

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2008 SECOND SEMESTER

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|-------------|---|
| 1. AGA 332 | APPLIED ANIMAL NUTRITION |
| 2. AGA 342 | ANIMAL BREEDING AND GENETICS |
| 3. AGA 412 | PIG & POULTRY PRODUCTION |
| 4. AGC 442 | PLANT BREEDING |
| 5. AGA 542 | ANIMAL HEALTH |
| 6. AGC 332 | FORAGE CROP PRODUCTION |
| 7. AGC 332 | PLANT PATHOLOGY |
| 8. AGC 422 | HORTICULTURE SCIENCE I |
| 9. AGC 572 | POST HARVEST TECHNOLOGY |
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| 11. AGE 562 | INTERMEDIATE FARM MANAGEMENT |
| 12. AGE 582 | PROJECT MONITORING & EVALUATION |
| 13. AGF 311 | CHEMICAL TECHNIQUES IN FOOD ANALYSIS |
| 14. AGF 332 | METHODS IN FOOD ANALYSIS I (PRACTICAL) |
| 15. AGF 342 | FOOD TOXICOLOGY |
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| 17. AGF 432 | PROCESS CONTROL AND INSTRUMENTATION |
| 18. AGS 222 | FUNDAMENTALS OF SOIL SCIENCE |
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| 21. AGS 452 | PRINCIPLES OF LAND HUSBANDRY |

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

AGA 332 – APPLIED ANIMAL NUTRITION

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

1. Describe good quality grass hay and discuss how quality is preserved during processing and storage.
2. Some of the commonly used feed ingredients are known to contain some factors/components detrimental to good nutrition. Identify the factors/components associated with the ingredients listed below explaining how and where they exert their detrimental effects as well as measures that can be taken to counteract or avoid their effects.
 - a. Sorghum
 - b. Soybean
 - c. Cotton seed
3. Using the ingredients listed in the table below, formulate a ration for growing pigs that meets the indicated requirements and satisfies requirements for vitamins and trace minerals.

Requirements

3,100 Kcal/kg Metabolizable Energy	18.00% Crude Protein
0.79% Lysine	0.50% Methionine
0.65% Calcium	0.55% Phosphorus

Available Ingredients

Ingredient	ME Kcal/kg	CP %	Lysine %	Methionine %	Ca %	P %
Maize meal	3,300	8.50	0.25	0.20	0.02	0.25
Sunflower meal	2,300	45.00	1.70	0.72	0.37	1.00
Tallow	7,500	-	-	-	-	-
Bone meal	-	-	-	-	28.00	12.00
Limestone	-	-	-	-	38.00	-
DL-Methionine	-	-	-	98	-	-
Lysine	-	-	80	-	-	-
Salt	-	-	-	-	-	-
Vit./mineral Premix*	-	-	-	-	-	-

*The premix is recommended for inclusion in a pig grower ration at a rate of 0.10%.

4. Calculate the following:

- a. The amount of silage required to supply a dairy cow 0.20kg roughage Dry Matter, and the amount of protein supplied if the silage has 60.00% moisture and 3.00% crude protein on as-fed basis.
- b. Percent crude protein content of a mixture of maize meal and cotton seed meal that contains 625kg maize meal and 300kg cotton seed meal if maize meal has 9.00% crude protein and cotton seed meal has 30.00% crude protein.
- c. The amounts of maize bran and cotton seed meal in a 8,000kg mixture of the two that has 12.00% crude protein if maize bran has 10.00% crude protein and cotton seed meal has 26.00% crude protein.
- d. The amounts of alfalfa meal and maize bran that will supply a dairy cow 4.50kg DM and 3.50kg TDN if alfalfa has 94% DM and 55% TDN and maize bran has 90% DM and 82% TDN.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2008 ACADEMIC YEAR – SECOND SEMESTER DEFERRED EXAMINATIONS

COURSE AGA 342 – ANIMAL BREEDING AND GENETICS

TIME ALLOWED: THREE (3) HOURS ONLY

INSTRUCTIONS TO CANDIDATES:

- a) All Questions carry equal marks (20).
 - b) Answer any five (5) questions; and clearly show all the calculations.
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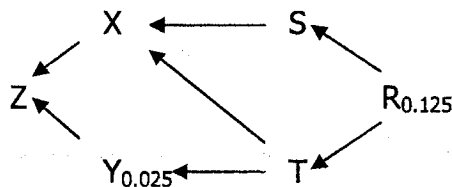
Q. 1 Outline the structure of Deoxyribonucleic Acid (DNA) in relation to its function as a carrier of genetic information. How is the genetic information translated into the sequence of amino acids in proteins?

Q. 2 Write notes, with examples, on the following:

- i. Allele;
- ii. Grading up;
- iii. Autosexing;
- iv. Sib Selection;
- v. Transcription;
- vi. Progeny testing;
- vii. Sex limited traits;
- viii. Over-dominance;
- ix. The Law of Segregation; and
- x. Xenophobia pimentosum.

Q. 3 a) What do you understand by the terms Cross Breeding as opposed to Inbreeding? What are their effects?

b) Given the pedigree (arrow diagram) below, work out the Coefficient of Inbreeding, F ; and the Coefficient of Relationship, R . Comment on the answers you get.



- Q. 4 a) An animal scientist interested in studying the heritability of milk yield (tonnes per lactation) in ten (10) cross-bred dairy cows kept at the Animal Science section of the Field Station. The animal scientist collected the following data on milk yield in 2007 from the cross-bred dairy cows (x) and the corresponding milk yield of their progeny (y). Work out the heritability of milk yield in tonnes per lactation in the cross-bred cows.

Milk Yield of Cross-bred cows (x)	Average Milk Yield of Progeny (y)
10.5	10.0
10.0	10.0
8.5	10.0
9.0	9.5
10.0	10.5
11.0	10.0
9.0	9.5
9.5	10.0
10.0	12.0
9.0	9.5

- b) Explain the sequence of events that take place during Prophase I of Meiosis and indicate their genetic consequences.

- Q. 5 a) State the Hardy-Weinberg Law. In a closed and randomly mating population, the frequencies of AA = 30%, Aa = 40% and aa = 30%, is this population at Hardy Weinberg equilibrium?

- c) In *Drosophila*, a gene that causes vestigial wings is 12.5 map units from the gene that causes purple eyes. A third gene that causes black body colour is 18.5 map units from the gene that causes vestigial wings and 6 map units from the gene that causes purple eyes. The alleles that cause vestigial wings, purple eyes and black body colour are all recessive. The dominant or wild type traits are long wings, red eyes and gray body colour. A researcher crossed the wild type flies to flies with vestigial wings, purple eyes and black body colour. All the F₁ flies were wild type. The researcher then crossed the F₁ female flies to male flies with vestigial wings, purple eyes and black body colour. If a total of 1,000 progeny were observed, what are the expected numbers with the following types of flies?

Long wings, red eyes, gray body;
 Long wings, purple eyes, gray body;
 Long wings, red eyes, black body;
 Long wings, purple eyes, black body;
 Vestigial wings, red eyes, gray body;
 Vestigial wings, purple eyes, gray body;
 Vestigial wings, red eyes, black body; and
 Vestigial wings, purple eyes, black body.

Work out the expected double crossovers and the coefficient of coincidence. Comment on your answers.

- Q. 6 a) A testcross performed in *Drosophila* by mating the F_1 female heterozygotes (b^+/b , pr^+/pr and vg^+/vg) to male flies that are homozygous recessive for all alleles (b/b , pr/pr and vg/vg) gave the following results:

$b^+ pr^+ vg^+$	411
$b^+ pr^+ vg$	46
$b^+ pr vg^+$	2
$b^+ pr vg$	45
$b pr^+ vg^+$	43
$b pr^+ vg$	1
$b pr vg^+$	45
$b pr vg$	412

- Are these genes linked? Justify your answer.
 - What is the correct order of the genes?
 - What is the map distance between the genes?
 - Calculate the coefficient of coincidence.
- b) The livestock breeders and/or owners are usually interested in selecting for improved performance of several traits at a time instead of only one trait. Discuss the methods that can be used for the selection of a number of preferred traits in order to achieve simultaneous improved performance.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

END OF SECOND SEMESTER EXAMINATIONS **2008/2009 ACADEMIC YEAR**

COURSE AGA 412 – PIG AND POULTRY PRODUCTION

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

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

Q1. For a fertile egg to hatch it has to be carefully selected and provided with the right conditions. Write in detail on the selection criteria and incubation conditions required for successful hatching of eggs.

Q2. Imagine you are the Animal Production Officer for Sesheke District. A group of farmers come to you for guidance on how to manage 300 broiler chicks which are due to arrive in a week's time. What advice would you give them?

Q3

- i.** Write briefly on any 10 (ten) factors that affect layer performance.
- ii.** Proper culling of layers ensures that feed is not wasted on non-laying birds or those that are laying too few birds to be economical. After the onset of lay changes can be observed in different parts of the body of hens which indicate whether a hen is in lay and whether it is a good a layer. Fill in the table below for observed changes in a good layer.

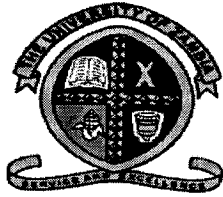
Part of the body	Changes occurring in good layer	Time period (from onset of lay) when change is observed
Vent		
Pelvic Bones		
Shanks		
Eyering		
Ear lobe		

Q4

Compare the predisposing factors to piglet mortality in the scavenging and large scale intensive systems of management.

Q5 Write on the constraints to Village or Traditional Chicken production improvement in Zambia.

END OF EXAMINATION



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

AGC 442 PLANT BREEDING

DATE: APRIL 2009

VENUE: SPORTS HALL

TIME 14:00-17:00

INSTRUCTIONS

Answer Question No. 1 and any other THREE. Points for each question are indicated in brackets.

TIME: 3 hours

Q1 Biotechnology has great potential applications in crop improvement. Tissue culture techniques are considered to be basic biotechnological techniques while Genetic Engineering or Recombinant DNA work being considered at the top, more sophisticated level.

- a) Discuss some of the possible application of tissue culture techniques in Plant Breeding (15 points)
- b) Discuss in general how the application of genetic engineering in crop improvement in the Zambian can benefit the country (15 points)
- c) Comment on the validity of the strong anti Biotechnology sentiments among politicians and the general public in Zambia and whether this is justified from the scientific point of view (10 points)

Q.2 Write short notes on the following:

- a) Seed production procedures (5 points)
- b) Male sterility (5 points)
- c) Germplasm formation (5 points)
- d) Robert Malthus hypothesis (5 points)

Q. 3 As a plant breeding student explain how you would breed for disease resistance in maize. In dealing with diseases what aspects need to be borne in mind by you the breeder?

(20 points)

Q4 What is the main objective of selection methods in cross-pollinated crops? Clearly describe the Recurrent Selection for Specific Combining Ability clearly pointing to the final products. Differentiate this from Recurrent Selection for General Combining Ability.

(20 points)

Q. 5 Why is it important to know the reproductive structures of plants? List clearly the major characteristics of self-pollinated crops and cross-pollinated crops outlining the mechanisms that promote the mode of reproduction.

(20 points)

END OF EXAMINATION

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

2009 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 542: ANIMAL HEALTH

TIME: THREE (3) HOURS

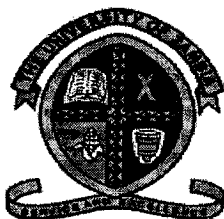
INSTRUCTIONS: ATTEMPT ALL QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. After your graduation and level of expertise in Animal Health, you are appointed as regional coordinator for Zambia for Food and Agricultural Organization in a livestock project looking at neglected diseases in neglected populations and multi dimension of poverty. You are also a consultant to the Ministry of Agriculture and Cooperatives. The project has requested you to establish a framework of problems, challenges and control in the traditional poultry and pig production systems.
 - a) How would you plan to come up with identifying problems and challenges affecting the two sectors? Include sectors or stakeholders you would involve. **(5 marks)**
 - b) List the neglected animal health issues and challenges you think would come up in your framework. **(5 marks)**
 - c) Concisely discuss the issues in b) above and how you would hope to address them in 10 years of the project (include your proposals for such a process and justifications for their inclusion). **(10 marks)**
2. Discuss the causative agent, epidemiology, clinical signs, postmortem signs, treatment and control of the following diseases
 - a) Heartwater **(5 marks)**.
 - b) Corridor disease **(5 marks)**.

- c) Gall-sickness (**5 marks**).
 - d) Red Water (**5 marks**).
3. Several bacterial diseases cause mortality and/or reduce livestock productivity. Write informative notes on the following (**20 marks**):
- a) Differential diagnosis of Brucellosis.
 - b) Transmission and epidemiology of Blackleg.
 - c) Control measures against Contagious Bovine Pleuropneumonia.
 - d) Transmission and epidemiology of Tuberculosis
 - e) Diagnosis of Anthrax.
4. In Zambia, intensive poultry farming system faces a lot of challenges including several diseases causing poultry diarrhea, dehydration and death (**20 marks**).
- a) List four (4) poultry diseases characterized by diarrhea.
 - b) Discuss one (1) such poultry diarrhoeal disease under the following headings:
 - i) Causative agent and transmission.
 - ii) Clinical signs.
 - iii) Postmortem findings.
 - iv) Control/preventive measures.
5. Foot and mouth disease and African swine fever are two of the most common diseases and important causes of economic losses to livestock farmers. The diseases have in recent years spread to most of the livestock rearing areas in the country. Describe the etiology, clinical signs, transmission and control of these diseases in Zambia. (**20 marks**)

END OF EXAMINATION



THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES DEPARTMENT OF CROP SCIENCE

SECOND SEMESTER EXAMINATIONS, 17TH APRIL 2009

AGC 322: FORAGE CROP PRODUCTION

TIME ALLOWED: 3 HOURS TIME: 09:00 – 12:00 HOURS

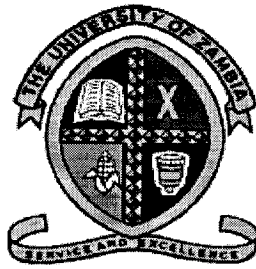
INSTRUCTIONS

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

QUESTION 1	a) What is the difference between permanent and cropland pasture? b) What are the five basic characteristics of a good pasture species? c) Briefly describe the importance of cytogenetic information in forage improvement. d) What broad class of substances does NPN include? e) How are ruminants able to use fibrous carbohydrates such as cellulose as food?	Marks 4 4 4 4 4
	Sub total	20
QUESTION 2	i) Describe how the production constraints of forage crops can be overcome. ii) Describe the soil management practices that must be built around pasture grasses and legumes?	Marks 10 10
	Sub total	20
QUESTION 3	Given the following forage grasses and legumes: Forage grasses: Buffel grass, Panic, Rhodes grass, Napier grass, Bana grass.	

QUESTION 3 CONTINUED	Forage legumes: Acher, Glycine, Siratro, Silverleaf, Axillaris.	Marks
	i) Give the scientific names of 2 of the forage grasses and 2 of the forage legumes as well as their places of origin.	2
	ii) Describe the main components of management of the crops you have selected.	10
	iii) How has stored feed been essential for efficient animal production?	8
	Sub total	20
QUESTION 4	i) Describe the role pasture research has played in the production and productivity and use of pasture crops	Marks 10
	ii) Briefly describe the breeding methods of apomixis, wide crosses and mass selection in the improvement of forages.	6
	iii) What factors control flowering in pasture crops? State the photoperiodic response of the pasture legumes given in question 3.	4
	Sub total	20
QUESTION 5	i) Describe the characteristics of high quality forages?	Marks 6
	ii) Describe the major compositional components and indicate which should be low or high for high quality forages.	10
	iii) What does the intake or consumption of a given pasture by animals depend upon?	4
		20

END OF EXAM



THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF CROP SCIENCE

SECOND SEMESTER FINAL EXAMINATION

AGC 332: PLANT PATHOLOGY

VENUE: LIBRARY BASEMENT

DATE/TIME: 28TH APRIL, 2009, 09:00 - 12:00

INSTRUCTIONS: ANSWER QUESTION 3 AND ANY OTHER 4 QUESTIONS

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1.
 - a). List 5 systemic and 5 localized disease symptoms giving 5 disease examples of each
 - b). Explain the gene –for –gene concept with the aid of a diagram **(20 marks)**

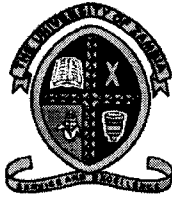
2. Explain the following in detail:-
 - Koch's postulates
 - Plant disease triangle
 - Seed health testing methods
 - Formation of tyloses in plants with the aid of a diagram
 - Biochemical defense reaction **(20 marks)**

3. You are a plant pathologist from UNZA and you have received a message from an extension worker on the Copperbelt that there is an outbreak of a disease on soybean. How are you going to solve this problem? **(20 marks)**

4.
 - a). What is seed health testing and what are the objectives of seed health testing? Give 5 examples of seed borne diseases. **(10 marks)**
 - b). Explain the importance of abscission layers in disease development with the aid of a diagram **(10 marks)**

5. a) List and explain in detail the environmental and human cultural practices that affect plant disease epidemics **(15 marks)**
- b). List all the disease gradient curves with the aid of a diagram for each curve giving one disease example of each **(5 marks)**.
6. a). List biotic and a biotic disease causing agents giving one disease example of each **(5 marks)**
- b) Give scientific names of causal agents for the following diseases:-
- Black arm of cotton
 - Late blight of potato
 - Bacterial wilt of tomato
 - Witchweed of maize
 - Purple blotch of onion **(10 marks)**
- c.) Write short notes on the following growth regulators:
- Auxins
 - Giberellins
 - Cytokinis
 - Polyssacharides **(5marks)**

END OF EXAM



University of Zambia

School of Agricultural Sciences

Fourth Year Examinations for Bachelor of Agricultural Sciences

AGC 422 HORTICULTURE SCIENCE 1

Second Semester 2008/09

Date: 16th April 2009

Time: 14.00 – 16.00 hrs

Instructions

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

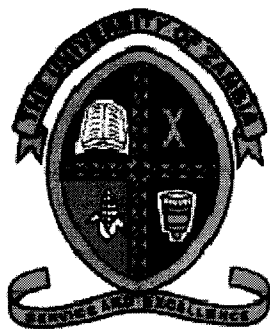
1. Lateral buds and adventitious roots are important in horticulture. Discuss this statement in detail giving examples where necessary. **(6 marks)**
2. What is trench layering? Where is this technique of layering used? Illustrate your answer with a diagram. **(6 marks)**
3. With reference to protected cultivation:
 - a. What is protected cultivation? **(2 marks)**
 - b. Why are crops grown in protected cultivation/environments? **(3 marks)**
 - c. What are the different designs used in protected cultivation? Illustrate your answer using a diagram. **(4 marks)**
 - d. Which design would you recommend for a farmer intending to grow ornamental crops and give a reason for your choice. **(1 marks)**
 - e. Climate is an important consideration when growing crops under protected cultivation. What are the climatic parameters? How do these parameters affect production and what preventive action can be taken? **(10 marks)**
4. The cultural method is used to control pests and diseases. Describe this method in relation to vegetable production giving examples where this method is applicable. **(15 marks)**
5. With reference to Onion production:

- a. What is maturity index in onion based upon? For a farmer intending to produce onions in the rainy season, what variety/varieties would you recommend and why?(4 marks)
- b. What happens to an onion crop when not irrigated according to the irrigation schedule? Illustrate your answer with a diagram. (5 marks)

6. With reference to Amaranthus production:

- a. What are the different stages of harvesting amaranthus? In order to have a continuous harvest, what does a farmer need to do? (3 marks)
- b. A farmer suspects leaf spot and leaf caterpillars in his amaranthus crop? As an Agricultural Officer, how can you confirm the farmer's suspicion? What remedial measures would you advise? Your answer should be in table form. (11 marks)

END OF EXAM



UNIVERSITY OF ZAMBIA

FACULTY OF AGRICULTURAL SCIENCES

Fifth Year Final Examination for the Degree of Bachelor of Agricultural Sciences

Programme

AGC 572: Post harvest technology. April 27th 2009

Instructions

Answer all questions

Answer each Section (A, B, C) in a separate booklet

Time- Three (3) hours

Section A (30 marks)

1. What is respiration, explain the role that respiration plays in shelf life of horticultural products? [10 marks]
2. What is the effect of low oxygen on the quality of harvested products? [5 marks]
3. Quality is an important parameter in food quality. What factors determine quality of a product? Using specific examples, explain the criteria that are used to determine quality and why they are critical to consumers?

[15 marks]

Section B (20 marks)

1. What are the major differences between Modified Atmosphere Storage and Controlled Atmosphere Storage?
2. Write short notes on the benefits of using Controlled Atmosphere for Short-Term Storage.

[4 marks]

[4 marks]

3. State 6 uses of Modified Atmosphere Storage for fresh produce. [4 marks]
4. State 7 methods used to restrict gas exchange in commodity generated Modified Atmosphere Storage. [4 marks]
5. The figure below shows the gas exchange dynamics in a MAP of tomatoes. Analyze the behavior of the gases in the graph. [4 marks]

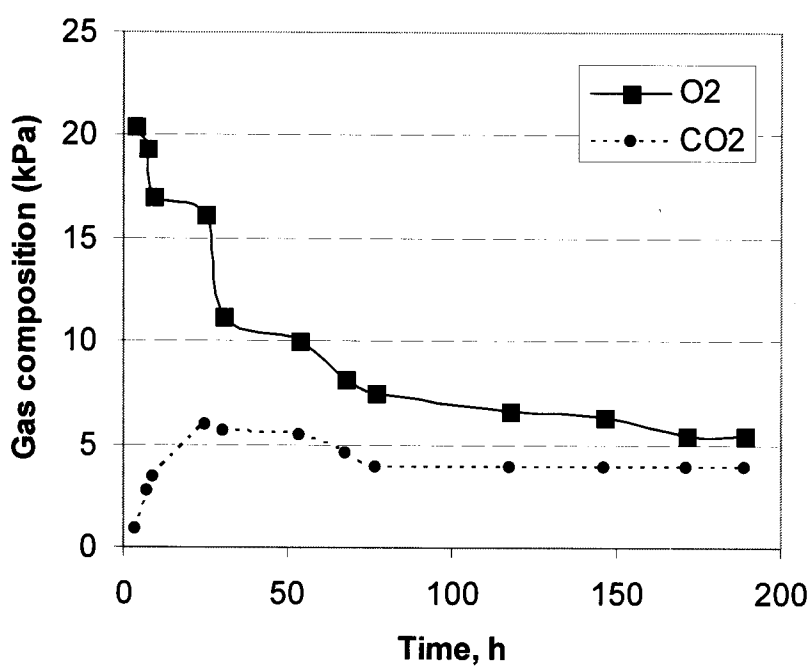


Figure 1. Gas exchange dynamics in a LDPE package containing tomatoes sealed under air and stored at 20 degree Celcius.

Section C (50 marks)

1. What hormone/hormone producing material is/are used to stimulate ripening in horticultural commodities.
(1.5marks)
2. What is bent neck? Which flower crop is susceptible to bent neck? (2 marks)
3. When handling bananas, what are the two considerations (in relation to the environment) which ensure that there is no product damage during ripening?
(3 marks)
4. What is the basis for grading cut flowers? How are these flowers graded? (3.5 marks)
5. Why are carbohydrates supplied to cut flowers? In what form are carbohydrates supplied? Give examples of such carbohydrates. (5 marks)
6. What is vacuum cooling? How is vacuum cooling achieved? What percentage of leafy vegetable product weight is lost for each 6⁰C of product cooling? (3 marks)
7. Growth Regulators are an important consideration when handling cut flowers. Give 2 examples of growth regulators. What is their effect on flowers? In cases where the effect is detrimental, what can be done about this? (6 marks)
8. In the packing section of a citrus packinghouse, what measures should be taken to ensure maximum marketable produce? (10 marks)
9. In what type containers are the following products packed? Roses, Asparagus and Gladiolus. How are these products packed? Why are these products packaged in such a way? (6 marks)
10. What is the major problem in field packed cabbage? What should the remedy be for this problem to ensure attractiveness of produce? (2.5 marks)
11. For field cured onion, what operation should be carried out before packaging it? How is it packaged? Give a reason for choice of packaging material? (2.5 marks)
12. What causes stem end rot in citrus? Which part of the fruit is infected? How can the disease be prevented/controlled? (5 marks)

END OF EXAMINATION

The University of Zambia
University Second Semester Examinations – April 2009
AGE 442

Agribusiness Statistics and Data Analysis

Instructions: There are two sections in this exam. Answer both questions in section A; and any one of the two questions in section B.

Time: Three (3) hours

Section A (80 points)

There are two questions in this section. Answer both.

1. Suppose you have been asked by the Embassy of Sweden to determine the ex post impact of their former project, the Economic Expansion in Outlying Areas (EEOA) project, which ran from the mid-1980s to 2000. The embassy wants to know if the target communities have continued to apply the knowledge they gained from the EEOA and if the impacts of such interventions were still visible in 2005. You learn by reviewing project documents that one of the aspirations of the EEOA project was to promote asset accumulation at household level. You postulate that if the households continued employing the EEOA interventions, then the value of assets for the target households should have continued to grow after the project. You collected data from former participants and non-participants of the EEOA project in Chadiza, Katete, and Petauke districts. In addition to collecting data on household characteristics and demographics, you also collected data on the value of assets in 2000 and in 2005. Based on your knowledge of econometrics, you fit a model in Stata using the *change in log of value of assets* as your dependent variable.
 - i) Suppose, based on your initial OLS regression (results not shown here), you determine that the Breusch-Pagan test statistic is 9.61 (p-value=0.002). Could you use such results? Explain your answer in not more than four short sentences.
 - ii) If you correctly estimated the model (results in Table 1 attached), what estimator(s) are you likely to have used?
 - iii) Answer the following questions based on the results in Table 1 (attached)
 - a) Are your regressors jointly significant at $\alpha = 0.01$?
 - b) List the variables that are significant at $\alpha = 0.10$.
 - c) Why did the model not include the dummy variable for Chadiza district?
 - d) What does the VIF column tell you about this model?
 - e) Did the EEOA project have any *ex post* impact on asset accumulation?
2. You have observed through the four years that you have been on campus that students use one of two modes of transport – minibus or taxi – to go to town. You are interested in determining the probability that a student will use a minibus. To do this, you develop the variable “mode of transport”, y , and code its two categories as one if minibus and zero if taxi. From your knowledge of econometrics, you determine that each observation of y will follow a Bernoulli probability density function, given as
$$f(y_i) = p^{y_i} (1 - p)^{1-y_i},$$
where p is the probability that the student will use a minibus and y_i is the value of y in observation i .
 - a) Derive the maximum likelihood estimator (MLE) for p , assuming a sample of size n .
 - b) Suppose you interview 5 students and obtain the following results:

Observation i	1	2	3	4	5
y_i	0	1	1	0	1

Use MLE to estimate the probability of using a minibus based on these data.
 - c) In a regression model with mode of transport, y , as the dependent variable, briefly explain
 - i. Why the linear probability model (LPM) is inappropriate.
 - ii. How you would correct for the problem(s) in c(i).

Section B (20 points)

Answer any one of the two questions in this section.

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

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

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

$$D = S,$$

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

- State which variables are endogenous and which are exogenous (or predetermined).
- Establish the identification condition of each equation.
- Why is it necessary to seek alternatives to OLS when estimating parameters of equations that are part of a system of simultaneous equations?

4. Suppose you estimate the following equations

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1x$$

$$\hat{y} = \hat{\gamma}_0 + \hat{\gamma}_1x + \hat{\gamma}_2w,$$

where x and w are explanatory variables.

- d) Explain in not more than four short sentences the circumstances under which

i) $\hat{\beta}_1 = \hat{\gamma}_1$

ii) $\hat{\beta}_1$ can test significantly different from zero when $\hat{\gamma}_1$ is not

- e) Compare and contrast simple correlation coefficient and variance inflation factors?

Table 1. Regression results (For Question 1)

Variable description	Coef.	Robust Std. Err.	t	p-value	[95% Conf. interval]		VIF
Intercept	1.102	0.338	3.260	0.002	0.431	1.772	
Sex of head, 1= male (DX)	-0.392	0.259	-1.510	0.134	-0.907	0.123	2.000
Age of hh head in years (X1)	-0.015	0.005	-3.090	0.003	-0.025	-0.006	1.170
Dependency ratio (X2)	-0.002	0.001	-1.910	0.060	-0.004	0.000	1.220
Education of head in years (X3)	0.044	0.023	1.900	0.061	-0.002	0.089	1.810
Educ of most educated household (X4)	-0.013	0.025	-0.500	0.617	-0.062	0.037	1.990
Km to nearest town (X5)	-0.004	0.010	-0.440	0.657	-0.023	0.015	3.360
km to nearest main road (X6)	-0.020	0.025	-0.780	0.440	-0.070	0.031	1.510
Marital status, 1=married (DM)	0.439	0.230	1.910	0.059	-0.017	0.896	2.030
EEOA dummy variable, eq to 1 if the household participated in the EEOA project (DE)	-0.067	0.178	-0.380	0.707	-0.420	0.286	1.250
District dummy, 1=Katete (DK)	0.277	0.196	1.410	0.161	-0.112	0.665	2.240
District dummy, 1=Petauke (DP)	0.149	0.302	0.490	0.623	-0.451	0.749	4.440
Number of observations	105						
F(11, 93)	2.65			0.005			
R ²	0.17						

Dependent variable: Change in the natural log of value of assets

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

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2008/9 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGE 562: INTERMEDIATE FARM MANAGEMENT

TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER ALL FIVE (5) QUESTIONS

Each Question Carries 20 Marks

- Q1. a) Having proven yourself to be an intelligent student (you being in final year student at the University of Zambia being a case in point), you are hired as a consultant for Cheke farm to assess how efficiently the labor is being utilized on its farm. Explain the ways in which you'll measure labor efficiency for the farm **(8 marks)**
- b) Assuming that one of your findings of low labor efficiency at Cheke farm is because of unmotivated employees due to poor communication by the farm manager Mr. Mundia, discuss the characteristics of effective communication that a manager must possess that you would put in your recommendation **(12 marks)**.
- Q2. a) Give three advantages and three disadvantages for a land lord under a crop share lease **(6 marks)**
- b) Explain all the types of land ownership (with title) that you know **(10 marks)**
- c) Assuming that you want to buy 100 ha piece of land, of which 20 ha is wasteland. An estimate of annual net revenue from 80 ha is K15,000,000. Using the income capitalization method and 4.5% discount rate, what is the value for i) one hectare of land, ii) the entire piece of land? **(4 marks)**
- Q3. a) Assuming you are an established farmer and need capital to expand your dairy enterprise, what materials would you need to provide the bank so that you can improve your chances of getting a loan? **(5 marks)**
- b) Assuming that a 300 million kwacha loan will be repaid in 30 annual installment at 10.5% annual interest. How much principal and interest will be due in each of the first 5 years if the loan is amortized with equal total payment **(5 marks)**
- c) Discuss the sources of equity in farming. **(10 marks)**
- Q4. A farmer has an option of buying a new hammer mill at K250,000,000 with a 7-year useful life or a two-year old used hammer mill at K150,000,000 with 5 years of useful life. Details are shown in the following table:

	New Hammer mill (,000,000 ZMK)							Used Hammer mill (,000,000 ZMK)				
Year (n)	1	2	3	4	5	6	7	1	2	3	4	5
Cash Income	120	120	120	120	120	120	120	120	120	120	120	120
Cash Expenses	25	30	40	48	54	63	78	43	50	56	69	77
Taxes	1.5	2.0	1.8	1.6	1.3	1.1	0.8	0.5	1.4	1.3	1.1	0.6
Tax savings to Invest credit	3							2				
Salvage Value				70	68	64	60				61	60

- a) Determine the most profitable hammer mill using the NPV criteria and a discount rate of 11 % (10 marks)
- b) Estimate the year are you going to replace the machine selected in a) above assuming the selected machine will be used for at least 3 years before replacement (10 marks).

Q5. a) Briefly outline the causes of liquidity problems on the farm. (5 marks)

b) On its 2008 financial records Lily Pond farm has the following:

Total Revenue: **K43.8 million**

Total Expenses: **K16.5 million**

Family withdrawals: **K9.8 million**

Interest Expense: **K 4.3 million**

Combine Lease payments due / year: **K8 million**

Depreciation Expense: **K1, 500,000**

Operating loan: **K2,000,000**

Four- year breeding livestock loan: **4.5 million due / year**

Value of total farm Assets: **K165 million**

Personal Taxes: **1.3 million**

Income from non farm work: **K 7.5 million**

Opportunity cost of management: **K4.3 million**

Opportunity cost of all capital: **15%**

Using the above information for Lily Pond farm, estimate the following ratios:

- Interest Expense ratio (3 marks)
- Asset turn over ratio (3marks)
- Cash available for debt payment (3 marks)
- Capital Replacement and Term Debt Repayment Margin (3 marks)
- Return to labor (3 marks)

End of Examination!



THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2008/2009 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGE 582: PROJECT MONITORING AND EVALUATION

TIME: THREE (3) HOURS

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

1. (a) Monitoring and Evaluation (M&E) are critical in the achievement of project objectives. Define the terms "Monitoring" and "Evaluation" and explain the distinction between monitoring and evaluation.

(b) Discuss the following evaluations and also elaborate on their purposes: Ongoing, Mid-term, Terminal and Ex- post evaluations.
2. Over the past three years, Agriculture Development Aid of Zambia (ADAZ) had been funding rural based agricultural projects in the Luapula province. They would like to work in the same area for an additional three years with 5 of the 10 local Community Based Organizations (CBO's) they worked with earlier on. You have been engaged as a consultant to carry out an institutional assessment of all 10 CBO's and submit recommendations on five of them.

(a) List and discuss the factors you would include in the institutional assessment.
3. You are a Monitoring and Evaluation Officer in an Agricultural Project. The Project Manager has asked you to draw the Terms of Reference (TOR) for an Impact Evaluation to be conducted by some external consultants. Outline the items that you will include in the TOR for a comprehensive Impact Evaluation.
4. (a) What are the different types of data one would collect in an evaluation survey?
(b) Explain the conceptual and methodological issues or problems associated with defining and measuring demographic data, income and employment in an impact evaluation.

5. (a) What is Participant Observation? Elaborate on its importance, advantages, and disadvantages in data collection in M & E. Ensure that you also outline and explain the stages followed in conducting a study using a Participant Observation approach.

(b) Identify four (4) other qualitative methods of data collection and briefly explain what they are.
6. Write brief notes explaining most important aspects of the following:
 - (a) Logical Framework Analysis
 - (b) Diagnostic studies

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2008/09 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGF 311 CHEMICAL TECHNIQUES IN FOOD ANALYSIS

TIME ALLOWED: THREE HOURS

INSTRUCTIONS

1. Answer **questions one** and any three other questions.
 2. Question one carries 51 marks while each other question carries 13 marks.
 3. Marks are shown in brackets
-

- 1
 - (a) Describe the steps involved in a sampling operation of a food sample. (4marks)
 - (b) Explain the differences, if any, between primary and secondary sampling. (2 marks)
 - (c) Outline the methods used to reduce a maize sample to a manageable size. (3marks)
 - (d) The Mohr method was used to determine the concentration of sodium chloride in a 1.004g sample. The sample was dissolved in water and titrated to the end point with 32.36ml of 0.1012M silver nitrate. Calculate the percent of sodium chloride In the sample. (5marks)
 - (e) Briefly explain, with equations, the meaning of resolution in chromatography. (2marks)
 - (f) Calculate H and N for a 25.0cm column if methyl benzyl alcohol has a retention time of 17.6minutes and a half peak width of 0.59minutes. (4marks)
 - (g) Explain how a Van Deemter plot of column efficiency is used to select the optimum mobile phase velocity (3 marks)

- (h) Sulphur can be determined by combustion analysis which produces a mixture of SO_2 and SO_3 . The gas stream is passed through H_2O_2 to convert these products to H_2SO_4 which is titrated with standard base. When 6.123mg of a substance was burned, the resulting H_2SO_4 required 3.01mL of 0.01576M NaOH for titration. What is the weight percent of sulphur in the sample? (6Marks)
- (i) Ultrafiltration is sometimes used to perform cold sterilization. Explain the meaning of this phrase giving relevant examples (3 marks)
- (j) What determines the effectiveness of precipitation as a chemical method in food analysis? (2 marks).
- (k) What is the minimum value of D that will allow the extraction of 99.0% of a food sample from 75.0cm³ of water with four successive extractions by 75.0cm³ quantities of ether? (5marks)
- (l) Discuss in detail the importance of molecular filtration in food science and how the process differs from dialysis.(3 marks).
- (m) A food mixture containing only sodium chloride and potassium chloride without any other substance present can be analyzed by a single direct titration with silver nitrate titrant. Calculate the percentage of sodium chloride in 191.44mg of the mixture if 30.0mL of 0.100M silver nitrate are required for complete precipitation of the chloride ion. (5marks)
- (n) (i) Explain the two types of errors that would affect the accuracy and precision of experimental results. (4 marks)
- (ii) How would you correct these types of errors? (2marks)
2. (a) The Mohr method was used to determine the concentration of sodium chloride (MM 58.44) in a 1.004g food sample. The sample was dissolved in water and titrated to the end point with 32.36ml of 0.1012M silver nitrate solution. Calculate the percent of sodium chloride in the sample. (5marks).

- (b) The Manager of a Food Processing Company was trying to decide whether or not to keep a young recently hired food technologist. The Manager decided to see if the new food technologist's work was of the same quality as that of the other staff. She asked both a senior food technologist and the new food technologist to analyze the same food sample using the same procedure, reagents and instruments. They obtained the following results:

Senior Food Technologist (% Ca)	New Food Technologist (%Ca)
18.89	20.10
19.20	20.50
19.00	18.65
19.70	19.25
19.40	19.40
	19.99

Determine if there is a significant difference in the precision of the data at 95% confidence level. (7marks)

- 3 (a) A solid food sample is known to contain only NaCl (MM 58.44) and KCl (MM 74.56). A 2.000g sample of this solid is dissolved in water and all the chloride ion is precipitated as AgCl by the addition of 50.0cm³ of 0.60M AgNO₃ solution. What is the percentage of KCl in the mixture? (6marks).

- (b) The calcium content of a powdered milk sample was analysed five times by each of the methods, with similar standard deviations. Are the two mean values significantly different at the 95% confidence level? (7marks)

Method 1	Method 2
0.271	0.0271
0.282	0.0268
0.279	0.0263
0.271	0.0274
0.275	0.0269

- 4 (a) (i) Write down the van Deemter equation explaining all the terms in it. (4marks)
- (b) A 100.0cm^3 volume of fresh milk contains 0.2000g of melamine. The distribution ratio for the extraction of melamine from this solution into ethyl ether is 4.25 . If 25.0cm^3 portions of ether are used, how many extractions are required to remove 99.0% of melamine from the aqueous solution?
- 5 (a) Describe the steps required in a volumetric analysis. (3marks)
- (b) A 25.00ml sample of unknown food sample containing Fe^{3+} and Cu^{2+} required 16.06ml of 0.05083M ethylenediaminetetraacetic acid (EDTA) for complete titration. A 50.00ml sample of the unknown was treated with NH_4F to protect the Fe^{3+} . Then the Cu^{2+} was reduced and masked by addition of thiourea. Upon addition of 25.00ml of 0.05083M EDTA, the Fe^{3+} was liberated from its fluoride complex and formed an EDTA complex. The excess EDTA required 19.77ml of 0.01883M Pb^{2+} to reach an end point using xylenol orange. Find the concentration of Cu^{2+} in the unknown food sample. (10marks)

END OF EXAMINATION

ANNEX

VALUES OF t FOR v DEGREES OF FREEDOMS FOR VARIOUS CONFIDENCE LEVELS.

v	CONFIDENCE LEVEL			
	90%	95%	99%	99.5%
1	6.314	12.706	63.657	127.32
2	2.920	4.303	9.925	14.089
3	2.353	3.182	5.841	7.453
4	2.132	2.776	4.604	5.598
5	2.015	2.571	4.032	4.773
6	1.943	2.447	3.707	4.317
7	1.895	2.365	3.500	4.029
8	1.860	2.306	3.355	3.832
9	1.833	2.262	3.250	3.690
10	1.812	2.228	3.169	3.581
15	1.753	2.131	2.947	3.252
20	1.725	2.086	2.845	3.153
25	1.708	2.060	2.787	3.078
∞	1.645	1.960	2.576	2.807

$v = N-1 = \text{Degrees of freedom.}$

REJECTION QUOTIENT, Q , AT DIFFERENT CONFIDENCE LIMITS

Number of observation	Confidence Level		
	Q90	Q95	Q99
3	0.94	0.970	0.994
4	0.76	0.829	0.926
5	0.64	0.710	0.821
6	0.56	0.625	0.740
7	0.51	0.568	0.680
8	0.47	0.526	0.634
9	0.44	0.493	0.598
10	0.41	0.466	0.568
15	0.338	0.384	0.475
20	0.300	0.342	0.425
25	0.277	0.317	0.393
30	0.260	0.298	0.372

Values of F at 95% confidence level

$v_1 = 2$	3	4	5	6	7	8	9	10	15	20	30
$v_2 = 2$	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.5
3	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.70	8.62
4	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.86	5.75
5	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.62	4.50
6	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	3.94	3.81
7	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.51	3.38
8	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.22	3.08
9	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.01	2.86
10	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.85	2.70
15	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.40	2.25
20	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.20	2.04
30	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.01	1.84

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2008/9 ACADEMIC YEAR SECOND SEMESTER FINAL
EXAMINATIONS

AGF 332 METHODS IN FOOD ANALYSIS I: PRACTICAL

TIME ALLOWED: THREE HOURS

INSTRUCTIONS TO CANDIDATES

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

1. Mr. Sichivula developed a food additive that gave the following mass spectrum, infrared and NMR spectra (on separate sheet). Study the spectra and determine the possible structure of the food additive. (15 marks)

2. A Food Company has made a formulation of iodated salt in order to prevent the probable outbreak of goiter. The Company brings a sample labeled **I** of its formulation to your Food laboratory for the analysis of the iodine. Carry out the determination and write a detailed report to the Company. [15marks]

Note: Titration determinations should be done in QUADRUPLICATE

END OF EXAMINATION

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

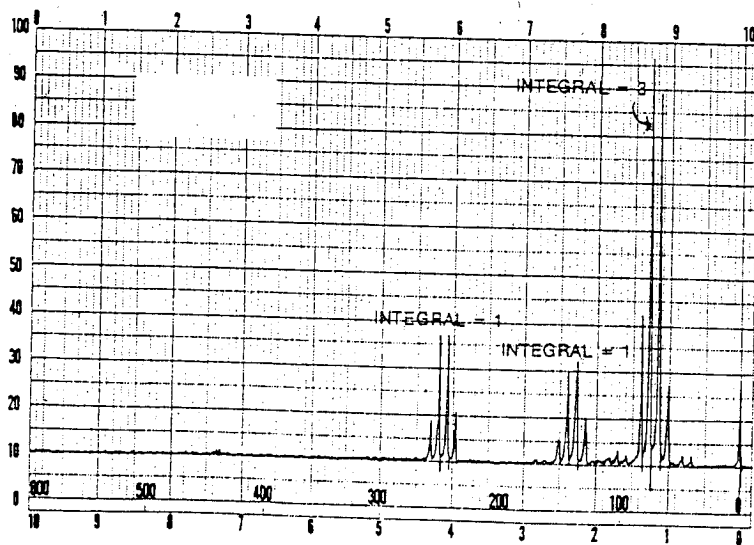
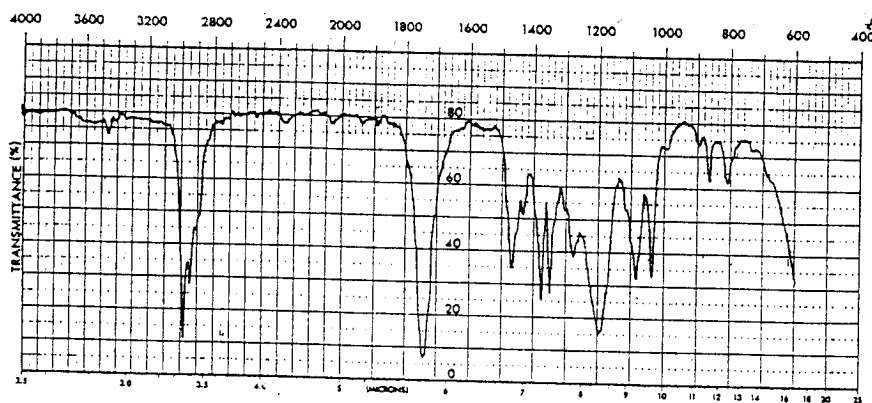
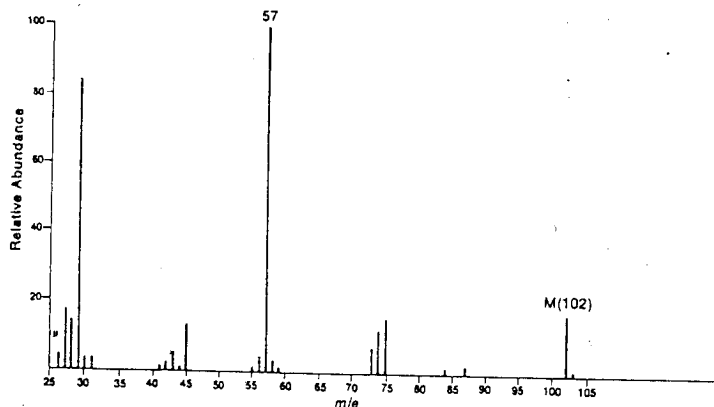
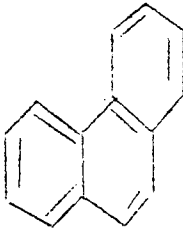
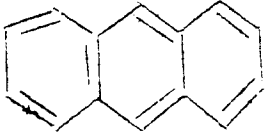


TABLE 2-3 A Simplified Correlation Chart

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

ULTRAVIOLET-VISIBLE ABSORPTION FOR π ELECTRON CHROMOPHORES

Chromophore	Formula of chromophore	Example	λ_{max} , nm	ϵ
	O=O	O ₂	~100 to ~180	-(gas)
	O=O ⁺ -O ⁻	O ₃	~200 to ~270	-(gas)
		{ NO ₃ ⁻	203	1 x 10 ⁴
	-N=O	{ NO ₂	~290 to ~360	-(gas)
			{ 227	1.6 x 10 ³
	Mn=O	MnO ₄ ⁻	525	2.2 x 10 ³
Aldehyde	C=O	(CH ₃) ₂ C=O	166	1.6 x 10 ⁴
Alkene	C=C	{ Ethylene	160	2 x 10 ⁴
		{ 2-Hexene	193	10 ⁴
Alkyne	C≡C	Acetylene	173	6 x 10 ³
		{ Butadiene	217	2 x 10 ⁴
	H(HC=CH) _n H	{ Hexatriene	268	3.5 x 10 ⁴
		{ Benzene	254	2 x 10 ²
		{ Salicylic acid	308	4 x 10 ³
		{ Acetylsalicylic acid	280	1.5 x 10 ³
				
Phenanthrene		Phenanthrene	251 293	5 x 10 ⁴ 1.5 x 10 ⁴
Anthracene		Anthracene	253 340, 357, 375	1.5 x 10 ⁵ all 9 x 10 ³

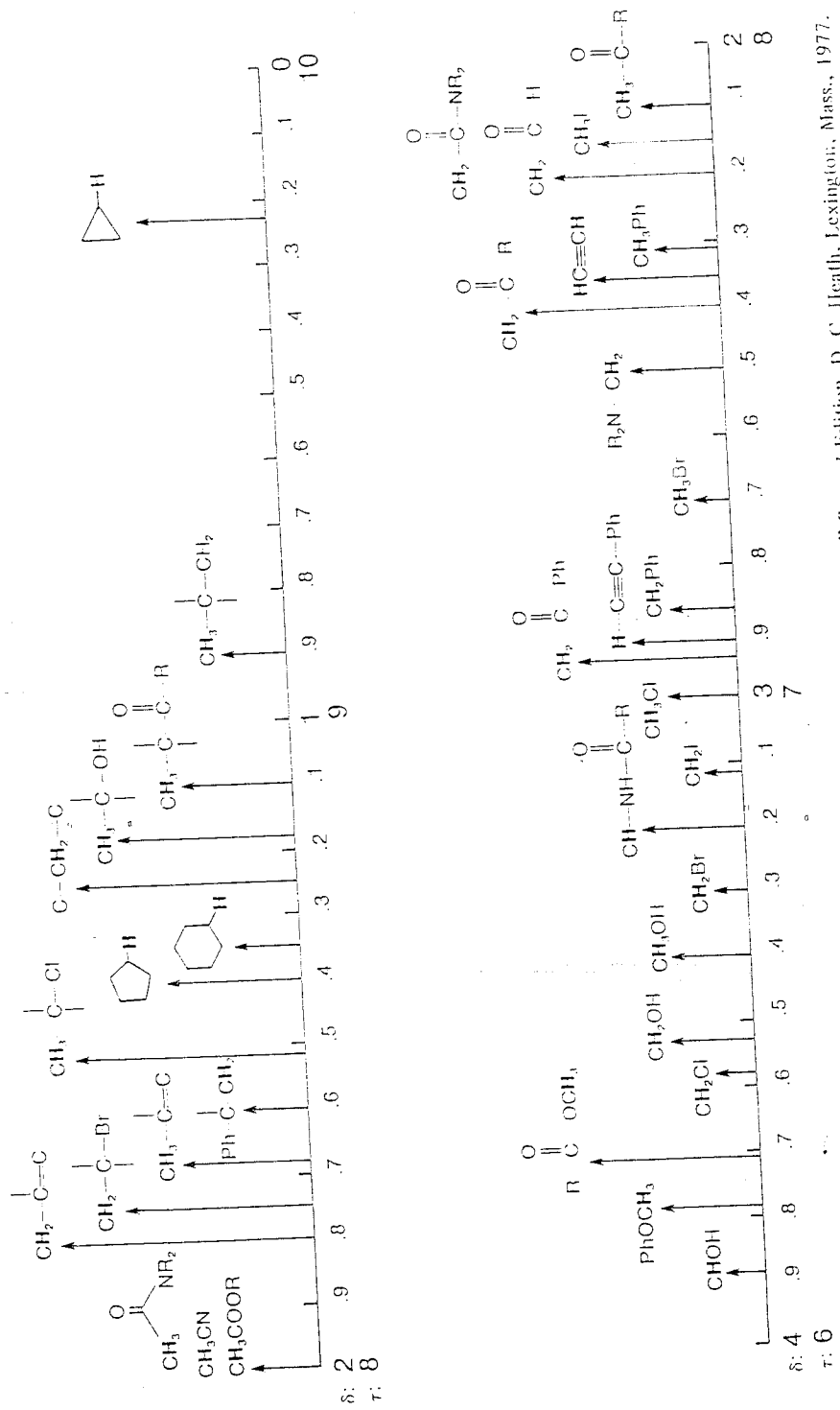
ULTRAVIOLET-VISIBLE ABSORPTION FOR π ELECTRON CHROMOPHORES

Name of chromophore	Formula of chromophore	Example	λ_{max} , nm	ϵ
Carbonyl	$\text{C}=\text{O}$	Acetone	270	18
		$(\text{C}_6\text{H}_5)_2\text{C}=\text{O}$	330	180
Carboxyl	$\text{R}-\text{C}=\text{O}(\text{OH})$	Acetic acid	204	60
Nitro	$\text{O}=\text{N}^+-\text{O}^-$	NO_2^-	300	7.5
Nitroso	$-\text{N}=\text{O}$	Nitrosobutane	300	100
			665	30
Thiocarbonyl	$\text{C}=\text{S}$	CS_2	318	108
		$(\text{C}_6\text{H}_5)_2\text{C}=\text{S}$	620	70
Azomethine	$\text{C}=\text{N}$	$(\text{C}_6\text{H}_5)_2\text{C}=\text{NH}$	340	125
Azo	$\text{N}=\text{N}$	$\text{C}_6\text{H}_5-\text{N}=\text{N}-\text{C}_6\text{H}_5$	448	425

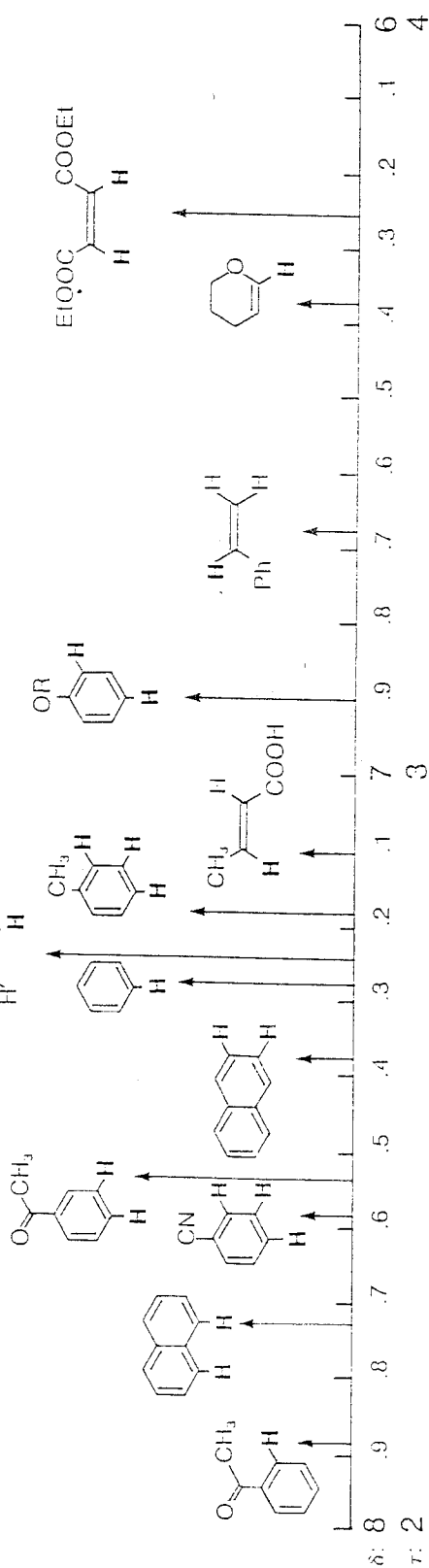
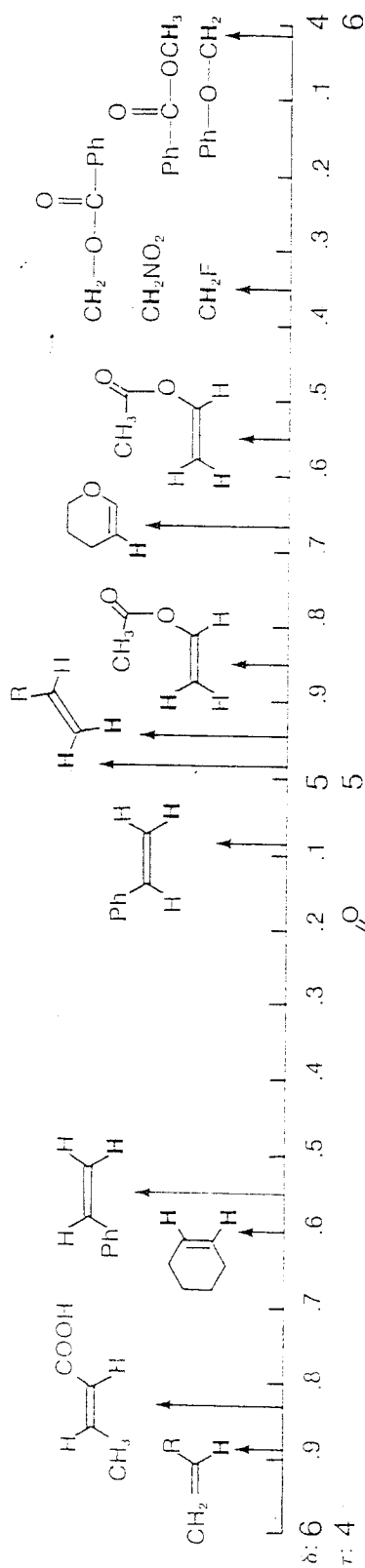
APPENDIX TWO

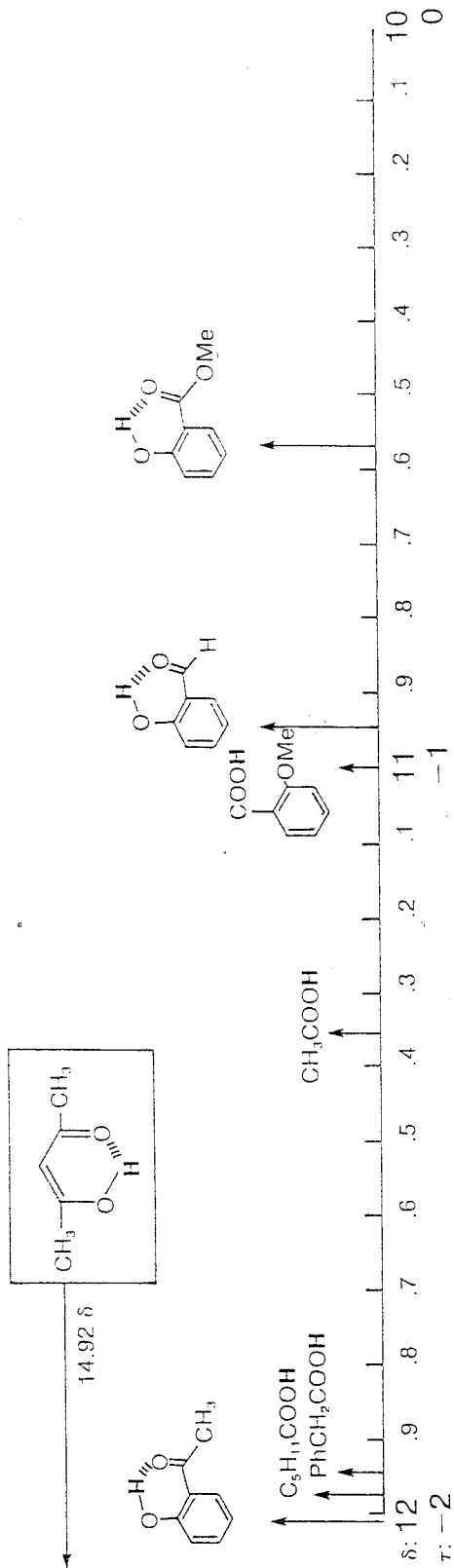
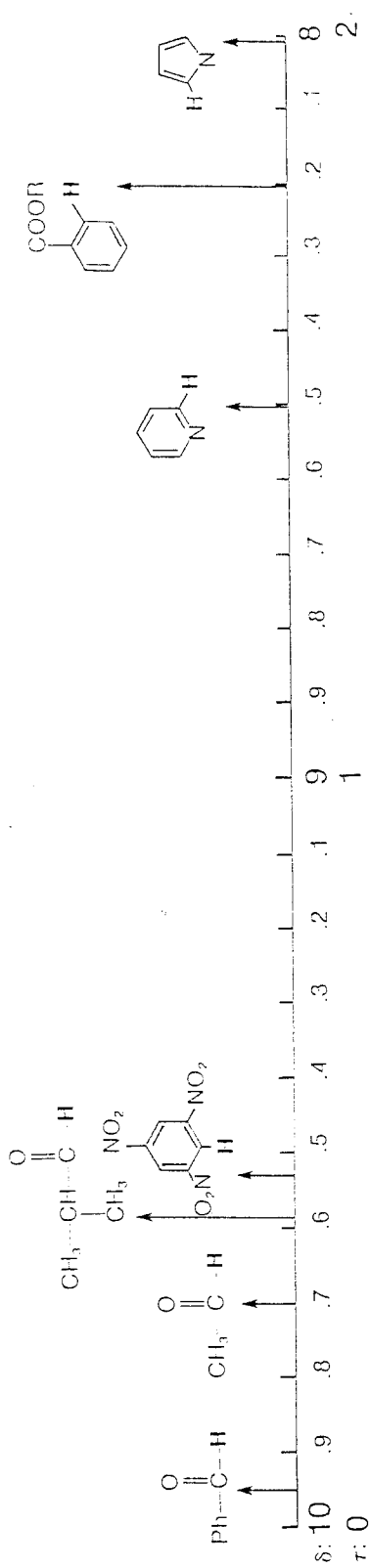
SOME REPRESENTATIVE CHEMICAL SHIFT VALUES FOR VARIOUS TYPES OF PROTONS*

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



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





UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

SECOND SEMESTER EXAMINATIONS APRIL 2009

AGF 342 - FOOD TOXICOLOGY

Instructions: (1) answer 5 questions

(2) Time: 3 hrs

- 1) a) Define a systemic toxin. **[2 marks]**
- b) (i) Why are pesticides potentially harmful to all living organisms? **[4marks]**
- (ii) What are the effects of dieldrins? **[5 marks]**
- c) (i) what is a plasma membrane? **[1 mark]**
- (ii) Describe the methods that toxicants use to cross the plasma membrane? **[8 marks]**
- 2) a) i) What is a bioassay **[5 marks]**
- ii) Differentiate between a carcinogenic agent and a teratogenic agent. **[5 marks]**
- b) i) three factors influence the toxicity of any chemical to a given species. What are these three factors? **[3 marks]**
- ii) What are the major routes of exposure to toxicants for an organism? **[3 marks]**
- iii) How do the chemical and physical properties of a toxicant determine the route by which exposure will occur? **[4marks]**

- 3) a) List four (4) primary objectives of food processing. **[4 marks]**
- b) Give four (4) examples of food processing operations in which a toxic substance results or is introduced into the food. Explain in detail how the toxic constituents result, giving in each case the name of the toxicant. **[8 marks]**
- c) (i) What is *Clostridium botulinum*. **[2 marks]**
- (ii) List the symptoms of *clostridium botulinum* poisoning. **[4 marks]**
- (iii) How can botulinum toxin contaminated food be decontaminated? **[2 marks]**
- 4) a) Food, apart from containing nutrition may also contain harmful substances either of natural or human origin
- (i) Name and discuss one naturally occurring toxin of plant origin **[4 marks]**
- (ii) What are the symptoms of this toxicant? **[3 marks]**
- (iii) What measures are available to avoid intoxication by this toxicant? **[2 marks]**
- (b) (i) Define a food additive **[3 marks]**
- (ii) What are parabens? **[4 marks]**
- (iii) What public health concerns are associated with the use of parabens? **[4 marks]**
- 5) (a) Some studies have indicated that Butylated hydroxyanisole is safe for human consumption. Why are there some debates against its use? **[5 marks]**
- (b) (i) what is an allergy? **[2 marks]**

(ii) Differentiate between a food allergy and a food intolerance. **[4 marks]**

(iii) List the 'big eight' allergenic foods **[4 marks]**

(c) List the major ways in which humans are exposed to cadmium **[5 marks]**

6) (a) (i) what intoxication would you get from consumption of mackerel whose recommended storage temperature was abused? **[2 marks]**

(ii) Discuss what happens in this fish at high temperatures and the symptoms that result **[5 marks]**

(b) (i) What is shellfish poisoning **[3 marks]**

(ii) What are the symptoms of shellfish poisoning? **[4 marks]**

7) (a) There are three ways in which marine toxins occur in food. Discuss in detail, giving examples. **[10 marks]**

(b) i) What are ochratoxins? **[2 marks]**

ii) How do ochratoxins occur in food? **[3 marks]**

iii) Which foods are susceptible to ochratoxins? **[3 marks]**

iv) What are the symptoms of chronic ochratoxin exposure? **[2 marks]**

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

2008 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGF 352: FOOD MICROBIOLOGY
TIME: THREE HOURS

INSTRUCTIONS:

The examination has two sections, **A** and **B** and questions in both sections carry equal marks. There are a total of **SIX** questions; answer **FIVE** questions, all the **THREE (3)** questions in section **A** and **TWO (2)** in Section **B**

SECTION A

Question One (1)

- a) Define food poisoning [2 Points]
- b) What are the general symptoms of Food Poisoning? Give at least five (5) [5 Points]
- c) Outline the mechanism of food intoxication by *Clostridium perfringens* enterotoxin (C.P.E) and the mechanism of food infection by *Vibrio cholera* [10 Points]
- d) Give three ways of preventing food poisoning [3 Points]

Question Two (2)

- a) What is Hazard analysis critical control point (HACCP)? [3 Points]
- b) List the principles of HACCP [3 Points]
- c) Explain in detail the concept of conducting a hazard analysis. [5 Points]
- d) Differentiate between a Control point and a Critical Control Point. [3 Points]
- e) What activities are involved in monitoring procedures in a HACCP program? [6 Points]

Question Three (3)

- a) Define Microbial growth [1 Points]
- b) Briefly describe the four phases of microbial growth [8 Points]
- c) Microbial growth in food is determined by a series of intrinsic, extrinsic, implicit and processing factors. Give the definitions of
 - i. Intrinsic factors
 - ii. Implicit factors

Identify one implicit factor that affect spoilage of food and elaborate on its importance [8 Points]

- d) Discuss the Hurdle Concept and microbiological stability and safety of food [3 Points]

SECTION B

Question Four (4)

You have been employed as a Quality Assurance Manager for a newly opened Ice Cream making factory. As a Quality Assurance Manager you have been asked to come up with a cleaning and disinfection program for the factory.

- a) Why should cleaning and disinfection procedures be considered integral to any food establishment? **[4 Points]**
- b) Describe four (4) criteria that would help you come up with the best detergent, and four (4) criteria that would help you come up with the best chemical disinfectant bearing in mind that there are different types of detergents and chemical disinfectants on the market **[8 Points]**
- c) Describe two types of chemical compounds that you would consider to use for cleaning and for each give Two (2) advantages and one (1) disadvantage. **[8 Points]**

Question Five (5)

- a) Describe in detail the contamination and spoilage of vegetables **[10 Points]**
- b) Define Microbiological criteria **[4 Points]**
- c) List the four components of a microbiological criterion **[4 Points]**
- d) Differentiate between Safety and Quality of a food product **[2 Points]**

Question Six (6)

- a) Describe the effect of **Freezing** and **Acidity (pH)** on microorganisms and how microorganisms respond to the stresses **[10 Points]**
- b) Differentiate between Pasteurization and Sterilization **[2 Points]**
- c) Give two advantages and two disadvantages of pasteurization **[2 Points]**
- d) Give two advantages and two disadvantages of Sterilization **[2 Points]**
- e) Explain how food with low water activity (a_w) and high in carbohydrate content will affect the heat resistance of microorganisms **[4 Points]**

END OF EXAMINATION

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

2009 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGF 432: PROCESS CONTROL AND INSTRUMENTATION

TIME: THREE HOURS

INSTRUCTIONS:

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

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



and proceeds at a rate:

$$R = k C_0$$

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

k = reaction velocity constant s⁻¹, and
 C_0 = concentration of A in reactor kmol/m³.

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

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

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

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

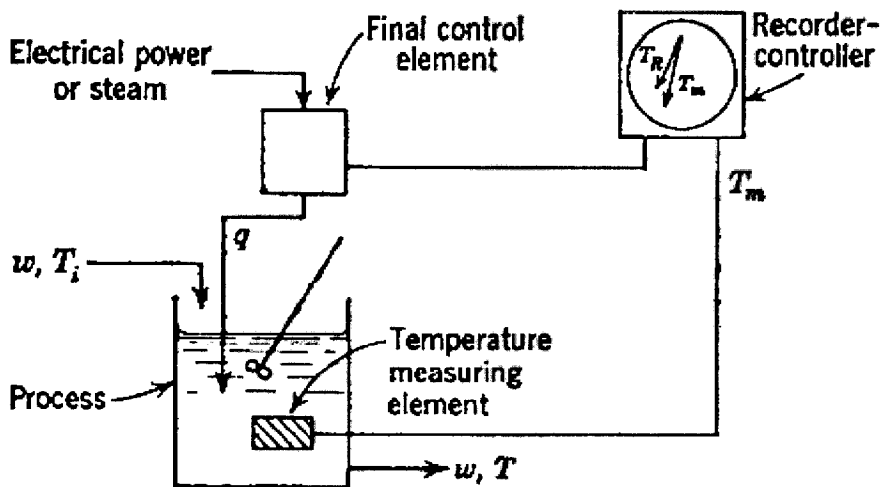
a) Determine the transfer functions relating

- Inflow and liquid level,
- Inflow and outflow.

(8 marks)

b) If the inflow increases from 10^{-3} to $1.1 \times 10^{-3} \text{ m}^3/\text{s}$ according to the step change, calculate the liquid level 200 s after the change has occurred. **(2 marks)**

c) A liquid stream at a temperature T_i enters an insulated, well stirred tank at a constant flow rate w (mass/time). It is desired to maintain the temperature in the tank at T_R by means of a controller. If the measured temperature T_m differs from the desired temperature, the controller senses the difference. Below is the control system for a stirred-tank heater.



- Determine the process control model for the controller and final control element. **(10 marks)**
- Draw the block diagram based on the model for the controller and final controller. **(2.5 marks)**
- Based on the model; describe how this system operates. **(2.5 marks)**

[Specific heat capacity = C]

3. A mercury thermometer having a first-order dynamics with a time constant of 1 min is placed in a bath at 35°C. After a thermometer reaches a steady state it is suddenly placed in a bath at 40°C at $t = 0$ and left there for 60 s, after which it is immediately returned to the bath at 35°C.
- Derive the first-order dynamic model for a mercury thermometer in the bath. **(10 marks)**
 - Draw a sketch showing the variation of the thermometer reading with time. **(5 marks)**
 - Calculate the thermometer reading at $t = 30$ s. **(5 marks)**

Outline the differences between the negative feedback and the positive feedback systems, and which of these two are the most utilized and preferred system in food processing. **(5 marks)**

- 4 .a) Two Post-graduate students Abebe and Asteway have usefully established a model for pasteurizing unit to be:

$$\frac{d^3x}{dt^3} + 2\frac{d^2x}{dt^2} - \frac{dx}{dt} - 2x = 4 + e^{2t}$$

The process is managed by the following settings:

$$x(0) = 1 \quad x'(0) = 0 \quad x''(0) = -1$$

Determine the $x(t)$ for this process. **(15 marks)**

- Explain in detail the following terms:
 - Proportional Control **(2.5 marks)**
 - Proportional Derivative Control **(2.5marks)**
 - Proportional Integrator Derivative Control **(2.5marks)**
 - Measuring element **(2.5 marks)**

THE END OF EXAMINATIONS

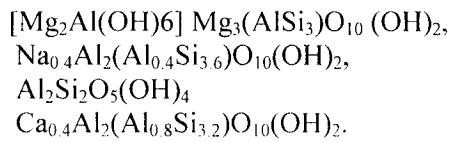
UNIVERSITY OF ZAMBIA
SECOND SEMESTER DEFERRED EXAMINATION
AGS222
FUNDAMENTALS OF SOIL SCIENCE
MARCH 2008

DURATION: 3 hours

INSTRUCTION: Answer all Questions

MARKS: 100

1. Indicate whether the following statements are true or false or whether you do not know the answer. (15 marks) (Note: 1.5 for correct answer, 0 for I don't know, and -0.75 for wrong answer).
 - a) Acidic soils generally have a higher base saturation than alkaline soils.
 - b) Compound D fertilizer (10 :20: 10) contains more phosphorus than nitrogen
 - c) A soils with a CEC of 5.6 cmol(+)/kg soil containing 200mg of exchangeable Na /kg soil will qualify to be classified as sodic.
 - d) Saline sodic soils are less susceptible to dispersion than nonsaline sodic soils.
 - e) Dolomite $\text{CaMg}(\text{CO}_3)_2$ had a higher neutralizing value than Magnesite (MgCO_3).
 - f) Actinomycetes are better adapted to drier soil conditions than bacteria.
 - g) A soil containing 400mg N/kg soil and an organic matter content of 2.5 % will mineralize nitrogen when is decomposed by soil microorganisms.
 - h) The mineral $\text{K}(\text{MgFe})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$ is a ferromagnesian double chain silicate mineral.
 - i) A soil with a relative humidity of 94.5 % at a temperature of 25 °C will be unable to supply water to plants.
 - j) Mycorrhiza are symbiotic bacterial that live on plant roots and help plants obtain nutrients from the soil such as phosphorus.
2. Answer **any 3** of the following questions briefly but concisely (20 marks)
 - a) Name and describe the 3 mechanisms by which nutrients get to the surfaces of roots in soils.(5 marks)
 - b) Name the three components of humus and describe hoe they are identified by chemical fractionation. (5 marks)
 - c) Describe how is the Effective Cation Exchange Capacity (ECEC) of a soil measured in the laboratory? (5 marks)
 - d) Name the following minerals and arrange them in order of increasing CEC, starting with the one that has the lowest CEC to the one that has the highest CEC. The minerals are:



(5 marks)

3 Define the following terms (15marks)

- Neutralizing Value of a liming material
- Saline sodic soil
- Matric potential
- Bioavailable form of a nutrient
- Compound Fertilizer
- Immobilization of nutrients

4 Tensiometers are instruments used to measure the matric potential of moist soils. Below are data from a tomato field. The owner of the farm had the tensiometers installed at three at different depths in the field as shown below: **(20 marks)**

Horizon	soil depth (cm)	Tensiometer reading (suction in cm)
A	30	560
B	60	680
C	90	630

Based on the information above answer the following:

- Is this any soil horizon in this field saturated with water? Give reasons to support your answer. (2.5)
- Assuming that the osmotic potential is negligible in this profile, calculate the total water potential within each horizon and express the water potential in bars. (5 marks)
- Indicate the direction of water flow in the profile and give reasons to support your answer. (7.5 marks)
- What relative humidity of the soil in the B horizon at 20°C? (5 marks)
- If the equation that relates the gravimetric moisture content of the soil to the pF of the soil in horizon A is:

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

where: θ_g is in $\text{gH}_2\text{O/g soil}$, and $pF = \log_{10}$ (suction corresponding to (ψ_m) matric potential of the soil in cm). Calculate the amount of water available for plants in horizon A in $\text{cm}^3\text{H}_2\text{O}/100\text{cm}^3$ soils. (5 marks)

- 5 A soil sample from the surface horizon a prospective farmer's field in Mpongwe District has the following selected physical and chemical properties. (25 marks)

Depth (cm)	Total N (%)	pb g.cm ⁻³	Available P mg/kg soil	Ca	Mg	Na	K	Al	H	EC mS/cm	Org C %
0 -20	0.03	1.5	5.0	0.25	0.15	0.1	0.07	1.5	0.2	0.12	2.5

Note: CEC_{8.2}: CEC measured at pH 8.2

Based on the data presented in the table above answer the following questions.

- What is the Effective Cation Exchange Capacity of this soil? (2.5 marks)
- Classify this soil in terms of its salinity and sodicity (2.5 marks)
- Would nitrogen be mineralized from this soil when its organic matter is decomposed? Give reasons to support your answer. (2.5 marks)
- If the soil has a constant respiration rate of 10 mgCO₂/kg soil/day, how much organic matter should be added per hectare every year to maintain the same organic matter content in the field? (5 marks)
- If the famer wants to grow a crop requiring 20 kg P/ha and 16.5 kg K/ha, will a hectare of this soil layer be able to meet the requirements of the crop? Show calculations to support your answer. (5 marks)
- Would applying 200 kg of Compound D fertilizer (10: 20: 10) per hectare of this soil meet the above requirements for the two nutrients? (3.5 marks)
- How much agricultural lime with a neutralizing value of 80 % is required per hectare to reduce the aluminum saturation of the soil to 10 %? (4 marks)

END OF EXAMINATION

“Soil Science is Fun”

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES

UNIVERSITY FIRST SEMESTER EXAMINATIONS-SEPTEMBER, 2006

AGS 311
AGROCLIMATOLOGY

Time: Three (3) Hours

Marks: 77

Instruction: Answer all Questions

Note that for calculated values the number of decimal places should be rounded off to between one to three decimal places where possible

1. Briefly define each of the following terms as applied in Agro climatology (10 marks)
 - a) Albedo of Earth
 - b) Zero absolute temperature
 - c) Basal Heat Production
 - d) Zone of survival
 - e) Solar Constant
2. With an aid of a diagram indicate all the components in percentages the earth's energy budget (20 marks)
3. The earth's atmosphere is composed of four distinct layers based on its thermal properties. Describe briefly the main features of the lower and the upper most layers (12 marks)
4. There has been significant level of consensus amongst scientists that there has been a global temperature change on Earth. What are these agreed changes according to IPCC (2001)? (10 marks)

5. Given the following meteorological data measured this year (2005) Brussels, Belgium (04°23' E, 50°48' N and altitude 100 m): (25 marks)

Maximum air temperature	21.5°C
Minimum air temperature	12.3°C
Maximum relative humidity	84 %
Minimum relative humidity	63 %
Wind speed measured at 10 m height	10 km hr ⁻¹
Estimated extraterrestrial radiation	476.644 W m ⁻²
Measured solar radiation	256.012 W m ⁻²
Inverse relative distance Earth-Sun	0.967 radians

$$1.0 \text{ MJ m}^{-2} \text{ day}^{-1} = 11.6 \text{ W m}^{-2}$$

Determine:

- Wind speed at standard reference height for agricultural uses (**m/s**)
- Latitude in **radians**
- Solar radiation on a clear-sky day in **MJ m⁻² d⁻¹**
- Net shortwave radiation in **MJ m⁻² d⁻¹**
- Sunset hour angle **in degrees**

End of Exam

UNIVERSITY OF ZAMBIA

UNIVERSITY SECOND SEMISTER EXAMINATIONS

APRIL 2009

AGS 322: SOIL PHYSICS

Time: Three (3) Hours

Marks: 100

Instruction: Answer all Questions

1. Briefly define each of the following terms: [20 marks]
- a) Wilting point
 - b) Hysteresis
 - c) Void ratio
 - d) Sorptivity
 - e) Soil water capacity
2. Briefly discuss the main principles of the each of the following soil water measurement methods: [10 marks]
- a) Neutron scattering method
 - b) Time Domain Reflectometry method (TDR)
3. An overhead (pivot) irrigation system at UNZA Farm under maize crop was set up based on the following field data: [20 marks]

Depth (cm)	Bulk Density (g cm ⁻³)	Soil Water Content on mass basis (%)	
		Field Capacity	Wilting Point
0 - 15	1.55	20.1	12.8
15 - 30	1.54	21.3	12.9
30 - 60	1.62	20.5	13.3
60 - 90	1.63	20.7	13.1
90 - 120	1.62	19.8	11.4

- a) Determine the available water-holding capacity (AWC) of the soil profile (in mm/m)
- b) How deep (in meters) would a 40 mm irrigation infiltrate the soil if the soil water content is maintained at field capacity and assuming that the water content in the profile is at wilting point
- c) Determine the depth of air (in mm) in the entire profile if the water content is maintained at field capacity
- d) What measures would you take in order to increase the available water-holding capacity of this soil

4. A soil profile in a rice field consists of an upper layer of 60 cm and a lower layer of 20 m with hydraulic conductivities of $2.7 \times 10^{-4} \text{ cm s}^{-1}$ and $4.5 \times 10^{-5} \text{ cm s}^{-1}$, respectively. If the water depth on the field is maintained constantly above the soil surface and the water discharge (Q) at the bottom layer of the soil profile is $1.2 \text{ cm}^3 \text{ min}^{-1}$ from a surface area of 20 cm^2 : [25 marks]
- Determine the amount of water supply required to maintain a constant water head at the soil surface in (i) mm day^{-1} and (ii) $\text{m}^3 \text{ ha}^{-1} \text{ day}^{-1}$
 - Determine the height of water above the soil surface required to maintain this constant water discharge above
 - Determine the soil water potentials (z , h and H) at (i) the bottom, (ii) interface between the two layers, (iii) interface with water and (iv) at the water surface
 - Draw soil water potential (z , h and H) diagram
5. Water flow in a soil media can be described by the following equation in its partial differential form: [15 marks]

$$\frac{\partial \theta}{\partial t} = K_x \cdot \frac{\partial^2 H}{\partial x^2} + K_y \cdot \frac{\partial^2 H}{\partial y^2} + K_z \cdot \frac{\partial^2 H}{\partial z^2}$$

- What assumptions are made for its application?
- Based on the above equation, write an equation describing:
 - Saturated flow under anisotropic conditions
 - Unsaturated flow under isotropic conditions
 - Horizontal flow under unsaturated conditions

End of Exam

THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS – APRIL 2009

AGS 452
PRINCIPLES OF LAND HUSBANDRY

TIME: 3 Hours

Marks: 100

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

1. Define the following:
 - a. Contour tillage [2 Marks]
 - b. Land [2 Marks]
 - c. Farming systems [2 Marks]
 - d. Pollution [2 Marks]
 - e. Reconnaissance surveys. [2 Marks]
2. Briefly discuss the nature and alleviation of five (5) different forms of land degradation. [25 Marks]
3. What is the importance of
 - a. Improved dialogue with farmers
 - b. Credibility of extension staff
 - c. Traditional (indigenous) knowledgein effectively dealing with issues of land management? [6 Marks]
4. Discuss the importance of institutions in implementing land husbandry. [10 Marks]
5. Water logging is undesirable on a farm.
 - a. What is water logging? [2 Marks]
 - b. How does the problem of water logging come about? [4 Marks]
 - c. What are the best ways of alleviating water logging? [6 Marks]
6. Discuss briefly how you can effectively minimize the following:
 - a. Rain drop impact. [2.5 Marks]
 - b. Runoff volume of water [2.5 Marks]
 - c. Runoff velocity [2.5 Marks]
 - d. Soil particles detachment [2.5 Marks]
7. Briefly discuss ten (10) benefits of mulching. [20 Marks]
8. Briefly discuss the similarities in the main strategy of managing arable land and rangelands. [7 Marks]

END OF EXAMINATION