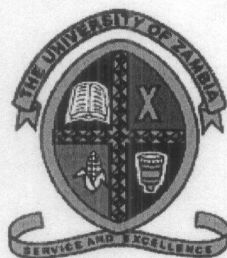


THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURE SCIENCE

2022 ACADEMIC YEAR – POST GRADUATE

1. AGA 6101: Animal Energetics and Energy Metabolism
2. AGA 6102: Ruminant Digestion and Range Management
3. AGA 6111: Non-Ruminant Digestion and Metabolism
4. AGA 6142: Proteins and Amino Acids Metabolism
5. AGA 6601: Biochemical Techniques and Instrumentation
6. AGC 6111: Plant Physiology
7. AGC 6125: Sustainable Agriculture
8. AGC 6162: Physiology of Yield
9. AGC 6211: Plant Breeding Methods
10. AGC 6211 Plant Breeding Methods
11. AGC 6322: Plant Protection
12. AGC 6432: Biometrical Genetics and Plant Breeding
13. AGC 6612: Seed Technology
14. AGC 6625: Seed Systems
15. AGE 6122: Agricultural Policy Analysis
16. AGE 6132: Production Economics
17. AGE 6222: International Trade
18. AGE 6231: Quantitative Analysis of Agricultural Policies
19. AGE 6311: Agribusiness Management
20. AGE 6322: Applied Econometrics
21. AGF 6211: Food Microbiology and Food Safety
22. AGF 6311: Food Processing, Preservation and Packaging
23. AGG 6715: Agroclimatology
24. AGN 6210: Biostatistics and Research Methods
25. AGN 6312: Advanced Clinical Nutrition
26. AGN 6410: Socio-Economic Dimensions of Nutrition
27. AGN 6420: Management, Nutrition Policy and Planning
28. AGN 6511: Advanced Maternal and Infant Nutrition
29. AGS 6211: Plant Nutrition



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

2020/2021 ACADEMIC YEAR FINAL EXAMINATIONS

AGA 6101: Animal Energetics and Energy Metabolism

Date: 02nd December 2021

Time: 14:00 Hours

Instructions: Answer any **four (4)** questions with each carrying 25 equal marks.

QUESTION ONE

- A) Explain how living organisms have evolved over millions of years to accommodate thousands of metabolites and enzymes under limited cellular solvent capacity and energy **(15 marks)**?
- B). What do you understand by the term “Unidirectionality” and explain the role of coupling agents in propelling pseudo reactions in one way or the other? What are the advantages of having futile cycles in metabolic sequences **(10 marks)**?

QUESTION TWO

- A). Using glycolysis and gluconeogenesis pathways, explain how allosteric enzymes control and regulate cellular energy metabolism in farm animals using hormonal secretions as metabolic messengers **(15 Marks)**?
- B) What is the relationship between Michaelis constant (K_m) with the symbol $S_{(0.5)}$ for enzyme catalyzed reactions and what makes this symbol to have a universal application **(10 Marks)**?

QUESTION THREE

A). Animals are said to eat to meet their energy requirements under normal circumstances. Explain how this situation changes under certain physiological conditions such as pregnancy or during lactation and what are the key factors regulating the flow of nutrients under these conditions **(10 Marks)?**

B). Explain the role of growth hormone (Somatotropin) in regulating mobilization of nutrients from other organs to fulfill a homeorhetic physiological condition such as pregnancy or lactation **(15 Marks)?**

QUESTION FOUR

A). What are the differences in cellular calcium (Ca^{++}) concentration and calmodulin in regulating energy metabolism in muscle cells **(10 Marks)?**

B). What is the role of the hypothalamus in regulating feed intake in farm animals and how do secretions from this organ interact with those from the periphery organs such as the gut and adipose tissue **(15 Marks)?**

QUESTION FIVE

A). The adipose tissue has long been seen or considered to be an inactive organ of the body that is solely concerned with storage of reserve energy for the organism. Explain how recent discoveries have put the adipose tissue at the centre of regulating long term and short term energy metabolism in a living organism **(10 Marks)?**

B). Explain some of the long term and short term metabolic disorders and management strategies you may wish to employ in order to minimize effects of prolonged negative energy balance in high producing dairy cows **(15 Marks)?**



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

2020/2021 FINAL EXAMINATIONS

AGA 6102– RUMINANT DIGESTION AND RANGE MANAGEMENT

INSTRUCTIONS

Answer one question from each section

Write your answers for questions in each section in a separate booklet

Read the questions carefully before attempting them

All questions carry equal marks (20 Marks each)

SECTION A

QUESTION ONE

- (A) Silage is a type of fodder made from green foliage crops which have been preserved by fermentation to the point of acidification. With at least FIVE points explain the advantages of this type of feed when managing ruminants such as dairy cows **(10 Marks)**
- (B) As a ruminant digestion expert, describe how complex carbohydrates such as cellulose and hemicellulose, which non-ruminant animals cannot utilize, are digested in a ruminant animal, mentioning the by-products released **(10 Marks)**

QUESTION TWO

In ruminants, saliva plays very important functions in the process of digestion. Describe in details, the functions of saliva in a ruminant animal. Show the depth of your knowledge by mentioning its components that aids in achieving the functions being described **(20 Marks)**

SECTION B

QUESTION THREE

- A. What are metabolic conditions/disorders? **(2 marks)**
- B. With examples, discuss five (05) general risk factors to metabolic conditions in ruminants. **(10 marks)**
- C. Give two (02) reasons why metabolic conditions are a common occurrence in dairy animals **(2 marks)**
- D. Discuss four (04) general ways in which metabolic conditions can be prevented **(4 marks)**.
- E. Mention two (02) metabolic conditions that you know **(2 marks)**

QUESTION FOUR

You are a Livestock Officer based in Kafue District. A farmer calls you to his farm on a beef ranch to sort out an emergency problem that he is experiencing. The farmer explains that he put 10 beef animals in the feedlot two (02) months ago. One morning he woke up and noticed that two of his animals have died suddenly. Prior to that he noticed that the animals have not been gaining weight at the expected rate and almost all of them were having diarrhoea, had sunken eyes were all limping (abnormal staggering gait when moving). The animals were also not eating as much as they are supposed to. You look around in the feedlot area and you observe that the faecal material scattered around is light coloured, very soft to watery with bubbles and you see poorly digested grainy materials.

- A. What is your diagnosis of the problem? (2 marks)
- B. Outline the basic biochemistry of events that occurred for this condition to develop? (4 marks)
- C. What are the two (02) main predisposing factors to this condition (2 marks)
- D. What could have led to the death of the animals (2 Marks)
- E. Is the lameness linked to the diagnosis in 'A' or is it a separate condition? Explain to the farmer the cause of the lameness (3 Marks)
- F. Explain how you would manage this emergency condition (2 marks)
- G. Mention three (03) preventive measures that you would you recommend to the farmer to avoid future occurrence of the problem? (3 marks)
- H. What is the economic importance of this condition? (2 marks)

SECTION C

QUESTION FIVE

In range management it is important to carry out a natural resource inventory

- a) Why is it importance to carry out natural resource inventory in Rangelands? (3marks).
- b) In natural resource inventory mention and explain the six types of plant attributes that are commonly measured. (6 marks).
- b) The following data of two desirable browse species *Julbernadia globiflora* and *Uapaca kirkiana* was collected from 10 quadrants from grazing area in Central Province. Each quadrant was 10 meters x 10 meters

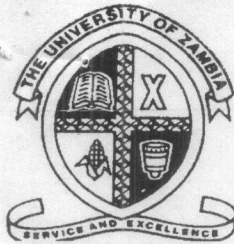
Quadrant No.	1	2	3	4	5	6	7	8	9	10
Number of <i>Julbernadia globiflora</i> plants	4	0	1	0	7	3	0	2	2	1
Number of <i>Uapaca kirkiana</i> plants	8	5	6	0	4	3	1	0	6	2

- (i) Calculate
 - (a) The frequency of *Julbernadia globiflora* and *Uapaca kirkiana*
 - (b) The density per hectare of *Julbernadia globiflora* and *Uapaca kirkiana* (7 marks).
- (ii) Which of the two has better results in terms of frequency and density (4 marks).

QUESTION SIX

Rangeland degradation consists of a reduction in the quantity or nutritional quality of the vegetation available for grazing. The prospect of increased rangeland degradation is common to all dryland areas. In particular, the deterioration is more advanced in semi-arid and sub-humid areas than in arid areas.

- (a) What are the characteristics of range lands? **(4 marks)**.
- (b) Outline the importance of rangelands in Zambia **(6 marks)**.
- (c) What are the causes of rangeland degradation in Zambia? **(4 marks)**
- (d) What measures should be carried out to improve the productivity of rangelands in Zambia? **(6 marks)**.



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

AGA 6111 (Non-Ruminant Digestion and Metabolism)

Instructions: Answer ANY THREE questions from the four provided

All questions carry equal marks (20 Marks)

Use a separate answer booklet for each section

SECTION A- NUTRIENT DIGESTION AND ABSORPTION

QUESTION ONE

- (a) Glucose and fructose are monomers of carbohydrates. The two have different functional groups in their molecular structures. With an aid of a diagram of each monomer, identify and name the functional group in each of them. **(8 Marks)**
- (b) Describe the hormonal control mechanisms of the intestinal phase of digestion of lipids and proteins. Show the depth of your knowledge in monogastric digestion by mentioning factors that stimulate the secretion of hormones involved and the effects of these hormones on the target tissues, and how the digesta (lipids and proteins) are affected **(12 Marks)**

QUESTION TWO

- (a) Describe the functions of one secretions produced by each of the following tissue cells, in the digestion of proteins in a monogastric animal
- (i) Chief cells **(4 Marks)**
 - (ii) Parietal cells **(4 Marks)**
 - (iii) Acinar cells **(4 Marks)**
- (b) Briefly, explain the mechanism that converts the zymogens secreted in the pancreas into the small intestines are converted into their active compounds **(4 Marks)**
- (c) Describe how the mucosal lining of the stomach is protected from self-digestion by the secretions that are meant to digest food nutrients **(4 Marks)**

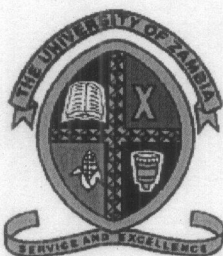
SECTION B –NUTRIENT METABOLISM

QUESTION THREE

- (a) Explain what happens to dietary amino acids after being absorbed and transported through the portal system for utilization by the host animal **(8 Marks)**
- (b) Explain how ketone bodies are generated and metabolised in farm animals including the dangers for the failure by the animal to metabolize them **(8 Marks)**
- (c) What management practices can you institute on the farm to avoid accumulation of ketone bodies in animal tissues? **(4 Marks)**

QUESTION FOUR

- (a) Explain the role of allosteric enzymes in the regulation of glycolysis, gluconeogenesis and the Krebs or Tri-carboxylic acid (TCA) cycle through activation of these enzymes using what is termed as end product inhibition **(12 Marks)**
- (b) Explain in detail how the energy conserved in reduced co-enzymes NADH + H and FADH₂ is released as ATP through the electron transport chain and oxidative phosphorylation? **(8 Marks)**



The University of Zambia
School of Agricultural Sciences
Department of Animal Science

2020/2021 FINAL EXAMINATIONS

AGA 6142: Proteins and Amino Acids Metabolism

Date: 10th December 2021

Time: 09:00 Hours

Instructions: Answer any **four (4)** questions, they all carry **25** equal marks.

Question One

- A). What are key factors that affect the quality of proteins in non-ruminant feedstuffs meant for formulating diets **(10 Marks)**?
- B). What precautionary measures do you need to consider when using synthetic amino acids in non-ruminant diets **(5 Marks)**?
- C). Why are amino acids termed as amphoteric and what is the importance of such a property as far as separation and quantification of different amino acids is concerned **(10 Marks)**?

Question Two

- A). Explain the steps of the Ninhydrin reaction and what is the importance of this reaction in the analysis and quantification of amino acids in feedstuffs or protein molecules **(10 Marks)**?
- B). What are pKa values of different amino acids and why is that some amino acids have more than two pKa values **(10 Marks)**?
- C). Explain what is meant by the term "non-protein amino acids" and what is the importance of these amino acids in animal metabolism **(5 Marks)**?

Question Three

A). Explain in detail the digestive and absorptive processes of proteins and nucleic acids that take place in different segments of the gastro-intestinal tract of non-ruminants including the enzymes that catalyse specific reactions **(15 Marks)?**

B). Explain the degradation and biosynthetic steps that occur in the transformation of oxaloacetate through aspartic acid to asparagine and vice versa including the enzymes that catalyse the different reaction steps **(10 Marks)?**

Question Four

A). Explain in detail the steps through which excess nitrogen is gotten rid of in non-ruminant farm animals **(15 Marks)?**

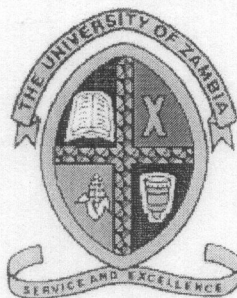
B). Explain the steps leading to biosynthesis of serine and how is this process linked with that of glycine **(10 Marks)?**

Question Five

A). Explain the degradation of five amino acids through the acetyl CoA pathway indicating the enzymes and co-factors involved in each step **(10 Marks)?**

B). What do you understand by the term "amino acids imbalances" and what are the consequences of having such imbalances in animal nutrition **(5 Marks)?**

C). Explain what is meant when someone talks about amino acids having sparing effects of other amino acids in animal nutrition and why is it that Methionine has a sparing effect on cysteine and Phenylalanine on tyrosine and not vice versa **(10 Marks)?**



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

AGA 6601 BIOCHEMICAL TECHNIQUES AND INSTRUMENTATION

2022 MID YEAR EXAMINATIONS

COURSE : AGA 6601-- BIOCHEMICAL TECHNIQUES AND INSTRUMENTATION

DATE : MONDAY, 20 JUNE 14:00 HOURS

DURATION : 3 HOURS

INSTRUCTIONS : ANSWER ANY FOUR QUESTIONS

- 1 Mention and explain the important factors to consider on laboratory samples under the following headings:
i. Sampling ii. Sample Storage iii. Preparation for Analysis
(25 marks).
- 2 The proximate analysis of a sample of maize (corn) indicates the following figures (in % of FM): moisture 14%, ashes 1%, crude protein 9%, ether extract 4%, crude fibre 2%, nitrogen-free-extract 70%
 - i). What is the percentage of DM of this maize?
 - ii) What is the percentage of OM?
 - iii) What is the percentage of carbohydrates?
 - iv) How many grammes of crude protein (CP) are there in 1 kg of maize?
 - v) How many grammes of DM are there in 1kg of maize?
- 3 Outline the effects of sample storage and preparation on nutrient content and precautions required to minimize them.? (25 marks).
- 4 In evaluation of chemical composition of feeds, outline the types of analyses that should be carried out and the importance of carrying out these analyses (25 marks).

5. Sampling protocols should meet scientifically recognized principles and procedures. Laboratory methods should be developed and validated according to scientifically recognized principles. Sampling procedures will depend on the nature of the raw material, in process or finished product lots, conveying and sampling equipment.
 - a) Outline the objectives of sampling.?(10 marks)
 - b) What are the sources of errors in sampling and what precautions should be put in place to reduce these errors (15 marks).
6. Explain the importance of ash and mineral determination of a feed. A grain was found to contain 11.5% moisture. A 5.2146-g sample was placed into a crucible (28.5053 g tare). The ashed crucible weighed 28.5939 g. Calculate the percentage ash. (25 marks).

THE END



UNIVERSITY OF ZAMBIA

UNIVERSITY OF ZAMBIA EXAMINATIONS- JUNE 2022

AGC 6111

PLANT PHYSIOLOGY

Time Three (3) hours.

Marks 100

INSTRUCTIONS:

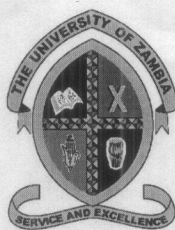
- i. Read the questions carefully before answering.
- ii. Answer any five (5) questions.
- iii. All questions carry equal marks.

-
1. Discuss the following;
 - i. Importance of branching in plants, and the key hormones and processes.
 - ii. Carbohydrate partitioning and how it is regulated. [25 marks]
 2. Describe nitrogen fixation in terms of ;
 - i. Host- bacteria recognition.
 - ii. Leghaemoglobin.
 - iii. Conditions that affect efficiency of nitrogen fixation. [25 marks]
 3. Describe any two (2) of the following;
 - i. Relative growth rate and its key determinants.
 - ii. Light movement into the canopy and within the canopy.
 - iii. Three ways in which environment influences plant development. [25 marks]
 4. Describe any two (2) of the following;
 - i. Thermoperiodism and photoperiodism
 - ii. Strigalactones and gibberellins.
 - iii. Cryptochrome and phytochrome. [25 marks]
 5. Briefly describe the following;
 - i. Electron transfer systems in photosynthesis.
 - ii. Importance of water in photosynthesis.
 - iii. Crassulacean acid metabolism (CAM) photosynthetic system. [25 marks]

6. Describe any three (3) of the following;
- i. Stress in plants and how the plant senses stress.
 - ii. Three stress survival mechanisms.
 - iii. General effects of heat stress during grain filling.
 - iv. Ultra violet radiation stress.

25 marks]

END OF EXAMINATION



UNIVERSITY OF ZAMBIA

School of Agricultural Sciences

DEPARTMENT OF PLANT SCIENCES

Programme- Master of Science, Agronomy: FINAL EXAMINATION

Course- AGC 6125: SUSTAINABLE AGRICULTURE

Date November 2020

Time 09:00 to 12:00 hrs

- i. Answer any five (5) questions**
- ii. All questions carry equal marks**

-
- 1) Describe organic agriculture. In your answer include the 4 principles on which organic agriculture is based and key limitations of this agricultural system.
 - 2) Answer the following
 - i. Limitation of Urban agriculture.
 - ii. Food systems.
 - iii. Supporting ecosystem services.
 - 3) Discuss the role that genetic modification technologies can play in sustainable agriculture and the associated risks.
 - 4) Describe the essential elements of Sustainable Assessment of Food and Agriculture systems.
 - 5) Discuss the relationship of livelihoods and health of the environment.
-

END OF EXAMINATION



UNIVERSITY OF ZAMBIA

School of Agricultural Sciences

DEPARTMENT OF PLANT SCIENCES

Programme- Master of Science, PBSS: FINAL EXAMINATION

Course- AGC 6162: PHYSIOLOGY OF YIELD

Date 18th December 2020

Time 14:00 to 17:00 hrs

- i. Answer any five (5) questions.
- ii. All questions carry equal marks.

-
- 1) Describe carbohydrate partitioning and with examples show how it can successfully be used to increase crop yields.
 - 2) Below is a general synthesis of average yields compared to record yields in key field crops. **For each crop**, give two reasons for the low average yields.

Table 1. Comparison of average yields and record yields of common crops indicating existing potential for further yield increases.

Crop	Average yield (ton ha ⁻¹)	Record yield (ton ha ⁻¹)
Maize	8	19- 23
Soybeans	2	7.5
Rice	5	14
Potato	32	95

The data shown above are averaged over different regions and time periods.

- 3) Answer the following;
- Account for reason(s) maize is successfully grown in the tropics and subtropics.
 - Describe phasic development in maize.
 - Contrast optimum temperature requirements for maize and with a temperate crop like wheat during early development.
- 4) Sugarcane (*Saccharum* spp), has been an important crop as a source of sugar, it will continue to be important albeit for new reasons (biofuels). Discuss the following:-
- The general growth curve of sugarcane and associated optimum temperature optima for each phase.
 - The rooting system of sugarcane and effects on ability to tolerate water stress.
 - Tillering in sugarcane.
- 5) With reference to Irish potatoes (*Solanum tuberosum*), describe the following;
- Yield components.
 - Water requirements of Irish potatoes and effects on water deficits on yield.
 - Tuber formation process.
- 6) Answer any **two** of the following;
- On the basis of environmental requirements outline suitable areas for Irish potato production in Zambia.
 - Discuss briefly factors that determine the rate of leaf appearance in maize.
 - What are the possible causes of lodging in crops such as maize?

END OF EXAMINATION



THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES

Examinations for Master of Science in Plant Breeding and Seed Systems

AGC 6211: PLANT BREEDING METHODS
First Semester 2022

DATE: Tuesday June 21st 2022, PM.

TIME: THREE HOURS

Answer five questions only. All Questions Carry Equal Marks

1.0 Write short notes on the following:

(20 Marks)

- a) Top cross test.
- b) Testcrosses
- c) What is Clonal degeneration, does it have a genetic basis?
- d) Modified single crosses
- e) A multi-line variety

2.0 In its effort to contribute to public service the University of Zambia, School of Agricultural Sciences conducted a Plant Breeding Appreciation Course (PBAC) to train peasant farmers in basic plant breeding (*nothing too scientific*) so that they can learn to improve their own local varieties, since historically, it is accepted that farmers were the first plant breeders!

After two years one of the female participants reported that she has been able to extend the leaf plucking period of her favorite leafy vegetable, a cross pollinated vegetable known as Indian mustard by three weeks. She excitedly stated that the Plant Breeding Appreciation course was *very, very good, to put it in her own words!* She said that the original variety used to flower too early and once flowering sets in, leaf production stops which means she had to buy this vegetable from the market. However using the knowledge she obtained in the PBAC training from UNZA, she can now enjoy her favorite leafy vegetable for three additional weeks.

How did this *bubbly but not-so-educated* lady achieve this feat which has since been verified by the University of Zambia?

(20 Marks)

ANSWER EITHER QUESTION 3 OR 4 COMPULSORY QUESTIONS

- 3.0 The beef industry in Botswana and Zambia is looking for a variety of maize suitable for silage production. A good silage variety should give very high biological yielding at the time harvest and also the silage made from it should be very digestible. It has been observed that plants with thick juicy stems tend to make good silage.

Supposing you as a plant breeder have teamed up with animal scientists and tasked at developing **Open Pollinated** and **Three way Cross Hybrid** varieties suitable for Silage production, how would you proceed to achieve that objective and what role would each member of the team play to achieve this objective? (20 Marks)

NOTE: Assume you have fistulated Beef animals for in vivo digestibility studies

- 4.0 The plant immune system is broadly divided into three types: 1) microbial-associated molecular-patterns-triggered immunity (MTI), 2) effector-triggered immunity (ETI), and 3) systemic acquired resistance (SAR). A bacterial disease of beans (disease X), previously reported in Mozambique and Malawi, has just broken out in Zambia. As a lead breeder for the company *Mukuni Solutions*, you decide to develop a bean variety with resistance against disease X. Upon examination of literature, you discover that resistance to disease X is mostly through MTI and is vertical. You also learn that one resistant variety has been developed in Mozambique and Malawi but is unsuitable for use under Zambian conditions.

1. What types of genes would you be looking to introgress into your bean variety to give it MTI against bacterium X? In your answer explain how your chosen genes would give your new variety the ability to deploy all the mechanisms and steps under MTI. (15 marks)
2. Briefly explain the 4 steps you would take in developing a bean variety with resistance to bacterium X in Zambia. (5 Marks)

- 5.0 Explain the Hardy-Weinberg law and its significance to crop improvement. (5 Marks)

Maize of an OPV of high lysine maize was studied for the frequency of the Opaque 2 gene which produces Quality Protein Maize (QPM) that is high in the essential amino acids; lysine and tryptophan. From a random sample of maize cobs, 200,000 kernels were studied for the Opaque 2 gene. Kernels of the following genotypes were obtained:

O_2O_2 (Normal maize)	O_2o_2 (Normal maize)	o_2o_2 (QPM)
40,000	20,000	140,000

Assuming a morphological marker to distinguish the O_2O_2 from the O_2o_2 genotypes exists;

- a) Calculate the frequency of the alleles O_2 and o_2 in the above population. (5 Marks)

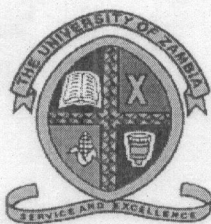
- b) If the rule of thumb is that the threshold proportion for the Opaque grains in the population to have an observable, clinical, nutritional impact on the health of consumers, should be above **65%**, did this OPV population comprise of enough High lysine maize grains (QPM) to make a difference in the nutrition of the people consuming this maize? **(5 Marks)**
- c) What about after one generation of random mating, is the proportion still good or not and if not what measures would have to be instituted to improve the nutritional quality of this OPV. **(5 Marks)**

6.0 Answer *Any Two* of the following:

- Define *auto polyploidy* and briefly describe methods of production of *auto polyploids* and their importance and limitations in crop improvement **(10 marks)**
- If a desirable trait is said to show heterotic response what does that information mean to the breeder with respect to his breeding program? **(10 marks)**
- Give a procedural account for developing hybrid varieties for self-pollinated crops with tiny flowers which are not easy to hybridize. **(10 marks)**
- What is a Primary synthetic Line? **(10 marks)**

7.0 Give a procedural account for developing hybrid varieties for self-pollinated crops with tiny flowers which are not amenable for artificial hybridization **(20 marks)**

-----END OF AGC 6211 EXAM-----



THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

Examinations for Master of Science in Plant Breeding and Seed Systems

AGC 6211: PLANT BREEDING METHODS

First Half 2021 academic year

DATE: Thursday December 4th 2021, PM. TIME: TWO HOURS

Answer five questions only. All Questions Carry Equal Marks

1.0 Write short notes on the following:

(20 marks)

- a) Linkage drag
- b) Progeny test
- c) Clonal degeneration
- d) Top cross test
- e) Show how scaling test C, $[C = 4F_2 - 2F_1 - P_1 - P_2]$ was derived

2.0 A group of farmers in a remote part of Zambia in Kaputa District, have formed a District Seed Association. Their aim is to select and also maintain the high value wild rice cultivar endemic in the District.

Supposing you were asked to train these farmers in some basic Plant Breeding for them to be able to improve the wild rice cultivars and also maintain the purity of the seed. What **five** components of the training program would you cover in the training?

(20 marks)

3.0 Write on **any two** of the following:

(20 Marks)

- a) The Doubled Haploid approach in plant breeding is solely for purifying hybrid varieties. **TRUE OR FALSE?** Explain?

- b) Participatory Plant breeding in modern agricultural systems is an over rated phenomenon. It is of little value in plant breeding. **TRUE OR FALSE?** Explain.
- c) Maintenance Breeding is too expensive for a seed company to waste its resources on. **TRUE OR FALSE?** Explain

4.0 An indigenous Zambian seed company has developed an extremely successful **Single Cross** hybrid variety of maize. A visiting plant breeder representing a foreign seed company at an Agricultural Field Day was keen to market this variety in his country. The only problem is that in his country they prefer yellow to white maize. This representative of the foreign seed company has asked the Zambian seed company to convert this very high yielding Zambian maize hybrid to yellow seeded type. How would the Zambian seed company respond to this potentially lucrative foreign market?

NOTE: kernel colour in maize is a qualitative trait with yellow being dominant to white.

5.0 The ministry of livestock has embarked on a program to improve the availability of forages for cattle and small ruminant animals such as goats during the dry season. A pilot project by the ministry of livestock known as "Enhanced Small holder Livestock Production" (**ESLIP**) has recruited 100 emergent farmers (*Facilitated with basic irrigation equipment*) and 10 commercial farmers (*who already have elaborate irrigation facilities*) to grow maize for silage under irrigation along the Zambezi and Kafue river frontage to improve animal feed in the dry season.

Suppose you as a Plant Breeder have teamed up with Animal Scientists from the ministry and have been tasked to develop **OPV** varieties especially suitable for silage making, how would you proceed with your research and what is the anticipated Value Addition you would expect from the other team members in this task.

(20 marks)

NOTE: The two critical requirements for silage varieties are high Biomass production and high Digestibility.

6.0 a) A maintainer line when developing a male sterile line must always be homozygous recessive for nuclear fertility restoration genes. **TRUE OR FALSE?** Explain.

(10 Marks)

- b) If fixation of heterosis is possible, with what type of crop species would you achieve that? Explain. (10 Marks)

-----END OF EXAMINATION-----



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – DECEMBER 2021

AGC 6322
PLANT PROTECTION

TIME: 2 Hours

Marks: 70

INSTRUCTIONS: ANSWER ALL QUESTIONS FROM SECTION A AND ONE (1) QUESTION FROM SECTION B. ANSWER EACH SECTION IN A SEPARATE ANSWER BOOKLET

SECTION A: PLANT PATHOLOGY AND WEED SCIENCE

Question 1: Say whether the following are true or false [30 Marks]

1. Fungicides effective against *Phytophthora spp* are more likely to be effective against *Pythium spp*. than against *Rhizopus spp*.
2. When a certain forma specialis has been detected in an area, switching crop variety is a good way to manage disease caused by the said pathogen
3. *Xanthomonas campestris* cause disease through genetic manipulation of the host tissue
4. Callose deposition, phytoalexins and hypersensitive response are all mechanisms through which plants counter pathogen attack
5. *Phytophthora infestans* can be controlled using chitin-degrading fungicides
6. You examined a diseased tissue under a microscope and observed an oospore. The causal organism for the disease might belong to the class basidiomycetes
7. Coenocytic fungi such as *Pythium spp* lack septa
8. Viruses cause disease through enzymatic breakdown of host tissue
9. Mutations and recombination are some of the methods through which new pathovars of fungi arise
10. The FRAC code is important in preventing pathogens such as *Xanthomonas* from becoming resistant against commonly used fungicides
11. Sporangiospores are products of sexual reproduction
12. Viral transmission through vectors is referred to as horizontal transmission
13. *Pseudomonas syringae* is an example of bacteria with monotrichous flagella
14. A facultative parasite is an organism that is normally a parasite but is capable of being a saprophytic
15. Some *Heterodera spp* cause Root Knot disease
16. *Striga asiatica* and *Striga hermonthicus* are both species of parasitic higher plants
17. Planting at a high spacing tends to increase disease spread

18. Viroids are small, low-molecular-weight DNA that can infect plant cells, replicate themselves, and cause disease.
19. The ooze test would be a good way to test for presence of *Erwinia tracheiphila*
20. Uredospores are a feature of basidiomycetes
21. Biotrophs use discontinuous infection chains
22. Bacterial ooze is a symptom
23. Giant cells are associated with cyst nematode infection
24. Disease incidence is the degree of damage done by a plant
25. Prolonged leaf wetness associated with high planting density may increase disease
26. The 4 stages of integrated disease management (IDM) include prevention, observation, intervention and acceptable disease levels
27. You will tell two viroids belong to different families by looking at their variable domain
28. In integrated disease management (IDM), chemical control should be used judiciously and immediately
29. Apple scar skin viroid lacks the central conserved domain
30. Some weeds are dispersed from one field to another, or from one area to another through spores

Question 2 [20 marks]

Striga asiatica is one of the problematic broad-leaved weeds affecting cereals such as sorghum in agroecological region I of Zambia. You have been tasked with a duty of developing a microbe-based biological control product for the management of this weed in Lusitu, an area falling in agroecological region I in Siavonga district. Explain, in detail, the steps you would take to develop a biological control product for this weed. At each step, explain the factors you would consider and how they would guide the choices you would make to increase the success of that step, and ultimately the product developed. As a guide, the steps would include, among others, 1. Choosing the biocontrol organism, 2. Setting up and conducting experiments/trials and collecting data to test the efficacy of the identified product on *Striga*, 3. Data analysis and interpretation of results.

SECTION B: ENTOMOLOGY

Question 1 [20 Marks]

When the topic of integrated pest management is mentioned, most people think first about monitoring for pests or intervening to reduce pests. However, prevention is an often-overlooked key strategy that farmers can use to minimize the likelihood of pest problems. Discuss this statement with examples.

Question 2 [20 Marks]

Explain briefly the different types of attractants and repellents used in integrated pest management.

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END OF EXAMINATION



UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
PLANT SCIENCE DEPARTMENT
UNIVERSITY EXAMINATIONS

AGC 6432 BIOMETRICAL GENETICS AND PLANT BREEDING

NOVEMBER 2021

INSTRUCTIONS

ANSWER QUESTIONS AS PER INSTRUCTIONS BELOW. ENSURE ALL SECTIONS ARE ATTEMPTED. POINTS FOR EACH QUESTION ARE INDICATED IN BRACKETS.

TIME: 2 hours

Section A: COMPULSORY

Q.1 Four maize inbred lines were crossed using a diallel mating design. The mean yield data for these crosses is shown in the table below. Compute the GCA effects for the four parents, (ii) Compute the SCA effects for the F1 crosses, (iii) Which inbred line could you adopt as a tester and which cross would you use to develop a hybrid variety? [40 points]

Parents	P1	P2	P3	P4
P1	86	87	91	115
P2	81	98	112	88
P3	102	104	74	101
P4	119	89	102	92

Q2. Three journal articles, listed below, described methods of identifying stable varieties in the presence of significant Genotype x Environment interactions. For each one of them describe the method used to characterize stable varieties giving a clear illustration.

Journal articles:

- a. Finlay and Wilkinson (1963) -10 points
- b. Eberhart and Rusell (1966) – 18 points
- c. Francis and Kannenberg (1978) – 12 points

Section B: Choose any ONE QUESTION ONLY

Q. 3 Write short notes on:

- Specific combining ability and General combining ability (8 Points)
- Consequences of inaccurate estimation of Genotype x Year versus Genotype x Location interactions in Stability analysis (4 points)
- Rationale for using GGE methods in dealing with yield stability in crop production (8 points)

Q.4 Given the following data do the following:

	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
Variety						
V1	7	12	10	9	14	8
V2	11	16	13	10	12	7
V3	10	15	9	12	8	10
V4	12	11	15	13	10	14
V5	8	13	12	10	7	11

- Calculate the variance for each variety (8 Points):
- Calculate the Coefficient of Variation for each variety (6 Points):
- Make an interpretation of the results of your analysis (6 Points)

Q.5 A bean breeder wants to determine if sufficient genetic variation for seed nitrogen exists in an F₂ population to select for genotypes with high nitrogen content in the seed. Out of a population of 6 F₂'s, three are designated as males while the other three as females. Each male is crossed to all three female (North Carolina Design II). Progenies from these crosses are planted in RCBD with two replications. Below is the raw data of nitrogen content for each progeny in a replication. Estimate the additive and dominance variance component for nitrogen content and comment on the implication of these components in breeding for high nitrogen content in the seed [20 Points]

Parents		P1	P2	P3
P4	Rep1	3.5	5.1	3.7
	Rep2	4.5	5.4	4.2
P5	Rep1	6.3	3.1	4.6
	Rep2	6.5	3.8	4.7
P6	Rep1	5.8	6.2	3.1
	Rep2	5.5	5.9	3.4

END OF EXAMINATION



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – DECEMBER 2021

AGC 6612- SEED TECHNOLOGY

TIME: 2:00 Hours

Marks: 100

INSTRUCTIONS: ANSWER ALL QUESTIONS

Question 1 (20 Marks): Indicate if it's True/ False

- a. In developing a three way cross hybrid the male parent should always be an F₁ hybrid
- b. Seed priming is employed with the primary aim of improving seed germinating percentage.
- c. A grain is the result of a well planned development program
- d. Evaluating the size and number of competitors is an important consideration in a 'seed demand forecast' exercise
- e. The minimum acceptable germination percentage for certified bean seed in Zambia is 90%.
- f. Assessment of the 'Distinctiveness' of a variety can be enhanced by use of molecular markers
- g. In the seed industry, "I.S.T.A" means the International Seed Testing Association
- h. The colour code of a certified seed produced for Pre-basic seed in Zambia is a violet stripe on white
- i. The major goal of seed technology is to increase agricultural production through the spread of good quality and high yielding grain
- j. "Off-type plant" means a plant which does not exhibit the recognized and accepted habits and characteristics of the cultivar being grown

Question 2 (30 marks)

- a) Explain the concept 'viviparous germination' ~~concept~~ as utilized in seed biology. (5 marks)
- b) Explain the concept of 'value for cultivation and use'. (5 marks)

- c) Compare and contrast the direct and single level seed marketing distribution system. (6 marks)
- d) List any four factors that affect seed longevity in storage. (4 marks)
- e) Discuss the factors that should be taken into consideration when selecting a site (piece of land) for seed production. (10 marks)

Question 3. Briefly explain the following concepts or terminologies (25 marks)

- i. Seed vigour vs seed germination
- ii. Disc separator
- iii. Air screen cleaner
- iv. Market price strategy vs Low price strategy
- v. Seed act

Question 4 (25 marks)

- a) Compare and contrast the use of a herbicide bioassay and a DNA based assay in detecting transgenic seeds (13 marks)
- b) You have been given 6 maize inbred lines by CIMMYT. What's the total possible number of three way cross hybrids that can be developed? Show your working (6 marks).
- c) Discuss the application of post and pre-control test plots (6 marks)

END OF EXAMINATION



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – DECEMBER 2021

AGC 6625- SEED SYSTEMS

TIME: 2:00 Hours

Marks: 100

INSTRUCTIONS: ANSWER ALL QUESTIONS

Question 1 (20 Marks): Indicate if it's True/ False

- a. In developing a three way cross hybrid the male parent should always be an F_1 hybrid
- b. Seed priming is employed with the primary aim of improving seed germinating percentage.
- c. A grain is the result of a well planned development program
- d. Evaluating the size and number of competitors is an important consideration in a 'seed demand forecast' exercise
- e. The minimum acceptable germination percentage for certified bean seed in Zambia is 90%.
- f. Assessment of the 'Distinctiveness' of a variety can be enhanced by use of molecular markers
- g. In the seed industry, "I.S.T.A" means the International Seed Testing Association
- h. The colour code of a certified seed produced for Pre-basic seed in Zambia is a violet stripe on white
- i. The major goal of seed technology is to increase agricultural production through the spread of good quality and high yielding grain
- j. "Off-type plant" means a plant which does not exhibit the recognized and accepted habits and characteristics of the cultivar being grown

Question 2 (30 marks)

- a) Explain the concept 'viviparous germination' ~~concept~~ as utilized in seed biology. (5 marks)
- b) Explain the concept of value for cultivation and use. (5 marks)

- c) Compare and contrast the direct and single level seed marketing distribution system. (6 marks)
- d) List any four factors that affect seed longevity in storage. (4 marks)
- e) Discuss the factors that should be taken into consideration when selecting a site (piece of land) for seed production. (10 marks)

Question 3. Briefly explain the following concepts or terminologies (25 marks)

- i. Seed vigour vs seed germination
- ii. Variety Denomination
- iii. Role of extension service in a seed system
- iv. Market price strategy vs Low price strategy
- v. Seed processing in informal seed sector vs the formal seed sector

Question 4 (25 marks)

- a) Compare and contrast the maize and bean seed system in the informal seed sector in Zambia (13 marks)
- b) You have been given 6 maize inbred lines by CIMMYT. What's the total possible number of three way cross hybrids that can be developed? Show your working (6 marks).
- c) Discuss the application of post and pre-control tests (6 marks)

END OF EXAMINATION



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – 2020/2021 ACADEMIC YEAR

AGE 6122
AGRICULTURAL POLICY ANALYSIS

TIME: 2 HOURS

MARKS: 100

INSTRUCTIONS:

- 1. ANSWER ALL QUESTIONS AND WRITE LEGIBLY**
- 2. ANSWER QUESTIONS 1 AND 2 IN ONE ANSWER BOOKLET AND 3 AND 4 IN A SEPARATE BOOKLET.**

-
1. a) Give two justifications for studying policy incidence. **[4 Marks]**
b) Illustrate using a clearly labelled diagram, the differential size and distributional welfare effects of a market quota and producer subsidy (a target price and deficiency payments) on the following: producers, consumers, tax payers and the government. **[12 Marks]**
c) Comment on the dead weight losses of the two policies. How can the social cost of each policy be approximated? **[8 Marks]**
d) What do you understand by the term surplus transformation curve? **[6 Marks]**
 2. What is the role of monitoring policy impacts in the cycle of policy formulation and implementation? Give one example of methods and tools for MPI under the following sub headings; a) Planning methods b) Data collection methods c) Analytical methods. **[20 Marks]**
 3. You have been hired by the World Bank as an Agricultural Policy Analyst to be based at the Country Office in Zambia. To begin your new job, you have been asked to prepare a concept note based on the following narrative.

The sudden rise in soya bean prices during the 2021 marketing season has generated a lot of interest among policy makers. This is because high prices of the commodity are expected to contribute to welfare improvements of soya bean producers. Unfortunately, there is limited empirical evidence on the welfare effects of high prices of soya beans on producers. Propose the most appropriate indicator that could be used to measure changes in welfare of soya bean producers. Your concept note should be written around the following sub-themes:

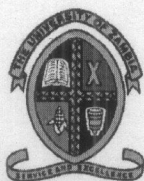
- a) Definition of the indicator **[3 Marks]**
- b) Information and data required to estimate the indicator **[8 Marks]**
- c) Steps for computing the indicator **[10 Marks]**
- d) Interpretation of the indicator **[4 Marks]**

4. Consider a consumer with the following Cobb-Douglas utility function:

$$U(X, Y) = 30\sqrt[3]{XY}$$

- a. Derive the consumer's Marshallian demands assuming the price of X is P_X , the price of Y is P_Y and income is M . **[15 Marks]**
- b. Suppose the prices of X and Y are 1 and 2 respectively and income is 100, would there be a change in utility if prices remain unchanged but income increases by 100% (doubles). Show your work and interpret your result. **[10 Marks]**

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



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – NOVEMBER 2021

AGE 6132
PRODUCTION ECONOMICS

TIME: 2 Hours

Marks:60

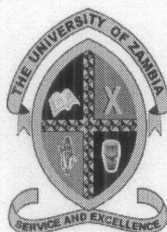
INSTRUCTIONS: ANSWER ALL QUESTIONS AND WRITE LEGIBLY

1. Sune Carlson contends that four forces interact to effectively determine the actions of profit-maximizing firms. Briefly discuss the four forces. [20 points]
2. Sally Street has a small business in which she clears red cedar from pasture land. She operates as a price taker. The prevailing price for clearing cedars is \$20 per acre. Her costs are given by

$$C(q) = 0.1q^2 + 10q + 50$$

where q is the number of acres Sally chooses to clear.

- a) Derive the average variable cost, fixed cost, and marginal cost functions [6 points]
 - b) How many acres should Sally clear to maximize profit? [6 points]
 - c) Calculate Sally's profit. [4 points]
 - d) What is the price elasticity of her supply curve at equilibrium? [4 points]
3. Consider the following production function:
$$q(x_1, x_2) = 100x_1 - 2x_1^2 + 50x_2 - x_2^2$$
 - a) Determine if the function is strictly concave. [4 points]
 - b) Derive the expansion path. [3 points]
 - c) Derive the factor demand for x_1 . [4 points]
 - d) Use comparative statics to determine the following: [6 points]
 - i) the impact of changes in the price of x_1 on x_1 ,
 - ii) the impact of changes in the price of x_2 on x_1 , and
 - iii) the impact of changes in the price of output on x_1 .
 - e) Derive the isoquant equation. [3 points]



THE UNIVERSITY OF ZAMBIA
UNIVERSITY MID-YEAR EXAMINATIONS – 2021/2022 ACADEMIC YEAR

AGE 6222
INTERNATIONAL TRADE

TIME: 3 Hours

MARKS: 100

INSTRUCTIONS:

- 1. ANSWER ALL QUESTIONS AND WRITE LEGIBLY**
- 2. ANSWER QUESTIONS 1 - 4 IN ONE ANSWER BOOKLET AND 5 AND 6 IN A SEPARATE BOOKLET.**

-
1. For each of the three models that explain trade based on comparative advantage (Ricardo, Specific factors, and Heckscher-Ohlin), give the basis of comparative advantage and the trade pattern. **[10 Marks]**
 2. Assume that Zambia and Malawi produce tomato and groundnuts with only one factor, labor. Labor requirements in Zambia are 50 man-hours per ton of tomatoes and 150 man-hours per ton of groundnuts. In Malawi, labor requirements are 60 man-hours per ton of tomatoes and 250 man-hours per ton of groundnuts. What is the range of relative wages $W_{\text{malawi}}/W_{\text{zambia}}$ that would make trade between Zambia and Malawi beneficial for both countries? **[10 Marks]**
 3. State the factor-price equalization theorem. Make sure to state the underlying assumptions (of the Heckscher-Ohlin model which are central to this theorem or result). **[10 Marks]**
 4.
 - a) What are the motives of regional integration? **[5 Marks]**
 - b) Discuss the following types of regional integration: **[5 Marks for each]**
 - (i) Free trade area
 - (ii) Customs union
 - (iii) Common market
 - (iv) Economic union
 - (v) Monetary union
 5. India, the second largest exporter of sugar in the world, recently announced that the country would restrict sugar exports to 10 million tons in 2022. In most years, the country exports more than 15 million tons. Using a clearly labelled partial equilibrium model diagram, explain in detail the potential price and welfare effects of this policy decision by India, assuming global sugar markets are competitive. **[20 Marks]**

6. The Zambian President has just read an article in the Economist magazine on the benefits of regional integration for small countries. The article also suggests that formation of regional integration groups might not always lead to improved overall welfare of a member country, particularly a small country. The President has questions and would like you provide a report as a member of his economic advisory committee in response to his questions. The report should include the following thematic areas:
- a. Explanation of the concept of small country **[2 Marks]**
 - b. Definition of trade diversion **[2 Marks]**
 - c. Assumptions of trade diversion **[4 Marks]**
 - d. Welfare effects of trade diversion of all economic actors in a small country **[8 Marks]**
 - e. Scenario when trade diversion might not improve overall welfare of a small country **[4 Marks]**

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



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – JUNE 2022

AGE 6231

QUANTITATIVE ANALYSIS OF AGRICULTURAL POLICIES

TIME: 3 Hours

Marks: 100

INSTRUCTIONS: ANSWER ALL QUESTIONS AND WRITE LEGIBLY

1. An agent has utility $U(X_1, X_2) = x_1 x_2^2$ [25 points]
 - a. (5 points) Find the agent's Marshallian demand.
 - b. (5 points) Find the agent's indirect utility function.
 - c. (5 points) The agent's income is $m = 300$. What is the agent's consumption? What is her utility level?
 - d. (5 points) The government would like to reduce the agent's consumption of x_2 by half. It considers two policies to achieve this. Policy A imposes a tax on each unit of x_2 . Policy B imposes a lump sum tax on the agent's income. Suppose the government uses policy A. How big a tax needs to be imposed on each unit of x_2 ? What is the government's tax revenue? What is the agent's utility?
 - e. (3 points) Suppose the government uses policy B. By how much would the government have to reduce the agent's income? What is the government's tax revenue? What is the agent's utility?
 - f. (2 points) Which policy would the agent prefer? Why?

2. Suppose that an individual has utility $U(x_1, x_2) = x_1(1 + x_2)$. Throughout assume income m is sufficiently high so there is an internal solution. [25 points]
 - a. (6 points) Find the Marshallian demand for x_1 and x_2 .
 - b. (4 points) Are x_1 and x_2 normal or inferior goods?
 - c. (5 points) Find the indirect utility function.
 - d. (5 points) What is the expenditure function?
 - e. (5 points) What is the minimum expenditure necessary to achieve a utility level of $u = 72$ with $p_1 = 4$ and $p_2 = 2$?

3. Please answer the following questions about **agricultural household models**. [25 points]

- a. (5 points) Under what circumstances is it useful to use an agricultural household model instead of a consumer demand model or an agricultural output supply/factor demand model?
- b. (5 points) Suppose you estimate Zambian consumers' maize own price elasticity of demand to be -0.52 using a single equation demand function and +0.10 using an agricultural household model. What likely explains the difference in these estimated elasticities? Define any terms that you use.
- c. Bardhan & Udry (1999) note that if there are market failures in multiple markets, then the separability or recursive property of agricultural household models breaks down.
 - i. (3 points) Define market failure.
 - ii. (4 points) What are 4 common reasons for market failure?
 - iii. (3 points) What does it mean for an agricultural household model to be non-separable?
 - iv. (5 points) What are the implications of non-separability for the empirical estimation of a reduced form output supply function for maize? Be specific.

4. Consider the ordinary least square regression results below in which the researcher wishes to determine the impact of education on the number of dairy cows owned:

[25 points]

$$Y = 16520.53 + 8.64X_1 - 786.12X_2 + 291.37X_3 - 17.32X_4 + 510.87X_5$$

(0.000) (0.000) (0.012) (0.045) (0.429) (0.03)

Where:

Y= number of dairy cows owned

X1= Feed cost per cow

X2= Revenue per 20 liters of milk

X3= Milking system, equal to 1, if the farmer uses an improved milk system, zero otherwise

X4 =Farmer's age

X5 =Farmer's education in years

The numbers in parenthesis are P-values

- a. (15 points) Briefly discuss the marginal impact of each of the explanatory variables on the number of dairy cows owned. Do these results make economic sense? If so interpret, if not, what may have caused the error?
- b. (5 points) What is the problem with using the equation above for evaluating the effect of education on the number of dairy cows owned?
- c. (2 points) Explain the difference between internal and external validity
- d. (3 points) Explain at least 3 factors that cause threats to internal validity



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – DECEMBER 2021
AGE 6311
AGRIBUSINESS MANAGEMENT

TIME: 2 Hours

Marks: 100

INSTRUCTIONS: ANSWER ALL QUESTIONS AND WRITE LEGIBLY

- 1 a. According to Porter's model, what are the key factors shaping competition in an industry? **[20 Marks]**

b. In your opinion, which of these factors will have the greatest impact on the seed industry prices and profits **[5 Marks]**
- 2 a. Distinguish between production, sales and consumer-oriented marketing philosophies **[10 Marks]**

b. Select an agribusiness product and discuss the marketing tactics that could be used to implement each philosophy **[15 Marks]**
3. Discuss the merits of the following legal forms of business organization (i) sole proprietorship, (ii) corporation and (iii) cooperative **[25 marks]**
- 4 a. Differentiate between equity and debt financing and in the process, highlight the benefits and draw backs of each type of financing **[15 Marks]**

b. Why aren't the cash flows of an agribusiness equal to its profits? **[10 Marks]**

THE END



THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – NOVEMBER 2021

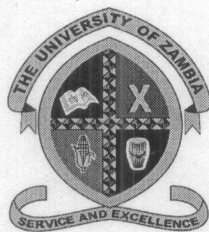
AGE 6322
APPLIED ECONOMETRICS

TIME: 2 Hours

Marks:60

INSTRUCTIONS: ANSWER ALL QUESTIONS AND WRITE LEGIBLY

1. A small business hires a consultant to predict the value of weekly sales of their product if their weekly advertising is increased to \$750 per week. The consultant takes a record of how much the firm spent on advertising per week and the corresponding weekly sales over the past six months. The consultant writes “Over the past six months the average weekly expenditure on advertising has been \$500 and average weekly sales have been \$10,000. Based on the results of a simple linear regression, I predict sales will be \$12,000 if \$750 per week is spent on advertising.” **[20 points]**
 - a) What is the estimated simple regression used by the consultant to make this prediction?
 - b) Sketch a graph of the estimated regression line. Locate the average weekly values on the graph.
2. You have the results of a simple linear regression based on state-level data and the District of Columbia, a total of $N = 51$ observations. **[20 points]**
 - a) The estimated error variance $\hat{\sigma}^2 = 2.04672$. What is the sum of the squared least squares residuals?
 - b) The estimated variance of b_2 is 0.00098. What is the standard error of b_2 ? What is the value of $\sum (x_i - \bar{x})^2$?
 - c) Suppose the dependent variable y_i is the state's mean income (in thousands of dollars) of males who are 18 years of age or older and x_i the percentage of males 18 years or older who are high school graduates. If $b_2 = 0.18$, interpret this result.
 - d) Suppose $\bar{x} = 69.139$ and $\bar{y} = 15.187$, what is the estimate of the intercept parameter?
 - e) Given the results in (b) and (d), what is $\sum x_i^2$?
 - f) For the state of Arkansas the value of $y_i = 12.274$ and the value of $x_i = 58.3$: Compute the least squares residual for Arkansas. (Hint: Use the information in parts (c) and (d).).
3. Assuming you are using version 17 of Stata and are using “C:\Documents\AGE4322\Data” as the working directory, write do-file statements that perform the following: **[20 points]**
 - a) Changes the directory to “C:\Documents\AGE4322\Data”
 - b) Opens and closes a new log file called “exam20”
 - c) Opens a Stata dataset called “exam20.dta” and explores its contents and computes summary statistics
 - d) Regresses y , a variable in exam20.dta, on x , another variable in the same file, using only the first 500 observations
 - e) Displays any one of the postestimation scalars
 - f) Saves the resultant dataset as exam20b.dta



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

2021/2022 ACADEMIC YEAR
MID-YEAR EXAMINATION

COURSE: AGF 6211
Food Microbiology and Food Safety

Date: 20th JUNE 2022

Time: 09 00 – 12 00 hours

Duration: THREE (3) HOURS

**Venue: FSN 2 (MSc LECTURE
ROOM)**

INSTRUCTIONS TO CANDIDATES:

- 1. This paper consists of Five (5) questions.**
 - 2. All questions carry twenty (20) marks each.**
 - 3. Answer ALL the Five (5) questions.**
-

Question 1

- a) Briefly discuss the close association of microorganisms with the health and welfare of human beings (give four (4) reasoning) **(8 Marks)**
- b) Write short notes on any two (2) groups of microorganisms associated with food **(8 Marks)**
- c) Discuss two (2) reasons why the food we consume is rarely sterile and explain the importance of understanding the sources of microorganisms in food **(4 Marks)**

Question 2

You intend to open up a small business of making beef samoosas and supplying to different retail outlets

- a) Discuss the role of food handlers, utensils and equipment in the contamination of food **(8 Marks)**
- b) Give two (2) examples of spoiler microorganisms and two (2) examples of pathogens that will be of concern for your new food product **(2 Marks)**
- c) Define the Hurdles concept **(2 Marks)**
- d) Differentiate between food quality and food safety **(4 Marks)**
- e) Explain how you would use the Hurdles concept to ensure the safety and shelf-life of the new food product you will be making **(4 Marks)**

Question 3

- a) Explain what is meant by microbial food spoilage **(3 Marks)**
- b) Differentiate between psychrotrophs and psychrophiles **(3 Marks)**
- c) Explain why fish easily spoils **(4 Marks)**
- d) Describe the mechanisms of fish spoilage. Three (3) modes **(6 Marks)**
- e) What two (2) approaches would you consider to reduce the rate of or inhibit microbial spoilage of fish **(4 Marks)**

Question 4

- a) Define biofilms and explain why they are a concern for the food industry (5 Marks)
- b) Define endospore and describe the characteristics that contribute to their resistance. Why are endospores a concern for the food industry? (7 Marks)
- c) Give two (2) reasons why food inspections are important (2 Marks)
- d) List three (3) areas of emphasis for food inspections and why (6 Marks)

Question 5

Food is a major determinant of health, nutritional status and productivity of the population. It is, therefore, essential that the food we consume is wholesome and safe.

- a) Differentiate with examples between synergistic and antagonistic microbial interactions in food (6 Marks)
- b) List four (4) major causes of foodborne illnesses in Zambia and suggest two (2) ways a consumer can reduce the risk of illnesses (6 Marks)
- c) *Bacillus cereus* causes food poisoning in two forms, diarrheal and emetic type. What are their significant differences? (6 Marks)
- d) Give one (1) of the goals of WHO Global strategy for food safety (2 Marks)

END OF EXAMINATION



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

AGF 6311 – FOOD PROCESSING, PRESEVATION AND PACKAGING

2021/22 FINAL EXAMINATION

Date: 23rd JUNE, 2022
Venue: FSN 3
Time: 14.00 – 17.00 hrs

Instructions:

This examination question paper contains two sections, A and B.

Answer all questions in Section A and choose any two questions in Section B.

Answer a total of five **(5)** questions.

All questions carry equal marks and allocated marks are shown in brackets at the end of each question.

The examination is three hours.

SECTION A: Answer all questions in this section

Question 1

- a) i) Differentiate between chilling and freezing. [1 mark]
- ii) List the advantages of chilling over freezing. [3 marks]
- iii) List the parameters that determine the transfer of heat from steam through the container and into the food. [3 marks]
- iv) State three important objectives of heat treatment in food processing. [3 marks]
- b) What factors determine the capacity of air to remove moisture from a food product during drying using air? [6 marks]
- c) Write short and concise notes on the following (5 lines or less)
- i) Constant rate period of drying [1 mark]
- ii) Steam quality [1 mark]
- iii) Cobalt-60 [1 mark]
- iv) Characteristics of instant products. [1 mark]

Question 2

- a) Packaging of foods has many objectives. Name and discuss four of the major objectives. [10 Marks]
- b) Discuss the mechanism of operation for a spray dryer. Include a diagram for illustration. [5 marks]

c) Write short and concise notes on the following (five lines or less)

- | | |
|---------------------------------|----------|
| i) D value | [1 mark] |
| ii) Multiple effect evaporation | [1 mark] |
| iii) Dew point | [1 mark] |
| iv) Psychrometry | [1 mark] |
| v) Tubular heat exchanger | [1 mark] |

Question 3

- a) List the two main reasons for blanching vegetables before freezing.
[2 marks]
- b) Describe in detail, the principles of cryogenic freezing, giving the key attributes of the process. [6 marks]
- c) Describe an industrial evaporator system. [6 marks]
- d) What are the advantages of machine sources for irradiating food?
[2 marks]
- e) What is the composition of the Joint Expert Committee on the Wholesomeness of Irradiated Food (JECFI)? [2 mark]
- e) Write short and concise descriptions on the following (five lines or less).
- | | |
|----------------------------------|----------|
| i) Radicidation | [1 mark] |
| ii) <i>Clostridium Botulinum</i> | [1 mark] |

Section B

Answer Any two questions in this section.

Question 1

- a) Foods are divided into three pH groups during food canning. Explain in detail the importance of these pH ranges and their effect on the heat processing parameters of the foods during sterilization. **[8 Marks]**
- b) Discuss the effects of drying on the texture of foods. **[8 marks]**
- c) Name four main types of paper used for packaging. **[4 marks]**

Question 2

- a) List and **discuss** in detail two methods of food preservation studied in this course that give product shelf-lives of more than one year indicating **why and how** the methods work. **[10 marks]**
- b) Outline two strategies that a food processor of steam pasteurized milk could implement to minimize the use of energy in the factory. **[10 marks]**

Question 3

- a) Draw a typical freezing curve. Label the curve and explain the phenomenon occurring during each temperature or temperature range.

[14 marks]

- b) How are thermal processes optimized towards the inactivation of microorganisms while at the same time maintaining the nutritional factors?

[6 marks]

Question 4

- a) Discuss the four extrinsic factors that affect the shelf life of a food product.

[12 marks]

- b) State the four disadvantages of using glass containers for packaging food products.

[4 marks]

- c) Solar drying has some major disadvantages that are peculiar to this form of drying. List two of these disadvantages.

[2 marks]

- d) Define in 5 lines of less

i) Climacteric species

[1 mark]

ii) Blanching

[1 mark]

- END -



UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND HALF EXAMINATIONS-NOVEMBER 2021

AGG 6715: AGROCLIMATOLOGY

Time: Three (3) Hours

Total Marks: 85

Instruction: Answer all Questions, *Non-programmable calculators are allowed*

1. Briefly define each of the following terms (25 marks)
 - a) Heat capacity
 - b) Tropopause
 - c) Kirchoff's Law
 - d) Deep space temperature
 - e) Geopotential height
2. The earth's atmosphere is composed of four distinct layers based on its thermal properties: (25 marks)
 - a) Describe the main features of the upper and the lower-most layers, and
 - b) Describe the three main causes of the thermal profile of the earth
3. With the aid of a diagram show the latitudinal distribution of mean annual incoming solar radiation and outgoing terrestrial radiation over the Earth's surface (10 marks)
4. Given the following meteorological data as measured on 15 July 2021 in Mbala (Northern Zambia) located at 08°51'S and at 1384 m above sea level: (25 marks)

Maximum temperature	22°C
Minimum temperature	15°C
Maximum relative humidity	75 %
Minimum relative humidity	50 %
Actual sunshine hours	5.8 hours
Sunset hour angle (w_s)	1.527 radians
Extraterrestrial radiation (R_a)	50 MJ m ⁻² day ⁻¹

Determine

- a) Saturation vapour pressure (e_s)
- b) Actual vapour pressure (e_a)
- c) Solar radiation (R_s)
- d) Clear-sky solar radiation (R_{so})
- e) Net short wave radiation (R_{ns})

End of Exam



THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION
AGN 6210 – BIOSTATISTICS AND RESEARCH METHODS
2020/2021 ACADEMIC YEAR EXAMINATION

TIME: TWO (2) HOURS.

INSTRUCTIONS: ANSWER ALL QUESTION. QUESTIONS 1 AND 2 SHOULD BE IN A SEPARATE BOOKLET.

Question 1 (25 marks)

- a) What is a systematic review? Explain the steps involved in conducting a systematic review (9 marks)
- b) Briefly explain three types of bias in systematic review. (6 marks)
- c) In a prospective study to establish the risk factors for cardiovascular diseases, one of the objectives was to determine the impact of several factors on the incidence of cardiovascular diseases.
 - i. Identify three possible exposures and outcomes in the study (6 marks)
Suggest two possible objectives for the study (2 marks)
 - ii. Suggest two possible null hypotheses for the study (2 marks)

Question 2 (25 marks)

- a) Define what randomized controlled trials (RCTs) are. Briefly explain two types of randomized controlled trials and their application. (5 marks)
- b) What is the importance of randomization in RCTs? State three situations when it is unethical to do randomization (6 marks)
- c) Explain why it is not always appropriate to use randomized controlled trials in studies of diet and disease risk. (5 marks)
- d) Briefly explain four factors one should consider when deciding on the data analysis techniques for his/her study. (4marks)
- e) State one distinction between the following statistical techniques:
 - i. Pearson product moment correlation and Spearman rank order correlation (2 marks)
 - ii. Multiple regression analysis and a logistic regression analysis (3 marks)

Question 3 (20 marks)

After completion of your course work for your MSc. programme in Human Nutrition, you are asked by your designated supervisor to meet to discuss your thesis proposal. A number of things are discussed during the meeting and you are asked to respond to the following questions raised by your supervisor:

- a) Phenomenology is one strategy or research design used in qualitative studies. With an example, explain the circumstances under which you would be compelled to use this strategy.
[4 marks]
- b) Sampling for a qualitative research study is done purposively. With an example, define purposive sampling and describe any two types of purposive sampling that are commonly used.
[10 marks]
- c) With an example, explain the difference between simple linear regression and multiple linear regression.
[4 marks]
- d) When an analyst runs a regression using a common statistical package like Stata, the output generated reports a number of results. Briefly explain what each of the following results informs the analyst:
 - a. R-squared [3 marks]
 - b. F-test [3 marks]
 - c. Coefficients on the independent variables [3 marks]
 - d. t-test [3 marks]

Question 4 (15 marks)

The Chemistry instructor suspects that the group of students he teaches in the evening (Group A) were likely to be worst performers compared to those taught in the afternoon (Group B) and in the morning (Group C). The test was administered to the three groups, each consisting eight (8) students. The mean performance for group A, B and C was 53.5, 67.1 and 75.7 % respectively and an incomplete analysis of variance (ANOVA) is shown below (Table 1).

Table 1. Analysis of variance for group performance in Chemistry

SOV	df	SS	MS	F-value
Group		1902		
Error	21			
Total	23	5288	229.9	

SOV- Source of variation

- i. Complete the ANOVA table, filling all the blank spaces (5 marks).

- ii. Test the null hypothesis that there is no difference in the mean Chemistry performance among groups (4 marks).
- iii. Compare the mean performances for all the groups and interpret the results (6 marks).

Question 5 (15 marks)

Eleven (11) Grade twelve students (ST) were examined in eight subjects. A multivariate analysis, using Principle Component Analysis (PCA) was then computed. The resulting PCA loadings and the scatter plot are displayed as Table 2 and Fig. 1 respectively.

Table 2. PCA Loadings

Subject	PC1	PC2
AGRIC	0.43605	0.03378
BIO	0.3737	0.39836
CHE	0.41003	-0.3038
ENG	0.37838	-0.3905
GEO	0.27096	0.5148
MATHS	0.36542	-0.4566
PHY	0.38982	0.34912

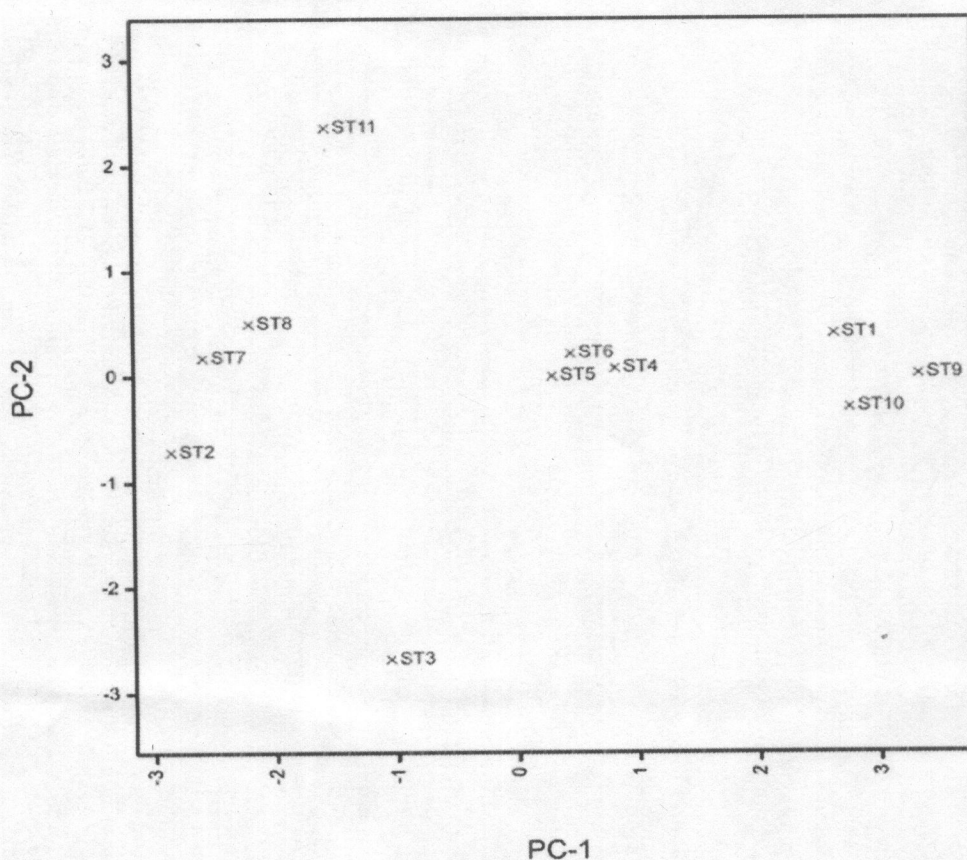


Fig 1. Diagrammatic presentation of Scatter plot exhibiting the performance clusters of 11 students across seven subjects. PC1 and PC2 explained 75.5 % and 18.4 % of the percentage variation respectively

- i. Differentiate between hierarchical and non-hierarchical clustering- (2 marks).
- ii. What are PCA loadings? (2 marks).
- iii. Which subject was the best at discriminating the students' performance? Justify your answer (4 marks).
- iv. What was the total percentage variation explained by PC1 and PC2? (2 marks).
- v. Interpret the results shown by a scatter plot (Fig. 1) (5 marks).

END OF EXAM

26th November 2021



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

MSc IN HUMAN NUTRITION PROGRAMME

2020/2021 ACADEMIC YEAR FINAL EXAMINATION

COURSE: AGN 6312 ADVANCED CLINICAL NUTRITION

DATE: 24TH NOVEMBER, 2021

TIME: 09:00-11:00

DURATION: TWO HOURS

VENUE: FSN MSc ROOM

INSTRUCTIONS TO CANDIDATES:

1. This paper has five (5) questions and carries 90 marks, please confirm.
2. Answer each question on a separate page in the booklets provided.
3. Answer all questions

- 1) One of the learning outcomes for the Advance Clinical Nutrition Course is that students should be able to “Summarize the evidence base underpinning the role of diet as a causal or preventative factor in disease”. Using the forest plot presented in Fig 1 below, answer the questions that follows:

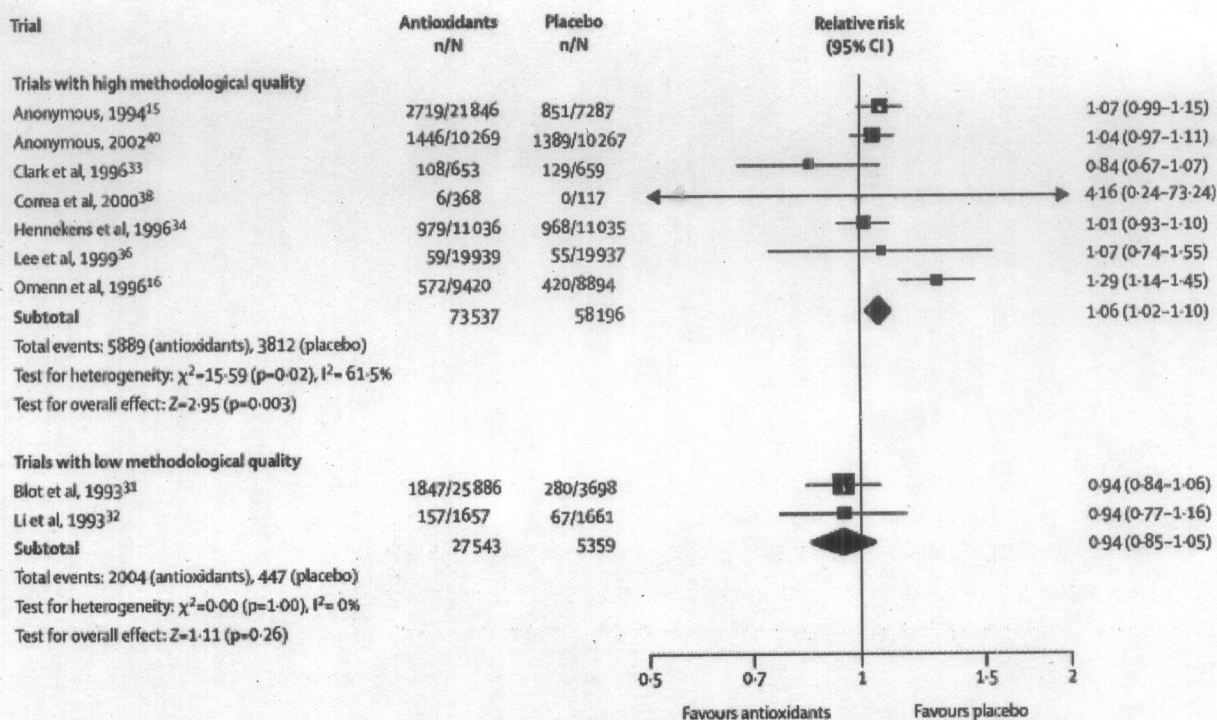


Fig1: Effect of antioxidant supplements on gastrointestinal cancers (by methodological quality)

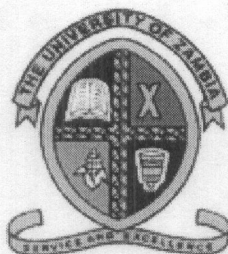
- Describe the data shown in the Figure (10 marks)
- What are the implications of the results shown? (2 marks)
- What is the advantage of using results pooled from a number of studies over individual studies? (2 marks)
- What is the name of this statistical analysis? (1 mark)
- Describe the potential mechanism(s) responsible for the results shown in the Fig 1 above. (5 marks)

- 2) Ms Chawama Chapwa is a 40 years old prophetess, she requires nutritional management for her condition; and has been referred to you as the Clinical Nutritionist of the University Teaching Hospital. Your examination of Ms. Chawama Chapwa gives you the following data:

Weight: 55.1 kg. Height 174 cm. Waist-Hip ratio: 0.87. Fasting plasma glucose value ≥ 7.0 mmol/l (126 mg/dl). She fasts for religious reasons most of the days per week.

- a) Explain your nutritional diagnosis for Mr. Karingaringa. (8 marks)
 - b) Document the diagnosis in (a) using P-E-S statement(s). (4 marks)
 - c) Describe the possible nutritional management recommendations for Ms. Chapwa (8 marks)
 - d) Identify both short and long term possible nutrition goals for Ms. Chapwa based on (c) (6 marks)
 - e) Briefly describe how progress made towards goals set during the nutrition intervention will be monitored and evaluated? (4 marks)
- 3) Briefly describe any four limitations of biochemical tests in assessment of nutritional status. (10 marks)
- 4) Briefly discuss the three main components of Evidenced Based Practice in Clinical Nutrition set up. (10 marks)
- 5) Discuss the four (4) basic components of the nutrition screen tools (8 marks)
- 6) Using relevant examples explain the importance of nutrition screening in clinical management of nutritional conditions (12 marks)

END OF EXAMINATION PAPER



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

MSc Human Nutrition
End of year Examination

AGN 6410
Socio-Economic Dimensions of Nutrition

Date: Friday 19th November 2021

Time: 14:00 – 16:00

Candidate Instructions

Section A:

This section consists of twelve (9) questions worth five (5) marks each.

- **Answer all questions in this section.**

Section B:

This section consists of four (4) questions worth twenty (15) marks each.

- **Answer three (3) questions: question 1, then any two questions**
- **Answer question 1 in a separate booklet.**

Section A: Answer all questions

1. Using two examples, describe how protein contributes to brain health. What are the consequences of (i) protein deficiency and (ii) protein excess on the brain?
2. How do gender issues such as early marriage affect household (mother and child) nutrition?
3. Micronutrients such as Selenium, Zinc and Iron and vitamin A are important to immune function and deficiencies can lead to problems in HIV patients. How does selenium and vitamin A support HIV patients? How does deficiency in selenium, zinc and iron affect HIV patients?
4. How can better rural road infrastructure improve the livelihoods of small-scale farmers?
5. What is the link between the nutrition transition and the rise in obesity and non-communicable diseases?
6. What are the benefits of growing and consuming underutilized crops, and why are they underutilized?
7. How can tobacco farmers become trapped in a cycle of poverty by the tobacco industry?
8. What aspects of food security does the Household Food Insecurity Access Scale (HFIAS) measure?
9. What are the key nutritional issues associated with malaria and which populations are most affected?

Section B:

Answer three (3) questions: Q1, then any two questions

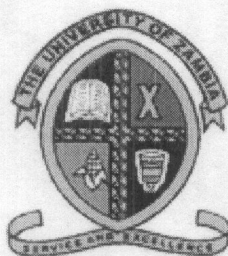
Question 1 (separate booklet)

Food safety is not quite apparent in nutrition. You have been asked to make a presentation on the relevance of food safety in nutrition. Make concise and clear notes you can use to make your presentation, proving that food safety is a critical component of nutrition.

2.
 - a) What are some of the contributing factors that may cause a low birthweight baby girl to become a stunted child? What are the consequences for that stunted child who will then grow to be an adolescent and adult woman?
 - b) What are the determinants for the definition of a woman's status in rural society?
 - c) How are the expected outcomes of a malaria infection in an undernourished child?

3.
 - (a) In Sub-Saharan Africa, obesity is growing faster among women than among men. What are some of the consequences of obesity for both mothers and infants during (i) gestation, (ii) labour and delivery, and (iii) post-partum?
 - (b) What five (5) nutrition-specific factors contribute to almost half of all child deaths annually?
 - (c) What are some nutritional interventions to reduce the high mortality rate in children under-5 years?

4.
 - (a) Describe the term oxidative stress. How does it contribute to wasting in HIV patients?
 - (b) Name five (5) Group 1 Carcinogens
 - (c) List the categories under which carcinogenic compounds are found in food products. Which one of these categories is avoidable?



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

MSc Human Nutrition
End of year Examination

AGN 6420
Management, Nutrition Policy and Planning

Date: Friday 10th December 2021

Time: 14:00 – 16:00

Candidate Instructions

Section A:

This section consists of eight (8) questions.

Answer all questions in this section.

Section B:

This section consists of six (6) questions worth ten (10) marks each

Answer five (5) questions in this section. Answer Questions 1 and 2, then any other three questions.

Answer questions 1 and 2 in a separate booklet.

Section A:
Answer all questions

1. Name and describe the type of evaluation system most suited for nutrition emergency settings. (4 marks).
2. Identify the six steps in setting up a Monitoring and Evaluation system (6 marks).
3. As part of a community nutrition task force, the goal of your project is to reduce the prevalence of vitamin A deficiency in the Northern Province. For this goal to be met, give examples of:
 - An outcome achieved (1 mark)
 - Two outputs produced (2 marks)
 - Two activities carried out (2 marks)
 - Two inputs required (2 marks)
4. What are the roles of UN and donor agencies in the nutrition policy process? (3 marks)
5. What are some of the factors that can affect the policy implementation phase? (5 marks)
6. The Ministry of Agriculture is a key stakeholder in food security and nutrition policies in many countries. At the local level, what are the roles of government institutions in the policy process? (5 marks)
7. During monitoring and evaluation, what are the key data analysis stages? (5 marks)
8. What are the roles and functions of local and international NGOs in the nutrition policy process? (5 marks)

Section B:

Answer questions (1) and (2), then any other three questions

Answer questions (1) and (2) in a separate booklet

1. Why are the cash flows of an agribusiness not equal to its profits?
2. Distinguish between production, sales, and consumer-oriented marketing philosophies
3. (a) Using an example, describe what a policy instrument is, and what is its purpose (b) What are the five types of policy instruments?
4. (a) What are the roles of Civil Society Organisations (CSOs) in the policy process? (b) What are the key characteristics of a log frame table?
5. The four phases of Policy Formulation are as follows:
PHASE 1 → Establishment of a task force for policy formulation
PHASE 2 → Diagnosis of the nutrition situation
PHASE 3 → Policy drafting
PHASE 4 → Validation
Describe what takes place during each phase of the policy formulation process
6. When designing nutrition policies, there are usually two options: (1) incorporating into other development policies, and (2) preparing a separate policy document.
 - a) Name an advantage and a disadvantage of each option.
 - b) In the logical framework, describe what indicators are.
 - c) What are the characteristics of the assumptions made in a logical framework?



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

2021/2022 ACADEMIC END OF YEAR EXAMINATIONS

**AGN 6511
ADVANCED MATERNAL AND INFANT NUTRITION**

**Date: 17/06/2022
Time: 09:00 Hours – 12:00 Hours
Venue: MSC LECTURE ROOM, FS**

Duration: THREE (3) HOURS

INSTRUCTIONS TO THE CANDIDATES

- 1. THIS PAPER HAS TWO SECTIONS: A AND B.**
- 2. ANSWER ALL THE QUESTIONS IN BOTH SECTIONS**
- 3. ALLOCATED MARKS FOR EACH SECTION ARE INDICATED IN THE BRACKETS**

SECTION A (30 MARKS)

1. Identify and briefly describe any four physiological benefits of exclusive breastfeeding to a lactating mother. **[8 marks]**

2. Should infants be given solid foods before they are six months old? Give two reasons. **[6 marks]**

3. What does the World Health Organization recommend on antenatal multiple micronutrient supplementation? **[4 marks]**

4. "You are what your mother ate". Explain this statement. **[4 marks]**

5. What is complementary feeding and list any two factors that affect intake of complementary feeds. **[4 marks]**

6. List 4 challenges in establishing the amounts of energy and nutrients required from complimentary feeding at different ages. **[4 marks]**

SECTION B (70 MARKS)

1. Regarding HIV and breastfeeding.

- a. Apart from during breastfeeding, discuss two other modes of transmission of HIV virus from the HIV+ mother to the child. **[5 marks]**
- b. List 6 maternal related factors associated with risk of transmission through breastfeeding. **[6 marks]**
- c. List 6 infant related factors associated with risk of HIV transmission through breastfeeding. **[6 marks]**
- d. Briefly describe the relationship between HIV and malnutrition. **[8 marks]**

2. Moyenda is two years old and was brought to the health center because she had had diarrhea for the last two weeks. You took anthropometric measurements and she weighed below weight for her age and her weight for height was below 70%. Her MUAC was 10.5cm and she has bilateral pitting oedema on both legs. Her height for age was below the third centile. Moyendas mother told you that Moyenda is the 10th child in the family, and they own one hectare of land and the land is not fertile.

- a. According to your assessment, what is the nutritional status of Moyenda? **[6 marks]**
- b. Explain how you have come to your answer. **[5 marks]**
- c. What do you think are the immediate, underlying and basic causes of Moyendas malnutrition? **[8 marks]**
- d. List any 3 strategies you will use for Moyendas family in order to promote proper nutrition in this family **[6 marks]**.

3. Discuss the 4 core components of community-based management of Acute malnutrition (CMAM) **[20 marks]**

THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS – NOVEMBER 2021

AGS 6211
PLANT NUTRITION

TIME: 2 Hours

Marks: 100

INSTRUCTIONS: **ANSWER ALL QUESTIONS AND WRITE LEGIBLY**

Some useful information: molar mass O = 16g, Na = 23g, S = 32g, N = 14g, P = 31g, K = 39g

1. In the study of plant nutrition it is important to understand how plant nutrients are taken up. **[20 Marks]**
 - a. What do you understand by selective uptake of different elements by plants? **[2 Marks]**
 - b. What is plasmalemma and why is it important in nutrient uptake? **[3 Marks]**
 - c. Briefly describe the different regions of a plasma membrane. **[4 Marks]**
 - d. What are the main compounds of plasma membrane? **[3 Marks]**
 - e. In what way is nutrient uptake similar to enzyme kinetics? **[4 Marks]**
 - f. Describe clearly but briefly the two (2) pathways used by solutes from outside the root to the centre of the root (Radial transport). **[4 Marks]**
2. With the help of a diagram indicate the main parts of a typical mesophyll cell and discuss in detail how some of the main parts function in the translocation of nutrients. **[10 Marks]**
3. In ion uptake by roots which is mainly determined by the transport across membranes, there are physicochemical properties of ions and other solutes which generally determine their rates of membrane transport. **[20 Marks]**
 - a. Briefly discuss two physicochemical factors of ion uptake. **[10 Marks]**
 - b. Briefly discuss two metabolic factors of ion uptake. **[10 Marks]**
4. You are working as an Agronomist in the Ministry of Agriculture. A farmer reports to your office that their crop looks stunted, yellow and has some purple pigmentation on the leaves. When you visit the farm, you notice that the purple pigmentation and yellowing is mostly on older leaves with the midrib and veins of the leaves being

affected more, whereas the young leaves remain green. Answer the following questions. [25 marks]

- a. Which two plant macronutrients would you suspect to be deficient in this soil? Give reasons for your answer. [6 marks]
 - b. Give two functions in plants of each plant nutrient identified in 4.a. [4 marks]
 - c. Name one compound fertilizer you would recommend for the farmer to use to remedy the deficiency problem identified in 4.a. [1 mark]
 - d. What six (6) things should a farmer do to ensure that there is efficient use of the fertilizer by a crop? [6 marks]
 - e. If a crop requires 100 kg N/ha; 15 kg P/ha; 30 kg K/ha per year per growing cycle. Calculate the number of 50 kg bags of each fertilizer a farmer will need to supply the quantities required by the crop for a **one hectare plot**. Use Urea (46% N), Triple super phosphate (45% P_2O_5) and Muriate of Potash (60% K_2O) to supply the N, P and K, respectively. [8 marks]
5. Plant nutrients in the soil are taken up by crops using any of the three transport mechanisms or a combination of the mechanisms. Answer the following questions. [25 marks]
- a. Briefly discuss the three mechanisms that nutrients move in the soil. [9 marks]
 - b. Which mechanism is aided by the presence of hyphal threads of mycorrhizal fungi? How does the mycorrhizal association with the crop enhance nutrient uptake. [4 marks]
 - c. Thirteen (13) essential plant nutrients are taken up by crops using a combination of the mechanisms in 5.a.
 - i. Using a practical example from a field with a crop, explain what you understand about the law of the minimum. [3 marks]
 - ii. Classify the 13 essential plant nutrients that are derived from the soil according to (1) plant nutrition, and (2) fertilizer industry and (3) give their bioavailable forms. [9 marks]

END OF EXAMINATION