

THE UNIVERSITY OF ZAMBIA
UNIVERSITY EXAMINATIONS - 2001
SECOND SEMESTER EXAMINATIONS
SCHOOL OF AGRICULTURE SCIENCE

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|-----|-------------|---|--|
| 1. | AGA 222 | - | Physiology of Domestic Animals |
| 2. | AGA 322 | - | Ruminant Production ✓ |
| 3. | AGA 412 | - | Pig and Poultry Production ✓ |
| 4. | AGA 432 | - | Environmental Management for Animal Production |
| 5. | AGA 552 | - | Animal Products and By- products |
| 6. | AGA 562 | - | Applied Animal Breeding |
| 7. | AGC 312 | - | Examinations |
| 8. | AGC 322 | - | Forage crop Production and Range Management |
| 9. | AGC 332 | - | Examinations |
| 10. | AGC 342 | - | Field Crop Production |
| 11. | AGC 422 | - | Examinations |
| 12. | AGC 442 | - | Plant Breeding |
| 13. | AGC 552 | - | Examinations |
| 14. | AGC 572 | - | Examinations ✓ |
| 15. | AGE 452 | - | Intermediate Agribusiness Management |
| 16. | AGE 552 | - | Agricultural Extension Education |
| 17. | AGE 562 | - | Farm Management |
| 18. | AGE 572 | - | Advanced Agricultural Policy |
| 19. | AGF 342 | - | Food Toxicology |
| 20. | AGF 352 | - | Food Microbiology |
| 21. | AGS 322/426 | - | Soil Physics |
| 22. | AGS 331 | - | Soil Survey Techniques |
| 23. | AGS 422 | - | Soil Microbiology |
| 24. | AGS 441 | - | Agricultural Hydrology and Hydraulic |
| 25. | AGS 522 | - | Soil and Plant Analysis |
| 26. | AGS 562 | - | Management of Irrigation and drainage Systems. |
| 27. | AE 512 | - | Agricultural Machinery Design |
| 28. | AE 522 | - | Farm Structures II |

THE UNIVERSITY OF ZAMBIA EXAMINATION

JULY, 2001

COURSE: AGA 222 PHYSIOLOGY OF DOMESTIC ANIMALS

TIME: 3 HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER 3 QUESTIONS

1. Write notes on any 5 of the following: (8 marks each)
 - a. Nervous control of blood flow.
 - b. Transport of carbon dioxide and oxygen in blood.
 - c. Compare and contrast simple diffusion and facilitated diffusion giving examples of each type of diffusion in the body of an animal.
 - d. Transport of semen in the female reproductive tract.
 - e. Puberty in the female and male cow.
 - f. Kidney regulation of sodium.
 - g. Regulation of gastric juice secretion.
 - h. Factors affecting milk fat.

2. Define vital capacity. Given the following young man's measurements:

Inspiratory Reserve Volume = 1.1 litres,

Tidal Volume = 0.5 litres,

Expiratory Volume = 0.8 litres.

Residual Volume = 0.5 litres

- a. Calculate his Vital Capacity.
 - b. What does the answer tell you about this man?
 - c. What is residual volume and what does it signify?
3. Almost all physiological actions of body systems are regulated by the nervous system through a series of actions initiated by a stimulus which generates an impulse which is propagated to a reflex center and on to the effector organs.
 - a. How is the nervous impulse to cold temperature (-20 C) generated and propagated? (10)
 - b. What reflex center will this impulse (above) be integrated from? (2)
 - c. What other actions does this reflex center coordinate? (3)
 - d. List the actions of the body that will be generated by the cold stimulus? (5)
4. Buffer systems of the body help keep internal body environment constant.

- a. What are the major buffer systems of the body and where are they active? (6)
 - b. Compare and contrast causes and effects of metabolic and respiratory acidosis? (8)
 - c. How does the body respond to metabolic and respiratory acidosis? (6)
5. Profit from cattle farming requires that the cows calve every year.
- a. What signs does a cow show that she is in estrus? (4)
 - b. If mating occurs, what prevents the egg from being fertilized by many sperms (polyspermy) (4)
 - c. What events signal approaching parturition in a cow? (4)
 - d. Describe the stages of labour. (8)

GOOD LUCK

THE UNIVERSITY OF ZAMBIA

END OF SEMESTER EXAMINATIONS – JULY/AUGUST, 2001.

COURSE AGA 322 – RUMINANT PRODUCTION

TIME ALLOWED: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

- a) All questions carry equal marks (20).
 - b) Answer any five (5) questions, at least one from each section.
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SECTION A –BEEF PRODUCTION

- Q. 1 Write notes on the following:
- a) The factors that may affect the calving percentage in a given beef herd in Zambia, and
 - b) Discuss the merits demerits of the use of the summer breeding season in any given beef herd in Zambia.
- Q.2 Write notes on the following:
- a) What do you understand by the terms ‘cyclic growth’ as opposed to ‘compensatory growth’? What are their causes?
 - b) Discuss the characteristics of the *Bos indicus* breeds of cattle that make them more suitable to rear in tropical countries, such as Zambia, as opposed to the *Bos taurus* breeds of cattle. List down *the Bos indicus* breeds of cattle that are indigenous in Zambia.

SECTION B – SHEEP AND GOAT PRODUCTION

- Q. 3 Write notes on the following:
- a) Discuss the factors that may affect the dry matter intake of Sheep and Goats on a farm of your choice in Zambia, and
 - b) Discuss the factors you would put into consideration when selecting female breeding or replacement stock in any flock of Sheep and Goats.
- Q. 4 Write notes on the following:
- a) Discuss the reasons why sheep and goats are compatible to rear together on a farm, than either of them with any other type of livestock, and
 - b) Discuss the merits and demerits of the various breeding seasons that are used in Zambia. Which breeding season would you recommend, with reasons, for use by Zambian commercial farmers?

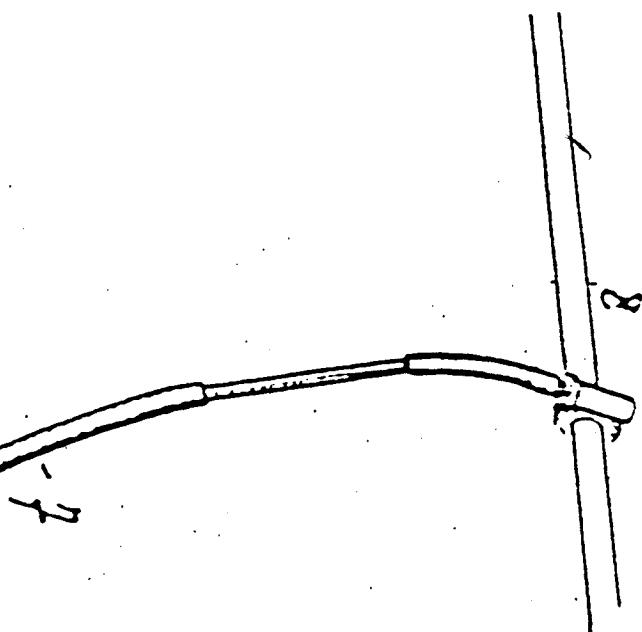
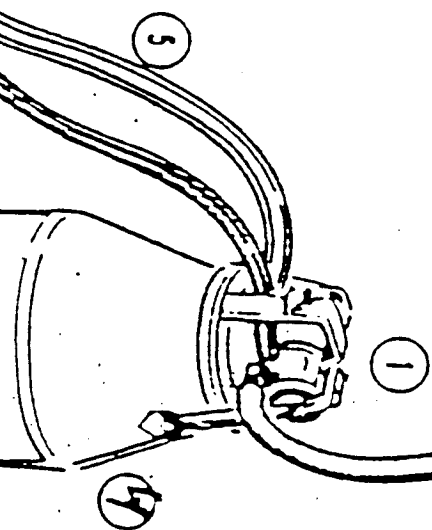
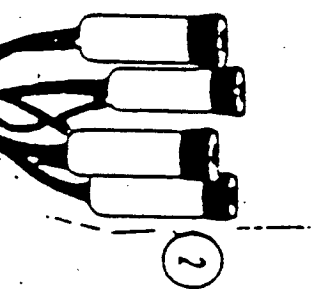
SECTION C – DAIRY PRODUCTION

- Q. 5 A new investor who has come to Zambia for the first time would like to start a dairy enterprise in Lundazi District in the Eastern province after finding out that the soils there are very rich and the area has very excellent for use as grazing lands. He approaches you as a graduate from the School of Agriculture, UNZA to carry out feasibility studies on the possibilities of investing in Lundazi, discuss the strengths and weaknesses if investing there and make recommendations to him based on your findings.
- Q.6
- a) Graphically illustrate and discuss the relationship of pressure in the udder to the milk secretion rate hours after milking;
 - c) Discuss the routine work and handling of animals in the milking parlour; and
 - d) Complete labeling the parts of the milking machine on the paper attached herewith.

SECTION D – RABBIT PRODUCTION

- Q.7
- a) Discuss the processing and grading of pelt skins from rabbits. ✓
 - b) Mention the advantages of rabbit farming over the other livestock. ✓
 - c) A hutch is one of the types of housing for rabbits. Discuss this type of housing indicating its dimensions. ✓
- Q.8 Write down the symptoms and control of the following diseases:
- a) Ear-canker ✓
 - b) Snuffles
 - c) Coccidiosis

END OF EXAMINATION



THE UNIVERSITY OF ZAMBIA
END OF SECOND SEMESTER EXAMINATIONS
JULY – AUGUST 2001

COURSE AGA 412 –PIG AND POULTRY PRODUCTION

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

- 1. Answer the two sections (Section A and Section B) in separate booklets**
 - 2. Answer all questions.**
 - 3. All questions carry equal marks.**
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Section A

1. Describe the following:
 - i) two main mating systems employed in pig production.
 - ii) main selection points for a breeding boar.
 - iii) differences in the management of pork and bacon producing pigs.
2. Discuss the management of a litter of piglets from farrowing to weaning.

Section B

1. The Director of an NGO has requested you to provide notes on “Preparation for broiler chicks and brooding”, for a women’s group fund raising project. Prepare the notes for the project.
2. A retrenched company executive has just bought 500 point of lay pullets. He comes to you for advice on how to determine when to sell off the birds after their laying period is over. What advice would you give him?
3. Coccidiosis and ascites are poultry health problems which can be controlled by good management. Explain how this is possible.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

END OF SECOND SEMESTER EXAMINATIONS

JULY – AUGUST 2001

COURSE AGA 432 – ENVIRONMENTAL MANAGEMENT FOR ANIMAL PRODUCTION

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

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

- Q.1** A farmer comes to you with the complaint that her three (3) week old broiler chicks are not growing as quickly as she expects them to. Upon visiting her poultry unit you discover that the chicks spend most of the time huddled together. What advice would you give the farmer? What is your explanation, in relation to physiology, for the slow growth of the chicks? What other factors would cause reduced growth rate of the chicks.
- Q.2** Many farmers in Southern Zambia have lost their cattle due to corridor disease. Out of desperation for draft power, some of these farmers are using cows to plough their fields. What advice would you give a farmer whom you found forcing a pregnant cow to plough in the middle of a hot day? What is the physiological basis for your advice?
- Q.3** Environmental pollution is an issue of global concern. What air pollutants are produced in the environment of housed animals/birds? How are they produced and what measures can be taken to minimize production of these gases? What effects do these gases have on housed animals/birds?
- Q.4** Chemical disinfection is one method of ensuring a disease free environment for housed animals. Which (3) types of chemical disinfectants would you recommend for use in disinfecting animal houses? Give reasons for your recommendations.
- Q.5** What effects does the presence of grazing livestock have on rangeland soil? What implications do these effects have on management of the range and the livestock.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SECOND SEMESTER EXAMINATIONS (JULY/AUGUST 2001)

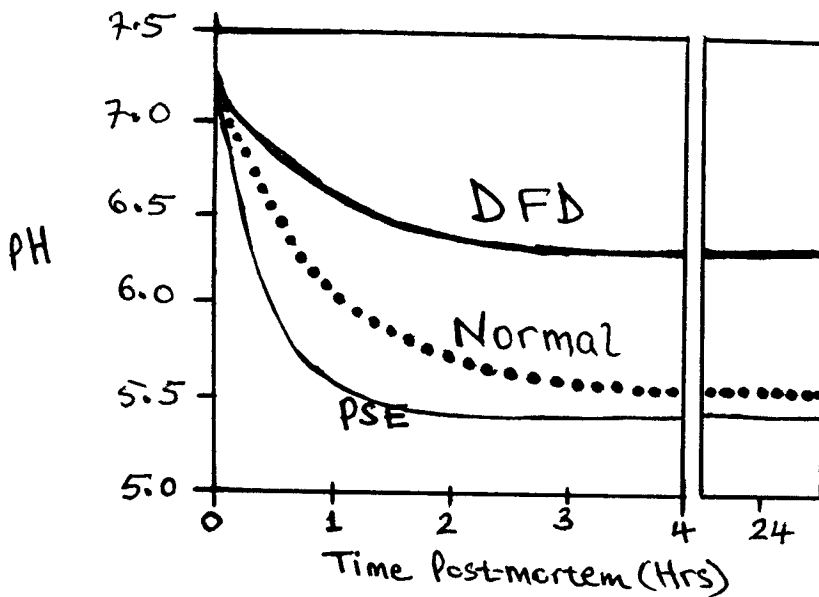
AGA 552
ANIMAL PRODUCTS AND BY-PRODUCTS

TIME ALLOWED: 3 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS.

Q1. (25 POINTS)

The figure below shows the pH drop of muscle as it is converted to meat following slaughter of a steer.



- Explain what the terms "Normal", "DFD" and "PSE" mean with respect to meat quality.
- As the pH drops to its normal value of 5.4 to 5.7, it approaches the isoelectric point of the major myofibrillar proteins. Describe what happens to the water holding capacity during this process.
- Describe the physiological role of the catecholamines in DFD and PSE meat.
- Glucidic Potential (GP) is defined as the sum of glycogen and its major metabolites from anaerobic glycolysis (glucose, glucose-6-phosphate, and lactate). What are the implications of high and low GP in relation to the ultimate pH?

- e) A pig farmer from Chisamba needs some expert advice. Out of the 200 pigs he has delivered to ZAPP for slaughter, 39% have yielded PSE meat. Please provide the advice.

Q2. (20 POINTS)

- a) The most important aspect of meat quality is eating quality, i.e. the level of overall eating satisfaction. Discuss the possible role(s) of marbling fat in controlling the eating quality of meat.
- b) Briefly discuss the factors that affect the fat content of meat (and subsequently meat quality).

Q3. (15 POINTS)

Milk can be defined as the normal mammary secretion, free of colostrum and obtained from the mammary gland of the cow, genus *Bos*, and shall contain not less than 3% fat and 8.5% solids-not-fat.

- a) What are the major components of milk? Which of these can easily be altered and why?
- b) Discuss (in detail) the factors that can influence the composition of milk?

Q4. (20 POINTS)

- a) What is milk adulteration and what are the available practical methods of determining it?
- b) Briefly discuss off-flavours that may appear in milk.

Q5. (20 POINTS)

- a) What are the main defects and faults found in hides and skins?
- b) Write short notes on the following:
- (i) Wet-salting
 - (ii) Dry-salting
 - (iii) Brine cure
 - (iv) Tanning

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END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

UNIVERSITY SECOND SEMESTER EXAMINATIONS – JULY 2001

APPLIED ANIMAL BREEDING (AGA 562)

TIME: **THREE (3) HOURS**

INSTRUCTIONS: **ANSWER QUESTION 1 AND ANY OTHER FOUR (4)**

1. Since coming to UNZA 7 years ago, Mr Graduate Punzilani had not gone to the village. After obtaining his B.Sc. Agric. degree, he decided to go home so that his parents and relatives could be proud of his achievement. After all the ceremonies were over, Graduate decided to head back to Lusaka to look for a job. His grandmother gave him her most prized possession, a cock, which he named Mr. Rooster (**R**). When graduate reached Lusaka, he realized that he had no pots, so he decided to keep Mr. Rooster; besides, he also wanted Mr. Rooster to remind him of his grandmother's generosity. To keep Mr. Rooster company Graduate bought a hen, Ms. Helen (**H**). Mr. Rooster and Ms. Helen were very happy together. They had 6 chicks (3 males and 3 females). One night, the neighbor's dog had a sumptuous late dinner by feasting on all the 3 cockrels and 1 pullet, leaving only 2 pullets, Pulletsy (**P**) and Betsy (**B**). Mr. Rooster had an affair with Cathy (**C**), one of the neighbor's hens. From this affair was born Leghorn (**L**), a white feathered cockrel and agemates with Pulletsy and Betsy. Leghorn mated with Pulletsy, and Gertrude (**G**) a neighbor's hen, and produced Sony (**S**) and Keti (**K**), a cockrel and pullet respectively. Sony mated with Idah (**I**), another neighbor's hen, and Keti and produced Mimie (**M**) and Nancy (**N**) respectively. Nancy mated with Oscar (**O**), a neighbor's cock, and produced Queen (**Q**), while Mimie mated with Andy (**A**) and produced Jimmy (**J**). Jimmy and Queen mated to produce Xavier (**X**). Betsy mated with Tom (**T**), a neighbor's cock and produced Andy.
- a. Sketch the pedigree in this tale of Graduate's chickens (12 marks)
- b. Calculate the inbreeding coefficient of Xavier (F_x) (12 marks)
- c. Calculate R_{JQ} (16 marks)

2. a. Explain the effect you believe that the practice of inbreeding has on the frequency of recessive lethal genes, the incidence of genetic abnormalities, and the likeness between herds within a purebred breed.
- b. Should a commercial calf producer practice inbreeding? Give reasons for your answer.
- c. Explain why mutation is not a potent force in changing gene frequency in most economically important species.

3. The average adjusted weaning weight (AWW) in a cattle herd is 200kg and the standard deviation is 20kg. It is assumed that many loci are involved in the genetic variation of the trait. The effects of genes are:

Additive effects

$$A = B = C = D = E = F = 1$$

$$a = b = c = d = e = f = 0$$

Dominance effects

$$A = B = C = D = E = F = 1$$

$$aa = bb = cc = dd = ee = ff = -1$$

Epistatic effects

Assume there are no epistatic effects.

- a. Three calves have the following genotypes:

<u>Calf # 1</u>	<u>Calf # 2</u>	<u>Calf # 3</u>
ABCdEF	aBBdeF	ABCDEf
a Bc dEF	a bCdeF	a b c Def

i) Average Breeding Value	_____	_____	_____
ii) Non-additive Value	_____	_____	_____
iii) Genotypic Value	_____	_____	_____

- b. If all three calves were raised under the same environment, how would you expect them to rank in performance?
4. a. Explain three (3) genetic causes (refer to gene action) for heterosis or 'hybrid vigor'.
- b. Daily milk yield records of close relatives of a bull used to sire F_1 's:
- 22.6, 19.8, 20.2, 24.4, 23.0 kg
- Daily milk yield records for cows: 25.2, 18.1, 14.2, 16.2, 20.4, 17.5 kg
- Daily milk yield records for F_1 's : 25.4, 31.0, 26.3, 32.7, 24.6 kg
- Calculate the hybrid vigor (heterosis).
5. Outline three circumstances under which Pedigree Selection is used in lieu of Individual Selection. What are its (Pedigree Selection) main disadvantages?
6. Briefly describe the terminal cross breeding system, outlining its advantages and disadvantages.

END OF EXAMINATION

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

SECOND SEMESTER FINAL EXAMINATIONS –JULY 2001

COURSE: AGC 312

TIME: THREE (3) HOURS

**INSTRUCTIONS: Read Instructions Carefully.
Answer all Questions.
Use Separate Answer Sheets for Each Section.**

SECTION 1: PLANT PATHOLOGY

Question 1. (25 points)

Why are plant viruses different from other biotic disease causing organisms.

Question 2. (25 points)

Which classes of people are affected by plant diseases? Give reasons to support your answer.

SECTION 2: WEED SCIENCE

Question 1. (15 points)

- a. Define a weed.
- b. Differentiate between primary and secondary dormancy.
- c. Discuss weed seed germination.
- d. List 5 monocotyledonous weeds, 5 dicotyledonous weeds found in the field station and 3 parasitic weeds by scientific name.

Question 2 (20 points)

- a. Define preventive weed control.
- b. List the various ways of classifying weeds.
- c. Enumerate the indirect losses caused by weeds.
- d. Differentiate between weed eradication and weed management.

SECTION 3: ENTOMOLOGY

Question 1. (15 points)

Outline ways of identifying an unknown insect and discuss the problems associated with insect identification.

END OF EXAM

THE UNIVERSITY OF ZAMBIA
SECOND SEMESTER EXAMINATIONS – July –August 2001
AGC 322
FORAGE CROP PRODUCTION AND RANGE MANAGEMENT

Time: Three (3) hours

Instruction: Questions one and two are compulsory where as you have the choice to answer either part (a) or (b) of question three.

1 A bill that seek to outlaw the use of fire on Zambian rangelands has been tabled before the 7th session of the August House. The Chairman of the Parliamentary Standing Committee on Agriculture and Natural Resources has taken upon himself to seek your expert advice on this bill so that the House may be properly guided on this issue. Outline your technical advice on the bill. (20 Marks)

2 A farmer wishes to embark on a pasture improvement programme in readiness for a 50 Hostein-Friesian cowherd he intends to bring from Mazabuka. He has approached you to give him technical advice on his programme. Could you outline the advice you would offer him. (20 Marks).

3 (a) write brief notes on the following: (5 marks each)

- i) The importance joint and multiple use of rangelands
- ii) Tannins
- iii) Oxalate poisoning
- iv) Severity and frequency of cut on pasture productivity

(b) Briefly outline the options that a dairy farmer could use to ensure continuity of feed supply for his enterprise. (20 marks)

THE UNIVERSITY OF ZAMBIA
SECOND SEMESTER EXAMINATIONS – July –August 2001
AGC 322
FORAGE CROP PRODUCTION AND RANGE MANAGEMENT

Time: Three (3) hours

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THE UNIVERSITY OF ZAMBIA
DEPARTMENT OF CROP SCIENCE
SECOND SEMESTER FINAL EXAMINATIONS-JULY 2001

COURSE: AGC 332

TIME: 3 HOURS

INSTRUCTIONS: READ ALL QUESTIONS CAREFULLY

ANSWER QUESTION 1 AND ANY OTHER TWO QUESTIONS

Question 1 (50 points)

Imagine you are an expert in Plant Pathology and you are invited to the University of Zambia as Guest Lecturer to give a lecture on plant disease control. What strategic control measures are you going to include in your notes. Explain the procedure you would undertake in detail.

Question 2 (25 points)

What is disease epidemiology? Explain in detail how the following affect development of an epidemic:

- a. Pathogen factors
- b. Host factors
- c. Environmental factors
- d. Man.

Question 3

Question 3a (10 points)

Draw and label the following:

- i. Pycnidium
- ii. Apothecium
- iii. Acervulus
- iv. Perithecium
- v. Cleistothecium.

Question 3b (10 points)

Explain the following in detail:

- i. True resistance
- ii. Horizontal resistance
- iii. Vertical resistance.

Question 3c (5 points)

Bacteria have several genera. List the most important ones in plant pathology. For each genus give one disease as an example.

Question 4 (25 points)

Write short notes on the following:

- a. Ectoparasitic nematodes
- b. Endoparasitic nematodes
- c. Monocyclic diseases
- d. Bimodal curve
- e. Disease gradient curve
- f. Saturation curve
- g. Sigmoid curve
- h. Isolation of nematodes.

END OF EXAM

UNIVERSITY OF ZAMBIA.
SCHOOL OF AGRICULTURAL SCIENCES.
CROP SCIENCE DEPARTMENT.
FINAL EXAMINATION.

COURSE NAME: FIELD CROP PRODUCTION
COURSE CODE: AGC342

INSTRUCTIONS.

Answer question one and three other questions. Question one is COMPULSORY. Marks for each question are indicated.

Q1 (40 points)

- a) Define farming system and discuss its importance giving Zambia as an example.
- b) Discuss photosynthesis in relation to crop production with particular reference to C3 and C4 plants.
- c) Define drought and discuss drought escaping mechanisms.
- d) Enumerate the indirect pest control methods.
- e) Describe the family Gramineae giving concrete examples.

Q2 (20 points)

- a) Define the following: equilibrium position, economic injury level and economic threshold.
- b) List the subfamilies in Leguminosae and discuss the important products of the major subfamily with examples of crops in each.
- c) What are the deficiency symptoms for potassium and iron.

Q3 (20 points)

- a) Differentiate between a key pest, an occasional pest, a perennial pest and a severe pest.
- b) What are the main uses of *Helianthus annuus*?
- c) Discuss the effects of heat on crop production.
- d) Define the following: physiotype, therapeutant, spreader, pathotype and host.

Q4 (20 points)

- a) Discuss response to damage in crop protection with particular reference to assessment techniques.
- b) In which family do these crops belong; *Camellia sinensis*, *Voandzeia subterranea*, *Chloris gayana*, *Avena sativa*, *Gycine max*?
- c) What are halophytic plants?
- d) List five categories of fungicides.

Q5 (20 points)

- a) Describe the two types of life cycles for insect pests and name four important orders of insect pests.
- b) Differentiate between *Oryza sativa* and *Oryza glaberrima*.
- c) Describe the characteristics and management of silt soils.
- d) Discuss breeding for resistance.

**UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF CROP SCIENCE**

SECOND SEMESTER EXAMINATIONS - JULY 2001

COURSE: AGC 422

TIME: THREE(3) HOURS

INSTRUCTIONS: Answer all Questions.

Question 1 (30 points)

A retiree would like to go into protected cultivations to produce horticultural crops. Advise her on the structures she needs to build and the climatic controls she needs to put in place for the success of this enterprise. What would be the constraints faced by such a farmer?

Question 2 (15 points)

Write short notes on the following giving examples as far as possible:-

- a. Rotation
- b. Hardening
- c. Dedifferentiation and Totipotency.

Question 3 (15 points)

In order to improve the productivity of the soils, a farmer needs to take certain measures. Discuss this statement.

Question 4 (25 points)

Give production recommendations for a farmer who intends to grow tomatoes for the first time.

Question 5 (15 points)

Describe the following diseases/pests indicating the crop(s) attacked and also advise on the control:

- a. Blight
- b. Thrips
- c. Damping off.

END OF EXAM

THE UNIVERSITY OF ZAMBIA EXAMINATION JULY, 2001

COURSE: AGA 222 PHYSIOLOGY OF DOMESTIC ANIMALS

TIME: 3 HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER 3 QUESTIONS

1. Write notes on any 5 of the following: (8 marks each)
 - a. Nervous control of blood flow.
 - b. Transport of carbon dioxide and oxygen in blood.
 - c. Compare and contrast simple diffusion and facilitated diffusion giving examples of each type of diffusion in the body of an animal.
 - d. Transport of semen in the female reproductive tract.
 - e. Puberty in the female and male cow.
 - f. Kidney regulation of sodium.
 - g. Regulation of gastric juice secretion.
 - h. Factors affecting milk fat.
2. Define vital capacity. Given the following young man's measurements:

Inspiratory Reserve Volume = 1.1 litres,
Tidal Volume = 0.5 litres,
Expiratory Volume = 0.8 litres.
Residual Volume = 0.5 litres

 - a. Calculate his Vital Capacity.
 - b. What does the answer tell you about this man?
 - c. What is residual volume and what does it signify?
3. Almost all physiological actions of body systems are regulated by the nervous system through a series of actions initiated by a stimulus which generates an impulse which is propagated to a reflex center and on to the effector organs.
 - a. How is the nervous impulse to cold temperature (-20 C) generated and propagated? (10)
 - b. What reflex center will this impulse (above) be integrated from? (2)
 - c. What other actions does this reflex center coordinate? (3)
 - d. List the actions of the body that will be generated by the cold stimulus? (5)
4. Buffer systems of the body help keep internal body environment constant.

- a. What are the major buffer systems of the body and where are they active? (6)
 - b. Compare and contrast causes and effects of metabolic and respiratory acidosis? (8)
 - c. How does the body respond to metabolic and respiratory acidosis? (6)
5. Profit from cattle farming requires that the cows calve every year.
- a. What signs does a cow show that she is in estrus? (4)
 - b. If mating occurs, what prevents the egg from being fertilized by many sperms (polyspermy) (4)
 - c. What events signal approaching parturition in a cow? (4)
 - d. Describe the stages of labour. (8)

GOOD LUCK

THE UNIVERSITY OF ZAMBIA

END OF SEMESTER EXAMINATIONS – JULY/AUGUST, 2001.

COURSE AGA 322 – RUMINANT PRODUCTION

TIME ALLOWED: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

- a) All questions carry equal marks (20).
- b) Answer any five (5) questions, at least one from each section.

SECTION A –BEEF PRODUCTION

- Q. 1 Write notes on the following:
- a) The factors that may affect the calving percentage in a given beef herd in Zambia, and
 - b) Discuss the merits demerits of the use of the summer breeding season in any given beef herd in Zambia.
- Q.2 Write notes on the following:
- a) What do you understand by the terms ‘cyclic growth’ as opposed to ‘compensatory growth’? What are their causes?
 - b) Discuss the characteristics of the *Bos indicus* breeds of cattle that make them more suitable to rear in tropical countries, such as Zambia, as opposed to the *Bos taurus* breeds of cattle. List down *the Bos indicus* breeds of cattle that are indigenous in Zambia.

SECTION B – SHEEP AND GOAT PRODUCTION

- Q. 3 Write notes on the following:
- a) Discuss the factors that may affect the dry matter intake of Sheep and Goats on a farm of your choice in Zambia, and
 - b) Discuss the factors you would put into consideration when selecting female breeding or replacement stock in any flock of Sheep and Goats.
- Q. 4 Write notes on the following:
- a) Discuss the reasons why sheep and goats are compatible to rear together on a farm, than either of them with any other type of livestock, and
 - b) Discuss the merits and demerits of the various breeding seasons that are used in Zambia. Which breeding season would you recommend, with reasons, for use by Zambian commercial farmers?

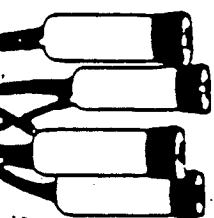
SECTION C – DAIRY PRODUCTION

- Q. 5 A new investor who has come to Zambia for the first time would like to start a dairy enterprise in Lundazi District in the Eastern province after finding out that the soils there are very rich and the area has very excellent for use as grazing lands. He approaches you as a graduate from the School of Agriculture, UNZA to carry out feasibility studies on the possibilities of investing in Lundazi, discuss the strengths and weaknesses if investing there and make recommendations to him based on your findings.
- Q.6
- a) Graphically illustrate and discuss the relationship of pressure in the udder to the milk secretion rate hours after milking;
 - c) Discuss the routine work and handling of animals in the milking parlour; and
 - d) Complete labeling the parts of the milking machine on the paper attached herewith.

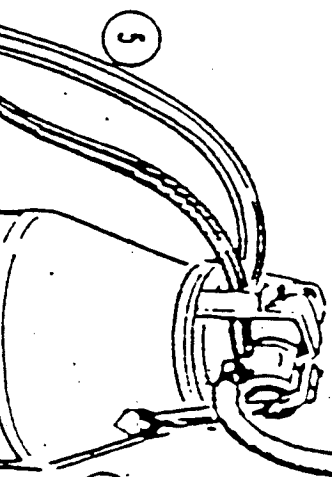
SECTION D – RABBIT PRODUCTION

- Q.7
- a) Discuss the processing and grading of pelt skins from rabbits.
 - b) Mention the advantages of rabbit farming over the other livestock.
 - c) A hutch is one of the types of housing for rabbits. Discuss this type of housing indicating its dimensions.
- Q.8 Write down the symptoms and control of the following diseases:
- a) Ear-canker
 - b) Snuffles
 - c) Coccidiosis

END OF EXAMINATION



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THE UNIVERSITY OF ZAMBIA
END OF SECOND SEMESTER EXAMINATIONS
JULY – AUGUST 2001

COURSE AGA 412 –PIG AND POULTRY PRODUCTION

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

- 1. Answer the two sections (Section A and Section B) in separate booklets**
 - 2. Answer all questions.**
 - 3. All questions carry equal marks.**
-

Section A

1. Describe the following:
 - i) two main mating systems employed in pig production.
 - ii) main selection points for a breeding boar.
 - iii) differences in the management of pork and bacon producing pigs.
2. Discuss the management of a litter of piglets from farrowing to weaning.

Section B

1. The Director of an NGO has requested you to provide notes on “Preparation for broiler chicks and brooding”, for a women’s group fund raising project. Prepare the notes for the project.
2. A retrenched company executive has just bought 500 point of lay pullets. He comes to you for advice on how to determine when to sell off the birds after their laying period is over. What advice would you give him?
3. Coccidiosis and ascites are poultry health problems which can be controlled by good management. Explain how this is possible.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

END OF SECOND SEMESTER EXAMINATIONS

JULY – AUGUST 2001

**COURSE AGA 432 – ENVIRONMENTAL MANAGEMENT FOR
ANIMAL PRODUCTION**

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

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

- Q.1** A farmer comes to you with the complaint that her three (3) week old broiler chicks are not growing as quickly as she expects them to. Upon visiting her poultry unit you discover that the chicks spend most of the time huddled together. What advice would you give the farmer? What is your explanation, in relation to physiology, for the slow growth of the chicks? What other factors would cause reduced growth rate of the chicks.
- Q.2** Many farmers in Southern Zambia have lost their cattle due to corridor disease. Out of desperation for draft power, some of these farmers are using cows to plough their fields. What advice would you give a farmer whom you found forcing a pregnant cow to plough in the middle of a hot day? What is the physiological basis for your advice?
- Q.3** Environmental pollution is an issue of global concern. What air pollutants are produced in the environment of housed animals/birds? How are they produced and what measures can be taken to minimize production of these gases? What effects do these gases have on housed animals/birds?
- Q.4** Chemical disinfection is one method of ensuring a disease free environment for housed animals. Which (3) types of chemical disinfectants would you recommend for use in disinfecting animal houses? Give reasons for your recommendations.
- Q.5** What effects does the presence of grazing livestock have on rangeland soil? What implications do these effects have on management of the range and the livestock.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SECOND SEMESTER EXAMINATIONS (JULY/AUGUST 2001)

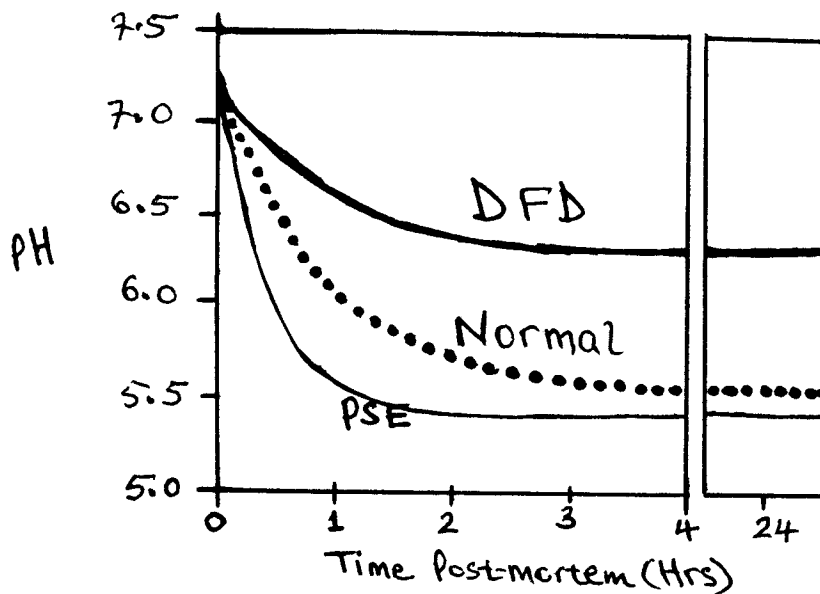
AGA 552
ANIMAL PRODUCTS AND BY-PRODUCTS

TIME ALLOWED: 3 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS.

Q1. (25 POINTS)

The figure below shows the pH drop of muscle as it is converted to meat following slaughter of a steer.



- Explain what the terms "Normal", "DFD" and "PSE" mean with respect to meat quality.
- As the pH drops to its normal value of 5.4 to 5.7, it approaches the isoelectric point of the major myofibrillar proteins. Describe what happens to the water holding capacity during this process.
- Describe the physiological role of the catecholamines in DFD and PSE meat.
- Glucidic Potential (GP) is defined as the sum of glycogen and its major metabolites from anaerobic glycolysis (glucose, glucose-6-phosphate, and lactate). What are the implications of high and low GP in relation to the ultimate pH?

- e) A pig farmer from Chisamba needs some expert advice. Out of the 200 pigs he has delivered to ZAPP for slaughter, 39% have yielded PSE meat. Please provide the advice.

Q2. (20 POINTS)

- a) The most important aspect of meat quality is eating quality, i.e. the level of overall eating satisfaction. Discuss the possible role(s) of marbling fat in controlling the eating quality of meat.
- b) Briefly discuss the factors that affect the fat content of meat (and subsequently meat quality).

Q3. (15 POINTS)

Milk can be defined as the normal mammary secretion, free of colostrum and obtained from the mammary gland of the cow, genus *Bos*, and shall contain not less than 3% fat and 8.5% solids-not-fat.

- a) What are the major components of milk? Which of these can easily be altered and why?
- b) Discuss (in detail) the factors that can influence the composition of milk?

Q4. (20 POINTS)

- a) What is milk adulteration and what are the available practical methods of determining it?
- b) Briefly discuss off-flavours that may appear in milk.

Q5. (20 POINTS)

- a) What are the main defects and faults found in hides and skins?
- b) Write short notes on the following:
- (i) Wet-salting
 - (ii) Dry-salting
 - (iii) Brine cure
 - (iv) Tanning

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END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

UNIVERSITY SECOND SEMESTER EXAMINATIONS – JULY 2001 **APPLIED ANIMAL BREEDING (AGA 562)**

TIME: **THREE (3) HOURS**

INSTRUCTIONS: **ANSWER QUESTION 1 AND ANY OTHER FOUR (4)**

1. Since coming to UNZA 7 years ago, Mr Graduate Punzilani had not gone to the village. After obtaining his B.Sc. Agric. degree, he decided to go home so that his parents and relatives could be proud of his achievement. After all the ceremonies were over, Graduate decided to head back to Lusaka to look for a job. His grandmother gave him her most prized possession, a cock, which he named Mr. Rooster (**R**). When graduate reached Lusaka, he realized that he had no pots, so he decided to keep Mr. Rooster; besides, he also wanted Mr. Rooster to remind him of his grandmother's generosity. To keep Mr. Rooster company Graduate bought a hen, Ms. Helen (**H**). Mr. Rooster and Ms. Helen were very happy together. They had 6 chicks (3 males and 3 females). One night, the neighbor's dog had a sumptuous late dinner by feasting on all the 3 cockrels and 1 pullet, leaving only 2 pullets, Pulletsy (**P**) and Betsy (**B**). Mr. Rooster had an affair with Cathy (**C**), one of the neighbor's hens. From this affair was born Leghorn (**L**), a white feathered cockrel and agemates with Pulletsy and Betsy. Leghorn mated with Pulletsy, and Gertrude (**G**) a neighbor's hen, and produced Sony (**S**) and Keti (**K**), a cockrel and pullet respectively. Sony mated with Idah (**I**), another neighbor's hen, and Keti and produced Mimie (**M**) and Nancy (**N**) respectively. Nancy mated with Oscar (**O**), a neighbor's cock, and produced Queen (**Q**), while Mimie mated with Andy (**A**) and produced Jimmy (**J**). Jimmy and Queen mated to produce Xavier (**X**). Betsy mated with Tom (**T**), a neighbor's cock and produced Andy.

- a. Sketch the pedigree in this tale of Graduate's chickens (12 marks)
- b. Calculate the inbreeding coefficient of Xavier (F_x) (12 marks)
- c. Calculate R_{JQ} (16 marks)

b. If all three calves were raised under the same environment, how would you expect them to rank in performance?

4. a. Explain three (3) genetic causes (refer to gene action) for heterosis or 'hybrid vigor'.

b. Daily milk yield records of close relatives of a bull used to sire F_1 's:

22.6, 19.8, 20.2, 24.4, 23.0 kg

Daily milk yield records for cows: 25.2, 18.1, 14.2, 16.2, 20.4, 17.5 kg

Daily milk yield records for F_1 's : 25.4, 31.0, 26.3, 32.7, 24.6 kg

Calculate the hybrid vigor (heterosis).

5. Outline three circumstances under which Pedigree Selection is used in lieu of Individual Selection. What are its (Pedigree Selection) main disadvantages?

6. Briefly describe the terminal cross breeding system, outlining its advantages and disadvantages.

END OF EXAMINATION

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

SECOND SEMESTER FINAL EXAMINATIONS –JULY 2001

COURSE: AGC 312

TIME: THREE (3) HOURS

**INSTRUCTIONS: Read Instructions Carefully.
Answer all Questions.
Use Separate Answer Sheets for Each Section.**

SECTION 1: PLANT PATHOLOGY

Question 1.(25 points)

Why are plant viruses different from other biotic disease causing organisms.

Question 2.(25 points)

Which classes of people are affected by plant diseases? Give reasons to support your answer.

SECTION 2: WEED SCIENCE

Question 1. (15 points)

- a. Define a weed.
- b. Differentiate between primary and secondary dormancy.
- c. Discuss weed seed germination.
- d. List 5 monocotyledonous weeds, 5 dicotyledonous weeds found in the field station and 3 parasitic weeds by scientific name.

Question 2 (20 points)

- a. Define preventive weed control.
- b. List the various ways of classifying weeds.
- c. Enumerate the indirect losses caused by weeds.
- d. Differentiate between weed eradication and weed management.

SECTION 3: ENTOMOLOGY

Question 1. (15 points)

Outline ways of identifying an unknown insect and discuss the problems associated with insect identification.

END OF EXAM

THE UNIVERSITY OF ZAMBIA
DEPARTMENT OF CROP SCIENCE
SECOND SEMESTER FINAL EXAMINATIONS-JULY 2001

COURSE: AGC 332

TIME: 3 HOURS

INSTRUCTIONS: READ ALL QUESTIONS CAREFULLY

ANSWER QUESTION 1 AND ANY OTHER TWO QUESTIONS

Question 1 (50 points)

Imagine you are an expert in Plant Pathology and you are invited to the University of Zambia as Guest Lecturer to give a lecture on plant disease control. What strategic control measures are you going to include in your notes. Explain the procedure you would undertake in detail.

Question 2 (25 points)

What is disease epidemiology? Explain in detail how the following affect development of an epidemic:

- a. Pathogen factors
- b. Host factors
- c. Environmental factors
- d. Man.

Question 3

Question 3a (10 points)

Draw and label the following:

- i. Pycnidium
- ii. Apothecium
- iii. Acervulus
- iv. Perithecium
- v. Cleistothecium.

Question 3b (10 points)

Explain the following in detail:

- i. True resistance
- ii. Horizontal resistance
- iii. Vertical resistance.

Question 3c (5 points)

Bacteria have several genera. List the most important ones in plant pathology. For each genus give one disease as an example.

Question 4 (25 points)

Write short notes on the following:

- a. Ectoparasitic nematodes
- b. Endoparasitic nematodes
- c. Monocyclic diseases
- d. Bimodal curve
- e. Disease gradient curve
- f. Saturation curve
- g. Sigmoid curve
- h. Isolation of nematodes.

END OF EXAM

UNIVERSITY OF ZAMBIA.

SCHOOL OF AGRICULTURAL SCIENCES.

CROP SCIENCE DEPARTMENT.

FINAL EXAMINATION.

COURSE NAME: FIELD CROP PRODUCTION

COURSE CODE: AGC342

INSTRUCTIONS.

Answer question one and three other questions. Question one is COMPULSORY. Marks for each question are indicated.

Q1 (40 points)

- Define farming system and discuss its importance giving Zambia as an example.
- Discuss photosynthesis in relation to crop production with particular reference to C3 and C4 plants.
- Define drought and discuss drought escaping mechanisms.
- Enumerate the indirect pest control methods.
- Describe the family Gramineae giving concrete examples.

Q2 (20 points)

- Define the following: equilibrium position, economic injury level and economic threshold.
- List the subfamilies in Leguminosae and discuss the important products of the major subfamily with examples of crops in each.
- What are the deficiency symptoms for potassium and iron.

Q3 (20 points)

- Differentiate between a key pest, an occasional pest, a perennial pest and a severe pest.
- What are the main uses of *Helianthus annuus*?
- Discuss the effects of heat on crop production.
- Define the following: physiotype, therapeutant, spreader, pathotype and host.

Q4 (20 points)

- Discuss response to damage in crop protection with particular reference to assessment techniques.
- In which family do these crops belong; *Camellia sinensis*, *Voandzeia subterranea*, *Chloris gayana*, *Avena sativa*, *Glycine max*?
- What are halophytic plants?
- List five categories of fungicides.

Q5 (20 points)

- Describe the two types of life cycles for insect pests and name four important orders of insect pests.
- Differentiate between *Oryza sativa* and *Oryza glaberrima*.
- Describe the characteristics and management of silt soils.
- Discuss breeding for resistance.

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF CROP SCIENCE

SECOND SEMESTER EXAMINATIONS - JULY 2001

COURSE: AGC 422

TIME: THREE(3) HOURS

INSTRUCTIONS: Answer all Questions.

Question 1 (30 points)

A retiree would like to go into protected cultivations to produce horticultural crops. Advise her on the structures she needs to build and the climatic controls she needs to put in place for the success of this enterprise. What would be the constraints faced by such a farmer?

Question 2 (15 points)

Write short notes on the following giving examples as far as possible:-

Rotation

Hardening

Dedifferentiation and Totipotency.

Question 3 (15 points)

In order to improve the productivity of the soils, a farmer needs to take certain measures. Discuss this statement.

Question 4 (25 points)

Give production recommendations for a farmer who intends to grow tomatoes for the first time.

Question 5 (15 points)

Describe the following diseases/pests indicating the crop(s) attacked and also advise on the control:

Blight

Thrips

Damping off.

END OF EXAM

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

UNIVERSITY EXAMINATIONS - JULY 2001

AGC 442 PLANT BREEDING 1.

TIME : THREE HOURS.

ANSWER : Five questions. **All questions carry 20 marks each.**

MARKS

1. Write short notes on the following:

- a). Allopolyploids and aneuploids.
- b). Advantages and disadvantages of Pedigree Selection Method.
- c). Invitro selection techniques for diseases and abiotic stresses in plants
- d). Pure line theory and its application to Plant Breeding.
- e) Reciprocal Recurrent Selection.

ANSWER EITHER 2 OR 3

2. Witch weed (*Striga spp.*) has become a very serious weed in the Eastern and Southern Provinces of Zambia. This weed parasitises the roots of maize plants from which it draws its nourishment and in the process severely stunts the maize plant to the point of badly affecting yield. Scientists have however established that there is resistance to striga in maize and that this trait is quantitative.

Studies on the parasitising mechanism of striga on maize have shown that striga seeds germinate in response to maize root exudate in the soil which attract the striga to the maize roots to attach itself to them. Resistant maize genotypes however do not exude or exude trace amounts of these root exudate. There is a range of root exudate amounts produced by various maize genotypes which show variation of tolerance in this crop to striga.

Suppose you were charged with the task of developing both open pollinated and hybrid varieties of maize which will be

- i) Resistant to witch weed
- ii) High yielding

How would you go about achieving your goal. **Explain clearly.**

Assume:

The root exudate assays can be done on seedlings of maize growing in nutrient solutions in potted experiments by analysing the solutions.

3. It has been reported that there has been a resurgence in the demand for Castor Oil world wide for various industrial applications. The market survey by the Export Board of Zambia has revealed that the international market is looking for millions of tons of castor oil. However they are particularly looking for castor oil which has a high concentration of a particular fatty acid

called **erucic acid**.
Zambia is well endowed with both a rich genepool of Castor Bean land races and suitable environmental conditions for the production of Castor Beans.

Suppose you were charged with the task of developing high yielding castor variety **with high oil content and the oil with high content of the desired fatty acid ; erucic acid**. How would you achieve this objective.

- Assume:*
- a) It is possible to analyse for oil content on individual seeds using the Nuclear Magnetic Resonance machine which is a non-destructive method.
 - b) The erucic acid analysis can be determined from a small portion of the seed cotyledon thereby making it possible for determining the fatty acid content non-destructively as well.

4. List and clearly discuss the breeding objectives for important field crops in Zambia and which institutions are involved in this important research work.

5. a). Discuss the application of cytoplasmic male sterility in the production of hybrids in maize
b). Presented below are yields of a diallel cross of six inbred lines of sunflower.

Inbred lines						
1	2	3	4	5	6	
1						
<u>1x</u> 4500						
2	<u>2 x 1</u> 7500	<u>2 x</u> 3000				
3	<u>3 x 1</u> 6500	<u>3 x 2</u> 6700	<u>3 x</u> 5000			
4	<u>4 x 1</u> 5500	<u>4 x 2</u> 5400	<u>4 x 3</u> 5900	<u>4 x</u> 4100		
5	<u>5 x 1</u> 4400	<u>5 x 2</u> 7200	<u>5 x 3</u> 6500	<u>5 x 4</u> 6100	<u>5 x</u> 4000	Parent Cross Yield kg/ha
6	<u>6 x 1</u> 8500	<u>6 x 2</u> 7400	<u>6 x 3</u> 8200	<u>6 x 4</u> 7500	<u>6 x 5</u> 6500	
					<u>6 x</u> 3200	

- c) Determine the best specific combining inbreds and the best general combining inbreds.

5. a) From a maize population, 200 plants were selected. They were found to be in the following genotypic frequency.

AA	Aa	aa
60	40	100

- i) Calculate the frequency of allele A and a in the population.
- ii) Estimate the proportion of different genotypes following one generation of random mating.

- b. Discuss in brief, the following statements.

- i) Mutation breeding is of limited practical use.
- ii) Allopolyploidy has proved more useful in crop improvement than autopolyploidy.
- iii) Biotechnology has potential in crop improvement.

***** E N D O F E X A M *****

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

CROP SCIENCE DEPARTMENT

AGC 552, 2001 FINAL EXAMINATION

INSTRUCTIONS:

ANSWER ANY FOUR QUESTIONS, ALL QUESTIONS CARRY EQUAL MARKS

DURATION 3 HOURS

1. A floriculturist intends to hold a flower festival, among the activities that need to be done are, promote flowering in roses, chrysanthemums, reduce plant height in poinsettia's and also reduce flower senescence in carnations after harvesting prior to display. Can you advise on the possible growth regulators to use?
 2. Grape production has the potential to develop into a successful venture in Zambia. What pruning and training method would you suggest for enhanced fruit yield and quality?
 3. Write short notes on the following:
 - Somaclonal variation in asexual propagation
 - Espalier system of pruning and training
 - Abscissic acid as a growth regulator
 - Flowering in papaya (*Carica papaya*)
 4. Describe the common method used for vegetative propagation of citrus in Zambia.
 5. Relative to exotic commodities, what are the advantages of indigenous species as potential horticultural crops in Zambia. Use named examples in your answer.
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END OF EXAMINATION

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF CROP SCIENCE

SECOND SEMESTER FINAL EXAMINATIONS – JULY 2001

COURSE: AGC 572

TIME: THREE (3) HOURS

INSTRUCTIONS: Answer all Questions.
Use a Different Answer Sheet for each Section.

SECTION A

Question 1. (30 points)

Describe the causal agents, symptoms of and control measures for the following diseases:-

- a. Crown rot
- b. Stem end rot
- c. Botrytis rot
- d. Sour rot.

Question 2. (15 points)

A farmer wishes to maximize her profits on her tomato produce during and after harvesting. What measures should she put in place?

Question 3. (15 points)

Why is packing an important operation during the handling of horticultural products? Illustrate your answer with examples where necessary.

SECTION B

Question 1. (20 points)

Outline the importance and relationship of pre-harvest production practices on post harvest quality of horticultural products.

Question 2. (20 points)

Outline the importance of maturity standards in determining time of harvest. What standards would you suggest for a small-scale fruit cooperative in a rural set up.

END OF EXAM

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

INTERMEDIATE AGRIBUSINESS MANAGEMENT
AGE 452

END OF SEMESTER EXAMINATION

INSTRUCTIONS: **ANSWER ALL QUESTIONS IN SECTION A AND ATTEMPT ANY TWO IN SECTION B**

TIME: **THREE HOURS**

SECTION A

- Q1. The first thing Business Managers must understand about Bank borrowing is that the bank desires to make a profit from the transaction while at the same time reducing the risk of the transaction. And therefore as required by the lending rules, the banker will apply the THREE Cs of lending before finally approving the loan.
- a) Specify the THREE Cs of lending
 - b) Describe the significance of each of the THREE Cs of lending.
 - c) What is the role of OWNER'S CAPITAL (i.e. EQUITY) in bank borrowing?
 - d) Specify and discuss the forms of installment financing when starting a new business venture.
- Q2. The production and operations manager is an active participant in determining the firm's mission and strategy. Only when these managers understand the organisation's overall strategy can optimal decisions be made.
- a) Define, clearly, what a strategy is.
 - b) What is the difference between management and strategic management
 - c) Show and describe the stages of development of an operations strategy.
- Q3. Quality goods and services are strategically important to firms and countries.
- a) Define (i) Quality (ii) Total Quality Management (TQM)
 - b) Explain how improved Quality brings about market gains. (Show understanding of the terms involved).
 - c) Explain how improved Quality reduces costs. (Show understanding of terms involved)
 - d) Explain clearly the relationship between Quality and Total Quality Management.

SECTION B

- Q1. Long-life Farms Investment Ltd. has been producing honey, as a competitive and alternative product to butter, for use on bread. The firm has been producing honey for the past ten years. Suddenly, the honey's rate of sales growth has started slowing down as the product is entering the stage of relative maturity.

Long-life Farms Investment Ltd. has decided to employ you as the Farm-Manager and would like you to formulate strategies that will reverse the down-ward trend in sales thereby bringing about sales growth and long-term profitability.

At your disposal, there are three professionally accepted strategies for handling a product in the maturity stage i.e.

- Market Modification
- Product Modification
- Marketing-Mix Modification

The existing circumstances require you to use only the Market Modification and Marketing-Mix Modification strategies.

- a) Market modification: Here the Company might try to expand the market for its mature brand by working with two factors that make up sales volume.

And sales volume = number of brand users X usage rate per user.

Explain in detail how you would apply this strategy to your company (i.e.) Long-Life Farms Investment Ltd.) to:

- (i) Expand the number of brand users (specify and describe at least three ways).
 - (ii) Convince the current brand users to increase their annual usage of the brand (specify and describe at least three ways).
- b)
- (i) Explain how you would use the Marketing-Mix Modification strategy to stimulate sales in Long-life Farms Investment Ltd.
 - (iii) Is the marketing-mix modification strategy an effective strategy in a competitive environment? Give reasons to support your answer.

- Q2. Entrepreneurship and small business development are important and vital activities in the socio-economic development of all countries and societies. Entrepreneurship is for everyone. No matter what job or position one occupies, there is need to cultivate entrepreneurial characteristics.

- a) Explain what an Entrepreneur is

- b) What is the Golden Rule of Entrepreneurship and explain its significance?
- c) What is the role of Entrepreneurship in business management and specify the benefits.
- d) One of the key characteristics of an Entrepreneur is: Risk –Taking.
 - (i) Specify the general rule or maxim about Risk.
 - (ii) Explain how an entrepreneurial manager should take and manage risk.
- e) As an Entrepreneur, how would you advise a JOBLESS PROFESSIONAL, who has no CAPITAL, to start a business venture?
- f) There are a number of requirements for success in the pursuit of entrepreneurship and small business management. Highlight at least four of these requirements and discuss them

Q3. The table below shows the major competitors in the milk industry.

Company	Product	Price per 2 litres
Zamcow	Dairy Milk	K4 000
Sonita	Dairy Milk	K3 980
Emerald Dale	Dairy Milk	K4 000

Kedric's Farm produces dairy milk and wants to enter the market and compete with the already existing three major producers. Strategic management singles out three generic approaches to competing in the market place: i.e.

- a) Striving to be the overall low-cost producer in the industry.
- b) Seeking to differentiate one's product offering in one way or another from rivals' products.
- c) A focussed approach based on catering (via low cost leadership or differentiation) to a narrow portion of the market rather than going after the whole market.

You are a business-consultant and Kedric Farms management have approached you to advise them on the appropriate strategy they should use to penetrate the market and gain competitive edge over Zamcow, Sonita and Emerald Dale. And you already have the above three generic strategies at your disposal:-

- a) **Choose the most appropriate strategy from the stated general strategies and:**
 - (i) Explain why your chosen strategy is best-suited for use by Kedric Farm.
 - (ii) Explain the advantages of this strategy

UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS – JULY 2001
AGE 552
AGRICULTURAL EXTENSION EDUCATION

TIME: THREE HOURS
TOTAL MARKS: 100%

INSTRUCTIONS: ANSWER 5 QUESTIONS (20 MARKS FOR EACH QUESTION)

- Q1. Why do theories and models of communication feature so prominently in Extension? Give reasons and describe at least one model in detail, explaining the relevance of each stage.
- Q2. What are the basic characteristics of innovations and how do they influence the success or failure of extension work?
- Q3. What is the importance of research extension linkages in agricultural information system and what role can “Indigenous Technical Knowledge” play?
- Q4. Describe the common approaches used in extension. Give more emphasis to the currently favoured approach in Zambia and advantages it has over other approaches.
- Q5. a) What is meant by “homophily” and “heterophily” and how can these concepts be applied to extension communication?
- b) Why is extension restricted to changing “voluntary behaviour” and what is the meaning of “voluntary behaviour”?
- Q6. Describe the problem solving cycle and its application to the planning of an extension programme.
- Q7. How does a method demonstration differ from result demonstration and when can a method demonstration appropriately be carried out?
-

THE UNIVERSITY OF ZAMBIA

SECOND SEMESTER EXAMINATION – JULY 2001

AGE 562

FARM MANAGEMENT

TIME: THREE HOURS

INSTRUCTIONS: ANSWER FIVE QUESTIONS

1. Risk, rate of return and repayment ability are often called the “three Rs of credit”. Discuss the effect of each on the farmer’s ability to borrow money.
2.
 - a) Discuss the characteristics of agricultural labour. How would these characteristics help a manager to improve labour utilization.
 - b) Compensation packages for employees will include a cash salary plus different bonuses and various incentives. Discuss factors that affect compensation decision on many farm businesses.
3. Write short notes, giving examples, on the following:
 - a) A System
 - b) Management Information System
 - c) Preliminary Controls
 - d) Concurrent Controls
 - e) Feed back Controls
4.
 - a) Discuss ways a manager can improve labour efficiency on a farm.
 - b) Purchasing of a farm is an important decision often involving large sums of money. The first step in the purchase decision would be to determine value of the land. Discuss factors that determine this value of land.
5. A farmer acquires a Combine harvester from Power Equipment with a \$10,000 loan. This loan is to be financed at 13% interest rate over a 10 year period. Two kinds of amortization plans can be used in the repayment of this loan. Contrast the two methods by calculating Payment, Principal and Interest – for each year of the 10 years period. Outline the advantages and disadvantages of each amortization plan.

Q6. a) A farmer borrowed \$1,200 at 7% add-on interest to be repaid over a year with 12 monthly payments.

i) What is the total interest charge on this loan.

ii) What is the monthly payments on this loan

iii) What is the annual percentage rate of interest being charged

is traded by a US\$ 6000 boat payment. 1%

b) The farmer also acquires a tractor which is financed by a dealer on a 3 year plan with equal payments of \$2,450 at the end of each year.

i) What is the interest charge on this loan

ii) What is the annual percentage rate being charged on the finance plan.

APPENDIX TABLE IV (continued): Capital Recovery or Amortization Factors (Annuity whose present value at compound interest is 1)

n		$\frac{1}{r} = \frac{1}{1 - (1 + i)^{-n}}$										n	
		13%	14%	15%	16%	17%	18%			19%	20%		
1	1.1300	1.1400	1.1500	1.1600	1.1700	1.1800	1.1900	1	1.1900	1.2000	1.2100	1.2200	1.2300
2	0.5995	0.6073	0.6151	0.6230	0.6308	0.6387	0.6466	2	0.6466	0.6545	0.6625	0.6705	0.6784
3	0.4235	0.4307	0.4380	0.4453	0.4526	0.4599	0.4673	3	0.4673	0.4747	0.4822	0.4897	0.4972
4	0.3362	0.3432	0.3503	0.3574	0.3645	0.3717	0.3789	4	0.3790	0.3863	0.3936	0.4010	0.4085
5	0.2843	0.2913	0.2983	0.3054	0.3126	0.3198	0.3271	5	0.3271	0.3344	0.3418	0.3492	0.3567
6	0.2502	0.2572	0.2642	0.2714	0.2786	0.2859	0.2933	6	0.2933	0.3007	0.3082	0.3158	0.3234
7	0.2261	0.2332	0.2404	0.2476	0.2549	0.2624	0.2699	7	0.2699	0.2774	0.2851	0.2928	0.3006
8	0.2084	0.2156	0.2229	0.2302	0.2377	0.2452	0.2529	8	0.2529	0.2606	0.2684	0.2763	0.2843
9	0.1949	0.2022	0.2096	0.2171	0.2247	0.2324	0.2402	9	0.2402	0.2481	0.2561	0.2641	0.2722
10	0.1843	0.1917	0.1993	0.2069	0.2147	0.2225	0.2305	10	0.2305	0.2385	0.2467	0.2549	0.2632
11	0.1758	0.1834	0.1911	0.1989	0.2068	0.2148	0.2229	11	0.2229	0.2311	0.2394	0.2478	0.2563
12	0.1690	0.1767	0.1845	0.1924	0.2005	0.2086	0.2169	12	0.2169	0.2253	0.2337	0.2423	0.2509
13	0.1634	0.1712	0.1791	0.1872	0.1954	0.2037	0.2121	13	0.2121	0.2206	0.2292	0.2379	0.2467
14	0.1587	0.1666	0.1747	0.1829	0.1912	0.1997	0.2082	14	0.2082	0.2169	0.2256	0.2345	0.2434
15	0.1547	0.1628	0.1710	0.1794	0.1878	0.1964	0.2051	15	0.2051	0.2139	0.2228	0.2317	0.2408
16	0.1514	0.1596	0.1679	0.1764	0.1850	0.1937	0.2025	16	0.2025	0.2114	0.2204	0.2295	0.2387
17	0.1486	0.1569	0.1654	0.1740	0.1827	0.1915	0.2004	17	0.2004	0.2094	0.2186	0.2278	0.2370
18	0.1462	0.1546	0.1632	0.1719	0.1807	0.1896	0.1987	18	0.1987	0.2078	0.2170	0.2263	0.2357
19	0.1441	0.1527	0.1613	0.1701	0.1791	0.1881	0.1972	19	0.1972	0.2065	0.2158	0.2251	0.2346
20	0.1424	0.1510	0.1598	0.1687	0.1777	0.1868	0.1960	20	0.1960	0.2054	0.2147	0.2242	0.2337
21	0.1408	0.1495	0.1584	0.1674	0.1765	0.1857	0.1951	21	0.1951	0.2044	0.2139	0.2234	0.2330
22	0.1395	0.1483	0.1573	0.1664	0.1756	0.1848	0.1942	22	0.1942	0.2037	0.2132	0.2228	0.2324
23	0.1383	0.1472	0.1563	0.1654	0.1747	0.1841	0.1935	23	0.1935	0.2031	0.2127	0.2223	0.2320
24	0.1373	0.1463	0.1554	0.1647	0.1740	0.1835	0.1930	24	0.1930	0.2025	0.2122	0.2219	0.2316
25	0.1364	0.1455	0.1547	0.1640	0.1734	0.1829	0.1925	25	0.1925	0.2021	0.2118	0.2215	0.2313
26	0.1357	0.1448	0.1541	0.1634	0.1729	0.1825	0.1921	26	0.1921	0.2018	0.2115	0.2213	0.2311
27	0.1350	0.1442	0.1535	0.1630	0.1725	0.1821	0.1917	27	0.1917	0.2015	0.2112	0.2210	0.2309
28	0.1344	0.1437	0.1531	0.1625	0.1721	0.1816	0.1912	28	0.1912	0.2010	0.2108	0.2208	0.2307
29	0.1339	0.1432	0.1527	0.1622	0.1718	0.1813	0.1910	29	0.1910	0.2008	0.2107	0.2206	0.2306
30	0.1334	0.1428	0.1523	0.1619	0.1715	0.1813	0.1910	30	0.1910	0.2008	0.2107	0.2206	0.2305
31	0.1330	0.1425	0.1520	0.1616	0.1713	0.1811	0.1909	31	0.1909	0.2007	0.2106	0.2205	0.2304
32	0.1327	0.1421	0.1517	0.1614	0.1711	0.1809	0.1907	32	0.1907	0.2006	0.2105	0.2204	0.2303
33	0.1323	0.1419	0.1515	0.1612	0.1710	0.1808	0.1906	33	0.1906	0.2005	0.2104	0.2203	0.2302
34	0.1321	0.1416	0.1513	0.1610	0.1708	0.1806	0.1905	34	0.1905	0.2004	0.2103	0.2202	0.2301
35	0.1318	0.1414	0.1511	0.1609	0.1707	0.1806	0.1904	35	0.1904	0.2003	0.2103	0.2202	0.2301
40	0.1310	0.1407	0.1506	0.1604	0.1703	0.1802	0.1902	40	0.1902	0.2001	0.2101	0.2201	0.2301
45	0.1305	0.1404	0.1503	0.1602	0.1701	0.1801	0.1901	45	0.1901	0.2001	0.2100	0.2200	0.2300
50	0.1303	0.1402	0.1501	0.1601	0.1701	0.1800	0.1900	50	0.1900	0.2000	0.2100	0.2200	0.2300
55	0.1302	0.1401	0.1501	0.1600	0.1700	0.1800	0.1900	55	0.1900	0.2000	0.2100	0.2200	0.2300
60	0.1301	0.1401	0.1500	0.1600	0.1700	0.1800	0.1900	60	0.1900	0.2000	0.2100	0.2200	0.2300

APPENDIX TABLE IV (continued): Capital Recovery or Amortization Factors (Annuity whose present value at compound interest is 1)

n		$\frac{1}{r} = \frac{1 - (1 + i)^{-n}}{i}$										n	
		19%	20%	21%	22%	23%	24%			25%	26%		
1	1.1900	1.2000	1.2100	1.2200	1.2300	1.2400	1.2500	1	1.2500	1.2600	1.2700	1	1.2700
2	0.6466	0.6545	0.6625	0.6705	0.6784	0.6864	0.6944	2	0.6944	0.7024	0.7104	2	0.7104
3	0.4673	0.4747	0.4822	0.4897	0.4972	0.5047	0.5122	3	0.5122	0.5202	0.5282	3	0.5282
4	0.3790	0.3863	0.3936	0.4010	0.4085	0.4159	0.4234	4	0.4234	0.4314	0.4394	4	0.4394
5	0.3271	0.3344	0.3418	0.3492	0.3567	0.3642	0.3716	5	0.3716	0.3796	0.3876	5	0.3876
6	0.2933	0.3007	0.3082	0.3158	0.3234	0.3311	0.3387	6	0.3387	0.3467	0.3547	6	0.3547
7	0.2699	0.2774	0.2851	0.2928	0.3006	0.3084	0.3160	7	0.3160	0.3240	0.3320	7	0.3320
8	0.2529	0.2606	0.2684	0.2763	0.2843	0.2923	0.2999	8	0.2999	0.3079	0.3159	8	0.3159
9	0.2402	0.2481	0.2561	0.2641	0.2722	0.2805	0.2885	9	0.2885	0.2965	0.3045	9	0.3045
10	0.2305	0.2385	0.2467	0.2549	0.2632	0.2716	0.2796	10	0.2796	0.2876	0.2956	10	0.2956
11	0.2229	0.2311	0.2394	0.2478	0.2563	0.2649	0.2730	11	0.2730	0.2810	0.2890	11	0.2890
12	0.2169	0.2253	0.2337	0.2423	0.2509	0.2596	0.2679	12	0.2679	0.2759	0.2839	12	0.2839
13	0.2121	0.2206	0.2292	0.2379	0.2467	0.2556	0.2641	13	0.2641	0.2721	0.2801	13	0.2801
14	0.2082	0.2169	0.2256	0.2345	0.2434	0.2524	0.2609	14	0.2609	0.2689	0.2769	14	0.2769
15	0.2051	0.2139	0.2228	0.2317	0.2408	0.2499	0.2589	15	0.2589	0.2669	0.2749	15	0.2749
16	0.2025	0.2114	0.2204	0.2295	0.2387	0.2479	0.2569	16	0.2569	0.2649	0.2729	16	0.2729
17	0.2004	0.2094	0.2186	0.2278	0.2370	0.2464	0.2556	17	0.2556	0.2636	0.2716	17	0.2716
18	0.1987	0.2078	0.2170	0.2263	0.2357	0.2451	0.2541	18	0.2541	0.2621	0.2701	18	0.2701
19	0.1972	0.2065	0.2158	0.2251	0.2346	0.2441	0.2533	19	0.2533	0.2613	0.2693	19	0.2693
20	0.1960	0.2054	0.2147	0.2242	0.2337	0.2433	0.2524	20	0.2524	0.2604	0.2684	20	0.2684
21	0.1951	0.2044	0.2139	0.2234	0.2330	0.2426	0.2517	21	0.2517	0.2597	0.2677	21	0.2677
22	0.1942	0.2037	0.2132	0.2228	0.2324	0.2421	0.2512	22	0.2512	0.2592	0.2672	22	0.2672
23	0.1935	0.2031	0.2127	0.2223	0.2320	0.2417	0.2508	23	0.2508	0.2588	0.2668	23	0.2668
24	0.1930	0.2025	0.2122	0.2219	0.2316	0.2414	0.2505	24	0.2505	0.2585	0.2665	24	0.2665
25	0.1925	0.2021	0.2118	0.2215	0.2313	0.2411	0.2502	25	0.2502	0.2582	0.2662	25	0.2662
26	0.1921	0.2018	0.2115	0.2213	0.2311	0.2409	0.2500	26	0.2500	0.2580	0.2660	26	0.2660
27	0.1917	0.2015	0.2112	0.2210	0.2309	0.2407	0.2500	27	0.2500	0.2580	0.2660	27	0.2660
28	0.1915	0.2012	0.2110	0.2208	0.2307	0.2406	0.2500	28	0.2500	0.2580	0.2660	28	0.2660
29	0.1912	0.2010	0.2108	0.2207	0.2306	0.2405	0.2500	29	0.2500	0.2580	0.2660	29	0.2660
30	0.1910	0.2008	0.2107	0.2206	0.2305	0.2404	0.2500	30	0.2500	0.2580	0.2660	30	0.2660
31	0.1909	0.2007	0.2106	0.2205	0.2304	0.2403	0.2500	31	0.2500	0.2580	0.2660	31	0.2660
32	0.1907	0.2006	0.2105	0.2204	0.2303	0.2402	0.2500	32	0.2500	0.2580	0.2660	32	0.2660
33	0.1906	0.2005	0.2104	0.2203	0.2302	0.2402	0.2500	33	0.2500	0.2580	0.2660	33	0.2660
34	0.1905	0.2004	0.2103	0.2202	0.2302	0.2402	0.2500	34	0.2500	0.2580	0.2660	34	0.2660
35	0.1904	0.2003	0.2103	0.2202	0.2302	0.2401	0.2500	35	0.2500	0.2580	0.2660	35	0.2660
40	0.1902	0.2001	0.2101	0.2201	0.2301	0.2400	0.2500	40	0.2500	0.2580	0.2660	40	0.2660
45	0.1901	0.2001	0.2100	0.2200	0.2300	0.2400	0.2500	45	0.2500	0.2580	0.2660	45	0.2660
50	0.1900	0.2000	0.2100	0.2200	0.2300	0.2400	0.2500	50	0.2500	0.2580	0.2660	50	0.2660
55	0.1900	0.2000	0.2100	0.2200	0.2300	0.2400	0.2500	55	0.2500	0.2580	0.2660	55	0.2660
60	0.1900	0.2000	0.2100	0.2200	0.2300	0.2400	0.2500	60	0.2500	0.2580	0.2660	60	0.2660

THE UNIVERSITY OF ZAMBIA
SECOND SEMESTER EXAMINATIONS – JULY 2001
ADVANCED AGRICULTURAL POLICY – AGE 572

TIME : 3 HOURS

INSTRUCTIONS: ANSWER ALL THE FIVE QUESTIONS

- Q1.**
- a) Explain the consequences for a country of not having a policy for the agricultural sector (6).
 - b) List only the agricultural sector objectives for Zambia (5)
 - c) A newly independent African country has requested the Zambian Government to send an expert in agricultural policy to work as an advisor to its first Permanent Secretary for the Ministry of Agriculture. The Ministry's priority is to formulate a policy for the agricultural sector. Explain the step-by-step process you would use to formulate an effective all encompassing agricultural policy for the newly independent African country. (9)
- Q2**
- a) What is a Policy Analysis Matrix (PAM) (4).
 - b) Give a concise description of the construction of a Policy Analysis Matrix (8).
 - c) Discuss the major weaknesses of a Policy Analysis Matrix (8)
- Q3**
- a) Give a comprehensive definition of poverty (2)
 - b) The average small-scale Zambian farmer does not seem to make headway in accumulating capital and overcoming poverty. It is also observed that fewer small-scale farmers ever graduate into emergent commercial farmers. Most of them have been small-scale since time immemorial and are likely to remain so for life.
 - i) Identify and discuss six causes which hinder small-scale farmers from graduating into emergent commercial farmers (12)
 - ii) Suggest any four ways other than handouts and subsidies that government can use to overcome poverty among small-scale farmers and in so doing facilitate their move into the emergent farmer category (6).

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 - i) Identify and discuss six causes which hinder small-scale farmers from graduating into emergent commercial farmers (12)
 - ii) Suggest any four ways other than handouts and subsidies that government can use to overcome poverty among small-scale farmers and in so doing facilitate their move into the emergent farmer category (6).

- Q4** Discuss the development, successes and failures of the Agricultural Sector Investment Programme in Zambia (20).
- Q5** Explain how demand and supply analyses can be used to understand the market(s) in a national economy leading to the formulation of appropriate agricultural policies (20)

END OF EXAMINATION

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

FOOD TOXICOLOGY (AGF 342) – EXAMINATION

Semester II July/August 2001

INSTRUCTIONS

1. **Attempt all questions**
 2. **The duration of the exam is two and half hours**
-

1. What do you understand by the following terms
 - (a) Generally Recognized as safe (GRAS)
 - (b) No Observable Adverse Effect Level (NOAEL)
 - (c) Acceptable Daily Intake (ADI)
 - (d) Acute Toxicity
 - (e) Chronic Toxicity
2. Some foods, contain chemical entities with a likelihood of being present as naturally occurring components in foods. Below are two examples of a class where such chemical entities belong.
 - (a) Toxicants in foods of plant origin (5 chemical toxicants)
 - (b) Toxicants in foods of animal origin (2 chemical toxicants)

For each,

- Give any (number in brackets) chemical toxicants
- State whether its likely to be commonly found in a 'typical Zambian diet' and/or 'affluent Zambian diet' for each chemical toxicant mentioned
- Give also an example of a food commonly found in Zambia in which such chemical toxicants may be found
- Suggest one possible adverse effect on the Zambian population for each toxicant mentioned

3. Some foods, contain chemical entities with a likelihood of being present as contaminants secondary either to microbial invasion of foods or chemical contaminants of the environments in which foods and feeds are produced. Below are three examples of a class where such chemical entities belong.
 - (a) Mycotoxins (2 chemical toxicants)
 - (b) Metals (3 chemical toxicants)
 - (c) Bacterial toxins (2 chemical toxicants)

For each,

- Give any (number in brackets) chemical toxicants

- State whether its likely to be commonly found in a 'typical Zambian diet' and/or 'affluent Zambian diet' for each chemical toxicant mentioned
 - Give also an example of a food commonly found in Zambia in which such chemical toxicants may be found
 - Suggest one possible adverse effect on the Zambian population for each toxicant mentioned
4. Some foods, contain chemical entities with a likelihood of being present as those added by man in the course of food manufacture and preparation. Below are three examples of a class were such chemical entities belong.
- (a) Pesticides (2 chemical toxicants)
 - (b) Animal drugs (2 chemical toxicants)
 - (c) 'Direct' food additives (2 chemical toxicants)
- For each,
- Give any (number in brackets) chemical toxicants
 - State whether its likely to be commonly found in a 'typical Zambian diet' and/or 'affluent Zambian diet' for each chemical toxicant mentioned
 - Give also an example of a food commonly found in Zambia in which such chemical toxicants may be found
 - Suggest one possible adverse effect on the Zambian population for each toxicant mentioned
5. Cyanogens are compounds derived not only from plants but also from fungi, bacteria and even members of animal kingdom. The toxic effects of cyanogens are of great concern, particularly, for diets like 'typical Zambian diets'. Answer the following concerning cyanogens.
- (a) Two (2) Common sources for humans
 - (b) Although more than 20 have been identified in edible plant varieties, only four cyanogens are of practical toxicological importance. Mention any two (2) cyanogens of practical toxicological importance.
 - (c) Explain the mechanism by which cyanogenic glycosides are converted into a toxic compound, HCN.
 - (d) Explain what makes HCN toxic
 - (e) Mention any two (2) signs of acute cyanide poisoning
 - (f) Mention any two (2) treatments of acute cyanide intoxication
 - (g) Mention any other three (3) causes that could be leading to chronic cyanide intake apart from intake of low levels of cyanide in the diet
 - (h) Mention any one (1) major detoxification pathways of low levels of HCN in the human body
6. Following the discovery of aflatoxins and their potent carcinogenicity, the search for mycotoxins in the last three decades has led to the identification of more than a hundred toxigenic fungal organisms and mycotoxins throughout the world. Answer the following concerning toxigenic fungal organisms and mycotoxins:
- (a) What do you understand by the term mycotoxins
 - (b) From the human and animal health concern, mention three (3) molds that have received most attention in terms of production of mycotoxins in foods
 - (c) For each mold mentioned in (b), mention any one (1) class of mycotoxins produced by each mold
 - (d) Mention any two (3) conditions/practices that can enhance mycotoxin production in foods
 - (e) Mention four (4) major aflatoxins and explain why they are given such a name
 - (f) Mention the most potent of the four classes mentioned

- (g) Mention the aflatoxin commonly found in milk
- (h) Mention any two (2) foods commonly found in Zambia which are susceptible to aflatoxins
- (i) Mention any two (2) effects of consuming foods containing aflatoxins
- (j) Suggest any three (3) approaches which could be used to protect the Zambian consumers from the unwanted effects of aflatoxins.

End of Exam

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

FOOD MICROBIOLOGY (AGF 352) – EXAMINATION

Semester II

July/August 2001

INSTRUCTIONS

1. **Attempt all questions**
 2. **The duration of the exam is three (3) hours**
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1. List and characterise the seven (7) core principles/steps employed in developing a Hazard Analysis Critical Control Point plan.
2. Compare and contrast the concepts of "food spoilage" and "food fermentation".
3. Devise (on your own) a possible mould spoilage scenario in a food. Detail approaches that could be used to prevent this spoilage?
4. Fermented milk products are said to have probiotic properties. Define probiotic and discuss 5 possible health benefits associated with ingestion of these products.
5. (a) List any four (4) class of chemical disinfectants used in cleaning and disinfection operations in the food industry

(b) To ensure cleaning and disinfection procedures are achieving the desired results, some form of assessment is necessary. Suggest two major methods you can use to monitor the effectiveness of cleaning and disinfection procedure on equipment surfaces and compare the two methods

(c) A client of a food company insists that they need a historical performance of the cleaning and disinfection procedure of the company. Suggest to such a company, a method of coming up with data which can be used for such purposes, and is easy to interpret to clients.
6. Discuss in general terms how drying affects growth of various groups of bacteria, yeasts and moulds.
7. Food irradiation
 - a. Briefly discuss approaches for the irradiation of food relative to sources and general types used in foods

- b. What are the ranges of radiation used for each general type and what are examples of foods where these are used?
 - c. Give examples of internationally approved irradiated foods.
8. Estimate the spoilage probability of a 60 minutes process at 110 °C when $D_{110} = 6$ minutes and the initial population is 10^6 . What will happen in terms of probability if the initial population increases. Discuss your answer.
 9. The decimal reduction times D for a spore suspension were measured at several temperatures, as follows:

Temperature °C	D (minutes)
104	27.5
107	14.5
110	7.5
113	4.0
116	2.2
- a. Determine the thermal resistance constant Z for the spores.
 - b. Estimate the activation energy (E_a) for the temperature influence on microbial death rate.

End of Exam

THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS
JULY 2001

AGS 322/426 SOIL PHYSICS

TIME: 3 HOURS

MARKS: 100

ANSWER ALL QUESTIONS

1. Define the following terms:
 - i) Hydraulic conductivity
 - ii) Psychrometer
 - iii) Pie zometer
 - iv) Air filled porosity
 - iv) Relative humidity [7.5]
1. a) Describe the principle employed in the use of the Gamma-ray Attenuation method of determining soil water content. [5]

b) Describe the structure of one layer silicate mineral, and briefly relate this structure to the physical and chemical properties of this mineral. [5]
3. a) A soil at 25°C has a dew point temperature of 22°C. Calculate the relative humidity and vapour density of the soil atmosphere. [10]

b) If the above soil atmosphere contains 18% gaseous oxygen (O₂), what will be the concentration of dissolved O₂ in pure water at equilibrium with the soil atmosphere, given that $k_{H}O_2$ at 25°C is $10^{-2.9}$ M.atm⁻¹. [5]
4. A sample of soil contains 15% kaolinite, with a platelet thickness of 40 nm.
 - i) Estimate the approximate surface area of the kaolinite present in the sample in m²/g. [3]
 - ii) If the kaolinite has a CEC of 5 meq/100g calculate the surface charge density of the kaolinite in Coulombs/m². [3]
 - iii) Calculate the double layer thickness of smectite platelets in nm, in a 0.001M NaCl solution at 20°C given the Dielectric constant of water as 78.5, $\epsilon = 8.85 \times 10^{-12} \text{ C}^2 \cdot \text{J}^{-1} \text{ M}$, $F = 96,484 \text{ C} \cdot \text{mol}^{-1}$, $k = 1.38 \times 10^{-23} \text{ J} \cdot \text{K}^{-1}$, $e = 1.602 \times 10^{-19} \text{ C}$ Avogadros' constant = $6.022 \times 10^{23} \text{ mol}^{-1}$. [4]
 - iv) Briefly discuss the influence of soil texture and soil structure on soil water retention. [5]

5. The following data were obtained from a ring infiltrometer on a soil from Makeni in Lusaka.

<u>Cumulative time</u> <u>(min)</u>	<u>cumulative intake (I)</u> <u>(mm)</u>
01	13
15	80
30	122
60	183
150	357
200	389

6. Given that Kostiakov's infiltration equation is.

$$I = ct^{\alpha}$$

Where I = cumulative intake (mm)

t = cumulative time (min)

- i) Determine the constants C and α for this soil using the log form of the Equation.

$$\text{Log } I = \log c + \alpha \log t$$

- i) What is the infiltration rate (mm/min) of the soil after 4 hours

$$\text{If } I_R = \alpha ct^{(1-\alpha)} \text{ is equation for infiltration rate. [5]}$$

7. Imagine you are managing a greenhouse in which tensiometers have been installed at specific locations, and you observe the following readings from the tensiometer gauges:

<u>Tensiometer depth (cm)</u>	<u>Tensiometer reading (kPa)</u>
15 cm	75.2
45 cm	70.4

Answer the following; assuming the osmotic potential is negligible and that the soil surface is the reference level.

- i) Express the matric potential at these two depths in terms of pF. [5]
 ii) Calculate the total potential of soil water at these two depths (in cm). [5]
 iii) In what direction is the water flowing between these two depths (give reasons to support your answer). ? [5]

- iv) Is the soil at any of these two depths saturated? Give reasons to support your answer. [2.5]

A soil sample with a wet mass of 300g has 28.0 percent water content on a mass basis. Its saturated water content is 36.1% on a mass basis. Assuming $P_s = 2.65 \text{ g/cm}^2$ and $P_w = 1.0 \text{ g-cm}^{-3}$.

- i) Find the mass of water in the soil. [5]
- ii) The total porosity of the soil. [5]
- iii) The air filled porosity at 28% water content . [5]
- iv) The bulk density of the soil. [5]
- v) The volumetric moisture content at 27% water content (mass basis). [5]

END OF EXAM

THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS
JULY 2001

AGS 331 SOIL SURVEY TECHNIQUES

TIME: 3 HOURS

MARKS: 80

INSTRUCTIONS: ANSWER ALL QUESTIONS

1. A soil survey can either be special-purpose or general-purpose. Explain.[10]
2. a) A man is interested in buying a farm in Lusaka West and intends to develop it for beef ranching and production of rainfed maize, citrus, irrigated wheat and vegetables. He has heard about soil surveys but doubts that this is necessary before he buys the farm. He approaches you for advice. Convince this man that it is to his advantage to have the farm surveyed in advance. [6]
3. How useful would soil survey information be in projects such as:
 - i) siting garbage disposal sites
 - ii) development of small-scale fish farming
 - iii) agricultural pest controls
 - iv) feeder road construction [4]
3. a) Briefly explain how airphotographs are used in soil surveying. [5]
b) Soil surveys, at various levels, have been carried out in Zambia since the early 1950s. Explain these survey levels. [5]
4. A foreign investor is looking for an area to establish a cotton farm in Southern Province. He asks you to help locate the most suitable site for the farm. With your knowledge in soil surveying, outline how you would proceed to help this man.
5. What is a soil map unit? [10]
6. a) What is soil variability? [4]
b) In a certain map unit sand content has been measured at five different points. Results of these measurements are given in Table 1 below. If the maximum permissible variability is 10%, how did this soil surveyor fair?[6]

Table 1. Sand content at five sites in a map unit

<u>Site Number</u>	<u>% Sand</u>
1	25
2	18
3	37
4	29
5	14

4. Give the main limitations of the Zambian land capability classification system. [10]
8. a) A certain map unit has a land capability class S3 t e. How would you interpret this?[4]
- b) What would be the mistakes in presenting land capability classes as C1w, C4 t and S4d? [6]
-

END OF EXAM

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF SOIL SCIENCES

UNIVERSITY SECOND SEMESTER EXAMINATIONS – JULY 2001

COURSE: AGS 441 (AGRICULTURAL HYDROLOGY AND HYDRAULICS)

DATE: 25TH JULY, 2001

TIME ALLOWED: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

- (a) Answer **ANY FIVE** questions.
- (b) All questions carry equal marks.
- (c) All the necessary steps of calculations should be clearly shown.

-
- Q1:** (a) Briefly explain the ***Rational Method*** of estimating surface runoff. (10 marks)
- (b) A catchment area mainly consisting of a wetland in the Chanyanya rice growing area in the Kafue Flats has an area of 575 km². During the 1999/ 2000 water year, the area received 950-mm of rainfall. The average discharge at the catchment outlet to the Kafue River was 17 m³/ sec.

Assuming that the change in storage within the catchment is negligible, calculate the catchment run-off coefficient. (10 marks)

- Q2:** (a) What is a Unit Hydrograph? (5 marks)
- (b) A large drainage ditch is to be constructed to drain rainwater from a busy agricultural area. The ordinates of the Unit Hydrograph for the catchment are tabulated below.

TIME (Hours)	UNIT HYDROGRAPH VALUES (m ³ /sec)
0	0
12	29.2
24	18.0
36	9.6
48	2.8
60	0

During the two days of storm, the rainfall depth was measured at 12-hour intervals using the Standard rain gauge installed by a commercial farmer within the catchment, giving the following data:

PERIOD (Hours)	RAINFALL DEPTH IN THE RAIN GAUGE (cm)
0 – 12	8.6
12 – 24	0.8

If the *phi* – index for the catchment is 0.9 cm/hr, estimate the maximum discharge expected in the ditch resulting from the 2-days of storm. (15 marks)

Q3: Fig. Q3 below shows a rectangular canal used to convey water from a dam to an irrigation scheme. A Rectangular Undershot Gate A,B,C,D, of height 50-cm, is installed for water control. The canal is 1.2 meters wide with 80-cm flow depth.

- (a) Calculate the magnitude of the resultant force, F , acting on the plate A,B,C,D. (10 marks)
- (b) Calculate the moment about the hinge line BC required to open the gate. (10 marks)

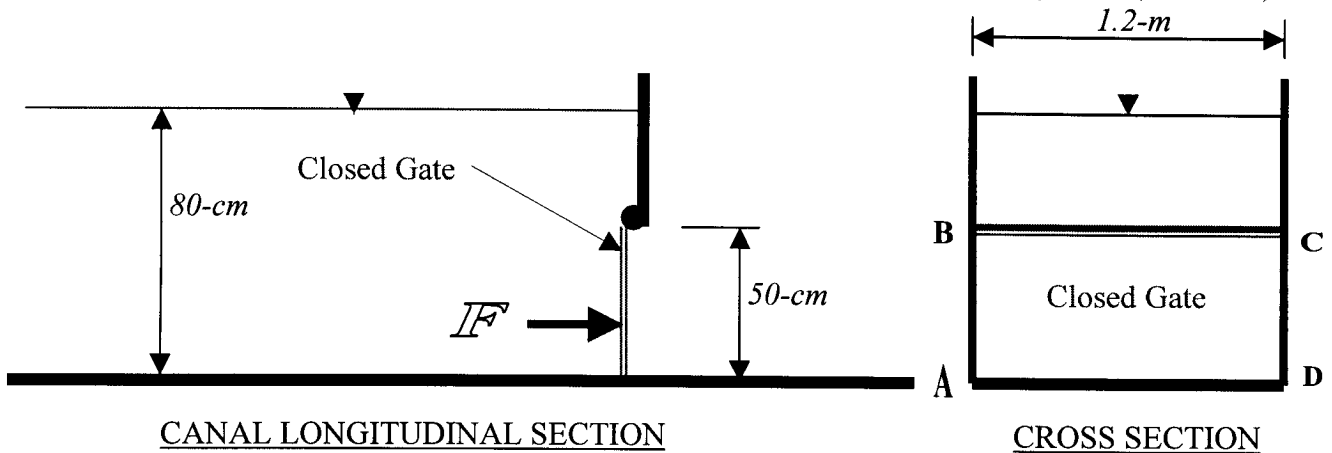


Fig Q3: Undershot Gate in a Rectangular Irrigation Canal

- Q4:** (a) What effect do water weeds growing in an irrigation or drainage canal have on the performance of the canal? Elaborate your answer. (6 marks)
- (b) The Ministry of Agriculture Food and Fisheries has secured funds from the African Development Bank to construct a new drainage canal at Buleya Malima Irrigation Scheme in Sinazongwe District. The canal should have a rectangular cross section, with 1.0-m bottom width. It will not be lined with concrete. It will be straight, uniform, and most likely poorly maintained. The average slope of the ground surface between the dam and the irrigated plots is 1 in 500.

Calculate the most suitable flow depth at 350-liters per second flow rate. (14 marks)

- Q5:** (a) Why is it NOT recommended to drill boreholes too close to each other? (5 marks)
- (b) A commercial farmer based in Mazabuka contracted Water Wells Limited to drill a borehole (**No. BH-2**) on a site 82-m away from an existing Borehole (**No. BH-1**), in order to supplement water supply for a *centre pivot irrigation system*. The two boreholes are 20-cm in diameter each, and penetrate an unconfined aquifer down to an impermeable layer at a depth of 65-m below ground surface. ($K = 0.0002$).

The depth of the water table is 18-m below ground level. When only borehole **No. BH-1** is pumped the drawdown in borehole **No. BH-1** is 10-m. When only borehole **No. BH-2** is pumped the drawdown in borehole **No. BH-2** is also 10-m.

Estimate the drawdown in borehole **No. BH-1** when both boreholes are being pumped at 30 litres per second flow rate. (15 marks)

Q6: A deep well turbine pump is to be procured and installed in a borehole at the University Farm to be used to supply water into an overhead tank for domestic use in the houses, workshop, and offices. Using installation data below, compute the minimum pressure (Total Dynamic Head) that the suitable pump must be able to meet the duty requirements.

DATA:

- (i) Pumping capacity:
 - expected discharge of the pump = 20 l/sec,
 - (ii) Pumping station/ Borehole:
 - pipe material = steel ($f = 0.025$)
 - length of riser pipe / or column = 42 m,
 - diameter of the riser pipe = 150 mm,
 - diameter of the line shaft = 20 mm,
 - rest water level = 25 m,
 - draw-down = 10 m.
 - (iii) Delivery pipeline:
 - pipe material = steel ($f = 0.025$)
 - length of delivery pipeline = 1,300 m,
 - diameter of delivery pipe = 150 mm,
 - water is to be discharged into a tank 30 m above ground level,
 - the pipeline has the following fittings:
 - 1 Gate Valve (fully open, $K = 2.2$), and
 - 1 Swing Check Valve, both of 200 mm diameter, ($K = 1.5$)
- (20 marks)*

Q7: Briefly explain each of the following:

- (a) Hydrological cycle *(5 marks)*
- (b) Double Mass Curve Analysis *(5 marks)*
- (c) Effect of Pumps in parallel and pumps in series *(5 marks)*
- (d) Well interference *(5 marks)*



Surface of channel	Condition	
	Good	Poor
Neat cement	0.010	0.013
Cement mortar	0.011	0.015
Concrete, <i>in situ</i>	0.012	0.018
Concrete, precast	0.011	0.013
Cement rubble	0.017	0.030
Dry rubble	0.025	0.035
Brick with cement mortar	0.012	0.017
Plank flumes, planed	0.010	0.014
unplaned	0.011	0.015
Metal flumes, semicircular, smooth	0.011	0.015
corrugated	0.022	0.030
Cast iron	0.013	0.017
Steel, rivetted	0.017	0.020
Canals, earth straight and uniform	0.017	0.025
dredged earth	0.025	0.033
rock cuts, smooth	0.025	0.035
rock cuts, jagged	0.035	0.045
rough beds with weeds on sides	0.025	0.040
Natural streams, clean smooth and straight	0.025	0.035
rough	0.045	0.060
very weedy	0.075	0.150

Table: Values of n in Manning's formula for flow in open channels

PROPERTIES OF AREAS AND VOLUMES

	Sketch	Area or Volume	Location of centroid	2nd. Moment of Area		Sketch	Area or Volume	Location of centroid	2nd. Moment of Area
Rectangle		bh	$y_c = \frac{h}{2}$	$I_{c0} = \frac{bh^3}{12}$	Parabola		$\frac{2}{3}bh$	$y_c = \frac{3h}{8}$ $x_c = \frac{3b}{8}$	$I = \frac{2bh^3}{7}$
Triangle		$\frac{bh}{2}$	$y_c = \frac{h}{3}$	$I_{c0} = \frac{bh^3}{36}$	Cylinder		$\frac{\pi d^2 h}{4}$	$y_c = \frac{h}{2}$	
Circle		$\frac{\pi d^2}{4}$	$y_c = \frac{d}{2}$	$I_{c0} = \frac{\pi d^4}{64}$	Cone		$\frac{1}{3}(\frac{\pi d^2 h}{4})$	$y_c = \frac{h}{4}$	
Semicircle		$\frac{\pi d^2}{8}$	$y_c = \frac{4r}{3\pi}$	$I_{c0} = \frac{\pi d^4}{128}$	Paraboloid		$\frac{1}{2}(\frac{\pi d^2 h}{4})$	$y_c = \frac{h}{3}$	
Ellipse		$\frac{\pi bh}{4}$	$y_c = \frac{h}{2}$	$I_{c0} = \frac{\pi bh^3}{64}$	Sphere		$\frac{\pi d^3}{6}$	$y_c = \frac{d}{2}$	
Semicellipse		$\frac{\pi bh}{4}$	$y_c = \frac{4h}{3\pi}$	$I_{c0} = \frac{\pi bh^3}{18}$	Hemisphere		$\frac{\pi d^3}{12}$	$y_c = \frac{3r}{8}$	

THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS
JULY 2001

AGS 422 SOIL MICROBIOLOGY

TIME: 3 HOURS

MARKS: 100

INSTRUCTIONS: ANSWER ALL QUESTIONS

1. Describe the mechanisms that microorganisms employ to eliminate competition and ensure survival in soil. Give examples in each case. [10]
2.
 - a) A soil contains 2.5% organic matter and a C:N ratio of 10:1 in the top 20 cm. Given that N mineralizes at a rate of 3.5% per year, calculate the amount of mineral N that would be released during the growing season in Zambia. [8]
 - b) Describe nitrogen management practices that can increase fertilizer efficiency and explain why. [10]
3.
 - a) What are the advantages and disadvantages of composting materials before applying them to soil? [10]
 - b) The following data were obtained from an experiment comparing straw compost with straw ploughed in the soil. Explain the differences in crop response to these treatments. [5]

Material	Year of application		Year after application	
	Compost	Straw ploughed in	Compost	Straw ploughed
Potatoes	20.20	23.70	19.6	20.30
Sugar	4.63	5.15	4.53	4.76
Barley	3.45	3.86	3.30	3.46

4. Calculate the % N in NH_4NO_3 with
 - a) Natural abundance of ^{15}N [5]
 - b) 60 atomic % ^{15}N enrichment [5]
 - c) How much ^{15}N enriched NH_4NO_3 is needed in order to apply 20g N per m^2 ? [5]

5. a) How are pathogens removed from sewage before the waste is disposed into the environment? [4]
- b) Describe the five steps followed in sterilizing root nodules before rhizobium are isolated and cultured for inoculum production. [10]
6. Describe the soil, plant and nutrient type conditions under which you would expect maximum benefit from plant-mycorrhizal associations. [10]
7. Microbial activity in soil can be estimated from evolution of CO_2 in incubated soil samples.
- a) How is the CO_2 trapped? Give balanced equation. [2]
- b) If the product in a) above is titrated with standard 0.1 M HCl, how much CO_2 and C would be equivalent to 1 cm^3 of the acid? [6]
8. a) What is the BOD in mg of O_2 per dm^3 of sample if a 25cm^3 aliquot of sample is titrated with 6.3 cm^3 of 0.0015 M $\text{Na}_2\text{Cr}_2\text{O}_7$? [6]
- b) Describe the mechanisms by which chlorine disinfects water. [4]

END EXAM

THE UNIVERSITY OF ZAMBIA

UNIVERSITY SECOND SEMESTER EXAMINATIONS – JULY/AUGUST, 2001

AGS 522: SOIL AND PLANT ANALYSIS

TIME : 3 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS

MARKS: 100

1. In order to determine the calcium content of a lime sample, 5.0gm material was weighed, digested and diluted to 100ml mark. Of this, 10ml solution was removed and diluted to 200ml mark in a volumetric flask. Upon reading this sample on the AAS, a reading of 30mg Ca/L was obtained. Calculate and express the Ca in the sample on a percentage basis. (5)
2. (a.) What is the difference between active and reserve acidity? (2)
(b) How is each portion measured and what are the potential problems with these procedures? (5)
(c) How does each portion affect the lime requirement? (3)
3. Explain the differences between the SLAN and BCSR approaches to making K, Ca, and Mg recommendations. What is the relative merit of each approach? (10)
4. Tissue contamination is a major problem. Discuss the washing procedure for leaf samples. When is it not recommended to wash samples and what characteristics of the analytical data would indicate the possibility of contamination? (5)
5. Given the following soil test results, indicate your interpretations and where you would make fertilizer recommendations for maize. (10)

<u>Element</u>	<u>Test level</u>	<u>Interpretation</u>	<u>Recommendation(Y or N)</u>
PH	5.2		
N	0.2%		
P	8mg/kg		
K	90mg/kg		
Ca	100mg/kg		
Mg	40mg.kg		
S	5mg/kg		
Mn	20mg/kg		
Zn	4mg/kg		
Fe	10mg/kg		
Cu	5mg/kg		
B	0.2mg/kg		

What are the goals of soil and plant analysis?

(5)

7. In the process of reading P on the spectrometer, your sample reading registers a value higher than your standard. Is this acceptable and what if anything would you do to your sample and calculation? (5)
8. Given the following foliar analysis data, discuss the nutrient concentration levels for crops generally and suggest symptoms that may have been observed on the plant. (10)
- | | |
|----|----------|
| N | 1.2% |
| P | 0.5% |
| K | 3.5% |
| Ca | 0.1% |
| Mg | 0.4% |
| Zn | 25mg/kg |
| Mn | 200mg/kg |
| Fe | 80mg/kg |
| B | 5mg/kg |
9. Give a step by step explanation of the Kjeldahl procedure and explain the chemistry or rationale for each step. (10)
10. Explain the general understanding of the relationship between crop yield and nutrient concentration or nutrient uptake. Use diagrams as needed. (10)
11. You have been hired as a consultant to prepare a land use plan for a farm. How would you go about a soil fertility survey? Be sure to indicate key factors to look out for. (10)
12. Discuss capacity, intensity, reserve and latent factors as they apply to soil tests and plant nutrition. (10)
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END OF EXAM