

The University of Zambia
School of Agriculture Sciences
2007 Second Semester final Examinations

1. AGA 222 Physiology of farm animals
2. AGA 332 Applied animal nutrition
3. AGA 412 Pig and Poultry production
4. AGA 422 Game ranching
5. AGA 552 Animal products and By- products
6. AGA 562 Applied animal breeding
7. AGC 222 Introduction to farming systems
8. AGC 312 Crop protection
9. AGC 322 Forage crop production
10. AGC 332 Plant pathology
11. AGC 342 Principles of crop production
12. AGC 422 Horticulture science I
13. AGC 442 Plant breeding I
14. AGC 542 Crop science
15. AGC 562 Seed technology
16. AGC 572 Post harvest technology
17. AGE 222 Fundamentals of macro economics
18. AGE 462 Agriculture marketing and pricing
19. AGE 552 Agriculture extension education
20. AGE 562 Intermediate farm management
21. AGE 572 Post harvest technology
22. AGE 582 Project monitoring and evaluation
23. AGF 221 Computer science
24. AGF 332 Methods in food analysis 1: thec
25. AGF 332 Methods in food analysis 2: practical
26. AGF 342 Food toxicology
27. AGF 352 Food microbiology
28. AGF 362 Food evaluation
29. AGF 422 Food science and technology
30. AGF 432 Process control and instrumentation
31. AGF 442 Food packaging
32. AGF 452 Methods in food analysis II: theory
33. AGF 512 Technology of fermented products
34. AGF 532 Technology of plant products II
35. AGF 542 Plant design
36. AGS 222 Fundamentals of soil science
37. AGS 322 Soil physics
38. AGS 331 Soil survey techniques
39. AGS 422 Soil microbiology
40. AGS 452 Principles of land husbandry
41. AGS 522 Soil and plant analysis

42. AGS 542
43. AGS 562

Soil genesis and classification
Management of irrigation and drainage systems

- 42. AGS 542 Soil genesis and classification
- 43. AGS 562 Management of irrigation and drainage systems



**UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES**

2007/8 ACADEMIC YEAR SECOND SEMESTER EXAMINATIONS

AGS 542: SOIL GENESIS AND CLASSIFICATION

INSTRUCTION: Answer all questions

TIME: 3 Hours

1. Why may colour, texture and mottling assist in differentiating soils in the field? (10 Marks)
2. Write short notes on the World Reference base for soil resources. (10 Marks)
3. a) Why is it important to classify soils. (5 Marks)
b) What differentiating criteria are used at sub order and great group level in the US soil taxonomy? (6 Marks)
4. a) State the soil forming factor as a topofunction. (3 Marks)
b) Explain and illustrate the effect of a) above in soil formation. (9 Marks)
5. What are the basic characteristics of oxisols and where in Zambia may you find these soils. (9 Marks)
6. a) What do the following horizon symbols mean? Ap, Cr, Bts, and AB. (8 Marks)
b). With the aid of well balanced equations explain the following chemical weathering processes. (i) Hydrolysis (ii) Carbonation (10 Marks)
7. A soil is classified as a fine loamy isohyperthermic Typic Natraustalf.
a) Explain the main characteristics of this soil (5 marks)
b). What are the limitations and potentials of this soil for crop production. (5 marks)

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2007 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 222
PHYSIOLOGY OF FARM ANIMALS

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:

- 1) ANSWER ALL QUESTIONS IN BOTH SECTIONS**
- 2) WRITE SECTION A AND SECTION B IN DIFFERENT BOOKLETS**
- 3) BE BRIEF AND TO THE POINT**

SECTION A

Q1. (30 POINTS)

You are temporarily attached to a high tech Animal Science Research Institute during industrial break. Using modern computerized equipment in respiratory physiology, you have successfully collected the following data from one dairy cow as per instructions from your supervisor:

Parameter	Gas		
	O ₂	CO ₂	N ₂
Partial pressure of alveolar air (mmHg)	104.0	40.0	569.0
Partial pressure in pulmonary capillaries (mmHg)	-	45.0	-
Partial pressure in arterial blood (mmHg)	95.0	40.0	-
Partial pressure in tissue capillaries (mmHg)	40.0	45.0	-
Partial pressure in venous blood (mmHg)	40.0	44.98	-
Interstitial partial pressure (mmHg)	-	44.99	-
Intracellular partial pressure (mmHg)	-	46.0	-
Solubility coefficient	0.025	0.571	0.013

- a) Explain why such big pressure differences are required to cause Oxygen diffusion compared to Carbon dioxide. (10)
- b) List, in order of importance, the modes of transport of Oxygen and Carbon dioxide in the blood. (5)
- c) What are the factors that determine alveolar concentration and partial pressure of Oxygen and Carbon dioxide? (8)
- d) When you measured the total pressure of the alveolar air, you found that it was 760 mm Hg, exactly the same as that of the atmospheric air. Briefly explain this scenario. (7)

Q2. (20 POINTS)

The bicarbonate buffer system is **not** a particularly powerful buffer. Yet, it is more important than all the other buffer systems in the animal body. Discuss this statement.

Q3. (30 POINTS)

Glucagon has been classified as a “counterinsulin” substance – stimulating glycogenolysis in the liver, promoting gluconeogenesis, inhibiting storage of triglycerides in the liver, as well as activating cell lipase.

- a) Describe how the glucagon molecule is able to effect these physiological/biochemical responses without actually entering into the cell. Hint: use diagrams. (15)
- b) Like glucagon, cortisol also stimulates gluconeogenesis by the liver. What mechanism does this hormone (cortisol) use to effect this response (Please explain in detail). Hint: use diagrams. (15)

Q4. (20 POINTS)

Describe two basic means by which membrane potentials can develop in the nerve fiber.

SECTION B

Q5 (25 POINTS)

Blood circulates in a closed system pumped by the heart.

- a) What is cardiac cycle? (6)
- b) How is cardiac electrical activity measured? (1)
- c) What is the meaning of the points seen on the graph? (5)
- d) Imagine that a goat has been frightened and is running for its life; determine the effect of this event on the cardiac cycle. (4)
- e) Define Blood Pressure. (2)
- f) What are the relative levels of blood pressure in various types of blood vessels in the same animal? (3)
- g) Explain the cause of differences in blood pressure? (4)

Q6 (14 POINTS)

Reproduction is important for perpetuation of the species. The male animal plays a major role in events of reproduction by providing half the genetic material of the offspring.

- a) What is spermiogenesis? (2)
- b) Describe the trail of sperm transport in the bull and cow? (6)
- c) How is sperm movement controlled in the female? (4)
- d) What do you understand by 'capacitation'? (2)

Q7 (32 POINTS)

Female animals are responsible for various events in the perpetuation of species including those related to growth of a newborn animal.

- a) Define estrous cycle? (2)
- b) How is estrous cycle regulated? (5)
- c) What are the signs of estrus in pigs? (3)
- d) Why is it important to know the signs of estrus? (3)
- e) What is cleavage? (2)
- f) How long is gestation in cattle? (1)
- g) Describe the hormonal control of parturition. (4)
- h) Define galactopoiesis? (2)
- i) How is this controlled? (3)
- j) Describe the events leading to milk let-down? (5)
- k) When do you expect milk production to reach peak in a lactation cycle? (2)

Q8 (16 POINTS)

Ruminant animals utilize grasses and forages for growth and production of meat, milk, eggs and others.

- a) How do ruminant animals utilize grasses for growth and production? (10)
- b) Describe biliary control? (6)

Q9 (13 POINTS)

The body's characteristic is to keep the body core temperature constant.

- a) Describe the actions and reactions that would occur when a cow is exposed to high environmental temperature? (6)
- b) What actions and reactions occur under extreme cold environment? (7)

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END OF EXAMINATION

Thank you for being with us in the course. We wish you good luck!

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2007 ACADEMIC YEAR – SECOND SEMESTER FINAL EXAMINATIONS

COURSE AGA 322 – RUMINANT PRODUCTION

TIME ALLOWED: THREE (3) HOURS ONLY

INSTRUCTIONS TO CANDIDATES:

- a) All Questions carry equal marks (20).
 - b) Answer any five (5) questions, **at least one from each section.**
 - c) Use separate answer book-lets for each Section.
-

SECTION A – BEEF PRODUCTION:

- Q. 1 Livestock production forms an integral part of the agricultural activity of traditional farmers in Zambia. The estimate of cattle population in Zambia is 2.6 million (FAO 2005). About 80% of the cattle are owned by the traditional farmers and are of indigenous types and their crosses.
- a) Mention and explain five problems related to breeding which are common among the traditional farmers. Suggest ways of correcting them.
 - b) Housing of cattle under this system is mostly in kraals at night. Mention 3 problems associated with the way farmers keep the cattle in kraals. What would you be your recommendations?
- Q. 2
- a) How should beef animals be fed under large scale commercial ranching.
 - b) Indicate when the following operations should be carried out in beef cattle:
 - i. weaning
 - ii. dehorning (de-budding)
 - iii. castration using elastrator method
 - iv. dipping
 - v. ear tagging

SECTION B – DAIRY PRODUCTION:

- Q. 3 A calf of today is the cow of tomorrow the saying goes. Explain the importance and principles of calf rearing in dairy animals.
- Q. 4 What is dairy hygiene? How would you go about in ensuring production and marketing of quality milk on a farm of your choice?

SECTION C – SHEEP AND GOAT PRODUCTION:

- Q. 5 In Zambia, especially in the Southern Province, sheep and goats have been described as the poor man's cattle:
- Why are sheep and goats more compatible to rear than either with any other type of livestock?
 - What are the factors that should be taken into consideration in the selection of the ram and the buck as breeding stock?
- Q. 6 After being appointed as the Farm Manager of an intensive sheep and goat farm in Mkushi District, discuss any ten (10) lamb and kid routine management practices that you would put in place to ensure that the Farm operates profitably.

SECTION D – RABBIT PRODUCTION:

- Q. 7 A farmer group in Kafue District would like to produce rabbit meat on a commercial scale for sale in the neighbourhood. However, the group lacks adequate knowledge on rabbit production. As a graduate of the University of Zambia, you have been requested to present a paper on rabbit production to the farmer group. Prepare notes on any ten (10) reasons and advantages of raising rabbits in Kafue District in preference to other types of livestock.
- Q. 8 Write notes on the following:
- The factors that should be taken into consideration in selecting good breeding rabbits?
 - The factors that may affect the feed intake in rabbits; and
 - Design a record card that can be attached to a hutch to help improve the management of rabbits at the Liempe University Farm.

END OF EXAMINATION

**THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2007 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS**

AGA 332: APPLIED ANIMAL NUTRITION

TIME : THREE (3) HOURS
INSTRUCTIONS : ATTEMPT ALL THE QUESTIONS
THE FIVE QUESTIONS CARRY EQUAL MARKS

1. a) Natural pastures are a major source of nutrition in ruminants. Identify and discuss three factors that influence their feeding value.

b) Single-cell protein can be used in livestock feeding. Identify three common types of single-cell protein applicable and discuss the limitations associated with their use.
2. Define or explain the following as applied in the description of feed ingredients and feeds:

a) bleaching in hay b) forbes c) soilage
d) Non-Protein-Nitrogen e) feed additive f) acidulated soap stocks
g) rock phosphates h) tannins i) gossypol
j) aflatoxins
3. Compare and contrast the nutritional and potential feeding value of the following in non-ruminants:

a) blood meal versus fish meal b) sorghum meal versus maize meal
4. Given ingredients listed below with indicated composition. Prepare 5000kg of a broiler feed supplying 23% crude protein; 3,000kcal/kg ME; 0.8% Calcium; 0.5% phosphorus, and some salt.

<u>Ingredient</u>	<u>Crude protein%</u>	<u>ME kcal/kg</u>	<u>Ca%</u>	<u>P%</u>
Soybean meal	42	2500	0.20	0.45
Maize meal	8	3300	0.02	0.03
Tallow	-	8000	-	-
Dicalcium Phosphate	-	-	25	18
Limestone	-	-	38	-
Salt	-	-	-	-

5. For the vitamin and mineral requirements and their concentrations in sources given below, prepare a pre-mix good for 1000kg of feed and indicate its rate of inclusion in the feed. The pre-mix must be protected from oxidation by adding 2g of an anti-oxidant.

<u>Vitamin/mineral</u>	<u>Requirement/kg of feed</u>	<u>Concentration in source</u>
A	1,000IU	800,000IU/g
K	1mg	60%
Biotin	0.30mg	25,000mg/kg
Folic acid	1.5mg	100%
Zn	100mg	80%
Mn	120mg	62%
Fe	100mg	33%
Cu	20mg	25%

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

END OF SECOND SEMESTER EXAMINATIONS **2007/2008 ACADEMIC YEAR**

COURSE AGA 412 – PIG AND POULTRY PRODUCTION

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

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

Q1. Write briefly on the following:

- i. Principles governing the incubation of eggs.
- ii. The relationship between feather development in chicks and environmental temperature requirements.
- iii. Skin colour pigmentation changes in laying hens.
- iv. The reasons for rearing quails in cages.
- v. Castration of pigs.

Q2.

Imagine you have been employed by a Non-Governmental Organisation promoting poultry production in HIV/AIDS affected families in Kapiri Mposhi District. One of your duties is to supervise group activities in relation to broiler production. The chairperson of one broiler unit (Twesheko Production Unit) invites you to her group's chicken run. Outside the chicken run you see pools of stagnant water everywhere left by the rain. At the door of the building you are met with an irritating pungent smell coming from inside. Inside the building you notice the chicks are huddled up in the corners. The chicks have white feathers covering most of the body but with yellow down feathers still covering the head. The birds look weak and stunted and their droppings have stains in different variations of the colour red. The chairperson informs you that out of an initial 300 chicks, 88 have so far died.

- i. What is your assessment of the management and care of the birds and their environment?
- ii. What is the biochemical basis for your observations?
- iii. What advice would you give the chairperson of Twesheko Production Unit and her group members?

Q3.

Chemical disinfection is one method of ensuring a disease free environment for pig and poultry houses. Write on the 10 (ten) characteristics that may be considered when choosing a disinfectant, giving at least one example of a disinfectant which either meets or fails to meet the requirements of a particular characteristic.

Q4

Compare and contrast the management of chickens reared under the 'traditional management system' and those reared under the 'intensive management system'. What consequences do the management practices utilized under the two systems have on the performance of the birds?

Q5

- i. Explain the purpose for the different protein levels in the five Zambia Bureau of Standards commercial pig feeds.
- ii. Explain the relationship between feeding programme and body changes from conception to farrowing in a gilt and in a sow.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SECOND SEMESTER UNIVERSITY EXAMINATIONS

FEBRUARY, 2008

AGA 422: GAME RANCHING

TIME: THREE HOURS

INSTRUCTIONS: QUESTIONS ONE (1) AND TWO (2) ARE **COMPULSORY**.
ANSWER QUESTIONS ONE (1) AND TWO (2) AND THREE (3) OTHERS.
ILLUSTRATE YOUR ANSWERS WHERE NECESSARY.

1. You are required to use the map provided to answer this question. Study the map carefully. It is assumed that you have just completed an ecological study of the area, and from this study answer the following questions:

- i. Which habitats are important for the following species and why?
 - a) *Aepyceros melampus*
 - b) *Syncerus caffer*
 - c) *Hippopotamus amphibious*
 - d) *Tragelaphus spekei*
 - e) *Damaliscus lunatus*
- ii. Describe the process which you might recommend in establishing this area as a Game Ranch.

2. Study carefully Figures 2a and 2b provided and answer the following questions:



Fig. 2a.

- a) Name the Order to which the species belongs
- b) Scientific Name
- c) Describe the habitat
- d) Describe feeding habits
- e) Describe breeding habits

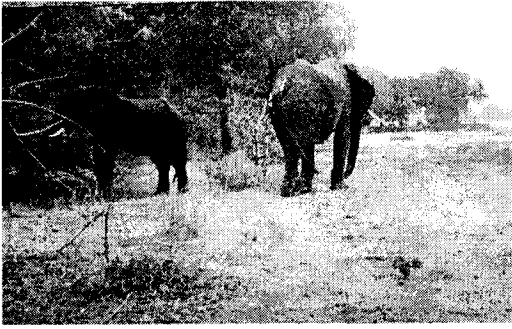


Fig. 2b.

- a) Name the Order to which the species belongs
- b) Scientific Name
- c) Describe the habitat
- d) Describe feeding habits
- e) Describe breeding habits

3. A rodent survey in the Nampundwe area used a capture-recapture method to determine the population of the Cane Rat (*Thryonomys swinderianus*). Twenty (20) traps were set at different points along each transect in the area for 2 occasions, and each captured rat was marked and released. The following data were obtained. The following data were obtained. (i) Using the Lincoln – Petersen method, calculate the populations of the rat in the area, and (ii) Discuss the differences between this method and the Schnabel method in assessing wildlife populations.

TRAPS	A	B	C	D	E	F	G
Initial Capture	6	9	23	14	18	7	3
Second Capture	12	13	11	9	15	10	12
Recaptures	3	8	3	5	7	4	2

4. Zambezi - Samaki Farms Ltd is considering establishing a Game Ranch in the Choma District along the Munyeki stream. Initial investigations show that the range is suitable for Impala, Zebra, Wildebeest, Kudu and Buffalo. The range is relatively flat, well watered and nearly all the range is within 3.5km from water. Based on the information from the Ministry of Agriculture, Food and Fisheries (MAFF) in Choma, the soils are generally excellent for the game ranch. Also results from your preliminary estimates indicate that the production of key forage species averages about 200kg/ha of dry matter per year. The proposed Game Ranch is 10,000 ha in size. Assuming that allowable use is 25% and daily dry matter intake is 2% of the animal body weight (a) how many 230 kg Sable antelopes can you stock as your base herd in the area and (b) List the main features important to a game ranch.

5. Discuss the meaning of the following terms as used in wildlife studies:

- (i) $1 - e^{-H}$
- (ii) King census method
- (iii) *Panthera pardus*
- (iv) *Kobus vardonii*

6. What are wildlife values? And discuss the main threats in the conservation of wildlife in Zambia
7. What is the significance of r in the management of wildlife? Discuss the assumptions and limitations associated with it.
8. State the main advantages and disadvantages of using chemical animal capture method in restraining wildlife species, and discuss difficulties associated with the translocation and restocking operations in wildlife management.

End of Examination

INFORMATION FOR QUESTION TWO (1)

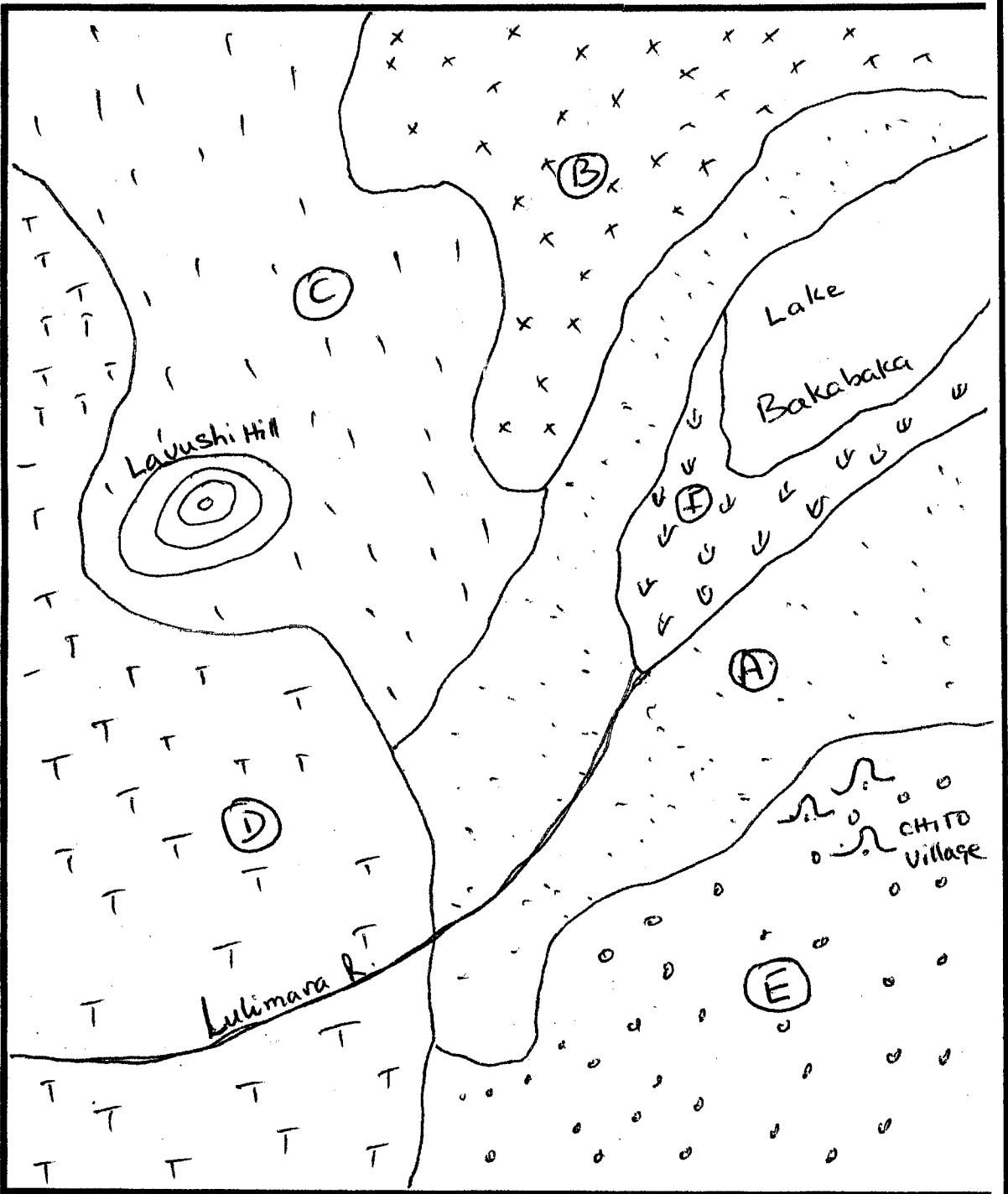
THE MAP AND THE DESCRIPTION OF THE AREA:

Vegetation types:

- A: Termitaria grassland
- B: Munga woodland
- C: Chipya woodland
- D: Miombo woodland
- E: Hyparrhenia grassland
- F: Swamp

The area is located in the western part of Mpika District in Chief Chiundaponde, Northern Province of Zambia. Average annual rainfall is approximately 1300 mm. Lake Bakabaka is a fresh water lake, and has fish. The river is perennial with riparian vegetation mainly *Diospyros sp* and *Zyzygium sp*. The Hot spring is salty. There is only one village of about seven household (or about 40 people). Its main activity is fishing. Farming is done at a low scale in vegetation type E. Hunting is important. The area is being considered for protection because of its importance to biodiversity. You have been asked to carry out an ecological study of the area. And from your study information, answer question (1).

Fig 1 for question 1



THE UNIVERSITY OF ZAMBIA

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2007/8 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGA 442 INTEGRATED AQUACULTURE AND FISH NUTRITION

TIME: THREE HOURS

INSTRUCTIONS: Attempt two questions in **Section A** and **two** questions from **section B**. **Questions 1** in section A and **4** in **section B** are compulsory. At the end of the examination please hand in your answer sheets together with the question paper.

SECTION A

Q1 Justify the following practices and activities in aquaculture:

- i) Preventing escape of farmed fish that are indigenous to the catchment area where the fish farm is located;
- ii) Stocking large fingerlings that are at least 10cm in length;
- iii) Introducing exotic species such as *Cyprinus carpio* or *Cherax albidus* the Yabbie Crayfish
- iv) Avoiding marsh, areas where underground water can seep into fish ponds for locating fish farms;
- v) Poly-culture in semi intensive aquaculture systems:

Q2 The three spotted bream *Oreochromis andersonii* has been selected for fish farming in many parts of the country. Taking into account the history of aquaculture in Zambia:

- i) Explain how decisions have been made to recommend *Oreochromis andersonii* for aquaculture in Zambia.
- ii) List some of the qualities of this species that make it suitable for culture
- iii) What are the prospects or potential for the farming of *Oreochromis andersonii* in future?

- Q3** An Investor in aquaculture plans to construct 2 hectares $20,000\text{m}^2$ of production ponds using *Oreochromis andersoni*. Assuming that one female brood produces 250 fry in a year, estimate the following requirements for the fish farm:
- i) Fingerlings needed for the production ponds to be constructed;
 - ii) Number of female brooders and females;
 - iii) The total area of breeding ponds;
 - iv) The total area of nursery ponds; and
 - v) What would be the advantages and disadvantages of producing his or her fingerlings in comparison to procuring them from a supplier who can deliver them to the fish ponds at a cost of K500 per fish.

SECTION B

- Q4** Define the following terms:
- a) SMR
 - b) PMR
 - c) SSA
 - d) FCR
 - e) Critical Oxygen Demand
- Q5** At temperature 20°C the metabolic rate of tilapia fish is $40\text{mg O}_2 \text{ kg}^{-0.8}$ per hour. After 2 hours the temperature of the water increases to 25°C and the metabolic rate also increases by $20 \text{ mg O}_2 \text{ kg}^{-0.8}$. Define Q_{10} and determine the Q_{10} value for the scenario
- Q6** Outline the environmental challenges that are experienced by a fish farmer growing *Tilapia* in earthen fish ponds off the shores of Lake Kariba.

END OF EXAMINATION

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

2007/08 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 542: ANIMAL HEALTH

TIME: THREE (3) HOURS

INSTRUCTIONS: ATTEMPT ALL QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. Give one specific symptom or postmortem finding that is very characteristic of the each of the following diseases:
 - i. *Escherichia coli* infection (2 Marks).
 - ii. Infectious coryza (2 Marks).
 - iii. Eysipelas in pigs (2 Marks).
 - iv. Infectious sinusitis in turkeys (2 Marks).
 - v. Brucellosis in cattle (2 Marks).

Assuming you are a farm manager on a farmer that rears chicken and you are been asked to make recommendation to control *Salmonella* infections in layers. Discuss your management system that will assure freedom from *Salmonella* infections? (10 Marks).

2. Describe the etiology, clinical sign, treatment and control of the following diseases.
 - i) Cowdriosis (Heartwater) (5 marks).
 - ii) Anaplasmosis (Gall-sickness) (5 marks).
 - iii) Babesiosis (Red Water) (5 marks).
 - iv) Theileriosis (Corridor disease) (5 marks).

3. Contagious bovine pleuropneumonia (CBPP) is one of the most common diseases and an important cause of economic losses to cattle keepers. The disease has in recent years spread to most of the cattle rearing areas in the country. Describe the etiology, clinical signs, postmortem findings and control of this disease in Zambia. (20 marks)

4. As a fresh graduate from the University of Zambia, you are asked to make a detailed presentation to the prospectus employers on the subject of poultry viral diseases.
 - i) List any five viral diseases affecting poultry in Zambia in their order of importance. (5 Marks)
 - ii) For any one of the named diseases in **i) above**, discuss how you can effectively manage it basing your discussion on issues relevant to the specific disease you have chosen. (15 Marks)

5. Discuss the principles of control of animal disease. (20 Marks)

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

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES
2007 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 552 ANIMAL PRODUCTS AND BY-PRODUCTS

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:

- 1) ANSWER ALL QUESTIONS
 - 2) EACH SECTION SHOULD BE ANSWERED IN SEPARATE ANSWER BOOKS
-

SECTION A

QUESTION 1 [25 points]

Following a long trip in an overloaded truck, personnel at a newly opened abattoir in Lusaka slaughtered all the 50 steers using the normal commercial procedures. It was, however, found that up to 70% of the carcasses did not yield normal meat. The meat quality data collected showed that 10% of the carcasses exhibited the following pattern of pH data:

Time after slaughter (h)	pH Value
0	6.8
0.75	5.5
1.0	5.3
3.0	5.2
24.0 (ultimate)	5.2

- a) What sort of meat was yielded in the above steers? [2]
- b) Describe the physiological, biochemical and physical events that occurred under the circumstances. [10]
- c) What sort of meat do you think was yielded in the other 60% abnormal carcasses? [3]
- d) Describe the physiological, biochemical and physical events occurring under the circumstances in (c) above. [10]

QUESTION 2 [30 points]

Flavour and Aroma are among the characteristics of palatability of meat

- a) Describe the psychological and physiological responses or events associated with these characteristics. **[10]**
- b) Describe the factors that may lead to undesirable changes in flavour and aroma. **[10]**
- c) Briefly describe what is meant by nutritive value of meat. **[10]**

SECTION B

QUESTION 3 [15 points]

Discuss the differences between Pasteurization and UHT processing in milk and state the effects of these treatments on the nutritional quality of the product.

QUESTION 4 [15 points]

- a) Explain the concept of spontaneous creaming in raw milk and how it can be prevented. **[5]**
- b) You are appointed as farm manager at Chiti Dairy Farm and the proprietor, Mr. Magweto informs you that the milk produced by the farm is often rejected by Lusebo Milk Processors because it fails the alcohol test and records low butterfat.
 - i. What are the possible causes of this problem? **[5]**
 - ii. What remedial measures would you put in place to improve the situation? **[5]**

SECTION C

QUESTION 5 [20 points]

Draw an egg and show the vital parts. Eggs are an essential food for mankind though highly perishable. Discuss their nutrient content, the quality parameters that are used for their retail, how they are preserved, where in industry they are utilized, the resulting products, the quality and analytical methods that are used to ensure that they conform to laid down standards and regulations.

SECTION D

QUESTION 6 [20 points]

About 40% and 80% of total hides and skins respectively produced in the traditional livestock sector are wasted, incorrectly processed or simply thrown away. Those which find their way to the tanner are of poor quality.

- a) Explain why there is such excessive wastage of hides and skins from these traditional farmers which result in them losing a valuable source of income [6].
- b) Mention and explain the causes of the damage to the hides and skins which makes it difficult for the tanners to buy these hides and skins. [8].
- c) Hides and skins can be converted into a non putrefiable, flexible and workable product through tanning. Describe the process of tanning. [6].

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END OF EXAMINATION

Thank you for being with us in the course. We wish you all the best in your new endeavours



The University of Zambia
School of Agricultural Science
Department of Crop Science
Second Year Examinations for Bachelor of Agricultural Sciences
AGC 222: Introduction to Farming Systems
Second Semester 2007/2008

Date: 12 February, 2008

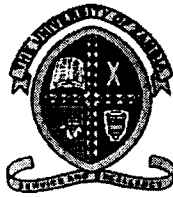
Time: 09.00 – 12.00hrs

Instructions

- 1. Answer all questions**
- 2. Marks as indicated**

- Q1. Describe five characteristics of Farming Systems Research. (10)
- Q2. Which is the most conducive agro-ecological region to crop production in Zambia? (11)
Give reasons for your answer.
- Q3 Write short notes on the following:
- a. Crop rotation (2)
 - b. Soil fertility maintenance under chitemene system (2)
 - c. Advantages of mixed cropping (2)
 - d. Informal survey (2)
 - e. Commodity Research Team Approach (2)
 - f. Objectives of Researcher Managed, Farmer Implemented type of experiments (2)
- Q4. a. What is a formal survey? (2)
b. Explain steps followed when carrying out a formal survey (8)
- Q5. a. Describe three types of experimental designs commonly used in Farming Systems Research (FSR) (6)
b. State strengths and weaknesses of the above designs (6)
- Q6. a. What is block chitemene? (1)
b. Describe three main distinguishing features of block chitemene (6)

END OF EXAMINATION



University of Zambia
School of Agricultural Sciences
Third Year Examinations for Bachelor of Agricultural Sciences
AGC342: Principles of Crop Production
Second Semester 2007/08

DATE: 18/02/2008 Time: 14:00 HRS – 17:00 HRS

TIME ALLOWED: 3 HOURS

INSTRUCTIONS

- (1) Answer all Questions**
 - (2) Marks as indicated**
-

QUESTION 1 (15 Marks)

A. Briefly state:

- i. Which Millennium Development Goal(s) is likely to be achieved with improvement in agricultural production?
- ii. Aspects of Conservation Farming as practiced in Zambia.
- iii. Distinguishing features of C₃, C₄ and Crassulacean Acid Metabolism plants.

B. Define:

- i. Crop coefficient.
- ii. Tissue culture and totipotency.

QUESTION 2 (25 Marks)

A. i) Describe soil water potential

ii) Explain why using the soil water potential concept plants grow differently in different soils despite having the same water content.

B. The soil water storage of a field was measured 61 days after planting using a neutron scattering method and is given in Table 1. What are the advantages and disadvantages of the method?

Given that the runoff was insignificant, calculate the change of soil water storage and evapotranspiration after 61 days.

Table 1.

SITE No	Days after planting								
	3	10	17	24	31	40	46	54	61
S*	17.48	19.0	19.86	19.09	23.47	17.48	19.76	21.95	19.76
q**	-	0.0	0.0	0.0	0.05	-0.14	-0.07	0.0	0.0
I (cm) ***	1.0	1.4	1.4	1.4	3.0	3.0	3.0	4.2	4.2
P (cm) ***	0.0	0.4	0.9	2.8	4.9	6.4	8.8	8.8	10

*Storage S (cm/100 cm of soil depth)

**Flux q (cm/day)

***I and P are cumulative values of irrigation and precipitation respectively.

QUESTION 3 (20 Marks)

- Define Agroforestry and improved fallows.
- An experiment was carried out to measure the effect of tillage practices on soil properties after two years of fallow at Msekera and Chadiza. Yields of maize stover and grain at 13.5% moisture content are given in Table 2. The soils at both localities were analysed for nitrate nitrogen (N-NO₃) and total N (N). Which locality do the results of the soil N relate to? Give reasons for your answer.
- Describe the functions of nitrogen and zinc in plant growth and development. At which site are you likely to encounter zinc deficiency?

Table 2:

Maize grain and stover yield at Msekera and Chadiza tillage expt. (1998-2000)

Land use system	Msekera yield (t ha ⁻¹)				Chadiza yield (t ha ⁻¹)			
	1998/99		1999/00		1998/99		1999/00	
	Stover	Grain at 13% moisture content	Stover	Grain at 13% moisture content	Stover	Grain at 13% moisture content	Stover	Grain at 13% moisture content
Maize + fert. + ridge	4.80	5.35	4.39	4.31	4.95	4.14	4.67	4.25
Maize + fert. + till	4.12	5.43	4.46	3.97	4.14	3.43	3.76	3.13
Maize + fert. + zero	4.15	4.47	3.88	3.65	3.62	2.79	2.76	2.14
Maize -fert. + ridge	2.48	1.70	1.94	0.96	0.90	0.84	1.14	0.75
Maize - fert. + till	2.62	1.45	1.84	1.15	0.90	0.38	2.14	1.42
Maize - fert. + zero	2.35	1.31	1.43	0.86	0.48	0.19	1.34	1.03
Sesbania + ridge	-	-	3.64	3.35	-	-	5.33	3.76
Sesbania + till	-	-	3.30	3.28	-	-	3.95	3.77
Sesbania + zero	-	-	2.62	2.39	-	-	2.48	2.01
SED	0.48	0.84	0.46	0.41	0.45	0.48	0.52	0.39
CV(%)	17.4	31.5	18.5	18.8	22.2	29.7	20.9	19.1
Pr	ns	ns	ns	ns	<0.001	<0.001	<0.05	<0.05

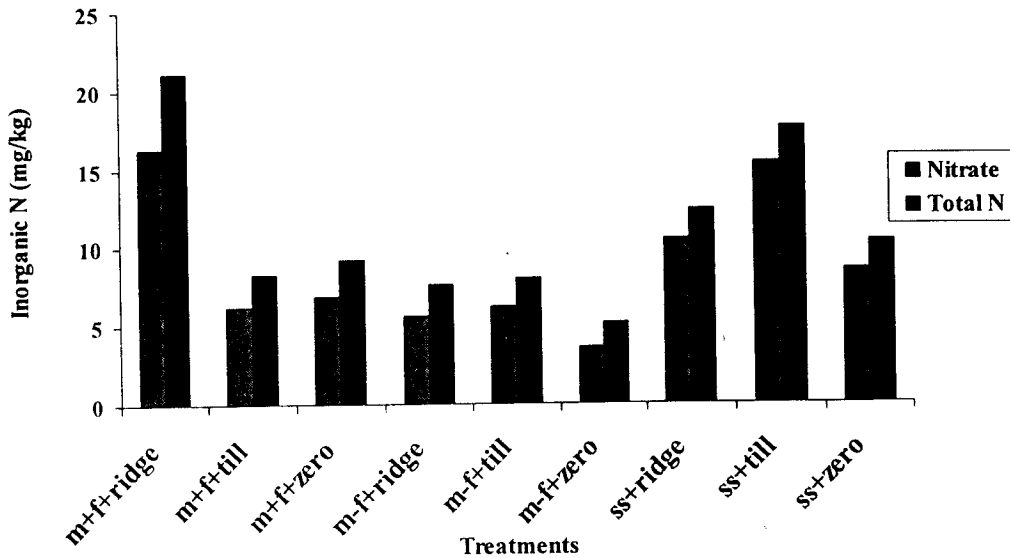


Figure 1: Inorganic N as affected by land use system (0-20cm soil depth) in September 1998

QUESTION 4 (20 Marks)

The growth and development of plants is influenced by external and endogenous factors.

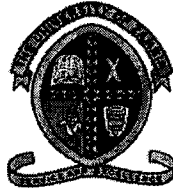
- Mention five of these factors.
- Describe the role of the endogenous factors.
- How are the external factors optimized for crop production at York Farm?
- What are the limitations for optimizing the same factors for the low-resourced farmers?

QUESTION 5 (20 Marks)

Crops in the families Poaceae, Cruciferae and Curcabitaceae are important in the national economy.

- Give two members of each family.
- What are their scientific names?
- What are their places of origin?
- Briefly describe their morphological characteristics.
- What is the economic importance of these crops?

END OF EXAM!



University of Zambia
School of Agricultural Sciences
Fourth Year Examinations for Bachelor of Agricultural Sciences
AGC 422 HORTICULTURE SCIENCE 1
Second Semester 2007/08

Date: 12th February 2008

Time: 14.00 – 17.00 hrs

Instructions

1. Answer all Questions.
2. Marks for each question are as indicated.

- Q1.** Describe the process of harvesting tomatoes indicating the considerations to be taken into account before harvesting. **(20 marks)**
- Q2.** You have been contracted by a farmer to produce pathogen free plantlets. What method would you select? Explain and describe it. **(18marks)**
- Q3.** A Young Farmer's club intends to grow cabbage. As an Agricultural Officer for the area, prepare production recommendations for each of the following:-
- i. Soil and climatic requirements
 - ii. Varieties
 - iii. Planting
 - iv. Irrigation and weed control
 - v. Fertilizer application
 - vi. Harvesting and expected yields. **(30 marks)**
- Q4.** Ethylene is a phyto hormone. What is it's action? **(12 marks)**
- Q5.** A farmer suspects the following in her fields:
- i. *Cercospora* leaf spot on citrus,
 - ii. Powdery mildew on mango,
 - iii. Onion fly.

As an Agricultural Officer, how would you confirm her suspicion and give remedial measures to be undertaken. **(20 marks)**

End of Exam-2008



University of Zambia
School of Agricultural Sciences
Fifth Year Examinations for Bachelor of Agricultural Sciences
AGC 542: Integrated Pest Management
Second Semester 2007/08

Date: 18th February, 2008

Time: 14-17hrs

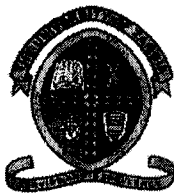
Instructions:

Answer all questions

All questions carry equal marks (20 Marks each)

- Q1.** a. Discuss how the three methods of biological control are used in pest management.
- b. What makes a parasitoid a good biological control agent?
- Q2.** a. Justify how indiscriminate use of pesticides gave rise to integrated pest management.
- b. How are pesticides used in the context of integrated pest management?
- Q3.** What is cultural control? Describe each of the eight (8) components of cultural control.
- Q4.** a. Describe the modes of entry of pesticide into the spray operator's body.
- b. How would the operator protect herself or himself during the spray programme.
- c. Define LD₅₀. Discuss the two types of pesticide toxicity.
- Q5.** a. Differentiate between intensive and extensive sampling.
- b. What are the factors that simultaneously affect the insect catch of any relative method?

*******END OF EXAM*******



University of Zambia
School of Agricultural Sciences
Fifth Year Examinations for Bachelor of Agricultural Sciences
AGC 562: Seed Technology
Second Semester 2007/08

Date: 25th February 2008

Time: 09:00- 12:00

Instructions

Answer question ONE (1) and any THREE (3) from section B. Points for each question are indicated in brackets.

SECTION A

Q1 (40 Points)

- a) A new seed company has been established in the Eastern Province of Zambia. It has headquarters in Chipata with branches in Lundazi and Petauke districts. Its main crop is groundnuts but it is also marketing sunflower, beans and maize. It does not have its own varieties but uses those licensed from the ministry of Agriculture. You have recently been employed as the marketing manager. Develop a marketing plan for the company.
- b) Write brief essays on the following:
- Air Screen Cleaner
 - Cytoplasmic Male Sterility in Seed Production
 - Pre and Post Control
 - Value for Cultivation and Use
 - Seed Sampling

SECTION B

Q2 (20 points)

- a) Distinguish Variety list from Variety denomination
- b) List any 8 maize varieties found in “The Active Variety List of Seeds in Zambia”.
- c) What is Germination Capacity and Vigour from the seed technologist point view
- d) Distinguish epigeal from hypogeal germination

Q3 (20 Points)

A new investor in seed production and marketing has bought 8 ha area of land and has consulted you, as a seed technologist to ascertain if the area will qualify for certified seed sorghum production. You have been taken to the site, explain the factors you would consider when assessing the suitability of an area?

Q4 (20 Points)

- a) What are the benefits of seed processing?
- b) Discuss the factors that determine storage life for seed?
- c) Explain in detail the components of the Certification Scheme in Zambia?

Q5 (20 Points)

- a) What is seed health testing and what are the requirements for a seed health test?
- b) Write short notes on the 8 seed testing methods.
- c) What causes seed defects?
- d) List 8 strategies considered in the control of seed borne diseases.

END OF EXAMINATION



The University of Zambia
School of Agricultural Sciences
Fifth Year Examinations for Bachelor of Agricultural Sciences
AGC 572: POSTHARVEST TECHNOLOGY
Second Semester 2007

Date: 21st February 2008

Time: 14.00-17.00 Hrs

Instructions

1. Answer all Questions.
2. Marks for each question are as indicated
3. Use a separate Answer Sheet for each section.

SECTION A

- Q1. As a grower, you have been contracted by Spar Supermarket at Arcades to supply carrots. How would you prepare your product to ensure that it is presentable and appealing to the customer and at the same time ensuring good marketable yields? [25 marks]
- Q2. A grower of tomatoes suspects *Botrytis* rot on her product. As a pathologist, name the causal organism and give the following: [15 marks]
- conducive environment for development of the fungus,
 - symptoms of the disease and
 - remedial measures to mitigate against the disease.

SECTION B

- Q3. a) State five (5) benefits of Modified and Controlled Atmosphere Storage. [2.5 marks]
- b) Michaelis-Menten Equation and Fick's Diffusion Law are given below.

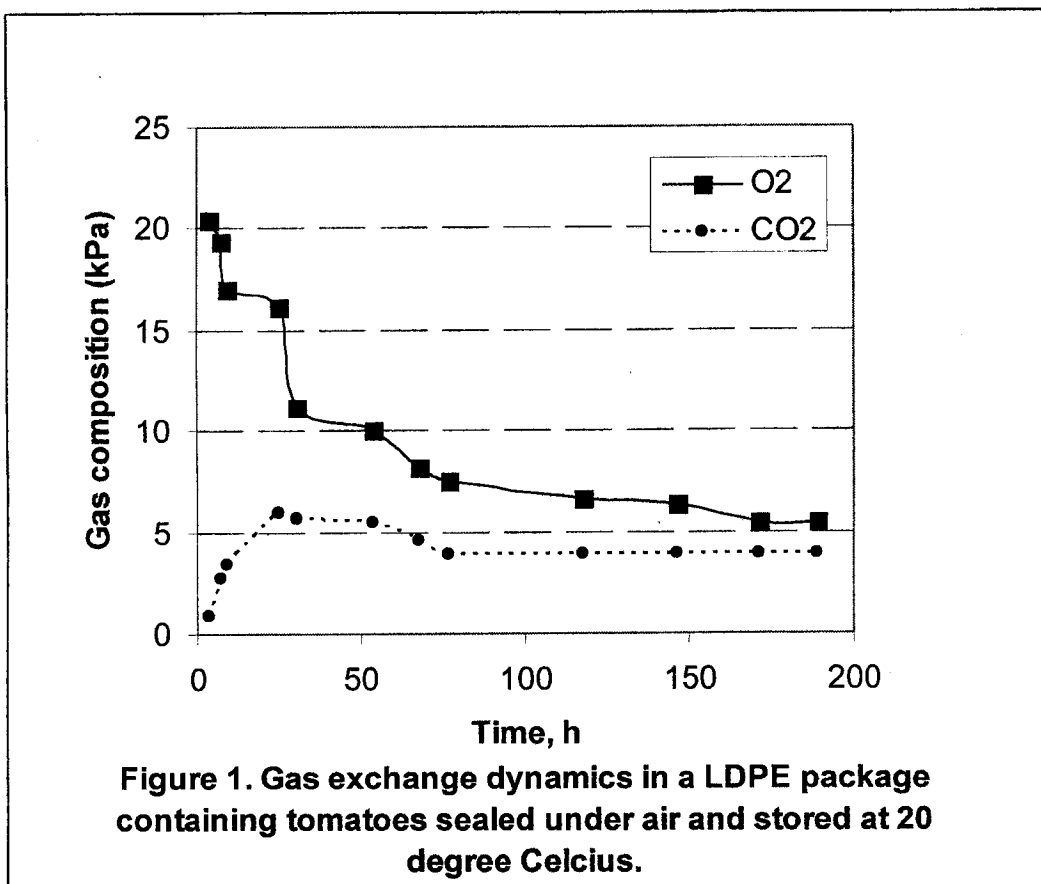
$$R_{O_2} = \frac{V_m^{max} P_{O_2}}{K_m + P_{O_2}} \quad \text{Michaelis-Menten Equation}$$

$$J_{O_2} = P_{eO_2} \frac{A}{x} (p_{O_2,ext} - p_{O_2,pkg}) \quad \text{Fick's Diffusion Law}$$

(i) Define the symbols with their appropriate units in the two equations above. [5 marks]

(ii) How are the 2 equations above used in Modified Atmosphere Packaging? [2.5 marks]

c) Figure 1 below shows the gas exchange dynamics in a MAP of tomatoes. Give an analysis of the behavior of the gases from graph. [5 marks]



SECTION C

Q4. Give a detailed explanation of the importance of respiration and how it affects the post harvest practices of different commodities. [15 marks]

Q5. Explain the importance of any **THREE** of the following:

- Environmental factors involved in physiological breakdown,
- Harvestable maturity,
- Objective methods of determining quality,
- Risks of globalization in trade and ways of minimizing them. [15 marks]

SECTION D

- Q6.** Nankamba Vegetable Cannery Ltd approaches you with a problem of stained seams on its tomato paste cans. Initial investigations show that there was no microbial spoilage. What is/are the causes(s) and what quality implications would you expect on the product as a result? **[7.5 marks]**
- Q7.** Explain the preservation of cucumbers by acidification. **[7.5 marks]**
-

END OF EXAMINATION

**THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES**

**DEPARTMENT OF AGRICULTURAL ECONOMICS AND
EXTENSION EDUCATION**

**2007 ACADEMIC YEAR SECOND SEMESTER FINAL
EXAMINATIONS**

AGE 22 : FUNDAMENTALS OF MACRO ECONOMICS

TIME : THREE (3) HOURS

INSTRUCTIONS: ANSWER ALL FIVE QUESTIONS

(1) The following data refer to a hypothetical economy:

$$\text{Consumption} = 100 + 0.8Y_d$$

$$\text{Investment} = 150$$

$$\text{Government} = 200$$

$$\text{Exports} = 200$$

$$\text{Taxation} = 0.2Y$$

$$\text{Imports} = 0.05Y_d$$

$$Y = \text{level of national income}$$

$$\text{Full employment level of national income} = Y_f = 600$$

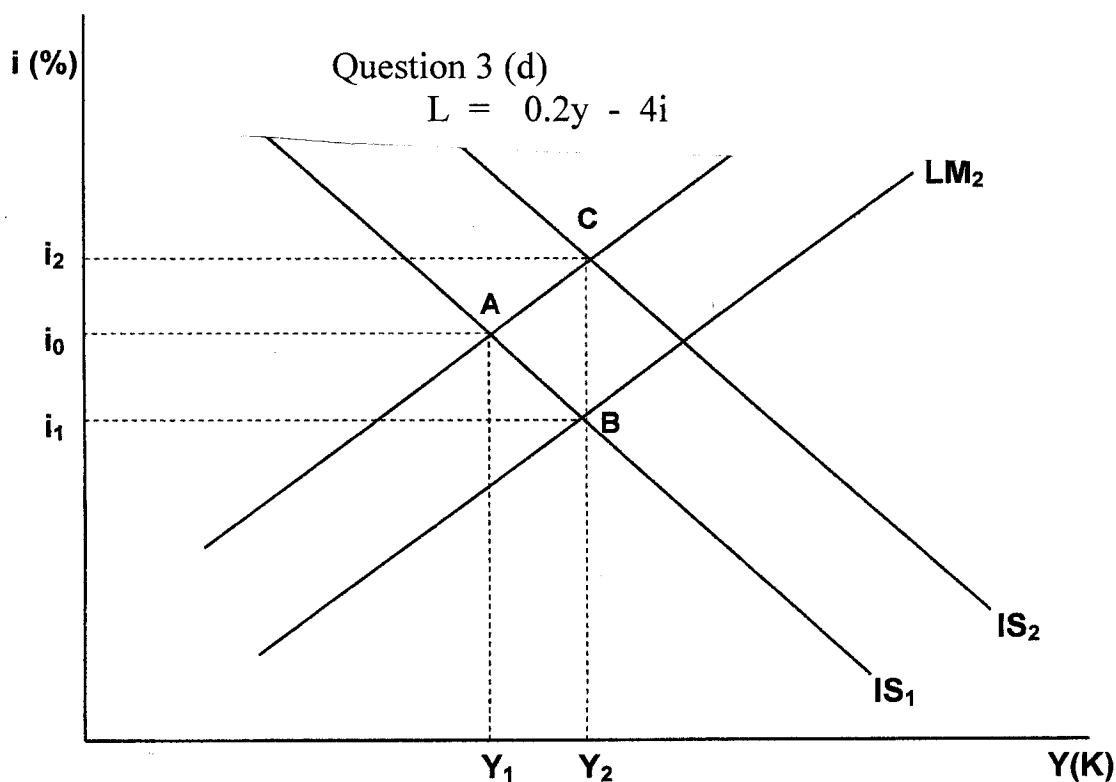
- (a) Find the equilibrium level of national income, using both the aggregate demand and injection – leakages approaches. (5 marks)
- (b) Is there a budget surplus or budget deficit at the equilibrium level of income? (3 marks)
- (c) Is the balance of trade in deficit or surplus at the equilibrium level of income? (3 marks)
- (d) Is the government pursuing an expansionary or contractionary fiscal policy? (3 marks)

- (e) What is the value of the multiplier in this economy? (3 marks)
- (f) If exports increase to 250, what is the new equilibrium level of income? (3 marks)
- (2) (a) Why is the balanced budget multiplier equal to 1? (4 marks)
- (b) The consumer price index (CPI) is a fixed weight index. It compares the price of a fixed bundle of goods in 1 year with the price of same bundle of goods in some base year. Given the table below:

Good	Quantity Consumed	Prices 2000	Prices 2001	Prices 2002
A	100	K1.00	K1.50	K1.75
B	150	K1.50	K2.00	K2.00
C	25	K3.00	K3.25	K3.00

- (i) Calculate the price of a bundle of quantities for each year. (2 marks)
- (ii) Using 2000 as a base year calculate the consumer price index (2 marks)
- (iii) What is the percentage change in index between 2000 and 2001 and 2001 and 2002? (2 marks)
- (iv) Was there inflation between 2001 and 2002? (2 marks)
- (c) Explain the difference and similarity between frictional and structural unemployment. (4 marks)
- (3) (a) Why is there a precautionary demand for money? (4 marks)
- (b) What is the difference between a flexible exchange rate environment and a fixed exchange rate environment? (4 marks)
- (c) Suppose output is initially Y_0 for schedules IS, and LM, in figure below. Full employment exists at output Y_1 .

Correction:



- (i) Establish how monetary or fiscal policy can be used to reach full employment. (3marks)
- (ii) Explain how the choice of monetary or fiscal policy has a selective impact on spending and composition of output. (3 marks)
- (d) Suppose the demand for money is $L = 0.2 Y - 4i$ the money supply is K200 and for a two sector model, $C = 100 + 0.8Y$ and $I = 150$.
- (i) Derive the equation for IS and LM. (3 marks)
- (ii) From the IS and LM equations find output, the rate of interest, consumption and investment. (3 marks)

- (4) (a) Suppose there were potential trading regions called A and B that produced and consumed only two goods, food and cloth. With an input of X resources, the production possibilities in each country are;

Country	Food (units)	Clothing (units)
A	100	10
B	64	8

- (i) Which country has a comparative advantage in the production of clothing? (5 marks)
- (ii) Which country has absolute advantage in the production of food? (5 marks)
- (b) What are the major sources of comparative advantage? (5 marks)
- (c) Explain what you understand by the following trade barriers:
- (i) Tarrifs
- (ii) Export subsidies
- (iii) Quotas (5 marks)
- (5) Explain what you understand by the following terms:
- (a) Phillips curve (4 marks)
- (b) Liquidity preference (4 marks)
- (c) Real Gross National product (4 marks)
- (d) Intermediate goods (4 marks)
- (e) Automatic stabilizers (4 marks)

The University of Zambia
University Second Semester Examinations – February 2008

AGE 442
Agribusiness Statistics and Data Analysis

Instructions: There are two sections in this exam, A and B. Answer both questions in section A; and any one of the two questions in section B. Thus, you will answer a total of three (3) questions in this exam.

Time: Three (3) hours

Section A (70 points)

Answer both questions in this section.

1. Estimation of the model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + e$ from a sample of 104 observations yields

$$(\mathbf{X}'\mathbf{X})^{-1} = \begin{pmatrix} 5.0 & -1.4 & -2.0 \\ -1.4 & 20.0 & -7.5 \\ -2.0 & -7.5 & 45.0 \end{pmatrix} \quad \mathbf{e}'\mathbf{e} = 20 \quad \hat{\boldsymbol{\beta}} = \begin{pmatrix} 4.8 \\ 4.0 \\ 3.6 \end{pmatrix}$$

where x_1 and x_2 are explanatory variables, and e is the error term. Assume $t_{crit} = 1.980$

- a) Which of the regressors has a statistically significant effect on y ? Show your work.
 - b) Construct and interpret the 95% confidence interval for x_1 . What does it communicate about the statistical significance of x_1 ?
2. You are conducting an empirical investigation into the median prices of houses in 506 communities of a large metropolitan area ($n=506$), and obtain the following OLS results (standard errors in parentheses):

$$\ln P_i = 11.08 - 0.9535 \ln NOX_i - 0.1343 \ln DIST_i + 0.2545 ROOMS_i - 0.05245 STRAT_i$$

$$(0.3181) \quad (0.1167) \quad (0.0431) \quad (0.0185) \quad (0.0059)$$

SSE = 35.1835; SST = 84.5822

where 'ln' = the natural log operator;

P = the median house price in community i , in dollars;

NOX = the level of nitrous oxide in the air of community i , in parts per 100 million;

$DIST$ = the weighted distance of community i from 5 employment centres, in miles;

$ROOMS$ = the average number of rooms per house in community i ;

$STRAT$ = the average student-teacher ratio of schools in community i ;

SSE = Error or residual sum-of-squares;

SST = Total sum-of-squares.

Assume further that $t_{\left(\frac{\alpha}{2}=0.025; n-k=501\right)} = 1.96$; and $F_{(\alpha=0.05; k-1=4, n-k=501)} = 2.37$

- a) Interpret each of the slope coefficient estimates for $ROOMS$ and $STRAT$.
- b) Test for the individual significance of $\ln NOX$ and $ROOMS$ at 5% level of significance.
- c) Test for the significance of all the explanatory variables together. Assume $\alpha = 0.05$.
- d) Construct the 95% confidence interval for $\ln DIST$ and use it to test for the significance of $\ln DIST$.

Section B (30 points)

Answer any one of the two questions in this section.

3. Answer the following questions about the normal probability distribution.
- A Sports Association is interested in the performance of 18 year-old male athletes in swimming one km, freestyle. The time taken is distributed normally with a mean of 24 minutes and a standard deviation of 3.5 minutes.
 - Find the probability that a male athlete takes more than 30 minutes.
 - If the association wants to designate the fastest 1% as “elite” swimmers, what time should the association set for this criterion?
 - Salaries in a certain corporation are known to have a mean of K3.8 million and a standard deviation of K56 million.
 - What is the Z-score corresponding to a salary of K70,520,000?
 - Suppose the corporation offers you a starting salary with a Z score of -0.8. To what starting salary does this Z score correspond?
 - Suppose a female bank executive believes that her salary is low as a result of sex discrimination. To try to substantiate her claim, she collects information on the salaries of her male counterparts in the banking business. She finds that their salaries have a mean of K1,700,000 and a standard deviation of K100,000. Her salary is K1,350,000. Does this information support her claim of sex discrimination?

4. Use the following market model to answer the questions below

$$D = b_0 + b_1P + u,$$

$$S = a_0 + a_1P + a_2W + v, \text{ and}$$

$$D = S,$$

where D is demand, S is supply, P is price, W is weather conditions, u and v are random error terms; and b_0 , b_1 , a_0 , a_1 , and a_2 are parameters to be estimated.

- State which variables are endogenous and which are exogenous (or predetermined).
- Establish the identification condition of each equation.
- Why is it necessary to develop alternative estimation procedures for the parameters of equations which are part of a system of simultaneous equations?
- Explain the two-stage least squares estimator. When is it not necessary to extend 2SLS to 3SLS?

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

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2008-2007 ACADEMIC YEAR SECOND SEMESTER
EXAMINATIONS
AGE 452: INTERMEDIATE AGRIBUSINESS MANAGEMENT
TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER FIVE QUESTIONS ONLY. SECTION A IS COMPULSORY. ALL QUESTIONS CARRY EQUAL MARKS.

SECTION A

1. You are an Agribusiness consultant and have been invited by a Youth group to give a speech on "Business plan writing". Prepare your speech notes, highlighting the following:
 - a) The definition of a business plan (**2 marks**).
 - b) How the business owner benefits from developing a business plan (**6 marks**).
 - c) Suggest a business plan format and its content (**12 marks**).

2. Entrepreneurship and business development are important and vital activities in the socio-economic development of Zambia. Entrepreneurship is for everyone. No matter what job or position one occupies, there is need to cultivate entrepreneurial characteristics.
 - a) Outline the role of entrepreneurship and agribusiness development in the socio economic development of Zambia (**7marks**).
 - b) Discuss the motives and challenges of starting and running a new business (**13 marks**).

3. a) Discuss the forces that could influence competition in an Agribusiness Industry (**10marks**)
 - b) How may the forces mentioned in (a) above be manipulated to capture the Zambian pork products market (**10 marks**).

SECTION B

4. Explain the three commonly used price strategies when introducing a new product and the rationale behind them **(20 marks)**.
5. a) Choose an agribusiness product and use the “product concept” to break the product into the core, tangible and augmented products **(9 marks)**.

b) Explain the difference between a product or sales oriented firm and market oriented firm **(6marks)**.

c) Explain the role of the Boston Group of Companies matrix as a tool in strategic choice **(5 marks)**.
6. a) A key part of the SWOT analysis is evaluating the impact of broad market factors such as government policies, international trade developments, new technologies etc. For an agribusiness industry of your choice, identify five key trends in the industry market place and describe the opportunities and threats each trend represents for agribusiness firms in that industry **(10 marks)**.

b) Explain the difference between Product differentiation and Market segmentation **(5 marks)**.

c) What are the risks involved in choosing a cost focus strategy rather than a differentiation strategy in order to gain competitive advantage **(5 marks)**.

END OF EXAM

**THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
SECOND SEMESTER EXAMINATION FEBRUARY 2008**

AGE 552: AGRICULTURAL EXTENSION EDUCATION

TIME: THREE HOURS

**INSTRUCTIONS: ANSWER FIVE QUESTIONS
ALL QUESTIONS CARRY EQUAL MARKS (20 MARKS)**

TOTAL MARKS: 100

QUESTIONS

1. With clearly identified steps, fully explain the process of extension programme planning in Zambia.
2. Describe any four extension methods and for each method state the results it brings forth
3. Communication is the precondition of any extension method. Explain the principles and main influencing factors of the communication process, and evaluate with emphasize the problems of inter-cultural communication
4. Outline any two common approaches to extension and examine both its delivery advantages and disadvantages
5. 'Extension is an out of school system of education in which adults and young people learn by doing. It's most important objective is the development of the people" (Adams, 1982). With practical examples evaluate and critically discuss the statement
6. Fully explain the five aspects of organization theory that would help you improve the design and operational efficiency of an extension service you have studied

.....**END**.....

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2008 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGE 562: INTERMEDIATE FARM MANAGEMENT

TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER ALL FIVE QUESTIONS

Each Question Carries 20 Marks

- Q1. a) Planning the farm's labor resources first begins with assessing the quantity and quality of labor needs. Discuss what is involved in this process **(10 marks)**
- b) Successful labor management requires an understanding & appreciation of basic human needs. Outline these needs according to Maslow (1954). **(10 marks)**
- Q2. a) Compare and Contrast the following terms in Land Acquisition and Management
- i) Quit claim deed and Warranty deed **(5 marks)**
 - ii) Joint tenants and Tenants- in -common **(5 marks)**
- b) Mr. Hachi is considering leasing some of his crop land that he is underutilizing but he doesn't fully understand leasing. He approaches your office in Choma where you are an agricultural officer. Discuss with him various lease arrangements that he might consider, indicating advantages and disadvantages of each of them to him **(10 marks)**
- Q3. a) Mr. Njamba has applied for a loan to expand his beef enterprise at a bank where you are working as a loan officer. Explain 3 "Rs" of credit that you would consider in determining his credit worthness **(9 marks)**
- b) Suppose Mr. Njamba is given a K40 million loan amortized with equal total payment at 9% interest to be repaid in 5 years, how much total interest will he pay over the life of the loan? **(5 marks)**
- c) Determine Mr. Njamba 's opportunity cost of capital given that his debt is 35%, equity 65%, increase in the value of assets is 7%, marginal tax rate is 35%, the proportion of the non cash items subject to tax is 20%, interest rate 9% and his cash return is 8.5% **(6 marks)**
- Q4. a) Under what condition will it be profitable to rent a farm machine? **(5 marks)**
- b) A Kalabo farmer is thinking of buying a new machine at K50, 000,000 with a 5-year useful life. The cash flow information associated with machine use is as given in the following table:

Machine cash flow					
Year	1st	2nd	3rd	4th	5th
	(K'000,000)				
Cash revenues	48	44	38	35	31
Cash expenses	36	28	25	23	22
Taxes	1.5	2.0	1.8	1.6	1.3
TS-invest credit	2.0	-	-	-	-
Salvage value	-	-	-	-	15

- i) Determine whether this machine is profitable given that his opportunity cost of capital is 12%: **(8 marks)**
- ii) Assuming the farmer wishes to replace the machine, which year would be his optimal replacement period? **(7 marks)**

Q5. a) Explain the procedure of diagnosing a farm problem (12 marks)

b) Outline corrective measures for a solvency problem in a farm business **(4 marks)**

c) Why is a cash flow record a better measure of financial performance than an income statement **(4 marks)**

END OF EXAMINATION!

**THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2007/8 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS**

AGE 572: AGRICULTURAL POLICY ANALYSIS

TIME: THREE HOURS

INSTRUCTIONS: Answer all questions

1. a) It has been argued that there is a need for government or public sector involvement in the agricultural sector of the economy. Discuss the reasons that have been advanced to underpin the general justifications for government intervention in the market economy. (14 marks)

- b) Market failure can arise due to the existence of monopoly power in the market economy. Discuss the effects which are due to the existence of monopoly in the market economy. (6 marks)

2. Write short notes on the following:
 - a) Food Security and Chronic Insecurity. (5 marks)
 - b) Private Sector Contribution to Agricultural Research. (5 marks)
 - c) Pan-seasonal Food Crop Pricing. (5 marks)
 - d) Input Disaggregation Table in the Construction of PAM. (5 marks)

3. The following table shows the PAM results for a maize commodity system constructed for the Ministry of Agriculture and Cooperatives (MACO):

	Total Revenue	Tradable Inputs	Domestic Resources	Profits
Private Prices	500.0	146.8	279.5	73.7
Social Prices	850.0	293.1	397.8	159.1
Transfers	-350.0	-146.3	-118.3	-85.4

Explain what the above PAM results mean by:

- a) Determining and interpreting the Nominal Protection Coefficient (NPC), Effective Rate of Protection (ERP) and Domestic Resource Cost Ratio (DRC); (9 marks)
- b) Interpreting the PAM Private Profits, Economic Profits and Transfers; (3 marks)
- c) Stating when might the policy makers at MACO find it appropriate to use the PAM. (8 marks)

4. a) It is anticipated that the heavy floods that have affected many parts of the country are likely to have an adverse effect on the overall crop harvest for the 2007/8 farming season particularly on the staple food maize. Discuss the considerations that may arise if the Food Reserve Agency (FRA) has to resort to the use of imports to stabilize maize grain supplies in the country. (14 marks)
- b) FRA maintains and operates a strategic maize grain reserve. What are the factors that may determine the role the private traders can play if FRA guarantees floor and ceiling prices? (6 marks)
5. a) What is Pan-Territorial Pricing Policy? What are the main determinants of a pan-territorial pricing policy and what are the arguments which have been advanced in support of pan-territorial pricing policy? (14 marks)
- b) What are the counter-arguments which have been advanced against pan-territorial pricing policy? (6 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2007/2008 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGE 582: PROJECT MONITORING AND EVALUATION

TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER QUESTIONS ONE AND ANY OTHER FOUR OF THE FOLLOWING QUESTIONS FOR A TOTAL OF FIVE QUESTIONS. EACH QUESTION IS WORTH 20%

1. Explain what the Logical Framework Approach is. Elaborate on the elements of a typical log frame and elucidate on the terms "vertical logic" and "horizontal logic".
2. You have been hired as a Monitoring & Evaluation Officer for a rural development project involved in building rural infrastructure, supplying inputs and training smallholder farmers. One of your major tasks is to set up a project monitoring system. Describe the main components of a project monitoring system you would set up to ensure efficient and timely production of outputs. Give details by citing appropriate examples to explain the purpose and timing in the utilization of each of these components.
3. Formal evaluations of projects usually focus on three areas, namely, performance; output, effects, and impact; and economic and financial efficiency. Identify and briefly elaborate on the kinds of data collected and analyzed focusing on performance of a project.
4. (a) Identify **five (5) qualitative methods** of data collection and briefly explain what they are. Elaborate on the advantages and disadvantages associated with these methods in data collection in M & E.

(b) Identify **three (3) quantitative tools** that are used in data collection in M&E. Explain what these are and outline the advantages and disadvantages associated with these tools.
5. (a) Explain what Quasi-Experimental (QE) designs are in project impact assessments. Elaborate on the advantages and disadvantages associated with QE designs.

(b) Explain how one can strengthen less robust Quasi-Experimental (QE) designs in order to improve the quality and usefulness of the findings.
6. Write brief notes explaining the **salient differences** between the following:
 - (a) Terminal Evaluation and Ex-post Evaluation
 - (b) Cross-sectional Studies and Longitudinal Studies
 - (c) Sectoral Analysis and Cost-Benefit Analysis
 - (d) Cost Variance Analysis and Diagnostic Monitoring Studies

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY
2007 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGF 211: GENERAL MICROBIOLOGY

PRACTICAL PAPER

DURATION: THREE (3) HOURS

INSTRUCTIONS: Answer ALL Questions

Question One (1)

PERFORM a direct stain on Specimen A and B

- a. Sketch a few bacteria, give magnification and, morphology and arrangement **(6 Points)**
- b. Explain the principle behind direct staining and the importance of direct staining **(4 Points)**
- c. List two (2) examples of basic dyes and two examples of acidic dyes that can be used in the simple staining technique **(2 Points)**
- d. Define differential staining and elaborate on one important differential staining procedure **(8 Points)**

Question Two (2)

- a) Define the following term
 - i. Pure Culture **(2 Points)**
 - ii. Aseptic Technique **(2 Points)**
- b) Describe how pure cultures can be isolated from mixed populations by using streak plate method **(8 Points)**
- c) What is the primary use of the following?

- i. Agar Slants (2 Points)
- ii. Agar Deeps (2 Points)
- iii. Broth (2 Points)
- iv. Solid Medium (Petri Plates) (2 Points)

Question Three (3)

- a) Perform a Catalase Test on **Specimen B** and interpret the results (4 Points)
- b) State the function of the enzyme catalase and mention the products that are released from a catalase test reaction (2 Points)
- c) Which other enzymes must be present in organisms (bacteria) that require oxygen for their growth and those that can grow in the presence of oxygen (4 Points)
- d) Define Osmotic Pressure and how it affects bacterial cells (4 Points)
- e) Name two (2) types of foods that can be preserved with
 - i. Salt (2 Points)
 - ii. Sugar (2 Points)
- f) The Acidity or alkalinity (pH) of the environment influences microbial growth. Name two types of food that can be preserved by organic acids with pH below 4.5 (2 Points)

Question Four (4)

- a) Contrast Selective media, Differential media and Enrichment media (6 Points)
- b) Identify the media and bacteria in the provided **Specimen C** (2 Points)
- c) What makes the identified media (in b) both differential and selective (4 Points)
- d) What is the difference between chemically defined and complex media (4 Points)
- e) Describe two methods used in the measurement of bacterial growth (4 Points)

Question Five (5)

- a) Describe ^{two}~~three~~ (2) factors that influence enzymatic activity **(4 Points)**
- b) Describe the method for testing for carbohydrate fermentation products and state how to interpret the results **(6 Points)**
- c) Name the general end products that may be formed as a result of the bacterial fermentation of sugars **(2 Points)**
- d) Define the following terms
- i. Deamination **(2 Points)**
 - ii. Decarboxylation **(2 Points)**
- e) Of what value is deamination to a microbe? **(2 Points)**
- f) When spoilage of canned foods occur, what causes the blackening of the cans? **(2 Points)**
-

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY
2007 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGF 211: GENERAL MICROBIOLOGY THEORY PAPER

TIME: THREE (3) HOURS

INSTRUCTIONS:

The examination has two sections, **A** and **B** and questions in both sections carry equal marks.

There are a total of **SIX** questions; answer **FIVE** questions, all the **THREE (3)** questions in section **A** and **TWO (2)** in section **B**

SECTION A

Question One (1)

a) Describe the following growth morphologies and arrangements:

- i. Staphylococci (2 Points)**
- ii. Streptobacilli (2 Points)**
- iii. Sarcinae (2 Points)**
- iv. Vibrioid (2 Points)**
- v. Spirochetes (2 Points)**

b) Briefly describe the following morphological structures and their functions:

- i. glycocalyx (differentiate between capsule and slime layer) (2 Points)**
- ii. Flagella (2 Points)**
- iii. Plasma membrane (2 Points)**
- iv. Plasmids (2 Points)**
- v. Endospore (2 Points)**

Question Two (2)

- a. Identify and describe the chemical requirements for bacterial growth
(10 Points)
- b. i) Define generation time (1 Point)
- ii) Briefly describe the four phases of the growth curve (what occurs during each phase?) (8 Point)
- iii) Which growth phase is best to use for experimentation or identification? Give your reasoning (1 Point)

Question Three (3)

- a. Describe the lysogenic cycle of bacteriophage Lambda (λ) (10 Points)
- b. Describe the life cycle of *Rhizopus stolonifer* (common bread mould) (10 Points)

SECTION B

Question Four (4)

- a. Contrast the four types of acquired immunity (8 Points)
- b. Name one function for each of the classes of antibodies (10 Points)
- c. Briefly describe the role of the non specific cellular components: Natural Killer cells; Macrophages (2 Points)

Question Five (5)

- a. Describe in detail the process of glycolysis (8 Points)
- b. What is the difference between **Aerobic Metabolism** and **Fermentation**? How do they differ in the amount of energy (ATP) produced? And what is the final electron acceptor in each pathway? (12 Points)

Question Six (6)

- a. Identify five (5) types of disinfectants. For each give one example and explain how they exert their Antimicrobial action **(10 Points)**

 - b. Compare and contrast the general characteristics of Rickettsias, Chlamydias, and Mycoplasmas **(10 Points)**
-

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2007/8 ACADEMIC YEAR SECOND SEMESTER FINAL

EXAMINATIONS

AGF 332 METHODS IN FOOD ANALYSIS I: PRACTICAL

TIME ALLOWED: THREE HOURS

INSTRUCTIONS TO CANDIDATES

1. There are two questions in this examination paper.
 2. Answer both questions.
 3. Marks are shown in brackets at the end of each question or part thereof.
-

- 1 (a) A food processing Company developed a food additive that gave the following mass spectrum, infra red and NMR spectra. Study the spectra and determine the possible structure of the food additive. (10 marks)
- (b) The analgesic (pain reliever) in aspirin tablets is acetylsalicylic acid (ASA). A series of standard ASA solutions were prepared in the solvent chloroform, which contained 1% acetic acid. Under those conditions ASA fluoresces at 335nm after excitation at 280nm. A 0.0100g sample of an aspirin tablet was dissolved in 1.000liter of the acetic acid chloroform solvent, and the fluorescence of all the solutions was recorded. Calculate the percent by weight of ASA in the aspirin tablet (MW ASA is 180.2).

ASA concentration, $\times 10^{-5}M$	Relative fluorescence intensity
0.50	8.8
1.00	17.3
2.00	35.0
4.00	69.9
6.00	96.4
Unknown	53.3

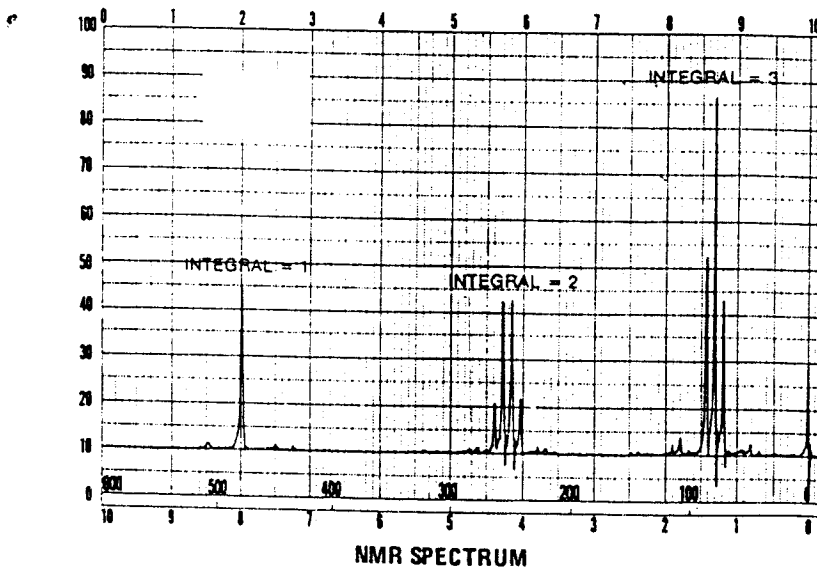
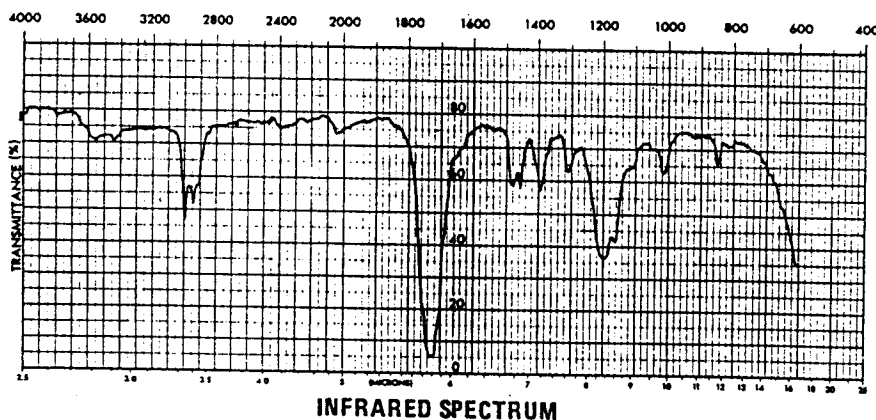
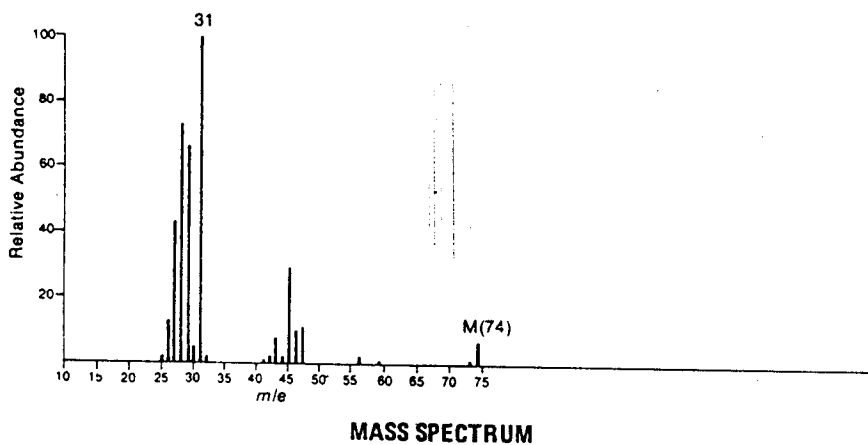
(5marks)

2. A new Pharmaceutical Company wants to make a food supplement rich in vitamin C in order to prevent the probable outbreak of scurvy on Moonovia. The Company brings the vitamin C source to your Food laboratory for the analysis of the vitamin. Carry out the determination and write a detailed report to the Company. **(15marks)**

END OF EXAMINATION

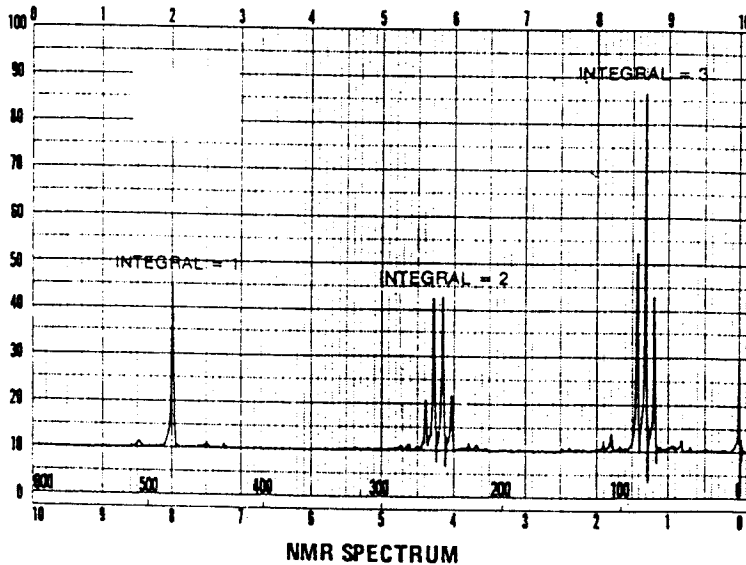
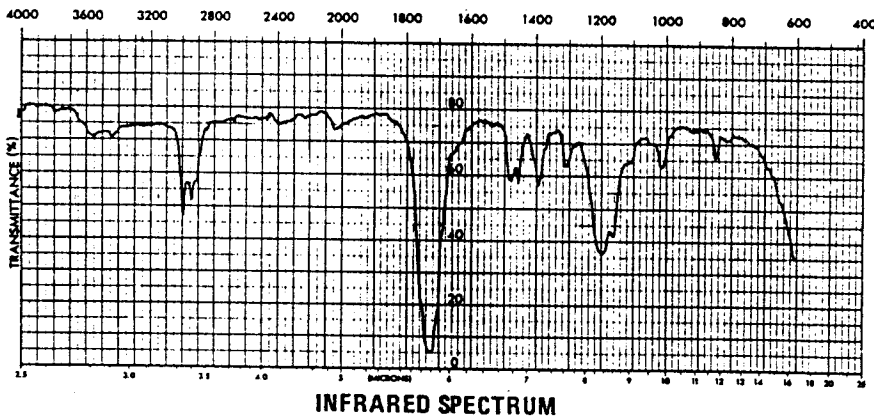
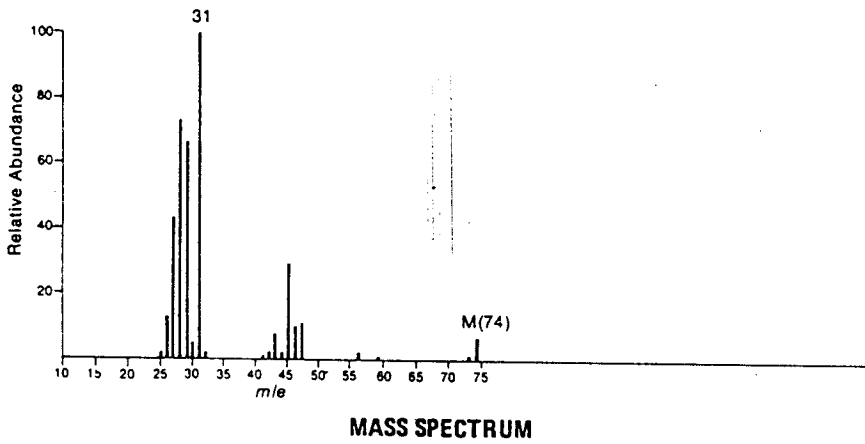
1(a) A food sample was analyzed using UV/VIS, IR, Mass spectrometer and NMR. The results of the analysis are shown below. Study the results and identify the component(s) present.

The uv spectrum of this compound shows no maximum above 205 nm. The ir spectrum is obtained on a neat liquid sample.




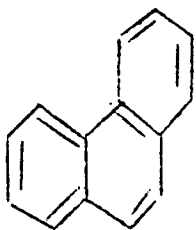
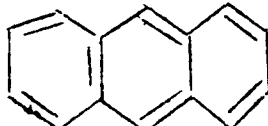
1(a) A food sample was analyzed using UV/VIS, IR, Mass spectrometer and NMR. The results of the analysis are shown below. Study the results and identify the component(s) present.

The uv spectrum of this compound shows no maximum above 205 nm. The ir spectrum is obtained on a neat liquid sample.



2052

ULTRAVIOLET-VISIBLE ABSORPTION FOR π ELECTRON CHROMOPHORES

Name of chromophore	Formula of chromophore	Example	λ_{max} , nm	ϵ
Oxygen	O=O	O ₂	~100 to ~180	-(gas)
Ozone	O=O ⁺ -O ⁻	O ₃	~200 to ~270	-(gas)
Nitroso	-N=O	$\left\{ \begin{array}{l} \text{NO}_3^- \\ \text{NO}_2 \end{array} \right.$	203	1 x 10 ⁴
			~290 to ~360	-(gas)
Manganate	Mn=O	MnO ₄ ⁻	227	1.6 x 10 ³
			525	2.2 x 10 ³
Carbonyl	C=O	(CH ₃) ₂ C=O	166	1.6 x 10 ⁴
Ethylene	C=C	$\left\{ \begin{array}{l} \text{Ethylene} \\ \text{2-Hexene} \end{array} \right.$	160	2 x 10 ⁴
			193	10 ⁴
Acetylene	C≡C	Acetylene	173	6 x 10 ³
Polyene	H(HC=CH) _n H	$\left\{ \begin{array}{l} \text{Butadiene} \\ \text{Hexatriene} \end{array} \right.$	217	2 x 10 ⁴
			268	3.5 x 10 ⁴
			254	2 x 10 ²
Benzene		$\left\{ \begin{array}{l} \text{Benzene} \\ \text{Salicylic acid} \\ \text{Acetylsalicylic acid} \end{array} \right.$	308	4 x 10 ³
			280	1.5 x 10 ³
			251	5 x 10 ⁴
Phenanthrene		Phenanthrene	293	1.5 x 10 ⁴
Anthracene		Anthracene	253 340, 357, 375	1.5 x 10 ⁵ all 9 x 10 ³

ULTRAVIOLET-VISIBLE ABSORPTION FOR n ELECTRON CHROMOPHORES

Class of chromophore	Formula of chromophore	Example	λ_{max} , nm	ϵ
Carbonyl	C=O	Acetone	270	18
		$(C_6H_5)_2C=O$	330	180
Carboxyl	R-C=O(OH)	Acetic acid	204	60
Nitro	$O^--N^+=O$	NO_3^-	300	7.5
Nitroso	-N=O	Nitrosobutane	300	100
			665	30
Thiocarbonyl	C=S	CS_2	318	108
		$(C_6H_5)_2C=S$	620	70
Iminethine	C=N	$(C_6H_5)_2C=NH$	340	125
	N=N	$C_6H_5-N=N-C_6H_5$	448	425

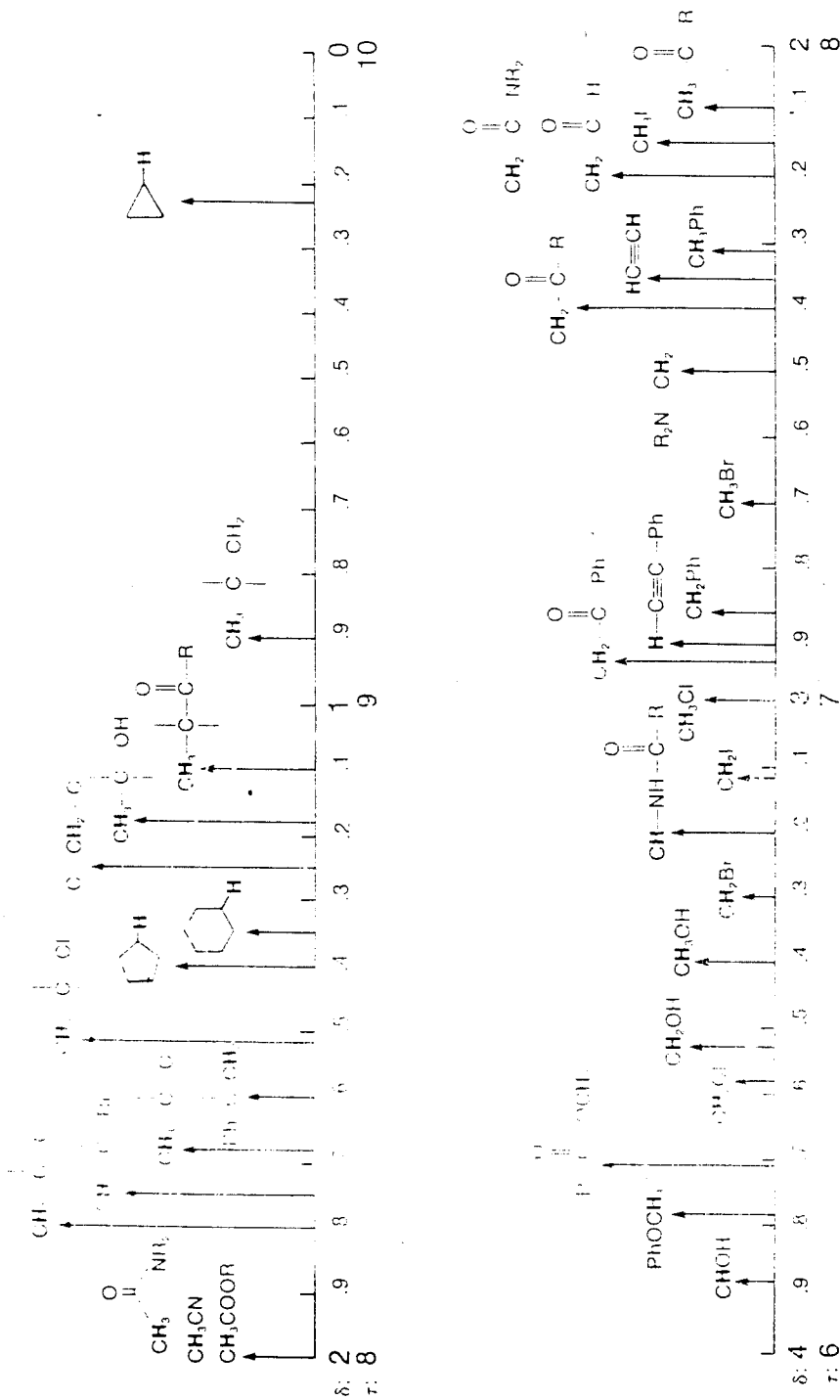
INFRARED SPECTROSCOPY

TABLE 2-3 A Simplified Correlation Chart

Type of Vibration		Frequency (cm ⁻¹)	Wavelength (μ)	Intensity	
C-H	Alkanes (stretch)	3000-2850	3.33-3.51	s	
	-CH ₃ (bend)	1450 and 1375	6.90 and 7.27	m	
	-CH ₂ - (bend)	1465	6.83	m	
	Alkenes (stretch)	3100-3000	3.23-3.33	m	
	(out-of-plane bend)	1000-650	10.0-15.3	s	
	Aromatics (stretch)	3150-3050	3.17-3.28	s	
	(out-of-plane bend)	900-690	11.1-14.5	s	
	Alkyne (stretch)	ca. 3300	ca. 3.03	s	
	Aldehyde	2900-2800	3.45-3.57	w	
			2800-2700	3.57-3.70	w
C-C	Alkane	not interpretatively useful			
C=C	Alkene	1680-1600	5.95-6.25	m-w	
	Aromatic	1600 and 1475	6.25 and 6.78	m-w	
C≡C	Alkyne	2250-2100	4.44-4.76	m-w	
C=O	Aldehyde	1740-1720	5.75-5.81	s	
	Ketone	1725-1705	5.80-5.87	s	
	Carboxylic Acid	1725-1700	5.80-5.88	s	
	Ester	1750-1730	5.71-5.78	s	
	Amide	1670-1640	6.00-6.10	s	
	Anhydride	1810 and 1760	5.52 and 5.68	s	
	Acid Chloride	1800	5.56	s	
	Alcohols, Ethers, Esters, Carboxylic Acids, Anhydrides	1300-1000	7.69-10.0	s	
	O-H	Alcohols, Phenols			
		Free	3650-3600	2.74-2.78	m
H-Bonded		3500-3200	2.86-3.13	m	
N-H	Carboxylic Acids	3400-2400	2.94-4.17	m	
	Primary and Secondary Amines and Amides (stretch)	3500-3100	2.86-3.23	m	
	(bend)	1640-1550	6.10-6.45	m-s	
C-N	Amines	1350-1000	7.4-10.0	m-s	
C=N	Imines and Oximes	1690-1640	5.92-6.10	w-s	
C≡N	Nitriles	2260-2240	4.42-4.46	m	
X=C=Y	Allenes, Ketenes, Isocyanates, Isothiocyanates	2270-1950	4.40-5.13	m-s	
	Nitro (R-NO ₂)	1550 and 1350	6.45 and 7.40	s	
S-H	Mercaptans	2550	3.92	w	
S=O	Sulfoxides	1050	9.52	s	
	Sulfones, Sulfonyl Chlorides, Sulfates, Sulfonamides	1375-1300 and 1200-1140	7.27-7.69 and 8.33-8.77	s	
	Fluoride	1400-1000	7.14-10.0	s	
	Chloride	800-600	12.5-16.7	s	
G-X	Bromide, Iodide	<667	>15.0	s	

SOME REPRESENTATIVE CHEMICAL SHIFT VALUES FOR VARIOUS TYPES OF PROTONS*

(Chemical shift values refer to the boldface protons **H**, not to regular **H**)



*Adapted with permission from C. A. J. Hoeve, "Theory and Practice in the Organic Laboratory," Second Edition, D. C. Heath, Lexington, Mass., 1977.

**THE UNIVERSITY OF ZAMBIA
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**2007 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS**

AGF 352: FOOD MICROBIOLOGY

TIME: THREE HOURS

INSTRUCTIONS:

The examination has two sections, **A** and **B** and questions in both sections carry equal marks.

There are a total of **SIX** questions; answer **FIVE** questions, all the **THREE (3)** questions in section **A** and **TWO (2)** in section **B**

SECTION A

Question One (1)

- a. Describe four (4) main sources of contamination in food processing industry and discuss how they can be controlled. **(8 Points)**
- b. Explain why sausages and ground meat products provide a better environment for the growth of food spoilage organisms than raw cuts of meat **(10 Points)**
- c. Give reasons why organ meat has higher degree of contamination than meat (carcass) **(2 Point)**

Question Two (2)

- a. Differentiate between Food Safety and Food Quality **(2 Point)**
- b. Describe Indicators and what their tests are used for **(6 Points)**
- c. What is the purpose of Microbiological Criteria? **(2 Points)**
- d. Describe the three types of Microbiological Criterion **(6 Points)**

- e. In a Sampling Plan, which Two (2) important principles are to be considered in choosing a Plan Stringency **(4 Points)**

Question Three (3)

Compare and contrast the transmission, pathogenic mechanism and disease characteristics of the following food borne pathogens

- a. *Vibrio cholera*
- b. *Salmonella enteritidis*
- c. *Clostridium perfringens*

(20 Points)

SECTION B

Question Four (4)

- a. In Food Preservation, what three (3) strategies can be applied to prevent food spoilage? **(3 Points)**
- b. Differentiate between physical and chemical methods of food preservation **(2 Points)**
- c. Name one (1) physical and one (1) chemical method of food preservation, and for the named methods elaborate on the mechanism of how they prevent food spoilage. Give examples. **(6 Points)**
- d. For the above named methods of food preservation, give one (1) advantage and one (1) disadvantage **(4 Points)**
- e. Briefly discuss the Hurdle Concept with regard to microbial stability and safety of food **(5 Points)**

Question Five (5)

Describe in detail the spoilage of the following;

- i. Fresh fish **(10 Points)**
- ii. Grains and grain products **(10 Points)**

Question Six (6)

3. You have recently opened up a new restaurant in Kamwala area and are trying to come up with a cleaning and disinfection program for your new restaurant
- a) Why should cleaning and disinfection procedures be considered integral to any food establishment? **(4 points)**
 - b) Outline the basic steps involved in the cleaning and disinfection procedures. **(4 points)**
 - c) Describe three (3) factors that will influence the cleaning procedure to be carried out. **(6 points)**
 - d) Describe two chemical sanitizers that you would consider to use for disinfection and for each give one (1) advantages and one (1) disadvantage. **(6 points)**
-

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
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DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY
2007/8 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGF 422: NUTRITION

INSTRUCTIONS:

Answer **ALL** Questions in Section A and **one (1)** question of your choice from Section B.

Answer each question in a separate booklet.

All questions carry equal marks and the marks allocated for each question are shown in brackets.

TIME: THREE (3) HOURS

SECTION A: Answer **ALL** questions in this section

Question 1

For the following gastrointestinal tract (GIT) disorders:

- i. Esophagitis
- ii. Gastritis and Peptic Ulcers

Explain in detail, the causes, symptoms and the medical and nutritional management of the disorders. **(20 Points)**

Question 2

Describe in detail the digestion and absorption of Protein and Lipids. **(20 Points)**

Question 3

- a.
- i. What is food insecurity? **(2 Points)**
 - ii. State and describe at least **four (4)** implications of food insecurity on a society or community. **(8 Points)**
- b. Discuss **four (4)** key steps in reducing food insecurity and how these steps would reduce this insecurity **(10 Points)**

Question 4

A Nutritionist / Statistician is carrying out a study of the nutritional intakes and status of different households in N'gombe Township. She uses various assessment techniques as well as different household surveys to get her data.

- a. Briefly describe and contrast any **two (2)** types of surveys that she could use to assess the intake of the individuals in the households. **(5 Points)**
- b. During the study, the Nutritionist has to follow up pregnant women.
- i. Name **two (2)** micronutrients you would advise her to look out for in the women when carrying out biochemical tests on the blood serum of the women. **(2 Points)**
 - ii. In the case that the women are found to be deficient in the two micronutrients (mentioned in b (i)), name **two (2)** conditions or diseases that the women or their babies would suffer from (**one (1)** for each micronutrient). **(4 Points)**
- c. Body Mass Index (BMI) was used during the study to assess and categorise the adults:
- i. List **four (4)** limitations that this assessment technique has. **(4 Points)**
 - ii. During the study, it was observed that most elderly people above the age of 55 years of age had BMI values of about 25 to 29. Make a comment on this trend. **(5 Points)**

SECTION B

INSTRUCTIONS: Answer ONLY ONE question.

Question 5

- a. Identify the **five (5)** major categories of nutrients and indicate (very briefly) two functions performed by each. **(10 Points)**
- b.
- i. Briefly describe the distribution of body water **(2 Points)**
 - ii. Identify the **four (4)** main functions that water perform in the body **(4 Points)**
 - iii. Mention the major ways of water elimination in the body **(4 Points)**

Question 6

Write short notes on any **four (4)** of the following concepts:

- a) Food Deprivation **(5 Points)**
- b) IUGR **(5 Points)**
- c) Household Budget survey (HBS) **(5 Points)**
- d) CPPE **(5 Points)**
- e) MUAC **(5 Points)**

END OF EXAMINATION

**THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY**

**2007 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS**

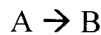
AGF 432: PROCESS CONTROL AND INSTRUMENTATION

TIME: THREE HOURS

INSTRUCTIONS:

1. Carefully read the instructions and each question.
2. Answer **ALL** questions.
3. **ALL** questions carry equal marks.
4. Table of Laplace transformations is provided on the last page.

1. A continuous stirred tank reactor is fed at a constant rate F m³/s. The reaction occurring is :



and proceeds at a rate:

$$R = k C_0$$

where R = kmoles A reacting/m³ (mixture in tank) s,

k = reaction velocity constant s⁻¹, and

C_0 = concentration of A in reactor kmol/m³.

- a) If the density ρ and volume V of the reaction mixture in the tank are assumed to remain constant, derive the transfer function relating the concentration of A in the reactor at any instant to that in the feed stream C_i . **(10 marks)**
(Hint: make a balance on component A).
- b) What would be the response of C_0 to an impulse in C_i . **(5 marks)**
- c) Illustrate in form of a diagram a stirred tank blending system, and indicate clearly the controlled variable, manipulated variable and disturbance variable. Further, make a classification of possible control strategies of this (your) blending system so that the management can easily understand them during your presentation in the management meeting. **(10 marks)**

2. A tank having a cross-sectional area of 0.2 m^2 is operating at a steady state with an inlet flowrate of $10^{-3} \text{ m}^3/\text{s}$. Between the liquid heads of 0.3 m and 0.09 m the flow-head characteristics are given by the equation:

$$Q_2 = 10^{-12} + 0.002H$$

Where Q_2 is the outlet flowrate and H is the liquid level.

a) Determine the transfer functions relating

(i) inflow and liquid level,

(ii) inflow and outflow.

(10 marks)

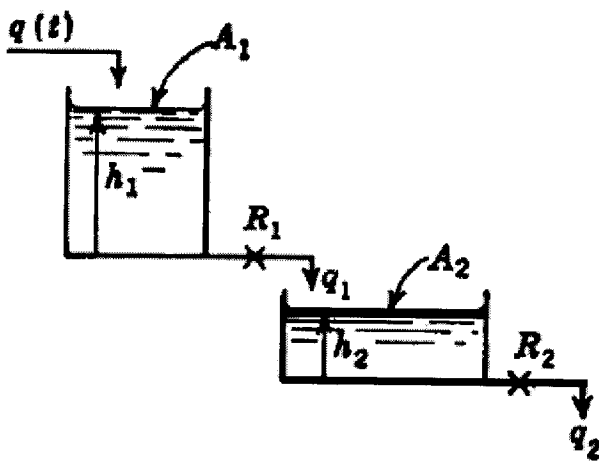
b) If the inflow increases from 10^{-3} to $1.1 \times 10^{-3} \text{ m}^3/\text{s}$ according to the step change, calculate the liquid level 200 s after the change has occurred. **(5 marks)**

c) Two non-interacting tanks are connected in series as shown in the figure

below. The time constants are $\tau_2 = 1$, $\tau_1 = 0.5$; $R_2 = 1$. Determine response of the level in tank 2 if a unit step change is made in the inlet flow rate to tank 1.

The transfer function for this system is

$$\frac{H_2(s)}{Q(s)} = \frac{R_2}{(\tau_1 s + 1)(\tau_2 s + 1)}$$



(10 marks)

3. A mercury thermometer having a first-order dynamics with a time constant of 60 s is placed in a bath at 35°C. After a thermometer reaches a steady state it is suddenly placed in a bath at 40°C at $t = 0$ and left there for 60 s, after which it is immediately returned to the bath at 35°C.
- a) Derive the first-order dynamic model for a mercury thermometer in the bath **(10 marks)**
 - d) Draw a sketch showing the variation of the thermometer reading with time. **(5marks)**
 - e) Calculate the thermometer reading at $t = 30$ s. **(5 marks)**
 - f) Outline the differences between the negative feedback and the positive feedback systems, and which of these two are the most utilized and preferred system in food processing. **(5 marks)**
4. a) Supposing that the model of the process is established to be $d^2x/dt^2 + 4x = 2e^{-t}$
Given the conditions $x(0) = x'(0) = 0$, determine the $x(t)$ for this process. **(15 marks)**
- b) Explain in detail the following terms:
- (i) Proportional Control **(2.5 marks)**
 - (ii) Proportional Derivative Control **(2.5marks)**
 - (iii) Proportional Integrator Derivative Control **(2.5marks)**
 - (iv) Measuring element **(2.5 marks)**

THE END OF EXAMINATIONS

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

2007/2008 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATION

FOOD PACKAGING AGF 442

TIME: THREE (3) HOURS

INSTRUCTIONS:

ANSWER ANY 5 QUESTIONS OF YOUR CHOICE

ALL QUESTIONS CARRY 20 MARKS

1. Describe the sterilization methods for packaging materials indicating the advantages and disadvantages of each method you have described.
2. Discuss and differentiate the (3) three packaging classifications giving examples of foods, packaging materials and situations unique for each class. (This is in relation to packaging toxicity).
3. Describe the difficulties associated with the following
 - (a) Recycling plastics
 - (b) Degradation of plasticsAlso describe the measures that are currently used to overcome the difficulties you have stated in (a) and (b) of the same question.
4. Explain what is involved in the production of the following
 - (a) Semi-synthetic resins
 - (b) Completely synthetic plastics
 - (c) Polycondensates
 - (d) Polymer Compounds
5. Describe the three processes used in papermaking. Also explain where each paper type is used. Explain why paper cannot be recycled forever.
6. Describe the Migration phenomena according to Ficks law and the equation that explains this. From the equation what 5 factors affect migration.
7. Discuss the properties of plastics as determined by the molecular structure.

UNIVERSITY OF ZAMBIA EXAMINATIONS

AGS222 FUNDAMENTALS OF SOIL SCIENCE

February, 2008

DURATION: 3 hours

INSTRUCTIONS: Answer all Questions

MARKS: 100

1. Indicate whether the following statements are true or false or whether you do not know the answer. (15 marks) (Note: 2.5 for correct answer, 0 for I don't know, and -1.0 for wrong answer).
 - a) Humus generally has a higher CEC than kaolinite.
 - b) CaCO_3 is more resistant to chemical weathering than SiO_2 .
 - c) The most common bioavailable form of phosphorus to plants in acid soils is H_2PO_3^-
 - d) The matric (ψ_m), gravitational (ψ_g), and osmotic (ψ_o) potentials are the main components of the "Total Water Potential" of an unsaturated soil.
 - e) Manure with an organic matter content of 95% and a total nitrogen content of 1.5 % will mineralize nitrogen when it is decomposed by soil microorganisms.
 - f) Magnesite (MgCO_3) has a higher neutralizing value than Calcite (CaCO_3).

2. (20 marks)
 - a) List any 3 factors that can lead to the development of acidity, and describe how they lead to the development of soil acidity. (4 marks)
 - b) Name the silicate minerals whose chemical formulae are given below; indicate the class of silicate minerals to which they belong and list them in order of increasing stability in humid soils (i.e. from the least stable to the most stable) (5 marks)
 $(\text{FeMg})_2\text{SiO}_4$, SiO_2 , KAlSiO_3 , $\text{KAl}_2(\text{Al,Si}_3)\text{O}_{10}(\text{OH})_4$.
 - c) Discuss the similarities and differences between fungi and actinomycetes in soils, with regard to their biological classification, morphology, adaptation to soil environmental conditions and main functions in soils. (6 marks)
 - d) The mineral $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$ is a common constituent of the clay fractions of tropical soils. Draw a schematic diagram of the structure of this mineral, indicating the planes in which all the elements and ions in its formula occur and briefly discuss its CEC, specific surface area, ability to expand and contract in relation to its structure. (5 marks)

3 Define the following terms (15 marks)

- a) Compound Fertilizer
- b) pH dependent charge
- c) Phosphate fixation
- d) pF curve
- e) Agricultural lime

4 The data in the Table below are readings of matric potentials (ψ_m) of three soil horizons obtained from tensiometers inserted at three soil depths and corresponding bulk densities of the horizons.

Soil point	Depth (cm)	ρ_b g/cm ³	matric potential (ψ_m) (cm)
A	15	1.6	-795
B	50	1.4	-700
C	75	1.5	-650

Based on the data given in the Table above answer the following questions: (25 marks)

- i) Are any of the three horizons in this soil profile saturated with water? Give reasons to support your answer (2.5 marks)
- ii) Assuming the osmotic potential of the soil water is zero throughout the whole soil profile, and that the soil surface is the reference point, calculate the total water potentials at the three soil depths and express them in J/kg. (6 marks)
- iii) Indicate the direction in which water will follow in this profile, with respect to the locations A, B, and C. Give reasons to support your answer. (5 marks)
- iv) If the equation that relates the gravimetric moisture content of the soil to the pF of the soil in horizon A is:

$$\theta_g = 10^{[(pF + 0.52) / (-3.4)]};$$

where: θ_g is in gH₂O/g soil, and pF = log₁₀ (suction corresponding to (ψ_m) matric potential of the soil in cm). Calculate the amount of water available for plants in horizon A in cm³H₂O/100cm³ soils. (5 marks)

- v) What is the diameter of the largest pores (in μm) in the second horizon (B) that are filled with water? (2.5 marks)
- vi) What is the relative humidity of the soil in the third horizon (C) at 25 °C? (4 marks)

Note: $\phi_m = \frac{RT \ln(RH / 100)}{Mw}$

- 5 A soil from the Tazara Corridor, the current prime area for large scale crop-related agricultural Investment in Zambia has the following selected physical and chemical properties.

Depth cm	pH (CaCl ₂)	pb g/cm ⁻³	Org C (-----%-----)	Total N mg/ kg soil	Avail P mg/ kg soil	Ca ²⁺ cmol(+)/kg soil	Mg ²⁺ cmol(+)/kg soil	Na ⁺ cmol(+)/kg soil	K ⁺ cmol(+)/kg soil	Al ³⁺ cmol(+)/kg soil	H ⁺ cmol(+)/kg soil	EC mS/cm
0 -20	4.8	1.5	1.3	0.03	7.5	0.25	0.10	0.09	0.20	0.40	0.20	2.5

Answer the following questions. (25 marks)

- i) What is the Effective CEC of this soil? 2.5 marks.
- ii) Interpret the pH value of this soil according to the Zambian classification of soil pH for agronomic purposes (2.5 marks)
- iii) Classify this soil horizon in terms of its salinity and sodicity and indicate its susceptibility to dispersion. Give reasons to support your classification (3.0 marks)
- iv) Will the decomposition of organic matter in this soil result in the mineralization of nitrogen? Give reasons to support your answer? (2.0 marks)
- v) If the soil respiration rate is 22 mg CO₂/kg soil/day, approximately how many months will it take for this soil to attain a C: N ratio of 18:1, if we assume that the respiration rate remains constant. (5 marks)
- vi) A company wants to invest in the production a high value export crop which requires a minimum available soil P level of 10 mg P/kg of soil for optimum yields. How many 50 kg bags of Triple Super phosphate fertilizer (46 % P₂O₅) will be needed to achieve the desired level of P in 250 hectares of this soil? (5 marks)
- vii) If the crop described above requires an aluminium saturation of not more than 10 % for optimum yields, calculate the minimum amount of agricultural lime with a Neutralizing Value of 95% that the company will need to lime 250 hectares of this soil to meet the requirements of the crop (5 marks)

SOIL SCIENCE IS FUN

END OF EXAMINATION



**UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES**

2008 ACADEMIC YEAR SECOND SEMESTER EXAMINATIONS

AGS 331: SOIL SURVEY TECHNIQUES

INSTRUCTION: Answer all questions

TIME: 3 Hours

1. a) Using the Zambian system, determine the land capability code for the land unit shown in annex 1. (3 marks)
- b) Comment on the limitations and potentials of this land unit. (8 marks)
2. What information is included in the first five sections of a soil survey report? (12 marks)
3. Compare and contrast between Reconnaissance and Very Detailed surveys. (10 marks)
4. What are soil map units? (10 marks)
5. a) Briefly state the information that is recorded at each observation point during a soil survey. (6 marks)
- b) Explain and illustrate how the recorded information can be used in delineation of soil mapping units. (10 marks)
6. Sand content has been measured at the following ten points in a certain soil map unit:

<u>Point</u>	<u>% Sand content</u>
1	20
2	19
3	21
4	25
5	27
6	22
7	18
8	21
9	25
10	27

- a) Determine the variability in sand content (5 marks)
- b) Comment on this variability given that the maximum permissible variability must not exceed 5%. (5 marks)

7. Given that you have been hired to survey an area that is 500 hectares. The objective of this survey is to assess the suitability of the area for irrigated wheat and fish farming.

- a) What kind of survey level would you recommend and why. (6 marks)
- b) How would you ensure consistency in soil mapping units? (5 marks)

8. How useful would soil survey information be in the following fields?

- a) Agriculture
- b) Fisheries
- c) Civil engineering
- d) Sale of farm property

(10 marks)

UNIVERSITY OF ZAMBIA EXAMINATIONS

AGS 422

SOIL MICROBIOLOGY

February 2008

INSTRUCTIONS: ANSWER ANY SIX (6) QUESTIONS.

ONLY NON-PROGRAMMEABLE CALCULATORS ALLOWED

TIME: 3 HOURS

MARKS: 60

1.
 - a). Describe the enzyme system that is involved in biological nitrogen fixation [5]
 - b). Discuss how abiotic and biotic factors in symbiotic nitrogen fixing systems can be manipulated and exploited to optimize biological nitrogen fixation in cropping systems [5]
2.
 - a). Define the term "Gram Stain" [3]
 - b). Describe the cell characteristics of a Gram positive organism [7]
3.
 - a). List ten (10) commonly monitored water quality parameters [5]
 - b). Explain the mechanisms of water disinfection and purification using chlorine [5]
4.
 - a) What is meant by soil being termed a biological filter? [2]
 - b). Describe the peculiar properties of soil that make it an ideal biological filter [8]
5.
 - a). A 50 cm³ water sample was titrated with 0.05 M of acidified dichromate solution, and 15 cm³ was used up to reach the endpoint. Calculate the COD in mg of O² per dm³ [5]
 - b). Describe the processes involved in the reduction in microbe load and their safe removal in a sewage treatment plant. [5]

6. Discuss how the study of Soil Microbiology can contribute to the Agricultural Policy in Zambia [10]
7.
 - a). Outline three (3) methods of evaluating/quantifying biological nitrogen fixation in cropping systems [5]
 - b). Discuss the merits and demerits of the three common methods of evaluating/quantifying biological nitrogen fixation [5]
8. Velvet bean (*Mucuna pruriens*) containing 3.5 % N in the dry matter was used to fertilize rainfed maize in Zambia, and 6 ton ha⁻¹ was applied. If the mineralization rate of N, $k = 0.143 \text{ week}^{-1}$, and 80 % of the dry matter was potentially mineralizable per growing season:
 - a). How much dry matter residue would remain in the soil after one month residence in the soil? [4]
 - b). How much N would be mineralized during the same period? [4]
 - c). Would the N released from the residue be adequate to fertilize a crop that requires an equivalent of 2 x 50 kg bags of urea per ha? [2]
9. A certain microbe has a generation time of 4 hours, and a sample showed a colony count of 4.5×10^5 per gram. If the organism replicated by binary fission, what would be the population in six days? [10]
10.
 - a). Define the term “serial dilution” as applied to Microbiology and why it is the most appropriate in the study of microorganisms [4]
 - b). Demonstrate clearly how you would carry out a serial dilution from an original concentration of 10^{-1} to 10^{-6} . [6]

END

THE UNIVERSITY OF ZAMBIA

UNIVERSITY SECOND SEMESTER EXAMINATIONS
FEBRUARY 2008

AGS 452 PRINCIPLES OF LAND HUSBANDRY

TIME: 3 HOURS

MARKS: 100

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

1. Define the following:
 - a. Land [2 Marks]
 - b. Soil productivity [2 Marks]
 - c. Recommendation domains [2 Marks]
 - d. Contour tillage [2 Marks]
 - e. Controlled burning [2 Marks]
2. Discuss three (3) ways in which voids are lost. [5 Marks]
3. Farmers are the ultimate decision-makers on what happens on their land. Briefly discuss the different factors that affect the decisions they make. [10 Marks]
4. Briefly discuss the nature of the loss of soil structure, the evidence of loss of soil structure and methods to alleviate this. [10 Marks]
5. Discuss clearly how the marketing policies may affect positively or negatively a particular farmer in the way he/she manages the land. [10 Marks]
6. What are the main characteristics which distinguish the different types of farming (resource-poor, small scale, commercial, etc.) and why do you think these characteristics are important? [10 Marks]
7. Sometimes when better land management technologies are introduced to a community, farmers are not willing to adopt the new technologies and instead they react with apathy or antagonism. What measures would you put in place to encourage farmers to adopt new technologies? [10 Marks]
8. Prevention of land degradation is important in the management of land.
 - a. What is land degradation? [2 Marks]
 - b. Discuss the different factors of land degradation. [10 Marks]
9. Discuss the role of water or wind in the actual process of soil erosion. [8 Marks]
10. What role does placement of watering points have on level of land degradation? [5 Marks]
11. Discuss the different points you would consider when reclaiming a degraded rangeland. [10 Marks]

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS
FEBRUARY 2008

AGS 522: SOIL AND PLANT ANALYSIS

TIME: 3 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS

Marks: 100

1. Given concentrated H_2SO_4 (36 N) and HCl (10 N), how would you first prepare 2.0 N stock solutions of each, and then a single working solution that is 0.05 N H_2SO_4 and 0.025 N HCl ? Give step by step description of what you would do in the laboratory. [10]
2. What are the key issues to consider in obtaining a homogenous soil sample? Give what you consider to be best practice of these. [15]
3. Given the following soil test results, indicate your interpretations and where you would recommend fertilizer application for soil fertility balance [20]

<u>Element</u>	<u>Test Level</u>	<u>Interpretation</u>	<u>Recommend (Y or N)</u>
pH_{CaCl_2}	3.9		
EC	0.2 mS cm^{-1}		
N	0.01 g kg^{-1}		
P	3.5 mg kg^{-1}		
K	150 mg kg^{-1}		
Mg	8 mg kg^{-1}		
Ca	50 mg kg^{-1}		
S	10 mg kg^{-1}		
Zn	0.4 mg kg^{-1}		
B	1.1 mg kg^{-1}		

4. List three purposes each for soil analysis and plant analysis. [10]
5. Laboratory analysis for soil S may be done in several ways. Discuss two options for extraction and two options for analysis. [10]
6. Given the following foliar analysis data, discuss the nutrient concentration levels and suggest the symptoms that may appear if it were a maize plant. [10]

N	-	2.5 %	Zn	-	5 mg kg^{-1}
P	-	0.5 %	Mn	-	80 mg kg^{-1}
K	-	3.5 %	Fe	-	120 mg kg^{-1}
Ca	-	1.5 %	B	-	25 mg kg^{-1}
Mg	-	0.6 %	S	-	0.4%

7. In order to have a good soil testing program, soil test correlation and calibration are necessary. Discuss these concepts. [10]
8. A soil analysis gives 25 mg of P kg⁻¹. The Technician had obtained a 1 ml aliquot from the extract and had to carry out a 5x dilution to obtain this value, but not on the blank. The extract contained 5 g soil in 50 ml solution. What is the weight of P in kg ha⁻¹? (BD = 1.3 g cm⁻³, furrow slice = 20 cm). [15]

END