchy of needs theory and how you could use it to motivate employees in your agribusiness firm **(10 Marks).**

   b) Briefly explain in what situations an agribusiness manager might adopt different management styles **(6 Marks).**

   c) Explain why agribusinesses should adopt a market oriented approach to doing business **(4 Marks)**

THE END

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

MID-YEAR EXAMINATIONS—2016/17 ACADEMIC YEAR

COURSE NAME: INTERNATIONAL AGRICULTURAL MARKETS, TRADE AND DEVELOPMENT

COURSE CODE: AGE 5151

DATE: 12TH MAY 2017

DURATION: THREE HOURS

MARKS: 100 POINTS

INSTRUCTIONS:

1. This examination paper has two sections. Section A has twenty-five (25) multiple-choice questions and Section B has three (3) short and long answer questions. Answer all questions from both sections.

2. Each multiple-choice question has four possible answers. Clearly write the letter of the option that you think is the correct answer in the answer booklet provided.

3. Clearly show your work in your answers to Section B questions.

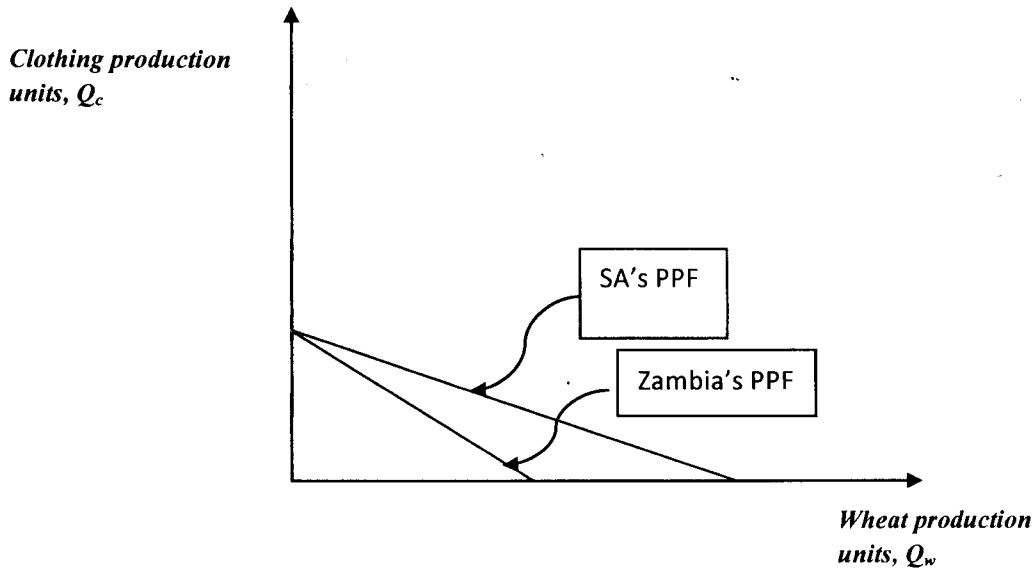
4. Please be concise in answering the questions and write legibly.

SECTION A (25 points – 1 point each)

1. The rise in international trade and investments in the last 50 years has been stimulated because countries have implemented
   A. Protectionist policies
   B. Trade liberalization
   C. Mercantilist policies
   D. Import substitution industrialization

2. In Country J, it takes one hour to knit a pair of socks, and five hours to brew a gallon of cider. In Country K, it takes three hours to knit a pair of socks, and six hours to brew a gallon of cider. If trade were to open between the two countries, Ricardo would predict that
   A. Country J will export cider and Country K will export socks
   B. Country J will export socks and Country K will export cider
   C. Country J will export both socks and cider
   D. Country K will export both socks and cider

3. Consider the clothing and wheat production possibility frontiers for Zambia and South Africa depicted in the graph below.



   Which of the following statements about the graph is **TRUE**?
   A. Zambia has comparative advantage in wheat production
   B. South Africa has a comparative advantage in wheat production
   C. Both countries have a comparative advantage in wheat production
   D. We cannot tell by looking at the graph which country has a comparative advantage in wheat production

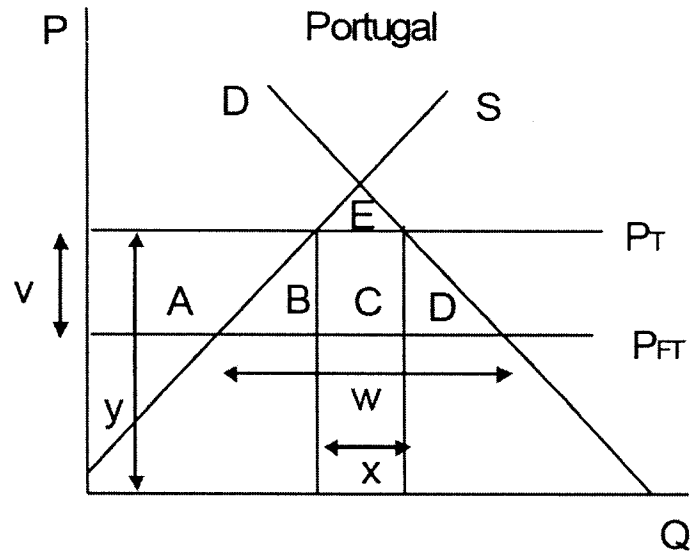
4. Adam Smith, David Ricardo, and Hecksher-Ohlin are alike in that
   A. They believed international trade was driven by differences in autarkic prices
   B. They believed production occurred under constant costs
   C. They believed everyone could be made better off through free trade
   D. They spent way too much time thinking

5. For Heckscher-Ohlin, the most important cause of the differences in relative commodity prices is the difference between countries in
   A. Factor endowments.
   B. National income.
   C. Technology.
   D. Tastes.

6. The general version of the Stolper-Samuelson theorem is called the
   A. Magnification effect for quantities
   B. Magnification effect for prices
   C. Factor-price equalization theorem
   D. None of the above

7. When economists say trade is not a zero sum game, they mean that
   A. The sum of the gains to the winners is exactly equal to the sum of the losses to the losers
   B. The sum of the gains to the winners is less than the sum of the losses to the losers
   C. The sum of the gains to the winners is greater than the sum of the losses to the losers
   D. None of the above

Answer questions 8 – 10 by referring to the following partial equilibrium diagram depicting the market for beef in Portugal, a small importing country. P_{FT} is the free trade price, P_T is the price in Portugal when a tariff is in place. Assume the letters, A, B, C, D, E, refer to areas on the graph. The letters v, w, x and y refer to lengths.



8. Where on the graph is the level of imports in free trade?
   A. w
   B. v
   C. x
   D. y

9. Where on the graph is the tariff revenue, collected by the importing government, depicted?
   A. A
   B. B
   C. C
   D. D

10. Where on the graph are the deadweight losses that arise with the tariff?
    A. + B
    B. – C
    C. B + D
    D. – (B+D)

11. What is the likely effect on foreign consumer welfare with respect to wheat markets if a small country imposes an export tax on wheat exports?
    A. Welfare increases
    B. Welfare decreases
    C. Welfare does not change
    D. Welfare may rise or fall

12. What is the likely effect on foreign consumer welfare with respect to wheat markets if a large country imposes an export tax on wheat exports?
    A. Welfare increases
    B. Welfare decreases
    C. Welfare does not change
    D. Welfare may rise or fall

Answer questions 13 – 15 by referring to the following trade policy game between two country governments, Kenya and Ethiopia.

	(Kenya, Ethiopia)	Ethiopia	
		Free Trade	15% Tariff
Kenya	Free Trade	(100, 100)	(100, 80)
	15% Tariff	(80, 100)	(80, 80)

13. Which set of strategies corresponds to the Nash (or non-cooperative) equilibrium?
    A. Both countries choose free trade
    B. Both countries choose 15% tariff
    C. Kenya chooses free trade and Ethiopia chooses 15% tariff
    D. Kenya chooses 15% tariff and Ethiopia chooses free trade

14. Which set of strategies corresponds to the cooperative equilibrium?
    A. Both countries choose free trade
    B. Both countries choose 15% tariff
    C. Kenya chooses free trade and Ethiopia chooses 15% tariff
    D. Kenya chooses 15% tariff and Ethiopia chooses free trade

15. Does the outcome of this game as depicted by your answers to question 13 and 14 help justify a trade liberalization organization like the World Trade Organization?
    A. Yes
    B. No
    C. It depends on the size of the two countries in global markets
    D. It depends on the frequency of trade between the two countries

16. Dumping occurs when a firm
    A. Sells too much of a good in a foreign country
    B. Sells in a foreign country at prices that are below fair value
    C. Sells in its home market at prices that are below the average price charged by its competitors
    D. Sells in a foreign market at prices that are below the prices charged by firms based in the foreign market

17. The equilibrium that results when trade policies are implemented in a model with imperfections and distortions is called
    A. First-best equilibrium
    B. Second-best equilibrium
    C. Partial equilibrium
    D. General equilibrium

18. A World Trade Organisation (WTO) rule that requires that a product made in one WTO member country be treated no less favorably than a similar good originating in another member country is called
    A. National treatment
    B. Most favoured nation
    C. Anti-dumping
    D. None of the above

19. A type of regional bloc that occurs when a group of countries agree to eliminate tariffs between themselves and set a common external tariff on imports from the rest of the world is called
    A. Customs Union
    B. Free Trade Area
    C. Monetary Union
    D. Common Market

20. Which of the following statements is **FALSE**?
    A. Zambian imports of South African oranges will create a demand for the South African Rand
    B. If all Zambians decide to buy Indian Basmati rice, the Kwacha will appreciate relative to the Indian Rupee
    C. A change from K10.50/$ to K9.67/$ represents an appreciation of the Kwacha
    D. The exchange rate is kept the same in all parts of the market by exchange arbitrage

Use the national income statistics for a fictitious country, Mojoland, provided in the table below to answer question 21 and 22.

Statistic	$
Gross Domestic Product	8,080
Exports of Goods and Services	934
Merchandise Exports	678
Imports of Goods and Services	1,043
Merchandise Imports	877

21. Based on the information provided, Mojoland has a current account
    A. Deficit
    B. Surplus
    C. Of Zero
    D. That cannot be determined

22. Based on the information provided, Mojoland has a financial account
    A. Deficit
    B. Surplus
    C. Of Zero
    D. That cannot be determined

Use the information in the table below to answer question 23 - 25.

	Bread Price/loaf	Exchange Rate 23/10/2015
Zambia	ZMW 3.00	--
Botswana	BWP 4.95	0.55 ZMW/BWP
South Africa	ZAR 6.00	0.47 ZMW/ZAR

23. The purchasing power parity exchange rate between Botswana and Zambia based on the price of bread is
    A. 1.65 BWP/ZMW
    B. 1.65 ZMW/BWP
    C. 0.61 BWP/ZMW
    D. 1.82 BWP/ZMW

24. The purchasing power parity exchange rate between South Africa and Zambia based on the price of bread is
    A. 2.13 ZAR/ZMW
    B. 2.00 ZMW/ZAR
    C. 2.00 ZAR/ZMW
    D. 0.50 ZAR/ZMW

25. Based on the information in the table, the Kwacha is
    A. Undervalued relative to the BWP
    B. Undervalued relative to the ZAR
    C. Overvalued relative to the BWP but undervalued relative to the ZAR
    D. Overvalued relative to both currencies

SECTION B (75 points – 25 points each)

1. Suppose Zambia's unit-labour requirement for maize is 3 hours/ton, its unit-labour requirement for wheat is 8 hours/ton and its total labour endowment is 4,800,000 hours. Suppose South Africa's unit-labour requirement for maize is 6 hours/ton, its unit-labour requirement for wheat is 2 hours/ton and its total labour endowment is 4,800,000 hours. Using the Ricardian model as the basis for trade:

    a. Draw and clearly label the maize and wheat production possibility frontiers for the two countries on the same diagram. **(6 points)**

    b. Derive the plausible free trade terms of trade in terms of each good between Zambia and South Africa and state the pattern of trade when free trade occurs. **(6 points)**

    c. If all manner of trade restrictions were removed, what would be the quantities of both goods produced by Zambia and South Africa respectively? Explain how the levels of production (of both goods) in free trade compare to those in autarky. **(5 points)**

    d. Compute and interpret the real wages for workers in both countries (in terms of both goods) in free trade. **(8 points)**

2. South Africa is a "large" country in African grain markets. Domestic supply and demand curves in South Africa are as follows,

$$S_G^{SA} = -40 + 0.5\,P_G^{SA}$$

$$D_G^{SA} = 150 - 0.6\,P_G^{SA}$$

Supply and demand curves in the rest of Africa are respectively,

$$S_G^{RoA} = 50 + 0.05\,P_G^{RoA}$$

$$D_G^{RoA} = 100 - 0.05\,P_G^{RoA}$$

where the subscript G stands for grain and the superscripts SA and RoA stand for South Africa and Rest of Africa respectively.

Suppose the South African government is considering an export subsidy of $10 per ton of grain exported as a way of encouraging exports, compute and briefly interpret the welfare effects (on all economic actors in South Africa and the rest of Africa) of moving from a free trade equilibrium to an equilibrium with a subsidy. To get full credit, ensure to provide two clearly labeled graphs: (1) a graph depicting domestic supply and demand in South Africa showing equilibrium prices and quantities in free trade and equilibrium prices and quantities with a subsidy, (2) another graph depicting supply and demand from the rest of Africa showing equilibrium prices and quantities in free trade and equilibrium prices and quantities with a subsidy. Be sure to express quantities in million tons and monetary values in US dollars. **(25 points)**

3. This question focuses on models of exchange rate determination.

   a. Compare and contrast interest rate parity and purchasing power parity. **(5 points)**

   b. For each of the **TWO** exogenous shocks/policy decisions outlined below, explain the following: (1) initial adjustment of the relevant parity condition; (2) supply of Kwacha on the Zambian FOREX; (2) demand for Kwacha on the Zambian FOREX; (4) ZAR/ZMW spot exchange rate, and; (5) final adjustment of the relevant parity condition. Each exogenous shock/policy decision is characterised as a scenario. ***Be sure to first state the model of exchange rate determination you are applying to analyse each scenario. Ensure to provide graphical illustrations.***

      i. **Scenario 1**: A significant increase in interest rates of financial market assets available in Zambia. **(10 points)**

      ii. **Scenario 2**: An import ban on fruits and vegetables originating from South Africa imposed by the Zambian government. **(10 points)**

------ END OF EXAM-----

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2016/ 2017 MID-ACADEMIC YEAR EXAMINATIONS

AGE 5241 – PRINCIPLES OF FARM MANAGEMENT

TIME : THREE HOURS

INSTRUCTIONS : *ANSWER ALL FIVE QUESTIONS*

---

1. Describe the types of risk and uncertainties faced by farmers in Zambia. Discuss the various safe guards' farmers and/or Governments use against these risk and uncertainties in the farming business. ***(20 marks)***

2. *A.* Explain what you understand by the term enterprise budget. Discuss the use of this Document on the farm. ***(10 marks)***

   B. Machinery and equipment expenses represent a major category of costs in crop production. However a consistence method of estimating machinery and equipment costs is needed for use in preparing enterprise budgets for both crop and livestock alternatives. Discuss reasons why it is important for farm managers to estimate machinery and equipment costs? ***(10 marks)***

3. A. Assume that a new tractor is purchased on January 1 for K62, 000 and given a salvage value of K10, 000 and useful life of 8 years. What would the annual depreciation be for the first two years under each depreciation method? The fixed rate of depreciation is estimated at 15%.

	Year 1	Year 2
Straight line		
Sum-of-the year's digits		
Declining balance		

   B. What would the tractor's book value be at the end of year 2 under each depreciation Method?

C. Give at least three (3) examples in each case of property that might be valued by each method.

4. Use a graphical method for profit maximizing plan for linear programming.

		Resource requirements (per hectare)	
Resource	**Limit**	**Maize**	**Soybeans**
Land (hectares)	120	1	1
Labor (hrs)	500	5	3
Operating Capital (K)	15,000.00	100.00	80.00
Gross margin (K)		120.00	95.00

a. What is the most profitable level of these two products, maize and soybean to produce?

b. What level of gross margin does this combination of output give? ***(20 marks)***

5. *A.* Identify and discuss reasons for keeping farm accounts and records. Why doesn't an average Zambian farmer keep these records? ***(10 marks)***

B. Suppose a farm experiences a decline in its current ratio from 1.7 to 1.3. Is this a favourable change? What factors might explain the decline in the ratio? ***(10 marks)***

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2016/2017 MID-YEAR FINAL EXAMINATIONS
AGE 5251: AGRICULTURAL PROJECT PLANNING AND APPRAISAL
TIME: THREE HOURS
INSTRUCTIONS:

i) Answer all questions
ii) Leave the discount tables in the examination hall

---

1. a) Why is choosing a discount rate important in project analysis? (2 marks)
   b) Describe and explain briefly the discount rates that can be used in both financial and economic analysis. (10 marks)
   c) Discuss and describe, with an illustration, the special case that involves the choice of technologies in which selection of one technology rules out its alternatives realizing the same result. (8 marks)

2. a) Define a shadow price in economic analysis? (4 marks)
   b) Why are shadow prices important in economic analysis? (6 marks)
   c) Discuss briefly the relationship between shadow prices and opportunity cost (OC) as well as marginal value product (MVP). (10 marks)

3. The following investment outlay, operation and maintenance costs (cash outflows) as well as gross benefits (cash inflows) are given for a coffee production and processing project proposal:

Amounts in K'000				
Year	**Investment Outlay**	**Operation and maintenance**	**Production Cost**	**Gross Benefit**
1	550	0	0	0
2	450	0	0	0
3	400	0	0	0
4	300	0	0	0
5	300	0	0	0
6	0	50	70	1220
7	0	50	80	1330
8	0	50	80	1430
9	0	50	90	1540
10	0	50	90	1540

a) Compute the Net Benefit-Investment (N/K) ratio if the opportunity cost of capital is 25%. On the basis of the N/K you obtain, would you recommend the project as good investment? Explain why? (6 marks)
b) Compute the Internal Rate of Return (IRR). On the basis of the IRR you obtain and given 25% as the opportunity cost of capital, would you recommend the project as good investment? Explain why? (10 marks)
c) In another project and at an opportunity cost of capital of 25%, a 30% reduction in the project's net benefits results in a positive net present value of K+60.00 whereas a 35% reduction in the project's net benefits results in a negative net

present value of K-40.00. What is the magnitude (switching value) of the net benefits decrease before the project's net present value falls below an unacceptable level? Explain your answer. (4 marks)

4. The following information is given for an agro-processing plant to be imported into the country: the c.i.f. price is US$150,000; the import levy is 10% of the c.i.f. price; the handling and clearing charges amount to K30, 000 and the transportation to the project site is K10, 000. The official exchange rate (OER) is K8 to US$1 and a foreign exchange premium of 20% is estimated.
   a) Calculate the economic import parity value at the farm gate or project boundary using the conversion factor approach. (7 marks)
   b) Calculate the economic import parity value at the farm gate or project boundary using the shadow exchange rate approach. (7 marks)
   c) What is the c.i.f. price in US$ for layers battery cages at point of import if the import parity price at farm gate is K 300,000; the official exchange rate (OER) is US$1=K8; the import duty is 10%; the domestic handling and marketing charges = K3,600 and the internal transportation to project site is K6,000? (6 marks)

5. The foreign exchange component and the domestic currency component of a phosphate production project are as given in the following table:

	Foreign Exchange Component (US$ '000)			Domestic Currency Component (K '000)	
Year	Value of Production	Investment Cost	Production Cost	Investment Cost	Production Cost
1	0	300	0	700	0
2	0	250	0	650	0
3	0	150	0	450	0
4	300	0	100	400	160
5	600	0	300	0	170
6	800	0	450	0	170
7	900	0	400	0	170
8	900	0	400	0	170
9	900	0	400	0	170
10	900	0	400	0	170

a) If the opportunity cost of capital is 25%, compute the domestic resource cost (DRC). If the official exchange rate (OER) is K 8 to US$1 and on the basis of the DRC you obtain, is the project favourable? Explain why? (10 marks)
b) If there is a foreign exchange premium of 20%, what is the shadow exchange rate (SER)? In the light of the SER you obtain and on the basis of the DRC you obtained in a) above, would you say the project is favourable? Explain why? (5 marks)
c) Why is it important to estimate the DRC and what are the major limitations of the DRC? (5 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

2016/17 ACADEMIC YEAR MID-YEAR FINAL EXAMINATIONS

AGF 2015
FUNDAMENTALS OF ORGANIC CHEMISTRY

Date: 10TH MAY, 2017
Time: 14:00 - 17:00 HRS
Venue: FSN 1

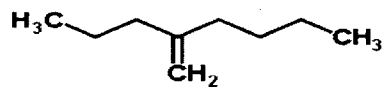
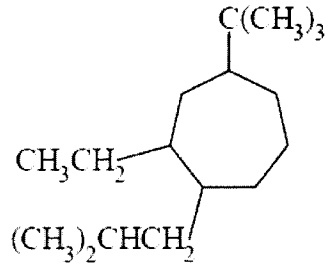
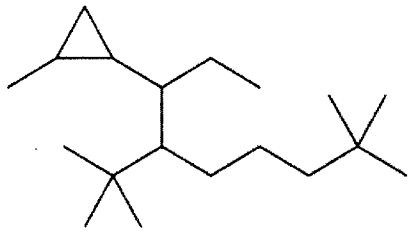
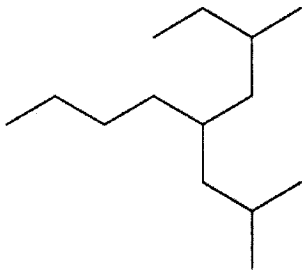
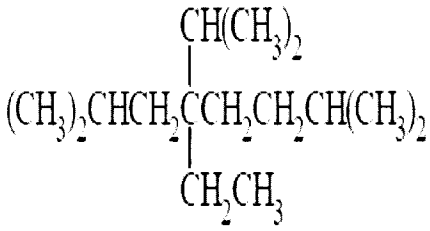
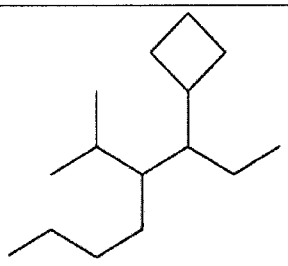
Duration: THREE (3) HOURS

INSTRUCTIONS TO THE CANDIDATES:

1. THIS PAPER CARRIES 100 MARKS AND HAS A TOTAL OF FIVE (5) QUESTIONS.
2. EACH QUESTION CARRIES 20 MARKS.
3. ANSWER ALL QUESTIONS.
4. USE ILLUSTRATIONS IN YOUR ANSWERS WHERE NECESSARY.

Question 1

a) Give the IUPAC name of each compound.

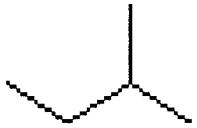
	
I.	II.
	
III.	IV.
	
V.	VI.

(6 marks)

b) Which compound has the highest boiling point and which one has the lowest boiling point?

I. pentane

II. hexane



III. 2-methylbutane

(4 marks)

c) For each of the following, provide a complete structural formula showing all atoms and bonding electrons.

i. 4,7,11-trimethyl-8-(1-methylbutyl)tetradecane
ii. 3-*sec*-butyl-1,1-dimethylcyclopentane
iii. 2,2,3,5,5-pentamethylhexane
iv. 3-cyclobutyl-1,5-hexadiene
v. 3-ethyl-1-methyl-1,3-cycloheptadiene

(10 marks)

Question 2

a) Which of the following compounds readily dissolves in water?

I. Pentane
II. Pentanol
III. Pentanoic acid
IV. Sodium pentanoate

(1.5 marks)

b) Organic compounds called aromatic hydrocarbons are compounds that

I. have a wonderful odor.
II. are based on the benzene ring structure
III. occur in nature with all carbons bonds saturated
IV. occur in nature with all carbon bonds unsaturated.

(1.5 marks)

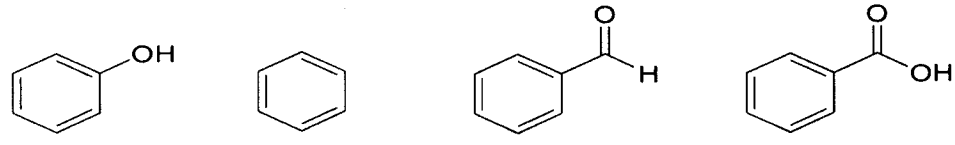
c) The characteristic odor and taste of fruit such as bananas, oranges, and pineapples comes from certain. **(1.5 marks)**

I. Ketones
II. Ethers
III. Aldehydes
IV. Esters.

d) State four (4) physical properties of ethane. **(5 marks)**

e) Compare and contrast the physical properties of alcohols and of alkanes. **(5 marks)**

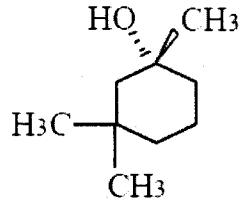
f) Based on their structures, rank phenol, benzene, benzaldehyde, and benzoic acid in terms of lowest to highest boiling point. Explain your reasoning.



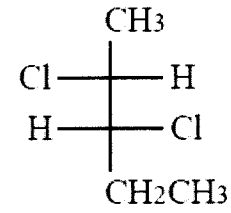
(4 marks)

Question 3

a) Give the IUPAC name of each compound using R-S designation where appropriate.



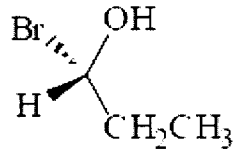
I.



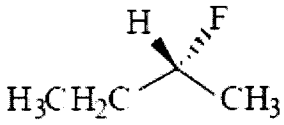
II.

(4 marks)

b) Draw a Fischer Projection for the following molecules - chiral, tetrahedral carbon. Assign R or S to the molecules, put the lowest priority group in the BACK (or top/bottom for Fischer Projection) before making R or S assignment



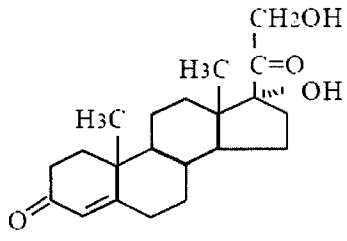
I.



II.

(8 marks)

How many tetrahedral stereocenters does the following structure contain? Ignoring the possibility of meso compounds, how many stereoisomers having this structure are theoretically possible?



(8 marks)

Question 4

a) With the help of a simple sketch describe the mechanism of operation a Polarimeter and explain its significance in Organic chemistry.

(5 marks)

b) A sample of S-2-heptanol was found to have an optical purity (or % ee) of 30%. What is the composition of the other 70% of the material? Give the IUPAC name of the other compound using R-S designation.

(5marks)

c) A sample of 3-(3,4-dihydroxyphenyl)alanine has a specific rotation of -4.5°. The specific rotation of optically pure (–)-3-(3,4-dihydroxyphenyl)alanine is -11.5°.

I. What is the optical purity (enatiomeric excess) of the sample?

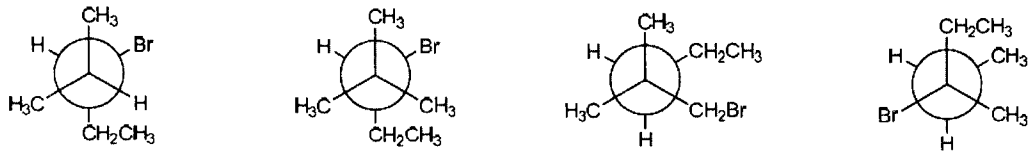
(6 marks)

II. What is the percentage of (+)-3-(3,4-dihydroxyphenyl)alanine in the sample?

(6 marks)

Question 5

a) Draw line drawings for the following Newman projections.



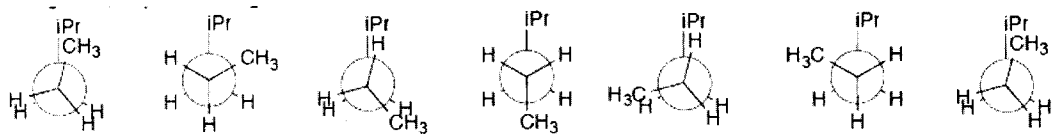
(4 marks)

b) Provide Newman projections for the most stable conformations of.

I. butane.
II. 1,2-dimethylcyclohexane.
III. 2-methylpropane.

(6 marks)

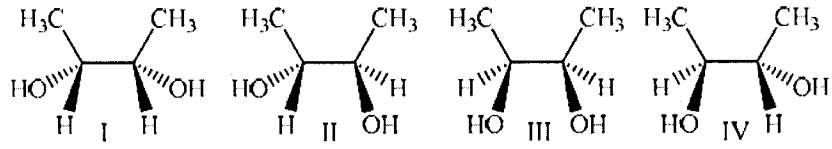
c) Draw a qualitative energy diagram for $CH_3CH_2CH_2CH(CH_3)_2$, relative to the bond between the two CH_2 carbons., using "iPr" as an abbreviation for the isopropyl $CH(CH_3)_2$ group. Put "S" (for staggered) by any "staggered" conformation, and "E" (for eclipsed) by an eclipsed conformation. The Newman projections are drawn below



(10 marks)

Question 6

a) given the following members of a set of compounds.



I. Which of the other three members of this set is not a stereoisomer .
II. Which two members of this set are enantiomers of one another?
III. What relationship do the two members that are not enantiomers of one another have with the two that are enantiomers of one another?

(4 marks)

b) Draw the structures of the two stereoisomers of butan-2-ol and state how they can be distinguished in the laboratory. explain why is it that, although butan-2-ol can exhibit this type of isomerism, why butanone, does not?

(6 marks)

c) You have a sample (Sample X) which is a mixture of +/- Carvone. The solution was made by dissolving 4.50 g of the sample in enough methanol to bring the volume of solution to 10.0 mL. Some of the solution is placed in a 100 cm polarimeter cell and its optical rotation is measured at 25°C using light of the sodium D line wavelength (589.6 nm). The observed rotation is +22.2°.

I. What is the specific rotation of this sample?
II. An enantiomerically pure sample of the (*S*) enantiomer of Carvone has a specific rotation of +15.5°. What is the % enantiomeric excess of Sample X.
III. What percentage of Sample X is the (*S*) enantiomer? What percentage of the sample is the (*R*) enantiomer?

(10 marks)

THE END

The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.0026
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
19 **K** Potassium 39.0983	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.955910	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933200	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.92160	34 **Se** Selenium 78.96	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.80
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THE END

THE UNIVERSITY OF ZAMBIA
School of Agricultural Sciences
Department of Food Science and Technology

INTRODUCTION TO INFORMATION COMMUNICATION AND TECHNOLOGY AGF 2401

2016-2017 FINAL EXAM

Date: 12th May 2017
Venue: FSN1
Time: 9hrs
Duration: 3 Hour

Instructions

1. This exam has one section
2. Answer any fivequestions. Each question carries 20 Marks.

Section A

Answer any five questions. Each question carries 20 marks

1. A. Explain the purpose of the personal computer? [4]

   B. Explain the following hardware components? [6]

      i. Motherboards

      ii. Computer cases

      iii. Central Processing Unit

   C. Explain about the different ports and cables in the desktop computers? [5]

   D. Write short notes about the Second and Fourth generation of computers? [5]

2. A. Every day, people around the world rely on different types of computers. List and Explain any three different types of computers? [6]

   B. Explain how the computers are useful in different sectors, and who will be the computer users in this sectors are? [10]

   C. Give some reasons how the computer systems in education before and after ICT? [4]

3. A. Explain the ethical and non-ethical computer code of conducts? [6]

   B. Give some guidelines on the E-mail and Internet usage? [4]

   C. Explain the different types of computer security? [6]

   D. List and explain any four malicious code that affects the computers? [4]

4. A. An operating system (OS) exploits the hardware resources of one or more processors to provide a set of services to system users. The OS also manages secondary memory and I/O (input/output) devices on behalf of its users.

   i. What are the characteristics of the operating systems? [4]

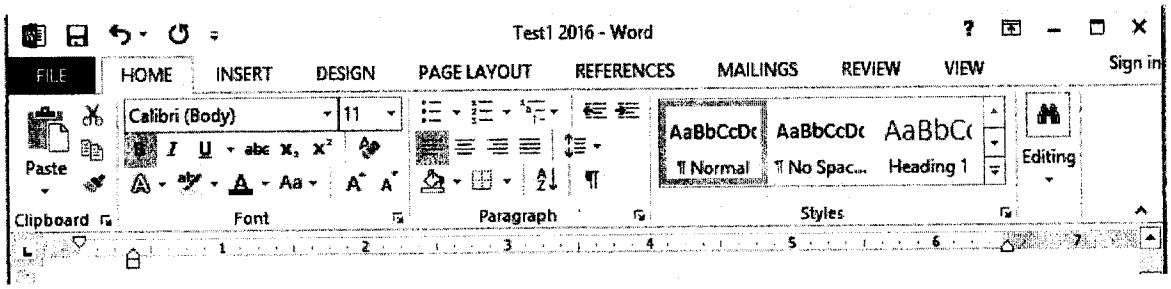
   ii. Explain the main four different roles in the operating systems? [4]

   iii. What are the difference between Desktop operating system and Network operating system? [2]

   B. Explain the logical system architecture of computer using diagram? [5]

   C. Explain the five ways of acquiring the software? [5]

5. A. You are required to do a number of tasks in Microsoft Word and when you open Microsoft thefollowing window opens. Explain which menu you will select to do the following tasks.**[5].**



   i. Find and Replace

   ii. To insert a Bookmark

   iii. Read Mode

   iv. Insert Citation

   v. Line Numbers

B. List out any 6 items and briefly explain when you click the Insert menu? [6]

C. What are the difference between footnote and endnote? [2]

D. What are the difference between font color and text highlight color? [2]

E. Give some advantages of using word processing software? [5]

6. A. Explain the any five layouts used in the PowerPoint? [10]

B. Write down any five advantages of using presentation software? [5]

C. Explain briefly the following term that what function it will do in MS PowerPoint? [5]

i. Slide Sorter

ii. Transitions

iii. Animations

iv. Slide Show

v. Handout Master

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

2016/17 ACADEMIC YEAR MID-YEAR FINAL EXAMINATIONS

AGF 3021
CHEMICAL TECHNIQUES IN FOOD ANALYSIS - THEORY EXAM

Date: 12th MAY 2017
Time: 14:00 - 17:00 HRS
Venue: OMNIA 1

Duration: THREE (3) HOURS

INSTRUCTIONS TO THE CANDIDATES:

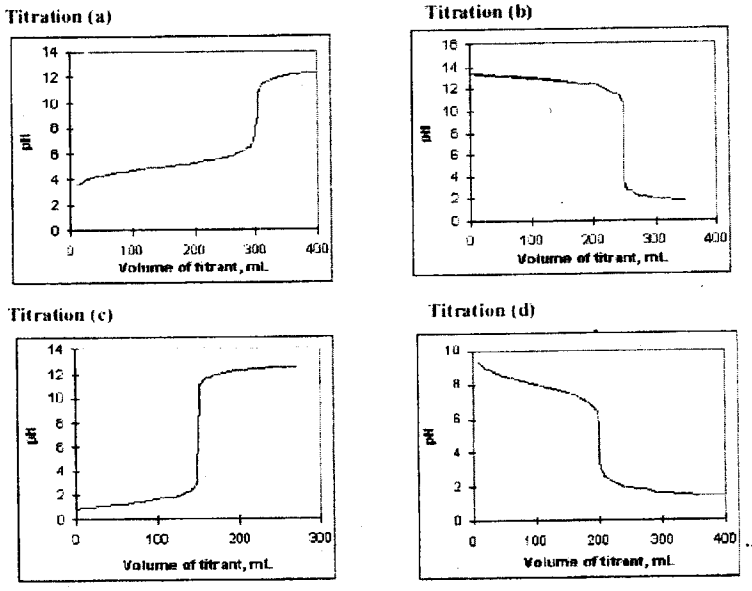
1. THIS PAPER CARRIES 100 MARKS AND HAS A TOTAL OF SIX (6) QUESTIONS.
2. EACH QUESTION CARRIES 20 MARKS.
3. ANSWER ANY FIVE (5) QUESTIONS.
4. ANSWER EACH QUESTION IN A SEPARATE ANSWER BOOKLET PROVIDED.
5. USE ILLUSTRATIONS IN YOUR ANSWERS WHERE NECESSARY

Question 1

a) Describe the general procedures involved in titration to determine the molarity of a solution of a given compound.

(3 marks)

b) Which one of the following titration curves corresponds to the titration of a weak acid (in flask) with a strong base (in burette)? And explain briefly the nature of this curve.



(3 marks)

c) The molarity of a hydrochloric acid solution can be determined by titrating a known volume of the solution with a sodium hydroxide solution of known concentration. If 14.7 mL of 0.102 M NaOH is required to titrate 25.00 mL of a hydrochloric acid, HCl, solution, what is the molarity of the hydrochloric acid

(4 marks)

d) A 25.0 cm3 sample of vinegar, $HC_2H_3O_2$, is neutralized by using 37.38 cm3 of a 0.500 M NaOH solution. Calculate the following:

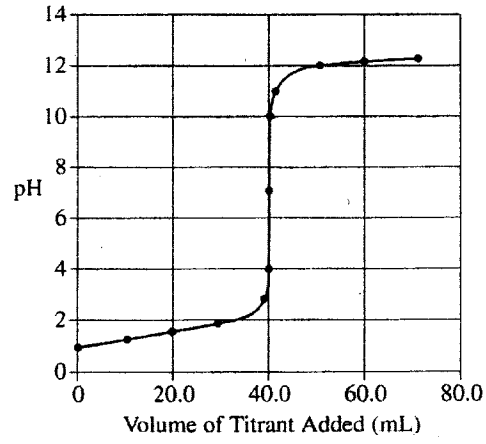
I. The concentration of the vinegar.

II. The mass of vinegar in 1.00 dm3 and the mass percent of the vinegar assuming a density of 1.00 g/cm3.

(10 marks)

Question 2

A solution of 0.100 *M* HCl and a solution of 0.100 *M* NaOH are prepared. A 40.0 mL sample of one of the solutions is added to a beaker and then titrated with the other solution. A pH electrode is used to obtain the data that are plotted in the titration curve shown.



a) What is the difference between the equivalence point of a titration and the end point of a titration

(2 marks)

b) On the titration curve above, circle the point that corresponds to the equivalence point and calculate how many moles of titrant were added?

(4 marks)

c) Sketch the titration curve that would result if the solutions in the beaker and burette were reversed. (i.e., if 40.0 mL of the solution used in the burette in the previous titration were titrated with the solution that was in the beaker).

(4 marks)

d) What volume of 0.175 M solution of KOH is needed to titrate 30.0 mL of 0.200 M H_2SO_4? 35.0 mL of a 0.040 M aqueous solution of perchloric acid reacts with 40.0 mL of a 0.090 M aqueous solution of lithium hydroxide. What is the pH of the solution?

(10 marks)

Question 3

a) Discuss in detail the relationship between reliability and the analytical method?

(3 Marks)

b) Explain in detail the following terms and give an example for each case:

I. Indeterminate (Random) Error.

II. Determinate (Systematic) Error.

(4 Marks)

c) Discuss the procedure involved in the rejection of data (Q-Test) in statistics.

(4 Marks)

d) A series of nine (9) absorbance measurements using an atomic absorption spectrophotometer are as follows: 0.855, 0.836, 0.848, 0.870, 0.859, 0.841, 0.095, 0.861 and 0.852.

I. According to the instrument manufacturer, the precision of the absorbance measurements using this instrument should not exceed 1.85% Relative standard deviation (RSD). Calculate the %RSD and make a conclusion based on the instrument manufacturer's remarks.

(5 Marks)

II. Calculate the Q-value based on the data given.

(2 Marks).

Question 4

a) What are the four (4) major steps involved in sampling? Explain briefly for each step.

(3 Marks)

b) Explain the coning and quartering method used for reducing the sample size during sampling of 25 kg of maize grains in order to come up with a 100 g of laboratory sample.

(4 Marks)

c) Describe the mechanism of operation involved in the following methods of sample size reduction:

I. Sample splitters
II. Rotary rifle

(5 Marks)

d)

I. List the six basic principles involved in sampling from a conveyor belt.
II. Discuss the mechanism of operation for a Linear Traversing Cut and a Rotational Traversing Cut.

(8 Marks)

Question 5

a) Briefly explain the difference between a Top-Loading Balance and an analytical Balance.

(2 Marks)

b) List three steps involved in a gravimetric analysis and briefly explain the basic procedure for each of these steps.

(6 Marks)

c) A sample that weighed 0.8112 g is analyzed for phosphorus (P) content by precipitating the phosphorus as $Mg_2P_2O_7$. If the precipitate weighs 0.5261 g, what is the % P in the sample?

(6 Marks)

d) How many grams of copper (II) sulfate hexahydrate are required to prepare a solution that has the equivalent of 0.339 g of copper dissolved?

(6 Marks)

Question 6

a) Distinguish and give similarities between destructive methods and non-destructive methods. Give examples for each method.

(4 Marks)

b) Explain briefly the following terms:

I. Qualitative analyses
II. Quantitative analyses
III. Semi qualitative analyses.

(6 Marks)

c) Outline the procedure involved in the calibration of a pH meter?

(4 Marks)

d) With the help of a diagram, describe the calibration curve indicating the points of limit of linearity and the detection limit.

(6 Marks)

END OF EXAMINATION

The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
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1995 IUPAC masses and Approved Names from http://www.chem.qmw.ac.uk/iupac/AtWt/
masses for 107-111 from C&EN, March 13, 1995, p. 35
112 from http://www.gsi.de/z112e.html

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION

2017 ACADEMIC YEAR
MID-YEAR EXAMINATION

COURSE: AGF 3031
Food Chemistry (Theory)

Date: Tuesday, 9th May 2017 **Time: 09.00 – 12.00 Hours**

Duration: THREE (3) HOURS **Venue: FSN 1**

INSTRUCTIONS TO CANDIDATES:

1. There are two (2) sections in this examination paper, Section A and Section B.
2. Each section has three questions. **Answer all questions in both sections**.
3. The marks allocated are given at the end of each question.
4. Answers to the two sections should be given in separate booklets.

SECTION A

QUESTION 1

(a) What do you understand by the following terms and what is their importance in food industry:

i. Hydrocolloid **(2 marks)**

ii. Iodine value **(2 marks)**

(b) Give short answers to the following questions

(i) How is the ADI for a recently discovered food additive determined **(2 marks)**

(ii) Write the structure of the following fatty acids: (a) 18:2□6 (b) 20:4 (n-6)

(2 marks)

(iii) A tin of baked beans had the following nutritional label per 50g serving:

- Water content 4.0g
- Protein content 25.0g
- Carbohydrate content 15.0g
- Oil content 5.0g
- Vitamin content 0.05g
- Mineral content 0.95g

Calculate the protein content (on dry basis) in g protein/Kg beans **(2 marks)**

QUESTION 2

You have recently developed a blended juice composed of an aqueous based fruit juice and a lipid based liquid. The blended juice is manufactured by homogenizing the two liquids so that the lipid based liquid is dispersed in the juice blend as small spherical lipid globules distributed uniformly throughout the blended juice. Visually, it is impossible to see the blended juice as being composed of two phases immediately after homogenization. Due to nutritional requirement, marine lipids were used. The juice was packaged in well-capped transparent glass bottles and pasteurized before storage. It was determined that the juice would stay fresh for at least two weeks if kept at 10°C or below. The manufactured juice is stored in a warehouse whose temperature increased from an average of 10°C to 40°C during the 5 days storage period due to the malfunctioning of the cold storage system in the warehouse. In your answers to the questions below, give examples where necessary:

A. If the juice blend is kept at 8°C for 2 days undisturbed, what physical quality deterioration would you expect to observe in the juice and why? **(2 marks)**

B. After five days of storage during the malfunctioning of the cold storage system, the manufactured juice was found to deteriorate (i.e., lost its quality) during storage under the stated conditions. Suggest the nature of chemically based deterioration you would most expect in this juice and explain the cause(s) of the deterioration(s) you have suggested

(8 marks)

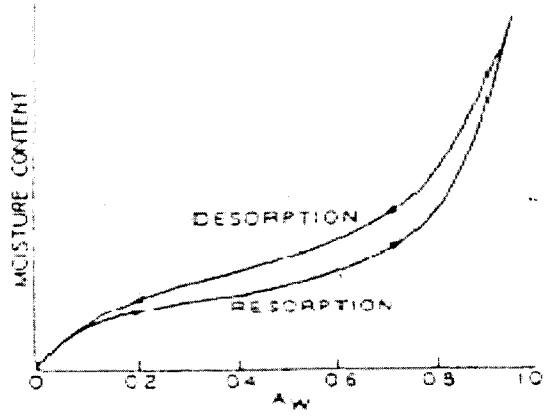
C. What would you do to extend the shelf life of the juice blend beyond the two weeks storage at 10°C **(6 marks)**

D. What would you do to make it more visually appealing to the consumers, including solving the problem in question A above? **(2 marks)**

E. Why do they prefer to use marine oils and what is the disadvantage of using the marine oils in this juice blend? **(2 marks)**

QUESTION 3

Examine the following graph. The graph exemplifies a number concepts concerning water. Identify four (4) of the **most important concepts** related to water represented in this graph. For each of the four concepts you identify: define each concept in full and state each concept's implication on food stability with practical examples related to food or food processing **(20 marks)**



SECTION B

QUESTION 1

You are an expert in Food Science and Nutrition, you are given a food which is supposed to be rich in proteins, carbohydrates. vitamins and minerals to feed children under five years old in a clinic. The sources of these nutrients are as follows: proteins from groundnuts and Soya beans, Carbohydrates from Cassava, minerals and vitamins from available fruits and vegetables. After six months you notice that these children are not growing through checking their weights and heights. Describe what is wrong with these children in terms of the food you were giving them? What will happen to these children in future as a result of the food which was not making them grow as required. Suggest correctional measures which you will make to this food in order to meet their growing needs **(*20 marks*).**

QUESTION 2

(a) Mention three reasons why enzymes are important in food science, and explain how PH and Temperature affect enzyme activity **(*10 marks*).**

(b) Name and describe four (4) types of browning reactions in foods as stated in your handout for enzyme, which ones are non-enzymatic in nature and which ones are enzymatic in mature ***(10 marks)***

QUESTION 3

Define these ***10 marks (2 marks each)***

(a) Latent enzymes
(b) Amylases
(c) Effect of compartmentalization of enzymes in foods
(d) Peptides
(e) Chromoproteins

END

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION

2014/2015 ACADEMIC YEAR FINAL YEAR SUPPLEMENTARY EXAMINATION

COURSE: AGF 3042
Instrumental Methods in Food Analysis - Theory

Date: Tuesday 1st November 2016 **Time: 09 00 – 12 00 hours**

Duration: THREE (3) HOURS **Venue: Omnia 3**

INSTRUCTIONS TO CANDIDATES:

1. There are two (2) sections in this examination paper, Sections 1 and 2
2. Answer **ALL** questions in **Section 1** and answer any **four (4)** questions in **Section 2**
3. Each question in **Section 1** is allocated marks as shown in **parenthesis**
4. **All** questions in **Section 2** carry equal marks of twenty **(20)** marks each

---

SECTION 1: Answer ALL questions in this section in the provided booklet

1. Progression of sucrose on a TGA would show one of the following scenarios about its mass. Which one is true? **(1 mark)**
   a. The mass would remain the same
   b. The mass would be fluctuating throughout the process
   c. The mass would decrease
   d. The mass would increase

2. The relative interaction of a solute with a mobile and stationary phase can be described by: **(1 mark)**
   a. Partition coefficient
   b. Distribution movement
   c. Supercritical coefficient
   d. Partition solubility

3. The refractive index (RI) is measured by one of the following equipment. Which one is it? **(1 mark)**
   a. Polarimeter
   b. refractometer
   c. UV – Vis Spectrometer
   d. Light reflector

4. The following are examples of alkaline earth metals except _____ **(1 mark)**
   a. Calcium
   b. Sodium
   c. Strontium
   d. Magnesium

5. Polyacrylamide gels are prepared by polymerisation of acrylamide monomer and N-N' - methylene bis acrylamide crosslinker in the presence of: **(1 mark)**
   a. APS and β-mercaptoethanol
   b. APS and TEMED

c. TEMED and β-mercaptoethanol

d. Tris Buffer and EDTA

6. Mirrors are a feature of all the following equipment except _____.

(1 mark)

a. Diffraction grating device

b. Older model UV – Vis Spectrometer

c. Newer model UV – Vis Spectrometer

d. Michelson Interferometer

7. All the following are main components of an GC except _____ **(1 mark)**

a. Oven

b. Detector

c. Injector

d. Pump

8. Which of the following has the shortest wavelength? **(1 mark)**

a. UV

b. γ-rays

c. RF

d. Vis

9. All the methods listed below are non - destructive methods except _____

(1 mark)

a. Mass Spectrometry

b. Differential Scanning Calorimetry

c. Near Infra-Red Spectrometry

d. Gas Chromatography

10. In ion exchange chromatography, three types of separations are possible except one. Which is the odd one out? **(1 mark)**

a. Cationic from anionic components

b. Differently sized particles in solution

c. Ionic from nonionic compounds

d. Mixture of similarly charged species

11. Which technique cannot be used for any sugar analyses

(1 mark)

a. Thermogravimetric analysis
b. Polarimetry
c. Isoelectric focusing
d. Refractometry

12. One of the following is a buffer used for RNA electrophoresis. Mark the correct one?

(1 mark)

a. TPE
b. TEMED
c. MOPS
d. TAE

13. Which of the following enzyme is used as immobilised enzymes in ELISA

(1 mark)

a. Horse radish oxidase
b. Acidic phosphatase
c. Alkaline peroxidase
d. Horse radish peroxidase

14.

15. Intensity of colour increases proportionally with the sample concentration in all the following except: **(1 mark)**

a. Liebermann–Burchard
b. Flame Photometry
c. Competitive ELISA
d. Indirect ELISA

16. (**True / False**) -CH=CH- will vibrate at a slower frequency than CH_2-CH_2

(1 mark)

17. (**True / False**) An Electron impact is a feature of a Mass Spectrometry

(1 mark)

18. What is the difference between a time domain spectra from a frequency domain spectra? **(2 marks)**

19. State one (1) advantage and (1) disadvantage of a capillary column when compared to a packed column? **(2 marks)**

SECTION 2: Answer any four (4) questions in this section

1. **Figure 1** shows a ray of light (radiation) entering a sample and emerging from the sample in a bid of quantifying the sample. Answer the following questions related to this figure.

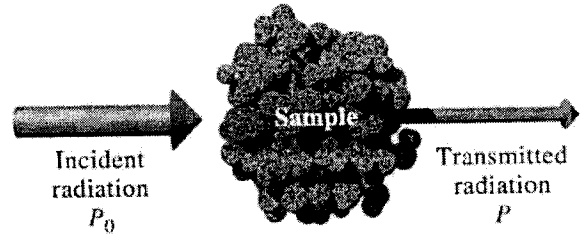


Figure 1: Radiation entering an unknown sample, Sample, and emerging on the other end

a. Describe briefly what you think is happening in the figure and how quantification of the sample can be achieved? **(5 marks)**

b. What analytical technique would be used and briefly describe this technique? **(7 marks)**

c. This figure is related to transmittance and absorbance in (or of) materials as well as a law called Beer's Law. Describe the mathematical relationship of these three (transmittance, absorbance and Beer's Law). [You may use formulas to explain this relationship] **(8 marks)**

2. You are informed that xylose (a sugar) can be analysed by various techniques including HPLC and GC. Discuss the principles of these two techniques and explain why you think each of these can be used to analyse xylose. **(20 marks)**

3. A protein sample was subjected to DSC in its native form and after pressure treating it at 600 MPa. The thermogram of the native protein showed two distinct depressions while the other one of the high pressure treated protein showed only one peak.

   a. Discuss why there was this difference in the themograms (native versus high pressure treated samples) and also what happened to the protein during the pressure treatment **(10 marks)**

   b. To achieve the same effect as pressure treatment, what one (other) thing could you do to the protein to ensure similar results of the pressure results? **(2 mark)**

   c. Draw a typical thermogram showing and labeling all the points on the thermogram. **(8 marks)**

4. NMR and Mass Spectrometry are two techniques that are used in analytical science. Compare and contrast these two techniques. (20 marks)

5. The molecular weight of an unspecified protein, at physiological conditions, is 70,000 Dalton by another technique. The polyacrylamide gel electrophoresis (PAGE) of the protein yields a single band corresponding to molecular weight of 70,000 Dalton. However, in the presence of the reducing agent, β-mercaptoethanol, SDS PAGE shows two bands, corresponding to molecular weights of 30,000 and 20,000 Dalton. Answer the following:

   a. Clearly describe why there is a difference in the results obtained between the PAGE and SDS - PAGE? **(8 marks)**

   b. Clearly explain the reagents (chemicals) used in SDS – PAGE and their roles in the technique **(8 mark)**

c. Describe **one (1)** type of bonding that is likely to exist between the subunits

(1 mark)

d. Describe how the analyst elucidated the weight of the proteins in this SDS – PAGE technique **(3 marks)**

THE END

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BACHELOR OF FOOD SCIENCE AND TECHNOLOGY

TECHNICAL THERMODYNAMICS
AGF 3201

2016-2017 MID-YEAR EXAMINATIONS

DURATION: 3 HOURS **VENUE: FSN 2**

INSTRUCTIONS TO THE CANDIDATES:

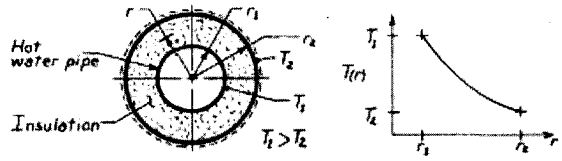
1. PLEASE READ THE INSTRUCTIONS AND EACH QUESTION CAREFULLY.
2. THIS PAPER CARRIES 100 MARKS AND HAS A TOTAL OF SIX (6) QUESTIONS.
3. EACH QUESTION CARRIES 20 MARKS.
4. ANSWER ANY 5 QUESTIONS ONLY.
5. ANSWER EACH QUESTION IN A SEPARATE ANSWER BOOKLET PROVIDED.

1.

a) The convection heat transfer coefficient between a surface at 40°C and ambient air at 20°C is 20 W/m2K. Calculate the heat flux leaving the surface by convection.

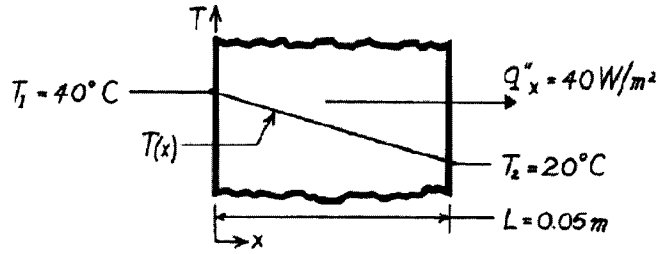
(4 marks)

b) A hot water pipe with outside radius r_1 has a temperature T_1. A thick insulation applied to reduce the heat loss has an outer radius r_2 and temperature T_2. On T–r coordinates, sketch the temperature distribution in the insulation for one-dimensional, steady-state heat transfer with constant properties. Give a brief explanation, justifying the shape of the curve shown.



(6 marks)

c) A rectangular slab of wood that is 50 mm thick has a known heat flux of 40 W/m^2. The surface temperatures on both sides of the wood slab are 40 °C and 20 °C, respectively. Calculate the thermal conductivity of the wood and the thickness of an aluminum slab that would be required to achieve the same heat flux for the same temperatures.



(10 marks)

2.

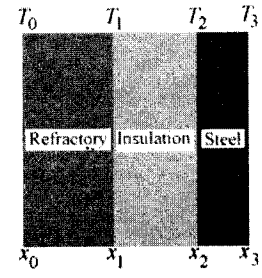
a) The inner and outer surface temperatures of a glass window 5 mm thick are 15 and 5°C, respectively. What is the heat loss through a window that is 1 m by 3 m on a side? The thermal conductivity of glass is 1.4 W/mK.

(4 marks)

b) Air at 300°C flows over a flat plate of dimensions 0.50 m by 0.25 m. If the convection heat transfer coefficient is 250 W/m2K, determine the heat transfer rate from the air to one side of the plate when the plate is maintained at 40°C.

(6 marks)

c) The wall of a furnace comprises three layers as shown in the figure. The first layer is refractory (whose maximum allowable temperature is 1400°C) while the second layer is insulation (whose maximum allowable temperature is 1093°C). The third layer is a plate of 6.35 mm thickness of steel [thermal conductivity = 45 W/(m K)]. Assume the layers to be in very good thermal contact. The temperature T0 on the inside of the refractory is 1370°C, while the temperature T_3 on the outside of the steel plate is 37.8°C. The heat loss through the furnace wall is expected to be 15800 W/m^2. Determine the thickness of refractory and insulation that results in the minimum total thickness of the wall.



Given thermal conductivities in W/(m K)		
Layer	*k* at 37.8°C	*k* at 1093°C
Refractory	3.12	6.23
Insulation	1.56	3.12

(10 marks)

3.

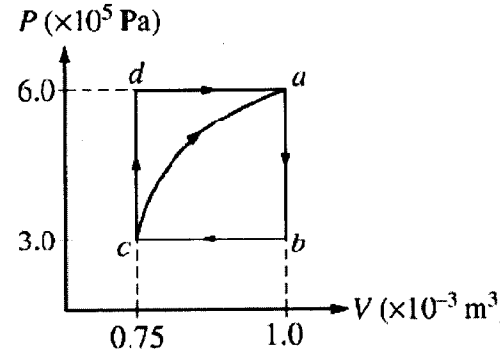
A cylinder with a movable piston contains 0.1 mole of a monatomic ideal gas. The gas, initially at state *a*, can be taken through either of two cycles, *abca* or *abcda*, as shown on the *PV* diagram above. The following information is known about this system.

Qc→a = 685 J along the curved path

Wc→a = −120 J along the curved path

Ua − Ub = 450 J

Wa→b→c = 75 J



a) Determine the change in internal energy, Ua – Uc, between states a and c.

(3 marks)

b)

I. Determine if the heat is added to or removed from the gas when the gas is taken along the path abc ? **(3 marks)**

II. Sketch and clearly indicate which path heat added to the gas and removed from the gas and calculate the amount added or removed. **(4 marks)**

c)

I. How much work is done on the gas in the process cda?

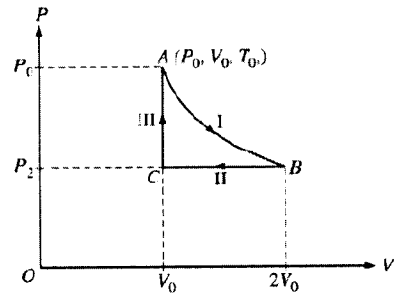
(5 marks)

II. Sketch and clearly indicate which path Is heat added to or removed from the gas when the gas is taken along the path cda? Explain your reasoning.

(5 marks)

4.

A sample of ideal gas is taken through steps I, II, and III in a closed cycle, as shown on the pressure *P* versus volume V diagram above, so that the gas returns to its original state. The steps in the cycle are as follows.



I. An isothermal expansion occurs from point *A* to point *B*, and the volume of the gas doubles.

II. An isobaric compression occurs from point *B* to point *C*, and the gas returns to its original volume.

III. A constant volume addition of heat occurs from point *C* to point A and the gas returns to its original pressure.

a) Determine numerical values for the following ratios, justifying your answers in the spaces next to each ratio.

I. P_A/P_B II. P_C/P_A III. T_B/T_A IV. T_C/T_A

(8 marks).

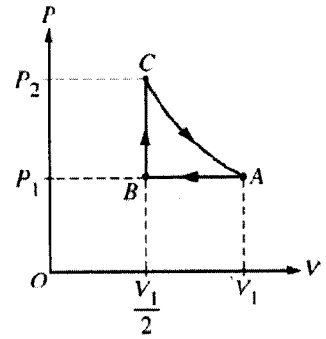
b)

I. During step I, Calculate the change in internal energy and justify your answer briefly. **(3 marks)**

II. During step III, Calculate the work done and justify your answer briefly. **(4 marks)**

c) From point A to Point B Explain why the process is called isothermal, justify your answer. **(5 marks).**

5. One mole of an ideal gas is initially at pressure P1, volume V1, and temperature T1, represented by point A on the PV diagram above. The gas is taken around cycle ABCA shown below. Process AB is isobaric, process BC is isochoric, and process CA is isothermal.



a) Calculate the temperature T_2 at the end of process AB in terms of temperature T_1. **(5 points)**

b) Calculate the pressure P_2 at the end of process BC in terms of pressure P_1. **(5 points)**

c)

I. Calculate the net work done on the gas when it is taken from A to B to C. Express your answer in terms of P_1 and V_1 **(5 points)**

II. Sketch and Indicate clearly all of the processes that result in heat being added to the gas. Give a clear Justification of your answer. **(5 points)**

6.

a) Under steady state operation, a 50 W incandescent light bulb has a surface temperature of 135°C when the room air is at a temperature of 25°C. If the bulb may be approximated as a 60 mm diameter sphere with a diffuse, gray surface of emissivity 0.8, what is the radiant heat transfer from the bulb surface to its surroundings?

(5 marks)

b) A surface of area 0.5 m2, emissivity 0.8, and temperature 150°C is placed in a large, evacuated chamber whose walls are maintained at 25°C. What is the rate at which radiation is emitted by the surface? What is the net rate at which radiation is exchanged between the surface and the chamber walls?

(5 marks)

c) An inspection window in a factory is defogged by passing warm air at 40°C over its inner surface, and the associated convection coefficient is 30 W/m2K. Under conditions for which the outside ambient air temperature is -10°C and the associated convection coefficient is 65 W/m2K, what are the inner and outer surface temperatures of the window? The window glass is 4 mm thick.

(10 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSC FOOD SCIENCE &TECHNOLOGY

NUTRITION
AGF 4065
2016/ 2017 MID-YEAR EXAMINATIONS

DATE: 12TH MAY, 2017TIME: 14 – 16:00H
DURATION: THREE (3) HOURS VENUE: OMNIA 2

INSTRUCTIONS TO THE CANDIDATES:

1. ANSWER ALL QUESTIONS

2. ALL QUESTIONS CARRY EQUAL MARKS

Question 1

a) Rose and Glenda are two adolescent girls of the same age and weight. Genetically, Rose has a much larger appetite than Glenda and therefore easily puts on weight whenever she is left to eat whatever she likes.
   i. Which hormone might Rose be lacking? **(2 marks)**
   ii. What is the role of the hormone you have mentioned in a. above? **(3 marks)**
   iii. Give four (4) ways of treating overweight/ obesity which Rose is at risk of **(8 marks)**

b) Compare and contrast type 1 and type 2 diabetes **(7 marks)**

Question 2

a) Summarize events involved in the digestion and absorption of protein **(12 marks)**
b) Write short notes on
   i. Protein processing and digestibility **(6 marks)**
   ii. Limiting amino acids **(2 marks)**

Question 3

Mr. Bowa and Mr. Tembo are 38-year old men who come to Kalingalinga clinic where you work as a nutritionist.

a) What are the four (4) building blocks used to undertake anthropometric assessments? **(4 marks)**
b) Using the building blocks you have listed in a), you find that Mr. Bowa's BMI is 24 and Mr. Tembo's BMI is 28.
   i. Classify the BMIs of the two (2) gentlemen and state whether or not they are at risk of disease based on BMI **(4 marks)**
   ii. List two (2) anthropometric methods you would use to assess body fat **(2 marks)**
   iii. Upon assessment, you find that Mr. Bowa's waist to hip ratio is 1 and Mr. Tembo's is 1.2
      a. Are the two (2) gentlemen at risk of chronic disease? Give a reason for your answer **(3 marks)**
      b. What type of body shape are these two men likely to have? **(1 mark)**
      c. Relating Mr. Bowa's BMI to his waist to hip ratio, does his BMI give a true representation of his current health status? Why? **(3 marks)**
c) What are the three indices used for nutritional assessment in children **(3 marks)**

Question 4

a) Describe the differences between soluble and insoluble fiber and their role in promoting health **(8 marks)**
b) Define body water balance **(2 marks)**
c) Describe control of water intake and water intoxication. And list three (3) water elimination routes **(10 marks)**

Question 5

a) Excessive sodium and fiber in the diet can impair the absorption of calcium leading to an increased risk of osteoporosis. Explain how these two substances impair calcium absorption **(4 marks)**
b) Provide four (4) steps that can be used to prevent osteoporosis **(4 marks)**
c) List four (4) American Institute for Cancer Research (AICR) recommendations for cancer prevention **(4 marks)**
d) Coronary Heart Disease (CHD) is becoming increasingly important in Zambia and this has in part been attributed to the escalating obesity levels. Several risk factors exist and these include modifiable, non-modifiable and intermediate causes.
    i. Give one (1) example of each risk factor listed above and explain why they are risk factors for CHD **(6 marks)**
    ii. Name the apolipoprotein specifically associated with the chylomicron and the apolipoprotein specifically associated with VLDL **(2 marks)**

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

2016/17 ACADEMIC YEAR MID-YEAR FINAL EXAMINATIONS

AGF 4221
PROCESS CONTROL AND INSTRUMENTATION

Date: 12th MAY, 2017
Time: 9:00 - 12:00 HRS
Venue: FSN 1

Duration: THREE (3) HOURS

INSTRUCTIONS TO THE CANDIDATES:

1. THIS PAPER CARRIES 100 MARKS AND HAS A TOTAL OF SIX (5) QUESTIONS.
2. EACH QUESTION CARRIES 25 MARKS.
3. ANSWER ANY FIVE (4) QUESTIONS.
4. ANSWER EACH QUESTION IN A SEPARATE ANSWER BOOKLET PROVIDED
5. USE ILLUSTRATIONS AND SKETCHES IN YOUR ANSWERS WHERE NECESSARY

1.

a) Explain the importance of mathematical modelling of a process in Process control.

(2 marks)

b) List the Characteristics of a feedback control system. Given an example to illustrate this kind of system.

(4 marks)

c) Develop a block diagram of a two-input control system in a home shower with separate valves for hot and cold water who's main objective should be to obtain a desired temperature of the shower water and flow rate. Explain the significance of this system.

(6 marks)

d) The variable $y\ (t)$ depends on its first derivative and forcing function $x\ (t)$ such that at $t = t_0$, $y = y_0$. Given the following equation, find the general solution.

$$a(t)\ \frac{dy}{dt} + y(t) = K\,x(t)$$

(8 marks)

2.

a) What are the four hardware elements that a control system is comprised of? Explain in details and give at least two examples for each of these elements identified.

(2 marks)

b) Illustrate how a first order dynamic system would respond to the following disturbances.

I. Step disturbance.
II. Pulse disturbance.

(4 marks)

c) Given that x is a step function at t_1 and that the response y will decay toward zero from IC y_0. At t1 the system will respond to being hit by a step disturbance. Illustrate how this system will respond to this disturbance.

(6 marks)

d) Consider a system's response which is defined by $y = y_H + y_1 + y_2$. Given that y_H decays toward zero from IC, that y_1 is the response to a step disturbance occurring at $t_1 = 1$, with gain of 3 and y2 is the response to a step disturbance occurring at $t_2 = 2$ with gain of -4. Give analysis of this system's response.

(8 marks)

3.

a) Discuss a system that exhibits first order dynamics. What are the principle characteristics of this system?

(2 marks)

a) Develop a block diagram for a control system for the opening of a vent when the temperature rises in a greenhouse or store house of vegetables.

(4 marks)

b) Develop a block diagrams for an open-loop system. Explain in detail its ability to perform accuracy and give an example.

(4 marks)

c) Given that the control objective for a process is to keep the store house temperature at a desired temperature of set on the thermostat by the home owner, in spite of unmeasured disturbances such as heat loss from the doors and windows opening, heat loss through the walls of the house. Develop a sketch of the showing all the necessary equipment working together.

I. Develop a block diagrams for this system.

II. Develop a set of control algorithm using the temperature as one of the variables.

(10 marks)

4.

a) Explain briefly the mechanism of operation in a feedback system.

(2 marks)

b) Define the following terms and give an appropriate example;

I. Manipulated variable.

II. Controlled variable.

(4 marks)

c) With the help of a simple sketch, devise a Control System to fill a container with water after it is emptied by a stopcock at the bottom. The system must automatically shut off water when the container is filled. Considering that this system is first order system, develop a material balance expressing the liquid level as a function of time and explain the term t_{fill}.

(6 marks)

d) Given that the overall material balance of an ideal process of filling a tank is presented below. Express the tank Volume in terms of the liquid level h (height of tank) and hence find the liquid lever h as a function of time.

$$\frac{d\rho V}{dt} = \rho F_i$$

(8 marks)

5.

a) A control scheme is the plan by which we intend to control a process. List four steps that are involved in developing a control scheme for the process of filling water in to a tank.

(2 marks)

b) Develop a block diagram to show that an electric toaster is an open loop control system and briefly Explain why.

(4 marks)

c) The student – teacher learning process is inherently a feedback process intended to reduce the system error to a minimum. The desired output is the knowledge being studied and the student may be considered as the process. Construct a feedback model of the learning process and identify each block of the system.

(6 marks)

d) With the help of a simple sketch, devise a Control System to fill a container with water after it is emptied by a stopcock at the bottom. The system must automatically shut off water when the container is filled. Considering that this system is first order system, develop a material balance expressing the liquid level as a function of time and explain the term t_{fill}.

(8 marks)

THE END

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION

2016 / 2017 ACADEMIC YEAR
MID-YEAR EXAMINATION

COURSE: AGF 5071
Food Colloids

Date: Friday, 12th May 2017 **Time: 09.00 – 12.00 Hours**

Duration: THREE (3) HOURS **Venue: Omnia 3**

INSTRUCTIONS TO CANDIDATES:

1. There are two (2) sections in this examination paper, Section 1 and Section 2.
2. Answer **Five (5) questions** in total
3. Answer at **least two (2) questions** from each section and the fifth (5th) question from either section 1 or 2
4. The marks allocated are given at the end of each question.
5. Answers to the two sections should be given in separate booklets.

SECTION 1: Answer at least 2 questions from this section in a separate booklet

Question 1

a. Brielfy describe or compare or contrast the following terms, where applicable

   i. Interface versus surface

   ii. Porosimetry

   iii. Hydrogen bonding versus hydrophobic bonding

   iv. Kinetic stability versus thermodynamic stability

   v. CMC

(10 marks)

b. Amphiphilic compounds are used in the area of food colloids to stabilise emulsions:

   i. What does amphiphilic mean? **(1 mark)**

   ii. Name two (2) compounds that are amphiphilic **(2 marks)**

   iii. Draw a simple structure of an emulsifier stabilising an emulsion of your choice and describe how such a compound sits at an interface to stabilise an emulsion (how does it stabilize the chooosen emulsion)?

(7 marks)

Question 2

a. Discuss the principle of micelle formation explaining in detail what happens at each stage. Include a diagram to show this formation of these structures.

(12 marks)

b. The Thermodynamics of adsorption has several mathematical deductions that are related to the presence of emulsifiers or surfactants and their activity in solution.

   i. Explain **three (3)** equations of your choice associated with thermodynamics of adsorption and describe what each of them deduce or explain in terms of the relationship of the emulsifiers or surfactants in solution. **(6 marks)**

   ii. Draw **two (2)** types of association colloids and give their names

(2 marks)

Question 3

Discuss in detail the physical principles of emulsion formation, giving attention to the fact that during this process there is coalescence and disruption taking place. Show sketches or figures where necessary. **(20 marks)**

SECTION 2: Answer at least 2 questions in a separate booklet

Question 1

(a) Write short notes on the following (maximum of five sentences each)

i. Microscopic stability of emulsions
ii. Von Smoluchowski's rapid coagulation
iii. $t_{1/2}$ in emulsions
iv. Diffuse layer
v. Peptisation **(10 marks)**

(b) Assume two droplets at such a large distance apart such that their interaction is almost non-existent. Describe the process of coagulation between these two droplets in an emulsion using the DLVO theory. **(10 marks)**

Question 2

(a) Calculate the required value of the stability ratio of Intra-lipid emulsions used for parenteral feeding in order to have a half-life of at least 2 years. These commercially available emulsions contain 20 g of purified soybean oil (δ=925 kg/m^3) as well as 1.2 g of purified egg lecithin (δ=1050 kg/m^3) per 100 ml of emulsion. The volume-equivalent particle diameter is 220 nm. It may be assumed that all lecithin is adsorbed to the O/W interface. The continuous phase is aqueous. **(10 marks)**

(b) A potential gradient of 20V/cm was applied across 0.2 mol/ dm^3 NaCl aqueous solution. A spherical particle of 1.0μm diameter was dispersed in this NaCl aqueous solution which was maintained at 25°C. The dispersed particles under these conditions were observed to be in motion and covered a distance of 140μm in 16 seconds. With the assumption that the viscosity of the water at 25°C was 0.89 Pa.s and the value of D was 78.55, estimate the:

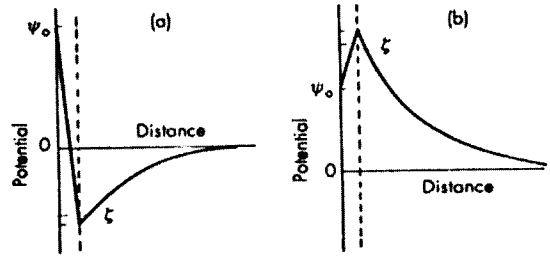
(i) electrophoretic mobility of the particle **(3 marks)**

(ii) zeta-potential of the particle **(7 marks)**

Question 3

(a)

i) The graphs (a) and (b) describe the surface charges of charged surfaces under different conditions. Explain the circumstance(s) that could lead to the surface potential (potential of the charged surface) and the zeta potential (potential around the stern plane and beyond) to vary as described in each of the two graphs **(4 marks)**



Figures (a) and (b)

ii) What is meant by lyophobic dispersions and suggest two (2) conditions that make lyophobic dispersions stable? **(3 marks)**

iii) When Ca^{2+} ions are added to soymilk, coagulation of the soymilk may be observed. Explain this phenomenon **(3 marks)**

(b) The behaviour of Newtonian and non-Newtonian liquids may be described using an empirical power law equation given below:

$$\tau = C^* (\gamma)^n$$

Where τ = stress, γ = strain, C = consistency index and n = the flow behaviour index

Use this equation to describe the Newtonian and non-Newtonian liquids

(10 marks)

END OF EXAM *(FORMULAE AND CONSTANTS OVERLEAF*

Formulae and constants for examination

$\Gamma = - 1/ (R*T) * (d\gamma / d\ln C) = - C / R*T * d\gamma / dC$

$\Gamma = - (1/ (z^+ + z^-))*1/(R*T)*(d\gamma / d\ln C) = - (1/ (z^+ + z^-))*C/(R*T)*(d\gamma / dC)$

$\Sigma = 1 / \Gamma$

$Pa_1 = (1/\Gamma) / N_A = \Sigma / N_A$

$\Delta P_L = 2\gamma / r = - 2 \cdot \gamma \cdot \cos\theta / r_c = h \cdot \delta \cdot g$

$(2 \cdot \pi \cdot r_c) \cdot \gamma \cdot \cos\theta = (\pi \cdot r_c^2 \cdot h) \cdot \delta \cdot g$

$$\mu = \frac{\zeta * \varepsilon}{1.5\eta}$$ Debye – Hückel equation

$$\mu = \frac{\zeta * \varepsilon}{\eta}$$ Helmoltz-Smoluchowski equation

$$\mu = \frac{v}{E}$$

$\kappa = \sqrt{(2* Z^2 * F^2 * C_o / \varepsilon RT)}$

$\kappa = \sqrt{(2* Z^2 * e^2 * n_o / \varepsilon kT)}$

$\kappa = 1.04 * 10^8 \sqrt{(C_o * Z^2)}$

$R*T*\ln [P_{vr}/P_{vo}] = 2* \gamma *M/\delta*r = 2*\gamma*V_L / r$

$t_{1/2, slow} = W * t_{1/2, fast}$

$t_{1/2, rapid} = 3*\eta / (4*k*T*N_o) = 2*10^{17}/ N_o$

$N_o = fv / [(\pi/6)*\phi^3]$

$F = 96485$ C / Mole

$e = 1.602 * 10^{-19}$ C

$R = 8.314$ J / (mole.K)

$\varepsilon_o = 8.85 * 10^{-12}$ F/m

$k = 1.38 * 10^{-23}$ J/K

$N_A = 6.023 \times 10^{-23}$

δ_{H2O} at 22°C ≈ 1000kg/m3

$g = 9.81$m/s

$\pi = 3.14$

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BACHELOR OF FOOD SCIENCE AND TECHNOLOGY

PLANT DESIGN AND ENVIRONMENTAL MANAGEMENT
AGF 5241

2016-2017 MID-YEAR EXAMINATIONS

DURATION: THREE (3) HOURS **VENUE: TRB**

INSTRUCTIONS TO THE CANDIDATES:

1. PLEASE READ THE INSTRUCTIONS AND EACH QUESTION CAREFULLY.
2. THIS PAPER HAS **TWO** SECTIONS (A & B) AND CARRIES **60** MARKS
3. SECTION **A** IS COMPULSORY,
4. ANSWER ANY **TWO** FROM SECTION **B.**

SECTION A

1. Lubega Farm, a vegetable and fruit exporting firm would like to expand its product portfolio by including bananas on its export list. The management's decision is to be storing 2500 kgs of these bananas in a recently built storage room of 9m (length), 5m (width) and 4m (height). The respective k-values of the roof, the walls and the floor are 0.8, 1.2 and 1.4 $W.m^{-2}.\ ^{o}C^{-1}$ and the air is supplied into the room at a rate of $0.20 m^3/s$

   Optimum conditions and relevant parameters for banana storage are given below:
   - γ = Air density = 1.2 $kg\ DA/m^3$
   - C_p = Specific heat of dry air = 1.004 $kJ/kgDA.^{o}C$
   - T_{opt} = 13 ^{o}C
   - H_V = 0.118 $W.kg^{-1}$
   - Tolerable CO_2 concentration = 8 L/m3, CO_2 concentration of open air = 0.35 L/m3
   - CO_2 production = 0.25 L/kgs

   a) In order to maintain the product integrity, is there need to install an artificial supply or withdrawal of the gas (CO_2) in the newly built storage room? **(5 points)**

   b) Calculate the amount of cooling or heating required for the 2500 kgs of bananas at the outside temperatures of 5 and 10 ^{o}C. The floor temperature is supposed to be constant and given to be 5 ^{o}C. **(10 points)**

   c) Do you need to install a cooler or a heater to maintain the optimum storage conditions for bananas in the room? **(5 points)**

SECTION B

2. A semi-automated wheat milling plant has an annual production capacity of 20,000 tons of flour with overall yield of 75%, on mass basis (Kg of product per Kg raw material). An investment of 50,000 USD for a fully automated mill will increase the yield to 85%, and additional operating costs are negligible. Raw material cost 200 USD/ton and the product sells for 350 USD/ton.

a) Is the investment into a fully automated mill worth making? Please justify based on the economic evaluation criteria such as pay-back period or Rate of Return (ROR) **(10 points)**

b) Using the project cash flow diagram, summarise the phases that a project such as this may follow during its life cycle **(10 points)**

3. You see an opportunity to put up an orange juice processing plant in Katete district of Zambia given the availability of raw materials in the area.

   a) One of the equipment you may require is that for filtration. Discuss five most important factors you may consider when selecting this equipment **(5 points)** 7.5

   b) List five specifications that you may consider useful in deciding whether to purchase the equipment or not from the vendor. **(5 points)**

   c) Would you consider aluminum as a material of choice for a storage tank for this type of product? Please justify your answer **(5 points)** 7.5

4. As a Plant design engineer, what are your expectations on the following features of the newly commissioned food processing facility:

   a) Structural components (walls, floor, doors, windows and pipelines **(5 points)**

   b) Plant layout with regards to equipment **(5 points)**

   c) Sanitary facilities **(5 points)**

   d) Arrangement of rooms, areas and processes within the establishment **(5 points)**

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

2016/17 ACADEMIC YEAR MID-YEAR FINAL EXAMINATIONS

AGF 5321
Technology of Dairy & Egg products

Date: Wednesday 10th May 2017
Time: 09:00hrs
Venue: FSN 1 Lecture Theatre

Duration: THREE (3) HOURS

INSTRUCTIONS TO THE CANDIDATES:

1. **THIS PAPER CARRIES 100 MARKS AND HAS TWO (2) SECTIONS.**
2. **ANSWER ALL QUESTIONS IN SECTION 1 AND SECTION 2.**
3. **ANSWER THE TWO SECTIONS IN SEPARATE ANSWER BOOKLETS.**
4. **ALLOCATED MARKS FOR EACH QUESTION ARE INDICATED IN BRACKETS.**

SECTION 1: Technology of Dairy Products

1. The manager of Mpima Dairy Cooperative approaches you for assistance on diversifying their production from set yoghurt to fresh cream. As a dairy expert, you are expected to make a presentation to the Board members on the viability of this project.
    a. Explain with aid of an illustration, the manufacturing process of fresh cream. **[15 marks]**
    b. State the changes (including new equipment) that should be made to the existing production line in order to produce the new product. **[4 marks]**
    c. Would you support this diversification plan? Give reasons. **[1 marks]**

2. Makwele Dairy Products is involved in the manufacture of UHT milk. The company's technical manager approaches you with a problem of their product bulging after 7 days of storage and further explains that the product in some packs tends to thicken after long periods of storage.
    a. Explain the possible causes of the problem. **[4 marks]**
    b. Give the different tests and checks you would carry out on the product and production line. **[4 marks]**
    c. Give the possible solutions and offer recommendations that will prevent the problem from recurring. **[4 marks]**
    d. Explain how sterilised milk differs from UHT milk in terms of the production process and product quality. **[4marks]**
    e. Differentiate the principle of heat-induced coagulation from acid-induced coagulation of normal milk. **[4 marks]**

3. For each of the following:
    a. Explain the principle of enzymatic coagulation in milk. **[6 marks]**
    b. Show the ice-cream manufacturing process on a flow diagram. **[6 marks]**
    c. Discuss the difference between physical and biological cream ripening. **[5 marks]**
    d. Describe the ripening process in cheese making **[3 marks]**

SECTION 2: Technology of Eggs – Answer all questions in a **separate booklet.**

1. Draw the egg and show its parts. From your diagram, show the part of the egg, which is an emulsifier, a good trapper of air, and the part of the egg associated with cholesterol. Explain in detail, how the first two parts impact the food industry. Describe the vital nutritional properties of eggs and relate this to their biological value. **[20 marks]**

2. (a) (i)Name the quality defect associated with dried eggs and describe how it can be prevented. **[5 marks]**

   (ii) Describe all possible pasteurisation methods used in egg processing. What should be of concern to ascertain that the pasteurisation has been done effectively? **[5 marks]**

   (b) Define the following in relation to eggs:

   i. Candling **[2 marks]**

   ii. Egg substitute **[2 marks]**

   iii. Jumbo and Pewee **[2 marks]**

   iv. Egg gelation **[2 marks]**

   v. Egg bloom **[2 marks]**

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

MAY 2017

FINAL EXAMINATION

PROCESSING AND PRESERVATION OF PLANT PRODUCTS

AGF 5615

DATE: 8TH MAY, 2017

TIME: 14.00 – 17.00 hours

DURATION: THREE (3) HOURS

INSTRUCTIONS

1. Students are NOT permitted to bring mobile phones and/or any other unauthorized electronic devices into the examination room.
2. Write your student number in the space provided on the answer booklet.
3. Answer all questions.
4. Each question must be answered in a separate booklet.

5. All questions carry a total of 20 marks each.

Answer **all** questions. Each question must be answered in a separate answer booklet.

1. (a) Production of sauerkraut undergoes three important stages
   (i) Initial stage
   (ii) Primary fermentation
   (iii) Secondary fermentation

   (I) Give the significance of initial stage in the production of sauerkraut. **(2 marks)**

   (II) Name the two groups of bacteria that facilitates fermentation in the primary fermentation of sauerkraut and state the groups they belong to. **(6 marks)**

   (III) Explain the need for a tight closing jar during fermentation of sauerkraut. **(2 marks)**

   (b) Fermentation of milk leads to formation of flavors such as diacetyl.
   (i) Discuss the three important steps needed to achieve highest possible levels of diacetyl. **(3 marks)**

   (ii) Define the term glycocalix and state the sugar associated with it. **(3 marks)**

   (iii) In what sense would you consider spontaneous fermentation a mixed strain fermentation. **(2 marks)**

   (iv) Give one example of a product produced from a single strain fermentation and mention its advantage. **(2 marks)**

2. (i) Explain the major aim of refining crude vegetable oil. **(2 marks)**

(ii) Describe the physical refining of crude soybean oil with the aid of a flow diagram **(8 marks)**

(iii) Discuss the hydrogenation of oils, outlining the effects that this process has on the nutritional and physical properties of the vegetable oil. **(5 marks)**

(iv) Write short notes (less than five lines) on the following

a. Nutritional significance of legumes in the diet **(1 mark)**
b. Aflatoxin **(1 mark)**
c. Anacardic acid **(1 mark)**
d. Isoflavones **(1 mark)**
e. Sprouted soybeans **(1 mark)**

3. (i) Discuss the structural differences between the caryopsis of hard and soft wheat cultivars. **(4 marks)**

(ii) Define the extraction rate of flour. **(2 marks)**

(iii) Discuss the advantages and disadvantages of high and low extraction rate flours. **(6 marks)**

(iv) Compare and contrast the nutritional composition of wheat and maize. **(3 marks)**

(vi) Write short and concise notes on the following (less than five lines)

a) Rice Hulls **(1 mark)**
b) Parboiling **(1 mark)**
c) *Sorghum bicolor* **(1 mark)**
d) Threshing **(1 mark)**
e) Food loss **(1 mark)**

4. a) The weather has been severe in Zambia and Belgium. In Zambia, there was severe drought which made it impossible to grow and process sugar cane into sugar. In Belgium, there was heavy snowfall which also made it impossible to grow and process beet root into sugar. Sugar is still required in the food industries of these countries for different applications Name and describe in detail other ways and methods used to produce sugar or sweeteners which can satisfy the demand for sugar in these two countries **(15 Marks)**

b) Apart from their culinary and flavor significance, what other important contributions do spices make to diets. **(2 Marks)**

c) How is **sugar** quality determined in **beet root** processing? **(3 Marks)**

5. a) Explain the manufacturing process of a mixed vegetable powder made from carrot, potato and spinach with aid of a flow diagram. **(15 marks)**

b) The manager of Fransiku frozen foods Ltd approaches you with a problem of discoloration and poor taste of their frozen rape. Explain the causes of the problem and offer possible solutions. **(5 marks)**

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

ACADEMIC YEAR 2016/2017 FINAL MID YEAR EXAMINATION

AGG3811: RURAL SOCIOLOGY

TIME: **THREE HOURS**

TOTAL MARKS: **100**

INSTRUCTIONS: **ANSWER ALL QUESTIONS**

EACH QUESTION CARRIES EQUAL MARKS

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1. "Traditional, Charismatic and bureaucracy constitute three main forms of authority"
    a) With practical examples, describe each one of these forms of authority
    b) State the advantages and disadvantages of traditional and charismatic authority
    c) Explain why bureaucracy is considered a more superior form of authority over others. (20 marks)

2. Differentiate the concept gender from sex and state four major gender issues it addresses in agricultural development. (20 marks)

3. Provide the sociological meanings of the following paired terms:
    a) Family of orientation and family of procreation
    b) Formal and informal organization
    c) Sustainable development and globalization
    d) Social systems and social stratification
    e) Decentralization and formalization (20 marks)

4. Define and clearly state at least two significant roles that following identified "socializers" play in lives of Zambian people.
    a) School, b) Peers, c) Mass media d) Religion (20 marks

5. "Social interaction takes many forms some of which help stabilize the social structure. Other forms help promote change." Outline and fully discuss any four most commonly known forms of social interaction (20 marks)

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES

FINAL EXAMINATIONS, 2016 ACADEMIC YEAR

COURSE: AGG 4851: EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS
DURATION: THREE (3) HOURS
TOTAL MARKS 100

INSTRUCTIONS: ANSWER ALL THE QUESTIONS. ANY STATISTICAL TEST SHOULD BE AT 5% SIGNIFICANCY LEVEL

QUESTION 1

Briefly:

a) Describe the types of hypothesis. **(5 marks).**
b) Describe the types of Linear Models. **(5 marks).**
c) What do you understand by Experimental Design and Treatment Design? **(5 marks).**

QUESTION 2

In a study of the influence of Planting Method (Machine Planting and Hand Planting) and the Maize Variety (MRI 694 and MRI 600) on maize yield. Six homogeneous plots were available for the experiment .The following data of maize yield (Kg) was collected from the experiment.

Planting Method	Replication	Maize Variety	
		MRI 694	MRI 600
Machine Planting	1	42	46
	2	47	29
	3	32	32
Hand Planting	1	39	46
	2	35	46
	3	34	30

a) What experimental design was used in this study? (**2 Marks**).
b) Write an appropriate linear model for this data. (**9 Marks**)
c) Determine both the simple and main effects. (**3 Marks**).
d) Analyze the data and make conclusions.(**16 Marks**).

QUESTION 3

A Food Scientist was approached by the Ministry of Health to make recommendations on whether Breast feeding (A), used as a control, should be replaced by other sources of milk such as Cow milk (B) or Goat milk (C). She undertook a study and collected the following data on weight gain (kg) over 24 months of feeding male children. It was assumed that only time of feeding and the area where the children reside could influence the results.

	AREA		
	High Density	Medium Density	Low Density
TIME OF FEEDING			
Morning	A:10	B: 8	C: 9
Mid-day	B: 6	C: 8	A: 12
Evening	C: 7	A: 9	B: 8

a) What experimental design was used in this study? (2 **Marks**).
b) Write an appropriate linear model for this data. (**9 Marks**).
c) Determine the treatment means and treatment effects. (**6 Marks**).
d) Analyze the data and make conclusions to report to the Ministry of Health. (**13 Marks**).

QUESTION 4

An Animal Breeder undertook a study to determine the variation of litter size in Large White (pigs). Four randomly selected sows produced four litters each and the number of piglets for each litter was recorded. The following data was collected.

Sow	**Litter size**			
1	11	9	7	10
2	6	5	9	12
3	11	7	6	9
4	6	13	11	6

a) Write the appropriate linear model for this data. (**10 Marks**)

b) Analyze the data and make conclusions (**15 Marks**)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & TECHNOLOGY

BSc Human Nutrition

ANATOMY AND PHYSIOLOGY
AGN 2110

Date: 1st November, 2016 Time: 09.00-12.00hrs

Duration: THREE (3) HOURS Venue: Other Rooms

INSTRUCTIONS TO THE CANDIDATES:

1. THIS PAPER CARRIES 100 MARKS AND HAS THREE SECTIONS A, B and C

2. ANSWER ALL THE QUESTIONS IN ALL SECTIONS. ANSWER SECTIONS A AND B IN A SINGLE BOOKLET AND SECTION C IN A SEPARATE BOOKLET

3. ALLOCATED MARKS FOR EACH SECTION ARE INDICATED IN THE BRACKETS

SECTION A: Choose the best answer **[30 Marks]**

1. _____separates the body into Anterior and Posterior parts.
   A. Sagittal
   B. Frontal
   C. Median
   D. Horizontal

2. According to the terms of relation or position, closer to the origin of a structure and further away from the origin of a structure is termed as _____.
   A. Posterior; anterior
   B. Medial; lateral
   C. Superficial; deep
   D. Proximal; distal

3. According to the terms of relation or position, towards the head and towards the tail (feet) termed as _____.
   A. Superficial; deep
   B. External; internal
   C. Supine; prone
   D. Cephalad; Caudad or superior; inferior

4. A dividing wall or a partition is _____.
   A. Sac
   B. Sinus
   C. Space
   D. Septum

5. A peristaltic rush which results in a failure to absorb enough colon water results in _____.
   A. Constipation
   B. Diarrheoa
   C. Cramps
   D. Flatus

6. Which structure contains the lowest amount of oxygen?
   A. Pulmonary vein
   B. Aorta
   C. Vena cava
   D. Right ventricle

7. The pulmonary semilunar valve prevents a back-flow of blood into the _____.
   A. Pulmonary artery
   B. Right ventricle
   C. Left ventricle
   D. Right atrium

8. The shortest section of the intestines is the _____.
   A. Ileum
   B. Duodenum
   C. Jejunum
   D. Colon

9. The finger-like extensions inside the small intestine are called _____ and increase the surface area.
   A. Microvilli
   B. Villi
   C. Lacteals
   D. lumens

10. The myocardium would be the thickest in the _____.
   A. left atrium
   B. left ventricle
   C. right atrium
   D. right ventricle

11. What is a mature gamete called?
   A. Oogenesis
   B. Ovary
   C. Ovulation
   D. Ova

12. Which cells produce testosterone?
   A. Interstitial cells
   B. T-cells
   C. Sertoli cells
   D. Sustentacular cells

13. In the female, what is the correct term for the production of gametes called?
   A. Oogenesis
   B. Ovary
   C. Ovulation
   D. Oocytation

14. Which of the following is NOT considered part of the male genital duct system?
    A. Rete testis
    B. Tubuli recti
    C. Seminal vesicles
    D. Ductus deferens

15. Which of the following is true about structure of the penis?
    A. Has one corpus cavernosa and one corpus spongiosum
    B. Has one corpus cavernosa and two corpora spongiosum.
    C. Has two corpora cavernosa and one corpus spongiosum
    D. Has two corpora cavernosa and two corpora spongiosum

16. Which one of the following are the earliest cells of spermatogenesis?
    A. Primary spermatocytes
    B. Spermatogonia
    C. Spermatids
    D. Spermatozoa

17. Which of the following is NOT a function of a hormone?
    A. Regulates chemical composition and volume of the internal environment
    B. Regulates metabolism
    C. Regulates glandular secretions
    D. Produces electrolytes

18. Which of the following accessory glands is not paired?
    A. Prostate
    B. Seminal Vesicular gland
    C. Bulbourethral gland
    D. Cowpers glands

19. Fertilization of an ovum by a spermatozoon occurs in the
    A. cervix
    B. fallopian tube
    C. ovary
    D. uterus

20. The adrenal glands consist of _____.
    A. the inner and outer layer of the kidney
    B. the inner medulla and the outer cortex
    C. lower adrenal and upper paradrenal sections
    D. ACTH and BCTH sections

21. Accessory organs of the gastrointestinal tract (GIT)
    A. Form the long tube of the digestive system
    B. An example is the oral pharynx
    C. Has both mechanical and chemical function
    D. Function mainly to soften the food

22. All of the following structures are components of the urinary system except

    A. kidneys
    B. ureters
    C. urethra
    D. gallbladder

23. What structure rests on the superior pole of each kidney?

    A. spleen
    B. transverse colon
    C. adrenal gland
    D. duodenum

24. The outer layer of the kidney, just internal to the fibrous capsule, is the renal

    A. medulla
    B. column
    C. pelvis
    D. cortex

25. Components of a nephron include

    A. a renal corpuscle
    B. proximal and distal convoluted tubules
    C. a nephron loop
    D. all of the above

26. The _____ part of the stomach is the area that is connected to the esophagus.

A. cardiac
B. pyloric
C. fundus
D. body

27. Which of the following maintains the patency (openness) of the trachea?

A. surface tension of water
B. surfactant
C. cartilage rings
D. pseudostratified ciliated epithelium

28. Which respiratory-associated muscles would contract if you were to blow up a balloon?

A. diaphragm would contract, external intercostals would relax
B. internal intercostals and abdominal muscles would contract
C. external intercostals would contract and diaphragm would relax
D. diaphragm contracts, internal intercostals would relax

29. The nose serves all the following functions except _____.

A. as a passageway for air movement
B. as the initiator of the cough reflex
C. warming and humidifying the air
D. cleansing the air

30. The exchange of gases and nutrients between blood and tissues is a major function of:

A. arterioles
B. . arteries
C. capillaries
D. veins

SECTION B

State whether each of the statements is true or false. **[9 Marks]**

1. The epididymis is secretes testosterone
2. The hand is inferior to the arm
3. The ovary has primordial follicles and corpus luteum during the luteal phase
4. The mesovarium is the broad ligament that does not cover the ovary
5. In an anatomical position, the thumb is medial to the ring finger
6. Appendicular portion of the skeleton consists of the arms and the legs
7. A red blood cell is a biconcave disk that has a nucleus
8. The glans penis is homologus to the clitoris in structure
9. The tricuspid valve is located between the right atrium and the right ventricle
10. Pancreas is located behind the stomach, attached to the duodenum
11. The stomach has no endocrine function.
12. The labia minora is homologous to the scrotum
13. The seminiferous tubules produce semen
14. Undescended testis at birth is referred to as cryptorchidism
15. The corpus luteum produces gonadotropin releasing hormone
16. The vagina is about 10cm
17. Atria is the same as auricles
18. Dartos is a muscle that forms part of the scrotal sac deep to the skin

SECTION C [61 Marks]

Question 1

Briefly discuss the implications of having a low packed cell volume. **(2 Marks)**

Question 2

Write short notes on neutrophils. **(4 marks)**

Question 3

Discuss the mechanism of transport of carbon dioxide in the body. in your discussion, use the alveoli as the point of exit and the body tissues as the point of origin. **(8 marks)**

Question 4

Describe the mode of action of any non steroidal hormone of your choice. **(10 marks)**

Question 5

Discuss in detail the disease associated with the Rh system.

(10 marks)

Question 6

Discuss the ovarian cycle with respect to the various hormonal interaction involved. **(18 marks)**

Question 7

Discuss in detail the regulation of sodium. **(9 marks)**

.....END OF EXAMINATION.....

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSc Human Nutrition

SUPPLEMENTARY EXAMINATION

HUMAN NUTRITION
AGN 3222
2015-16

Date: 2nd November, 2016 **Time: 09:00 – 12:00**

Duration: THREE (3) HOURS **Venue: Omnia 3**

INSTRUCTIONS TO THE CANDIDATES:

1. **THIS PAPER CARRIES 150 MARKS AND HAS TWO SECTIONS, A & B**

2. **ANSWER ALL QUESTIONS IN SECTION A AND ONLY FOUR (4) QUESTIONS FROM SECTION B.**

3. **ALLOCATED MARKS FOR EACH SECTION ARE INDICATED IN THE BRACKETS**

Section A: (TOTAL 50 MARKS)

Answer ALL questions in this section

1. During infancy exclusive breastfeeding is recommended for the first six months of a child's life. LIST five (5) advantages of breast milk/breastfeeding for either the mother and/or her infant **(5 MARKS)**

2. a. List the FOUR (4) KEY nutrients needed in higher amounts for older adults **(4 MARKS)**
   b. Name the KEY nutrient that is required in lower amounts for older women **(1 MARK)**

3. During pregnancy there is an increased requirement for protein; what is this needed for? **(5 MARKS)**

4. What is the PRIMARY purpose of Food Based Dietary Guidelines (FBDGs) **(5 MARKS)**

5. a. Name the hypothesis which links the intrauterine effect of under nutrition to adult health? **(2 MARKS)**
   b. LIST THREE (3) chronic diseases which are linked to poor intrauterine nutrition? **(3 MARKS)**

6. a. Outline FOUR (4) food sources of Riboflavin **(4 MARKS)**?

   b. List TWO (2) consequences of Vitamin B1 deficiency in infants? **(2 MARKS)**

7. Which vitamins make up vitamin B complex? **(5 MARKS)**

8. What are the functions of antioxidant vitamins and which vitamins do they include? **(5 MARKS)**

9. Explain the role of Vitamin C in preventing Iron Deficiency Anaemia (IDA) **(2 MARKS)**

10. Mention THREE (3) factors that hinder Calcium absorption **(3 MARKS)**

11. Which key nutrients would a pregnant woman require in larger amounts to ensure she provides for her unborn child's.....?
    a) Blood? **(2 MARKS)**
    b) Bones? **(2 MARKS)**

Section B: (TOTAL 100 MARKS)

Answer ONLY four (4) questions in this section

1. **It is essential to work on strategies that promote and facilitate dietary diversification of cereal & tuber-based diets, with foods rich in micronutrient. FAO/Life Sciences Institute propose five strategies to increase dietary diversity through food-based approaches.**

   a) List these FIVE (5) proposed strategies (**5 MARKS**)

   b) Using your answers from *question 1a*, discuss what is involved with each strategy and how it can increase dietary diversity (**20 MARKS**)

2. **Weight gain and atherosclerosis often begin during the adolescent period.**

   a) What is the CAUSE of obesity in humans? (**5 MARKS**)

   b) Adolescents and young adults must establish healthy eating and lifestyle habits to reduce the risks of chronic disease later in life; discuss potential barriers to this **(20 MARKS)**

3. **Josephine weighs 70.5 Kg and she is trying a new diet that provides 1200 calories. She is eating 20% carbs, 50% protein and 30% fat. Assuming that she needs to consume 130g of carbohydrates/day?**

   a) Determine whether Josephine is getting the minimum of 130 grams of carbs/day? **(10 MARKS)**

   b) Given that her recommended allowance for protein is 0.8g/day. Is she consuming more than the recommended 0.8 grams protein/kg or is she getting more than the recommended maximum of 2 g protein/kg per day? **(10 MARKS)**

   c) Explain the consequences of not meeting the recommended allowances for;

   i) Carbohydrates **(2.5 MARKS)**

   ii) Proteins **(2.5 MARKS)**

4. **Complete the table below; (25 MARKS)**

	Vitamin E	**Vitamin K**
Dietary Sources	i) ii) iii) iv)	i) ii) iii) iv)
Functions	i) ii) iii)	i) ii) iii)
Organs where stored	i) ii) iii)	**i)** **ii)**
Where its absorption takes place		
Consequences of deficiency	i) ii)	i) ii)

5. a) List and explain the THREE (3) components of energy expenditure**?** (**7 MARKS**)

b) Explain how each of the factors below affects the Basal Metabolic Rate (BMR)? **(8 MARKS)**

i) Age

ii) Gender

iii) Exercise

iv) Exposure to cold temperature

c) Briefly define the FOUR (4) forms of energy in the human body (**10 MARKS**)

- End of Examination -

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSC HUMAN NUTRITION

NUTRITION ASSESSMENT
AGN 3311
MID- YEAR EXAMINATION 2016/2017

DATE: 11TH MAY, 2017 TIME: 14:00 TO 17:00hrs
DURATION: THREE (3) HOURS VENUE: TRA
AGN 3311

INSTRUCTIONS TO CANDIDATES

I. THIS PAPER CARRIES **60 MARKS**
II. ANSWER **ALL** THE QUESTIONS IN SECTION A AND ANY TWO (2) QUESTIONS IN SECTION B.
III. EACH QUESTION CARRIES **20 MARKS**
IV. MARKS ALLOCATED FOR EACH QUESTION ARE INDICATED IN BRACKETS

SECTION A : ANSWER ALL (20 MARKS)

1. Weighing and measuring portion sizes is an example of applying which principle of dietary assessment to your diet? **(2 marks)**

2. Which of the following factors is least likely to affect growth? **(2 marks)**

a) Genetics b) Nutrition c) Ethnicity d) Socioeconomic status

3. The Estimated Average Requirement (EAR) means: **(2 marks)**

a) An intake level that meets the nutrient needs of 97.5% of healthy people.

b) An intake value that meets the nutrient needs of half the healthy individuals in a group

c) The upper limits of a nutrient compatible with health

d) The nutrient intake standards for healthy people

e) That this is a "tentative"RDA

4. .....assesses body fat distribution as an indicator of health **(2 marks)**

a) Body mass index b) body weight as a percentage of ideal body weight c) waist-hip-ratio d) Percentage usual body weight

5. Which of the following is correct when considering overweight in children? **(2 marks)**

a) Child is considered overweight when the BMI is greater than 50th percentile on the BMI-for-age chart.

b) Child is considered overweight if their BMI is increasing over time.

c) Child is considered overweight when their BMI is greater than the 85th percentile

d) Child is considered overweight when their waist-to-hip ratio is less than 0.5

6. The RDAs (Recommended Dietary Allowances) recommend nutrient amounts for essential nutrients for practically all healthy people by gender and by age. **True or False? (2 marks)**7. When interpreting child growth charts for children 12-18 months of age, when the growth line crosses the z-score, it may indicate a problem or suggest a risk. **True or False (2 marks)**

8. BMI tends to overestimate obesity among taller people. **True or False (2 marks)**

9. Random error can be traced to a defect in the measuring instrument. **True or False (2 marks)**

10. Serum Ferritin is a biomarker for Iron stores. **True or False (2 marks)**

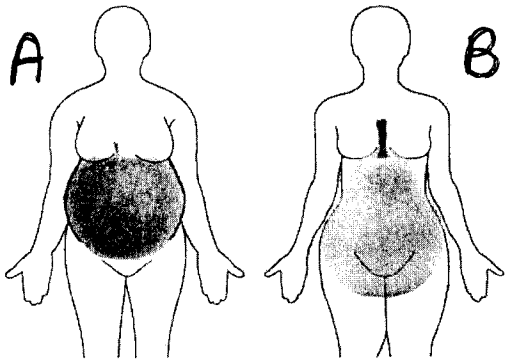
SECTION B : APPLICATION QUESTIONS

(ANSWER ANY 2 FROM THIS SECTION)

QUESTION 1 (20 MARKS)

The diagrams below show the distribution of fat in the body.

a) Which one of the two shapes identifies with i) visceral fat ii) subcutaneous fat? **(2marks)**



b) Give two parameters and the index you would calculate to assess the risk of developing chronic diseases? **(3 marks)**

c) Compare and contrast the two diagrams in terms of: **(9 marks)**

i) Which shape is common in males and females?

ii) Distribution of fat

iii) Risks associated with each shape and the shape with the highest risk

d) A 25 year old male athlete weighs 87.3kg and has a height of 1.75m.

i) Calculate his BMI **(2 marks)**

ii) How would you classify his BMI? **(1 mark)**

ii) Is the classification in (ii) based on BMI reliable for this man and, if not, why? **(3 marks)**

QUESTION 2 (20 MARKS)

2. a) One of the methods of nutrition assessment is clinical /physical examination. What would the following signs/symptoms imply? (**8 marks**)

i) Bilateral Pitting Oedema

ii) Pallor

iii) Severe visible wasting

iv) Bleeding, swollen and spongy gums

b) Give two **(2)** limitations of the clinical assessment method in determining nutritional status (**2 marks)**

c) How would you validate your clinical findings? **(2 marks)**

d) An adult, female patient is brought to you with the following Lab test results. From your interview with her you gather that she lives in a swampy area, does not sleep under a mosquito net and has a swollen/sore tongue, general body weakness, and shortness of breath.

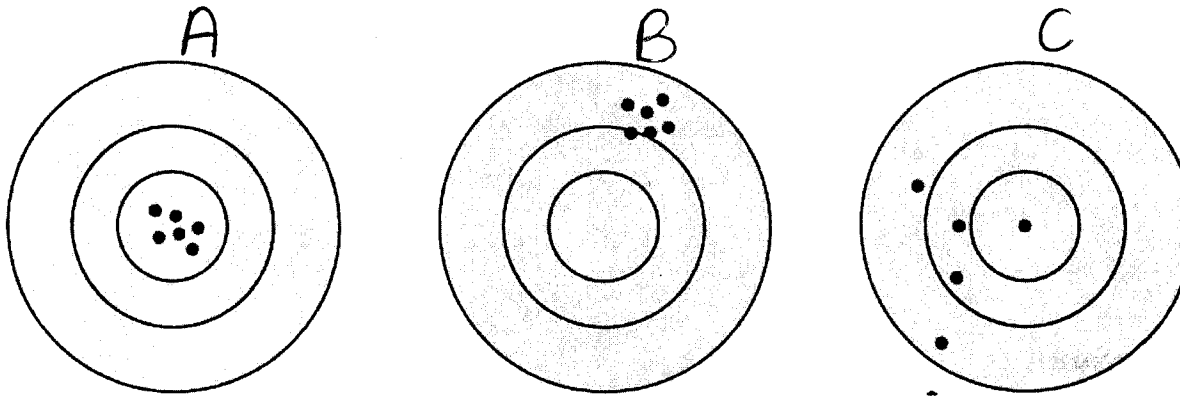
Biomarker	**Test result**	**Normal range**	**Interpretation**
Example: **serum ascorbic acid**	**0.25mg/ dL**	**0.6-2 mg/dL**	**Scurvy due to levels of ascorbic below the normal**
Hemoglobin	4.5g/dL	Male= **13.2 – 17.3 g/dL** Female = **11.7 – 16.1 g/dL**	?
Serum Albumin	4.5g/dl	**3.9–5.0 g/dL**	?
Glucose (fasting)	55mg/dl	**70-100 mg/dL)**	?

i) Interpret the biochemical test results in relation to the normal ranges provided in the table. Serum ascorbic acid has already been answered for you as an example. (**6 marks**)

ii) What is causing the shortness of breath and general body weakness from the results in the table? **(2 marks**)

Question 3 (20 MARKS)

3 a) Describe the diagrams below in terms of precision and accuracy (**6 marks**)



A.....

B.....

C.....

b) Define the following terms in relation to measurements (**4 marks**)

i) Precision

ii) Accuracy

c. Using the standard z-score tables provided, calculate for the children in the table the;

i) Weight-for-age,

ii) Height-for age (**8 marks**)

Children	**Weight (kg)**	**Height (cm)**	**Age (months)**
Masautso (**M**)	**11.5**	**94**	**48**
Nthanda (**F**)	**10.5**	**90**	**26**

d. Give two benefits of using the WHO child growth charts. (**2 marks**)

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSC HUMAN NUTRITION

NUTRITION DISORDERS
AGN 4241
2016/ 2017 MID-YEAR EXAMINATIONS

DATE: 9TH MAY, 2017 TIME: 09 – 12:00H

DURATION: THREE (3) HOURS VENUE: FSN 1

INSTRUCTIONS TO THE CANDIDATES:

1. THIS PAPER CARRIES 100 MARKS
2. ANSWER FIVE (5) OUT OF SIX (6) QUESTIONS
3. EACH QUESTION CARRIES EQUAL MARKS

Question 1

a) The parathyroid glands are important in calcium homeostasis as they are responsible for releasing parathyroid hormone (PTH) whenever they sense low calcium levels in the blood.
   i. Describe in detail calcium homeostasis **(10 marks)**

b) Mrs. Chimbelu is an obese 70-year old woman who drinks a 500 ml bottle of coca-cola at every meal. She comes to the clinic complaining of constant pain in the muscles, joints and legs. From your assessment, you find that she is calcium deficient.
   i. Give two (2) reasons why the coca-cola might be the source of her calcium deficiency **(4 marks)**
   ii. Which non-communicable disease (NCD) might Mrs. Chimbelu be at risk of if she continues drinking coca-cola at every meal? **(1 mark)**
   iii. Ketoacidosis is a severe form of the NCD you mentioned in ii above. Briefly describe ketoacidosis, being sure to name the ketone bodies that are formed in this process **(5 marks)**

Question 2

a) Define the term "malnutrition" **(1 mark)**
b) Justify the place of vitamins and minerals in human nutrition **(3 marks)**
c) With the help of specific examples, explain the stages of undernutrition development **(6 marks)**
d) Compare and contrast the signs and symptoms of kwashiorkor and marasmus (4 marks)
e) Discuss the precipitating factors for kwashiorkor **(6 marks)**

Question 3

a) Describe in detail the endogenous transport of lipids (VLDL metabolism) **(6 marks)**
b) What is meant by the term "dyslipidemia"? **(3 marks)**
c) Tobacco and hypertension have been described to be modifiable and intermediate risk factors of heart disease, respectively.
   i. How does tobacco increase the progression of atherosclerosis whenever one has dyslipidemia? **(3 marks)**
   ii. Give two (2) reasons why raised blood pressure is dangerous **(2 marks)**
d) Compare and contrast the two (2) types of hypertension **(6 marks)**

All the best!

Question 4

a) What is micronutrient deficiency? **(1 mark)**
b) Discuss the power of micronutrients through the life cycle approach **(9 marks)**
c) Identify at least two (2) micronutrients of public health significance in Zambia and explain the interventions in place at national level **(4 marks)**
d) Explain how culture, social factors and social inequalities contribute to nutrition disorders **(6 marks)**

Question 5

Cancer can be defined as a loss of control of the normal cell cycle process as a result of damage to its genetic information.

a) List the three (3) stages of cancer? **(3 marks)**
b) Folate is required for the synthesis of DNA. In the cell cycle, identify the phase in which folate is most important **(1 mark)**
c) Why is it not advisable to supplement with folate when an individual has cancer? **(2 marks)**
d) Define the term apoptosis and explain why this is important when DNA damage is present **(4 marks)**
    i. List two (2) examples of foods that may help initiate apoptosis **(2 marks)**
e) Mrs. Chishimba is a 42 year old woman with breast cancer. You are the nutritionist on the ward and you find that her chart shows stage M.
    i. Based on the TNM staging system, what does the M on her chart mean? **(1 mark)**
    ii. The last stage of metastasis is generally characterized by angiogenesis
        1. Define angiogenesis **(2 marks)**
        2. Which supplement would you recommend for Mrs Chishimba and why? **(3 marks)**
        3. Give one other supplement you might recommend for Mrs. Chishimba and why? Be sure to explain the mechanism through which these supplements work. **(2 marks)**

Question 6

a) Using specific examples justify "anaemia" as a micro-nutrient deficiency problem? **(3 marks)**
b) Identify and explain the causes of vitamin B_{12} deficiency **(4 marks)**
c) Identify and explain the cause of folic acid deficiency **(4 marks)**
d) Outline at least six (6) of the clinical features of megaloblastic anaemia **(6 marks)**
e) Give three (3) dietary sources of vitamin B_{12} **(3 marks)**

All the best!

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

2015/2016 ACADEMIC YEAR MID-YEAR FINAL EXAMINATIONS

BSc Human Nutrition

COURSE: AGN 4321

RESEARCH METHODS AND EPIDEMIOLOGY FOR NUTRITIONISTS

Date: 10TH May 2017 Time: 09.00 – 12.00 HRS

Duration: THREE (3) HOURS Venue: TRA

INSTRUCTIONS TO THE CANDIDATES:

1. THIS PAPER HAS TWO SECTIONS: SECTION A AND B

2. ANSWER ALL QUESTIONS IN BOTH SECTIONS IN THE BOOKLETS PROVIDED.

3. SPEND ABOUT ONE HOUR ON SECTION A AND TWO HOURS ON SECTION B.

4. ALLOCATED MARKS FOR EACH SECTION ARE INDICATED IN BRACKETS.

Section A (Total marks: 30)

1. Describe the term "epidemiology", including its two fundamental assumptions. (3 marks)
2. In nutritional epidemiology, what is meant by the term "outcome", and how is it usually expressed? (3marks)
3. What is cumulative incidence and how is it calculated? (3marks)
4. In a cohort study examining the relationship between iron and malaria in adult women, the relative ratio was calculated at 1.79. What does this indicate? (3marks)
5. Under what conditions is a variable considered to be a confounder? Give an example. (3marks)
6. Explain what is meant by BIAS in human research and state two types of bias. (3marks)
7. Define what ecological studies are and provide two strengths of ecological studies, (3marks)
8. Distinguish between stratified random sampling and quota sampling. (3marks)
9. What is crowdsourcing? Give an example of how it could be applied in research. (3marks)
10. Distinguish between systematic review and meta-analysis. (3marks)

Section B (Total 70 Marks)

1. a) In nutritional epidemiology, describe what is meant by the term "exposure", including examples of expressing exposure, and limitations in its measurement. (7marks)

   b) When making a link between diet and risk of disease, what type of evidence is collected, and how difficult is it to conduct and interpret this evidence? (8 marks)

2. a) In Lusaka, from January 2012 and December 31st 2013, 1500 women aged 45 – 64 years developed breast cancer out of a total population of 1,200,000. A total of 400 women developed breast cancer in 2012, while the remainder developed the disease in 2013. Calculate both the incidence rate and prevalence rate of breast cancer in this population. (10 marks)

b) A group of 500 women, 300 who consumed alcohol and 200 who did not consume alcohol at baseline, was followed for 20 years. Thirty five (35) women developed breast cancer, of whom 30 were alcohol consumers at baseline and 5 were non-consumers.

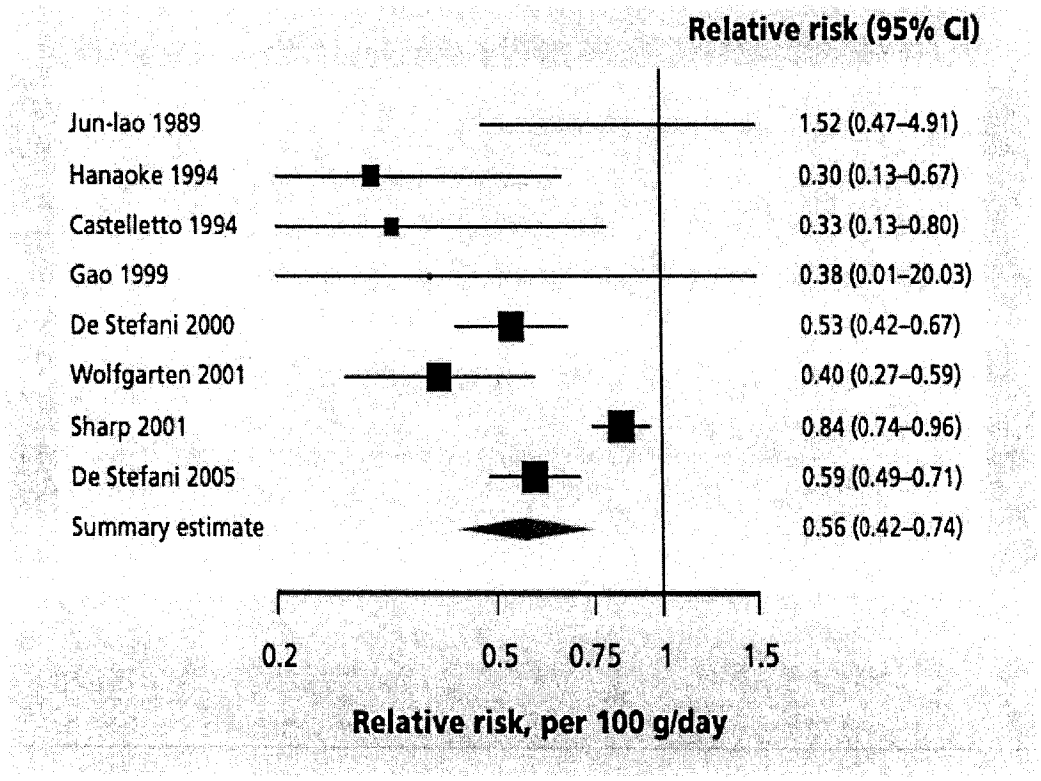
i) What study design was used here? (1 mark)

ii) Using this information, insert the appropriate numbers in the table below (4 marks)

	Breast cancer	No breast cancer	Total
Alcohol consumers			
Not alcohol consumers			
Total			

3. a).Outline the steps involved in conducting a systematic review (5 marks)

b) The following figure is a Forest Plot showing findings from a meta-analysis of case-control studies examining association between fruit consumption and oesophageal cancer. Study the figure and answer the questions below.



a. Suggest a hypothesis that these studies set out to test. (1 marks)

b. How many studies are included in the analysis? (1 marks)

c. Choose one study. Cite the author and year of that study and state the relative risk and 95% confidence intervals of that study. Interpret the findings of that study, relating fruit consumption to risk of oesophageal cancer. (5 marks)

d. What do you understand by the size of the black squares? (2 marks)

e. Explain what the 'summary estimate' tells us. (2 marks)

f. Suggest another study design to test the hypothesis you have proposed. Briefly describe what you would do. (4marks)

4. a) Explain the importance of using randomized controlled trials for nutrition policy making, in preference to using only case-control studies and cohort studies. (8 marks)

b) Distinguish between case-controlled studies and cohort studies. Provide an example in each case (6 marks)

c) What is meant by the term "validity" in research? Briefly explain two threats to internal validity in experimental studies (6 marks)

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSC HUMAN NUTRITION

AGN 4520 PUBLIC HEALTH NUTRITION – **DEFERRED EXAM**

DATE: 14TH OCTOBER 2016 TIME: 14 – 17 HOURS

DURATION: THREE (3) HOURS

VENUE: NEW DEMOGRAPHY LECTURE THEATRE

INSTRUCTIONS TO THE CANDIDATE:

1. THIS PAPER CARRIES ~~100~~ 105 MARKS
2. PART A IS COMPULSORY. ANSWER ANY OTHER 4 QUESTION FROM PART B
3. ALLOCATED MARKS FOR EACH QUESTION ARE INDICATED IN BRACKETS

PART A: SHORT ANSWER QUESTIONS

ANSWER ALL QUESTIONS IN THIS SECTION [TOTAL 20 MARKS]

1. Define the following terms in Public Health Nutrition **(2 marks):**

a) Social Marketing b) Systems Approach

2. a) What do the letters **CMAM** stand for? (**1 mark**)

   b) When was **CMAM** endorsed by the World Health Organization (**WHO**)? **(1 mark**)

3. Give **TWO (2)** examples of functional outputs in programme management **(2 marks)**

4. In emergencies, what is considered as a proxy-indicator for the general health and well-being of the entire community? Give a reason for your answer. **(2 marks)**

5. What does the **Nuffield Intervention Ladder** describe? **(2 marks)**

6. The ecological approach to public health seeks to develop sustainable PHN solutions by first developing an understanding not just of what people are eating, but understanding the social, cultural, political, economic, and policy environments in which they live. **True or False? (1 mark**)

7. The use of norms to encourage positive behaviors is an example of a Nudge. **True or False**

8. An example of a fortificant is flour **True or False? (1 mark**)

9. Policy is deemed as **public policy** when it is created by government **True or False? (1 mark**)

10. Government creates policies to regulate its own actions and to govern actions of citizens, businesses and other entities under its control **True or False? (1 mark**)

11. A guideline is a reference document that constitutes the ***what, how, when, why and where*** providing nutrition advice for general health **True or False? (1 mark**)

12. With the help of a vivid example, justify the statement "Good health is not merely the result of good medical care but what is done to create conditions in which people can be healthy" (**1 mark**)

13. Unexplained weight loss (>10% of body weight) is used as a sure indicator of the shift from asymptomatic to symptomatic HIV phase **True or False? (1 mark)**

14. Growth monitoring serves the purpose of malnutrition prevention and not rehabilitation or treatment **True or False? (1 mark)**
15. Exclusive breastfeeding in NOT a recommended feeding option for HIV-positive mothers **True or False? (1 mark)**
16. Body mass index (BMI) of <16 in adults represents severe under nutrition **True or False? (1 mark)**
17. The term "**HIV exposed**" refers to infants born to HIV positive women until a definite diagnosis of HIV is made or HIV is reliably excluded **True or False? (1 mark)**
18. The 2013 WHO guidelines recommend putting ALL HIV positive pregnant and lactating women on ARV regimen regardless of their CD4 count or disease stage and keep them on ART for life **True or False? (1 mark)**
19. Regular physical activity is among the critical nutrition actions recommended for PLHIV **True or False? (1 mark)**
20. In September 2015 World leaders adopted the 2030 Agenda for Sustainable Development in a set of 19 sustainable development goals (SDGs) **True or False? (1 mark)**

PART B: APPLICATION QUESTIONS

ANSWER ANY FOUR (04) QUESTIONS IN THIS SECTION

QUESTION 1

a) Explain what is meant by the term '**SHOVE**' in public health (**2 marks**)

b) Compare and contrast Traditional enforced change and Nudge techniques in Social marketing? (**10 marks**)

c) List the **Five (5)** different types of interventions in social marketing **(5 marks)**

d) Outline **THREE (3)** limitations of the Ecological Approach to public health? (**3 marks**)

QUESTION 2

a. Distinguish between
    i. definitions of community and society (**4 marks**)
    ii. top-down and bottom-up approach to development (**4 marks**)
b. With the aid of clear examples, demonstrate your understanding of at least five characteristics of a community (**5 marks**)
c. Explain the characteristics of dysfunctional communities (**7 marks**)

QUESTION 3

a) What is the **PRECEDE-PROCEED** model? (**3 marks**)

b) What do the acronyms **PRECEDE** represent? (**3 marks**)

c) Explain the **FOUR (4)** steps of the **PRECEDE** phase of the PRECEDE-PROCEED model? **(10 marks)**

d) State **TWO (2)** advantages of using this model in public health (**4 marks**)

QUESTION 4

a. Outline the major nutrition problems requiring policy attention in Zambia (**4 marks**)

b. With the aid of specific and relevant examples, illustrate the use of **FIVE (5)** "Ws" in the policy making process (**10 marks**)

c. Outline at least **SIX (6)** tenets of food and nutrition policy statements (**6 marks**)

QUESTION 5

You are employed by Concern worldwide and your first appointment is to help manage a Nutrition project in Milenge District of Luapula province. The project objective is to '***Reduce the Micronutrient Status of Children 6-59months* by 20%**' and it is expected to run for a period of **FIVE (5)** years.

a) Propose a strategy you will employ to meet this objective (**2 marks)**

b) Outline **FOUR (4)** benefits and **FOUR (4)** challenges of using your proposed strategy **(10 marks)**

c) List **THREE (3)** micronutrient deficiencies common to this particular age-group and explain why? (**3 marks)**

d) List **THREE (3)** indicators you will use to measure the impact of your proposed strategy on the micronutrient status of this age-group? (**3 marks**)

e) Mention **TWO (2)** consequences of micronutrient deficiencies for children 6-59 months? (**2 marks)**

QUESTION 6

a. What is policy? (**2 marks**)

b. Explain the "step-by-step" process of policy development (**12 marks**)

c. According to Theodoulou and Kofinis (2004), how well policy is implemented is affected by three criteria. Outline the said criteria. (**6 marks**)

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSC HUMAN NUTRITION

AGN 5531 FOOD AND NUTRITION SECURITY

DATE: 12TH MAY, 2017 TIME: 14:00 – 17:00H

DURATION: THREE (3) HOURS VENUE: OMNIA 2

INSTRUCTIONS TO CANDIDATES

1. THIS PAPER CARRIES 100 MARKS
2. DURATION OF THE EXAMINATION IS THREE (3) HOURS
3. ANSWER **ANY** FOUR (4) QUESTIONS
4. MARKS ALLOCATED FOR EACH QUESTION ARE INDICATED

Answer any four (4) Questions. Marks are indicated against each question

Question 1

Identify and explain or define the food and nutrition indicators at national and regional level (***25 marks***)

Question 2

a. Compare and contrast the advantages and disadvantages of using the three (3) principal methods of measuring food insecurity (***20 marks***)
b. Discuss the fact that states that "food security does not equal nutrition security" (**5 Marks**)

Question 3

a. The state of food insecurity in the world report (2014) sets out 5 key dimensions for an enabling environment for food security and nutrition security.
    I. Outline the five (5) dimensions identified ***(5 marks***)
    II. Discuss what Zambia could do NEXT to improve national food and nutrition security (***20 marks***)

Question 4

a. Food insecurity in a household can be seen as a combination of two (2) distinct problems; i.e. inability to acquire and utilize the food. Explain, using specific examples what each of these term refers to (***5 marks***)
b. Discuss how women's empowerment programmes can impact positively to improve household food security (**20 marks**)

Question 5

a. Anthropometry can provide insightful information on the global prevalence of undernutrition, however there are disadvantages to utilizing these measurements. Discuss some of these disadvantages (**12.5 marks**).

b. Childhood anthropometry provides clear methods and indicators that can be used to study the prevalence and drivers of childhood undernutrition, as well as assess the impact of policies related to undernutrition outcomes. Describe how the internationally recognised reference standard used to calculate Z-scores in child anthropometry was developed (**12.5 marks**)

UNIVERSITY OF ZAMBIA

UNIVERSITY MID-YEAR EXAMINATIONS – MAY, 2017

AGS 3711: AGRO-CLIMATOLOGY

Time: Three (3) Hours

Instructions: Answer **ALL** Questions Total Marks: **100**

Non-programmable calculators are allowed

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1. Define the following; **[15 Marks]**
   a. Climate
   b. Return period
   c. Troposphere
   d. Growing degree days
   e. Radiative forcing

2. Zambia is said to have been affected by climate change. As a result, efforts are being made in various sectors to mitigate and adapt to the impacts of climate change.

   [25 Marks]

   a. What do you understand by climate change? **[4 Marks]**
   b. How would you go about assessing if climate has changed or not in Zambia? **[8 Marks]**
   c. Give five potential impacts of climate change. **[5 Marks]**
   d. Discuss at least two mitigation and two adaptation measures to impacts of climate change. **[8 Marks]**

3. Write short notes on;

[15 Marks]

   a. The relationship between air temperature and saturation vapour pressure. **[5 Marks]**
   b. Radiation depletion in the earth's atmosphere. **[5 Marks]**
   c. Agroecological regions of Zambia. **[5 Marks]**

4. Mrs. Sakala intends to undertake crop and livestock farming as a business in Eastern province of Zambia. She wants to know if the climatic conditions in this area are suitable for crop and livestock farming.

[25 Marks]

   a. What weather parameters would you look at to see if climatic conditions of this area are suitable for crop and livestock farming? Explain why you have chosen these weather parameters. **[15 Marks]**
   b. Outline how the weather parameters you have named in 4.a above can be measured at a standard weather station. **[10 Marks]**

5. A meteorological station in Choma recorded the following weather parameters on a clear day of 17th October 2016:

Parameter	
Shortwave irradiance	1050 Wm^{-2}
Maximum Air Temperature	36 °C
Minimum Air Temperature	17 °C
Maximum Relative humidity	50 %
Minimum Relative humidity	12 %
Barometric pressure	872 kPa
Average wind speed	2 ms^{-1}
Predominant Wind direction	80° to 110°

[20 Marks]

Based on the weather data above, calculate:

a. Saturation vapor pressure. **[3 Marks]**
b. Vapor pressure deficit. **[5 Marks]**
c. Net longwave radiation. **[4 Marks]**
d. Solar declination angle. **[5 Marks]**
e. Sunset hour angle. **[3 Marks]**

Constants and equations

$\sigma = 5.7\,(10)^{-8}\ \mathrm{W\ m^{-2}\ K^{-4}}$

$\gamma = 0.0662\ \mathrm{kPa\ ^{o}C^{-1}}$

$$\alpha = \frac{R_r}{R_i}$$

$$d_r = 1 + 0.033\cos\left(\frac{2\pi}{365}J\right)$$

$$J = 275\frac{M}{9} - 30 + D - 2$$

$$RH = \frac{e_a}{e_s}(100)$$

$$R_{ns} = R_s(1-\alpha)$$

$$R_{nl} = \sigma\left(\frac{T_{\max}^4 + T_{\min}^4}{2}\right)(0.34 - 0.14(\sqrt{e_a}))\left(1.35\frac{R_s}{R_{so}} - 0.35\right)$$

$$J = 30.4M - 15$$

$$\delta_s = 0.409\sin\left(\frac{2\pi}{365}J - 1.39\right)$$

$$\omega_s = \cos^{-1}[-\tan(\varphi)\tan(\delta_s)]$$

$$N = \frac{24}{\pi}\omega_s$$

$$e_o = 0.6108e\left[\frac{17.27T}{237.3+T}\right]$$

$$R_l = \varepsilon\sigma T^4$$

$$R_n = R_{ns} - R_{nl}$$

UNIVERSITY OF ZAMBIA
FIRST HALF EXAMINATIONS- MAY 2017
AGS 4221: SOIL AND PLANT ANALYSIS

TIME: Three (3) Hours

INSTRUCTIONS: Answer all Questions **MARKS**: 100

1. Soil and plant analysis laboratories are equipped with various instruments which are used for determination of elements in plants and soils. **[25 marks]**
   a. Describe the principles on which the following instruments operate.
      i. UV- visible spectrophotometer **[2.5 marks]**
      ii. pH meter **[2.5 marks]**

   b. The atomic absorption spectrophotometer is used to determine the concentration of various micronutrients in soils.
      i. Describe the method currently used in Zambian soil testing laboratories to extract plant available zinc, copper, manganese and iron from the soils clearly stating the extracting solution and the mechanisms of nutrient extraction. **[5 marks]**

      ii. A 20 grams sample of air dry soil was mixed with 40 ml of the extracting solution identified in question (i) above. The filtrate from the suspension was analysed by AAS and found to contain 0.22 mg/l of zinc. If the critical limit of Zn for arable cropping is 0.5 mg/kg soil, is this soil able to supply sufficient Zn for crop production? Show calculations to support your answer. **[6 marks]**

   c. Boron deficiency is a serious problem which often leads to poor crop establishment and reduced yields in Zambian soils.
      i. In what chemical form is boron available to plants? **[2 marks]**
      ii. Briefly describe the method used in Zambia for determining plant available boron in soils. Indicate the extracting solution and the instrument used to determine the concentration of the element in soil solution extracts. **[4 marks]**

iii. What are some of the known problems associated with the use of the method of extracting boron described in question (ii) above? **[3 marks]**

2. Soil Microbial Biomass is an important component of soil organic matter. Based on your understanding on Soil Microbial Biomass, answer the following questions. **[15 marks]**
   a. Define Soil Microbial Biomass **[2 marks]**
   b. Explain the functions of Soil Microbial Biomass in soil systems **[4 marks]**
   c. Describe one approach of measuring soil microbial biomass under laboratory conditions **[6 marks]**
   d. Explain why the measurement of Soil Microbial Biomass rather than Microbial Activity is more appropriate for monitoring changes in soil health due to land management practices **[3 marks]**

3. A farmer in Chisamba notices leaf chlorosis (yellowing) and poor plant growth of his maize crop. **[15 marks]**
   a. As a Soil specialist, how would you distinguish chlorosis due to potassium deficiency from that due to herbicide injury? **[4 marks]**
   b. Poor crop growth is suspected to be due to the effect of soil compaction.
      i. List five (5) signs of soil compaction **[5 marks]**
      ii. Describe a laboratory method you would carry out to confirm that the soils are compacted. **[6 marks]**

4. An analysis of water from a groundwater source was tested to assess its suitability for irrigation. Results of the water analysis are presented in the Table below:

pH	EC µS/cm	HCO_3^- mg/l	CO_3^{2-} mg/l	Ca^{2+} ppm	K^+ ppm	Mg^{2+} ppm	Na^+ ppm	Cl^- ppm	SO_4^{2-} ppm
8.33	1949	969.0	16.2	33.6	0.6	30.1	358.0	6.0	364.5

Answer the following questions: **[25 marks]**

a. Determine the (i) salinity, (ii) sodicity and (iii) alkalinity hazards of this water source showing the necessary calculations where necessary to support your answer. **[17 marks]**
b. What is the overall suitability of this water for use in irrigation? **[3 marks]**
c. What soil management problems if any, are likely to occur from the use of this water for irrigation? Give reasons to support your answer. **[5 marks]**

5. Copper (Cu) mining is the major economic activity in Zambia. The activities of copper mining are associated with environmental pollution when measures are not put in place to protect the environment. Answer the following: **[20 marks]**

a. A study was conducted to establish if there was Cu contamination near a copper processing plant. A 2 gram soil sample was digested in 25 ml of 4M HNO_3 and the volume of the digest was brought to 50 mL with distilled water. After filtering, a 5 ml aliquot was placed into a 50 mL volumetric flask and brought to volume with distilled water. The solution was analysed for Cu by Atomic Absorption Spectroscopy and a reading of 1.036 mg/L was obtained. If the mean back ground levels of Cu in uncontaminated soil before establishment of the processing plant was 141. 4 mg/kg soil with a standard deviation of 20.4 mg/kg, state whether the results of the analysis confirm that the sample analysed has been contaminated with Cu. Show necessary calculations to defend your answer. **[8 marks]**

b. Four surface soil (0-20 cm) samples were randomly collected from a natural forest believed to have not been contaminated with Cu. The soils had the following concentrations of Cu in mg/kg: 157.1, 127.5, 120.5, and 160.6.

Answer the following:

i. What is the degree of variability of Cu in the forest soil? Show necessary calculations to support your answer. **[6 marks]**

ii. Estimate with 95 % confidence the mean quantity of Cu (in kilograms) present in 250,000 m^2 of surface soil of 20 cm depth if the bulk density of the soil is 1.45g.cm^{-3}. Note $Z_{0.025} = 1.96$. **[6 marks]**

END OF EXAMINATIONS

THE UNIVERSITY OF ZAMBIA

UNIVERSITY EXAMINATIONS-MAY 2017

AGS 5121

SOIL GENESIS AND CLASSIFICATION

TIME: **THREE HOURS**

TOTAL MARKS: **100**

INSTRUCTIONS: **ANSWER ALL QUESTIONS**

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1. Explain the main soil forming processes involved in establishing the following soil morphological features:
   a. Clay films around pores and peds in the subsoil (2 marks)
   b. Fe and Mn mottles in the subsoil (2 marks)
   c. Grey colours in the subsoil (2 marks)
   d. Hardened organic material throughout the profile (2 marks)
   e. Strongly red colours and high clay content throughout the profile (2 marks)
   f. Cracks and gilgai micro-relief on the soil surface (2 marks)
   g. Easily weatherable minerals in the soil profile (2 marks)
   h. Mixture of organic matter and Fe in the subsoil (2 marks)
   i. Very sandy soil overlaying a heavy clay subsoil (2 marks)
   j. Strong resemblance between the soil and its parent material (2 marks)

2. a. With specific examples discuss the role and influence of parent material in soil formation (6 marks)
   b. How do Jenny's state factors of soil formation affect the distribution of processes in Simonson's model? (5 marks)
   c. What is a catena? Briefly discuss the relevance of this concept in soil science (5 marks)
3. One of the soil forming processes as presented by Simonson (1959) is translocation:
   a. Define translocation as a soil forming process (2 marks)
   b. Give five examples of translocation (5 marks)
   c. Climate change may lead to increased levels of carbon dioxide; state which type of weathering will become more dominant and explain why? (5 marks)
   d. Organic matter is critical for crop production. Explain the role of organic matter to soil fertility and why it decreases with soil depth? (5 marks)
   e. Weathering proceeds in stages, arrange the following compounds in order of resistance to weathering K-feldspar, biotite, gypsum, calcite, quartz, K-feldspar. (5 marks)
4. Present the major characteristics of the following soils, identify their potential and constraints to sustainable arable cropping and suggest a package of measures to redress the limitations in each one of them:
   a. Very fine, Mixed, Isohyperthermic, Petrocalcic Natrudoll (2 marks)
   b. Clayey, Kaolinitic, Hyperthermic, Typic Eutrustox (2 marks)
   c. Sandy, Siliceous, Thermic, Plinthic Quartzipsamment (2 marks)
   d. Clayey, Montimorillonitic, Isothermic, Lithic Calciustert (2 marks)
   e. Clayey, Halloysitic, Isohyperthermic Umbric Kandiaqualf (2 marks)

5. Show similarities and differences in the key features of the following:
   a. Organic matter and sesquioxides (2 marks)
   b. Mollic and Umbric epipedons (2 marks)
   c. Anthropic and Plaggen epipedons (2 marks)
   d. Spodic and Argillic subsurface horizons (2 marks)
   e. Hyperthermic and Isohyperthermic temperature regimes (2 marks)
   f. Argillic and Natric subsurface horizons (2 marks)

6. As you go from Livingstone (Agroecological Region I) to Mbala (Agroecological Region III) what are the expected differences in nutritive value of natural pastures. Justify your answer. (10 marks)

7. If indeed the earth was created the same day, explain with specific examples why soils are different in age. (10 marks)

END OF EXAMINATION

The University of Zambia

School of Agricultural Sciences/

AGS 5131: Soil Survey and GIS Techniques

Time: 3 hours **Total Marks: 100**

Instructions: Answer all the questions

Question 1: Field survey procedures consist of four main phases, namely: research, mapping, correlation/quality control and interpretation.

a) What are the main component activities in the mapping phase? (4 marks)
b) Explain the significance of the interpretation phase in soil survey (4 marks)
c) What are the main methods of soil survey that are commonly used in mapping soils? **(3 marks)**
d) Define observation field density and explain its significance in soil survey (3 marks)

Question 2: Data collected during a soil survey will have both a location and attribute component. Explain with examples your understanding of this approach (10 marks)

Question 3: Explain with suitable examples from soil science and related fields what is meant by each of the following:

a) Compound buffering (5 marks)
b) Nested buffers (5 marks)

Question 4: Soil mapping units are delineations of soils with similar characteristics:

a) Briefly discuss the principles that must be adhered to when establishing mapping units (5 marks)

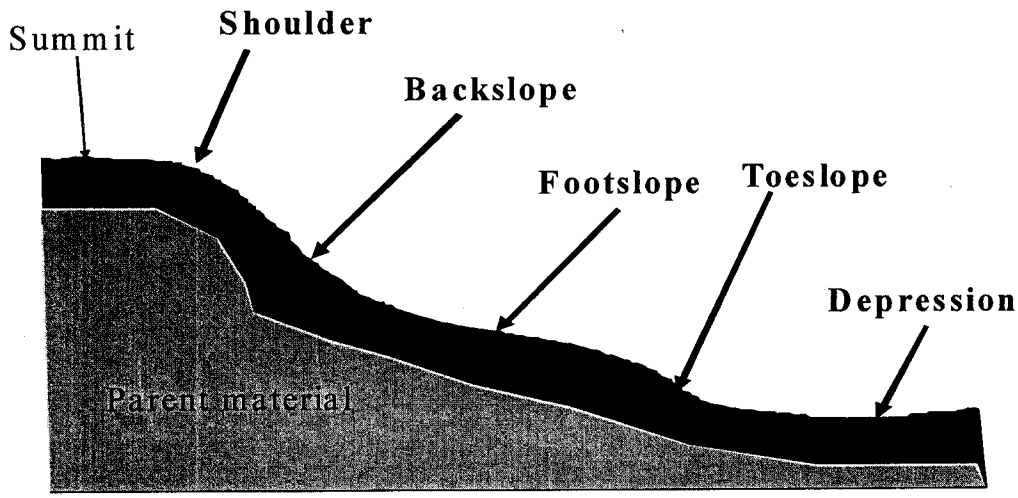
b) What are the main characteristics of the following soil mapping units: simple units, soil associations and soil complexes? (6 marks)

c) Explain what soil variability is and its significance in soil mapping (4 marks)

d) What is the appropriate way of expressing soil variability in a soil survey? (2 marks)

e) What are the major causes of soil variability within mapping units? (3 marks)

Question 5: The figure below shows 6 topographic positions (toposequence) in a landscape with a uniform parent material:



a. Explain how water would be expected to move into the different topographic positions (6 marks)

b. In the topographic positions indicated above, where would you expect to find the following: (4 marks)

   i. Deep soils

   ii. Redoximorphic features (Soil mottling)

   iii. High water percolation

   iv. Very shallow soils

Question 6: You have just completed preliminary data collection of a selected part of a new farm block in Serenje district. Upon return to the office on day one, you try to map the points in GIS and realize that some of the observation points are falling outside Serenje district:

a) Expain the possible reasons why the points are falling outside Serenje district? (5 marks)

b) What measures will you take to correct the situation described above. (5 marks)

Question 8: a) A client approaches you to conduct a soil survey, explain four critical aspects you will need to ask the client for feasibility of the soil survey. (5 marks).

b) If the land is suspected to be compacted, what field and laboratory approaches would you take to confirm the degradation type mentioned in a above (5 marks).

Question 9 a) Why is planning for a survey important (1 mark)

b) During the process of planning for a survey, briefly state what a soil scientist is expected to understand before embarking on a survey. (3 marks)

c) List 4 types of soil augers and briefly explain where they can be used appropriately (8 marks)

d) Broadly give three classes of tools/equipment that is import to have before conducting a survey (4 marks)

END OF EXAMINATION

UNIVERSITY OF ZAMBIA

FIRST HALF EXAMINATIONS – MAY 2017

AGS 5411: SOIL MICROBIOLOGY

Time: Three (3) Hours **Marks: 100**
Instructions: Answer all Questions

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1. The decomposition of organic matter is affected by many factors. If one were to provide the optimum environment for this process, discuss any **five factors** that they would need manipulate to accomplish the highest possible rate. **[20 marks]**

2. The soil environment contains a large number and different types of microorganisms. Based on their carbon source, energy source and the ability to grow in the absence of oxygen, how would you classify the following microorganisms: **[20 marks]**
    a. *Nitrosomonas* and *Nitrobacter* bacteria **[5 marks]**
    b. Denitrifying bacteria **[5 marks]**
    c. Cellulose degrading fungi **[5 marks]**
    d. *Rhizobia* **[5 marks]**

3. Describe, using examples where necessary, the following methods of isolation, characterization and enumeration of soil microorganisms:**[25 marks]**
    a. Traps **[4 marks]**
    b. Direct Plate Counting **[8 marks]**
    c. Direct isolation **[4 marks]**
    d. Gram Staining **[4 marks]**
    e. Enrichment cultures **[5 marks]**

4. The use of nitrogenous fertilizers in the production of legume crops is highly debatable. This is because most legumes in symbiotic associations with bacteria of the genus *Rhizobia* are able to fix atmospheric nitrogen and make it available for plant use. Nevertheless, some agronomists recommend the application of nitrogen fertilizers to soybeans.**[20 marks]**
    a. At what stage of crop growth and under what soil fertility conditions would you advise the application of a micro-dose of nitrogenous fertilizer to soybeans? **[4 marks]**
    b. What are the effects of the type of host and plant nutrients, (Nitrogen, Phosphorus and Potassium) on symbiotic nitrogen fixation? **[8 marks]**

c. What nodule characteristic would you use to differentiate effective from non-effective nodules? **[3 marks]**
d. Briefly describe an experiment you would use to confirm the ability of a legume plant to fix atmospheric nitrogen.**[5 marks]**

5. The fungus *Aspergillus flavus*is a common soil fungus and a major producer of aflatoxin, a potent carcinogen present in susceptible crops such as maize. A study on the population ecology of this fungus showed higher fungal populations associated with soils containing higher amounts of organic matter. Answer the following questions using your knowledge of microbial ecology.**[15 marks]**
    a. In what nutritional class would you place this fungus and why?**[5 marks]**
    b. Explain whether or not paddy rice can get infected by the named fungus at field level when soil is saturated with water.**[5 marks]**
    c. Discuss the relationship between soil organic matter content and soil microbial activity.**[5 marks]**

The End!

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF SOIL SCIENCE

FINAL EXAMINATIONS MID-YEAR 2015/2016 ACADEMIC YEAR

AGS 5511: AGRICULTURAL HYDRAULICS AND IRRRIGATION DEVELOPMENT

INSTRUCTIONS:

ANSWER ALL QUESTIONS

ANSWER QUESTION FIVE (05) IN A SEPARATE BOOK

TIME: 3 HOURS

MARKS: 25 MARKS FOR EACH QUESTION.

Q1. Explain using the photosynthesis and the energy release equations the role of water in plant growth and hence in irrigation.

It is necessary to calculate how much water the crop in the field will need. Traditionally this water was supposed to be stored in the soil between field capacity and wilting point and taken up by the plant until it is exhausted. This was plant available water. The modern approach is different. It is not based on soil available water but on a holistic approach. Explain the soil – plant – atmosphere concept and compare and contrast it with the plant available water concept. Why does the modern approach give better results?

Q2. When selecting a suitable pump for any particular purpose, a number of curves are used to identify the most appropriate pump. Give the four (04) curves for pumps which all show its behavior when related to Q i.e. discharge. For each of these four curves explain what each stands for, explain the behavior of the pump that the curve is showing, explain or identify on the curve the most appropriate areas to select the pump form the curve.

Q3. There are eleven steps which are followed when designing a portable sprinkler irrigation system. Carefully identify each step. Explain what is done in each of these steps very briefly. Explain also the basis upon which the step is based i.e. what data or information do you need to successfully carry or do this step.

Q4. Draw a sketch of a drip irrigation system. Indicate all the elements and what their purpose is i.e. what the components do. Finally describe the control head. What does it do? Carefully describe the components in the control head.

Q5. An irrigation system requires a total head of 35 m to operate optimally. Water to the irrigation system is supplied through a main line from a tank placed at the ground surface. The main line has pressure head of 30 m and a diameter of 76 mm which is reduced to a lateral of 51 mm diameter. At the time of measurement, the discharge in the main line was 240 l/min.

a. What do you understand by total head?
b. Calculate the pressure head in the lateral line.
c. Calculate the total head of the system.
d. Show whether the total head calculated above is enough to operate the irrigation system optimally?
e. Determine whether you need to raise the tank and to what height you should raise it to ensure optimal operation of the irrigation system?

END