THE UNIVERSITY OF ZAMBIA

FIRST / SECOND SEMESTER EXAMINATION PAPER

SCHOOL OF AGRICULTURAL SCIENCES

1. AGA   2011   Anatomy of domestic Animals
2. AGA   322   Ruminant production (Beef, Dairy,Sheep,Goats and Rabbits)
3. AGA   2022   Physiology of domestic Animals
4. AGA   332   Applied animal Nutrition
5. AGA   342   Principles of Genetics
6. AGA   412   Applied Animal Production
7. AGA   422   Game Ranching
8. AGA   442   Integrated Aquaculture and fish Nutrition
9. AGA   511   Techniques in Animal Science
10. AGA   542   Animal Health
11. AGA   552   Animal Products and By-Products
12. AGC   312   Crop Protection
13. AGC   322   Forage Crop Production
14. AGC   332   Introduction Plant Pathology
15. AGC   342   Fundamentals of Crop Production
16. AGC   521   Advanced plant Breeding
17. AGC   542   Integrated Pest Management
18. AGC   552   Horticultural science
19. AGC   572   Post harvest Technology
20. AGC   2022   Plant Physiology
21. AGE   421   Production Economics
22. AGE   451   Intermediate Agribusiness Management
23. AGE   462   Agricultural Marketing and Pricing
24. AGE   521   Principles of Farm Management
25. AGE   552   Agricultural Extension Education
26. AGE   562   Intermediate Farm Management
27. AGE   572   Agricultural Policy Analysis

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ANIMAL SCIENCES

AGA 2011 FINAL LABORATORY EXAMINATION
ANATOMY OF DOMESTIC ANIMALS

28th November, 2011

COMPUTER #..

INSTRUCTIONS:

1) DO NOT TURN THE PAPER UNTIL YOU ARE TOLD TO DO SO.

2) ANSWER ALL QUESTIONS.

3) YOU HAVE **3 MINUTES** TO ANSWER EACH QUESTION.

TIME ALLOWED: 50 MINUTES

1

QUESTION 1 (3 minutes)

Refer to specimen labeled **1**
(a) Identify the following parts labeled:

A..   **B**...
C...   **D**...
E...

(b) List two types of microscopes that are commonly used.
1...
2...

QUESTION 2 (3 minutes)
Identify the soft tissues on slides D, E and F under the Microscope and state one important feature you have used to identify the tissue.

D..
Feature:...................................

E..
Feature:...................................

F..
Feature....................................

QUESTION 3 (3 minutes)
Examine the model provided for this question.
(a) Identify the regions of the vertebral column labeled A through E.
A..   **B**...
C..   **D**...
E..

(b) Write the names of the first two bones in region A
1. ....   2....................................

(c) Identify the parts labeled F through J.
F..   **G**...
H..   **I**....................... ....
J..

QUESTION 4 (3 minutes)
 (a) Identify the parts labeled A and B.
A..   **B**...

(b) What is the function of Extensors?

....

(c) Most muscles have attachments to two different bones. The least movable attachment is called the

....

QUESTION 5 (3 minutes)

Examine the specimen provided.

Identify parts labeled A through G.

A..   B..

C..   D..

E..   F..

G..

QUESTION 6 (3 minutes)

Examine the specimen provided.

(a) Identify parts labeled M, N and O.

M..

N..

O..

(b) Which hormone is manufactured by the organ labeled M? ....

(c) Write two functions of the organ labeled N

      1)..

      2)..

QUESTION 7 (3 minutes)

(a) Identify parts labeled A through F.

A..   B..

C..   D..

E..   F..

G..

(b) What is the role of the part labeled F?

....

QUESTION 8 (3 minutes)

(a) Identify the parts labeled V, W, X, Y, Z.

V..   W..

X..   Y..

Z..

3

(b) Name three domestic animal species in which these organs are found

(1) .... (2) .... (3) ....

QUESTION 9 (3 minutes)
(a) Identify the parts labeled A through F

A... B...
C... D...
E... F...

(b) Write one function of the part labeled E?

....

QUESTION 10 (3 minutes)
Identify parts labeled P-U

P... Q...
R... S...
T... U...

QUESTION 11 (3 minutes)
Study the provided diagram and identify the parts labeled A through F.

A... B...
C... D...
E... F...

QUESTION 12 (3 minutes)
(a) Study the provided specimens (A through D) and give their classification

A... B...
C... D...

(b) Write the function of:
C ....
D ....

QUESTION 13 (3 minutes)
List two enzymes produced in the following parts of the animal's body:

Stomach   (i) .... (ii) ....
Pancreas   (i) .... (ii) ....
Small Intestine (i) .... (ii) ....

QUESTION 14 (3 minutes)

Study the provided diagram and identify the parts labeled A through F.

A……………………………………….. B……………………………………………..

C……………………………………….. D……………………………………………..

E……………………………………….. F……………………………………………..

QUESTION 15 (3 minutes)

Draw the provided specimen in the space below and label fully.
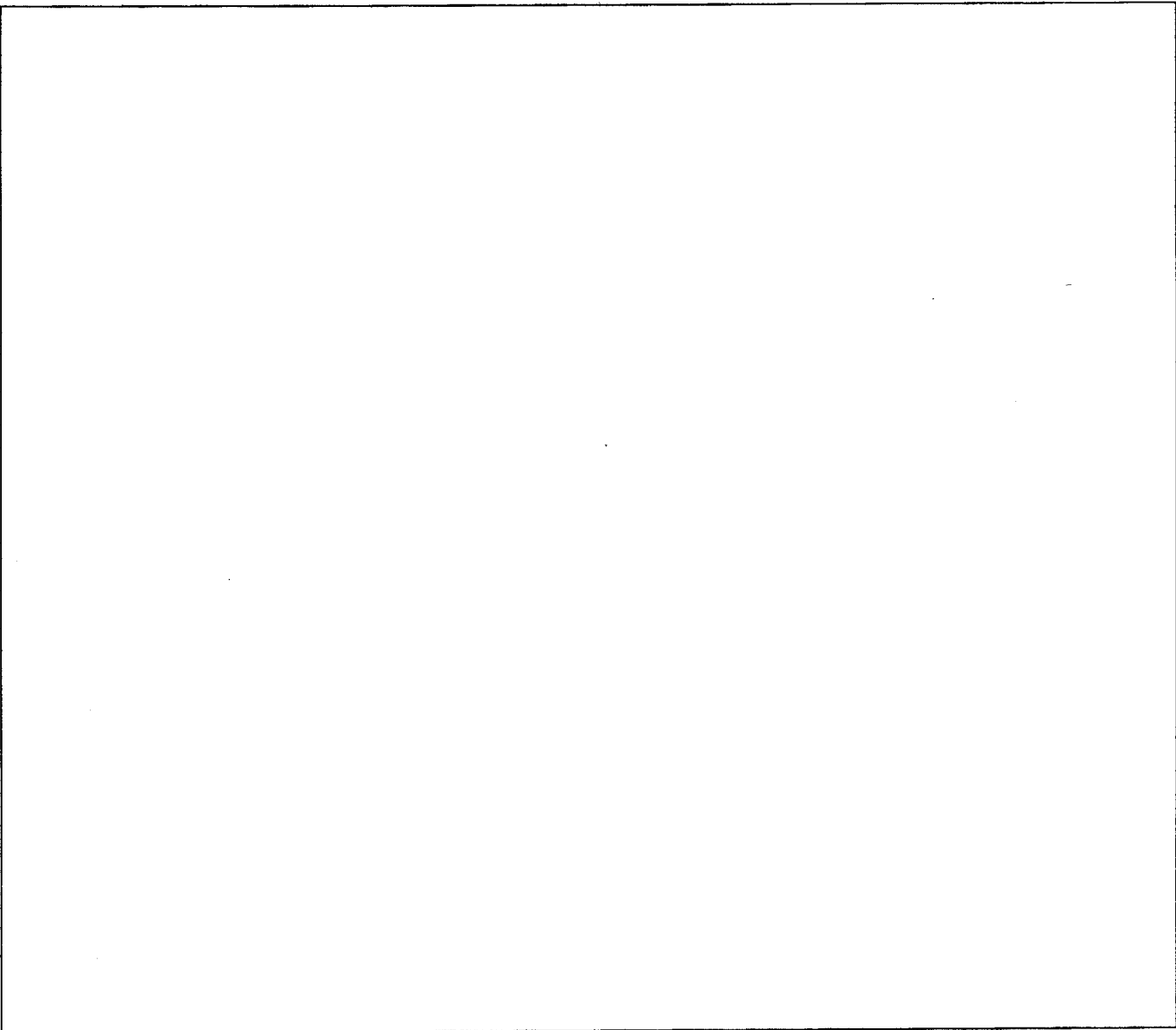
xxxxxxxxxxxxxxxxxxxxxxxxxxx **END** xxxxxxxxxxxxxxxxxxxxxxxxxxxx

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2011 Academic Year – Second Semester Final Examinations

Course AGA 322 – Ruminant Production (Beef, Dairy, Sheep, Goats and Rabbits)

Time Allowed: Three (3) Hours Only

Instructions to Candidates:
a.   All questions carry equal marks (20).
b.   Answer any five (5) questions, *at least one from each section.*
c.   Use different answer books for each section.

Section A – Beef Production:

Q. 1   A farmer in Choma has the following herd of beef cattle; Tonga bulls 3, Angoni Cows 90, Heifers 40, steers 20 and 8 oxen. In 2011, all the 81 calves born on the farm were born between September and November representing a calving percentage of 90%. Comment and offer any advice on the performance of the farm in terms of:
a)   Breeding Ratio.
b)   Breeding system or breeding type
c)   Breeding season

Q. 2   Mention and explain the general routine management practices that should be carried out in a beef herd. Indicate when and why these practices should be carried out.

Section B – Dairy Production:

Q. 3   Give a detailed account of the steps you would undertake for the preparation and successful hand milking a dairy cow;

Q. 4   What steps would you undertake to ensure production and marketing of high quality milk on the farm that is free of physical and microbial contamination?

Section C – Sheep and Goat Production:

Q. 5   The breeding management of sheep and goats will determines their profitability. Discuss the breeding seasons for sheep and goats that can be used in Zambia with respect to different the level of management. Also mention any two breeds of sheep and goats that are recommended for the different levels of management.

1

Q. 6   Upon graduating from the University of Zambia you have been employed as a Farm Manager of an intensive sheep and goat farm in Mkushi District. Discuss any ten (10) lamb and kid routine management practices that you would put in place to ensure that the Sheep and Goat Farm operates profitably.

Section D – Rabbit Production:

Q. 7   As a University of Zambia graduate; you have been requested to present a paper to emergent commercial farmer group members in Monze District on rabbit production in Zambia. Prepare notes on the following for your presentation:

a)   Proper rabbit feeding is important for profitable rabbit production. Discuss any five (5) factors that may affect feed in take in rabbits being reared in Monze District;

b)   Accurate records are an important guide to breeding and financial management. Design a breeding record card to help the members of the emergent commercial farmer group improve rabbit.

Q. 8   Rabbit meat has been described as tasty, of good quality and highly nutritious just like chicken meat. As a result there is high demand for rabbit meat by the general public mainly to feed the aged, the sick and children on the Copperbelt Province. As an extension officer in the Ministry of Agriculture and Livestock (MAL), you have been requested to present a paper on rabbit production in order to encourage to farmer groups in Chililabombwe, Chingola, Kitwe, Ndola and Luanshya Districts who intend to start rabbit production. In particular, prepare notes on any ten (10) reasons and advantages of raising rabbits in the Copperbelt Province in preference to other type of livestock.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2011/2012 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 2022
PHYSIOLOGY OF DOMESTIC ANIMALS

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:

1) ANSWER <u>ALL</u> QUESTIONS IN SECTIONS **A** AND **B**. IN SECTION **C**, QUESTION 1 IS COMPULSORY; THEN ANSWER EITHER QUESTION 2 OR 3. IF YOU ANSWER BOTH QUESTIONS 2 AND 3 IN SECTION **C**, YOU WILL LOSE 5 MARKS ON THE FIRST ONE THAT WILL BE MARKED AS YOUR CHOICE.

2) WRITE EACH SECTION IN SEPARATE ANSWER BOOKS.

SECTION A

Q1. Your favourite dairy cow has suddenly gone into a shock-like state. You quickly arrange for a thorough laboratory examination to find out the cause. A number of physiological tests in the extracellular fluid (ECF) are carried out and the following are the results:

PARAMETER	STATUS
K^+ ion concentration	6 mEq/L
Na^+ ion concentration	125 mEq/L
Cl^- ion concentration	80 mEq/L
pH	7.2
PO_2	33 mmHg

a) What do you think is the status of the cardiac output (CO) in your cow? Explain. **(7 marks)**

b) Which hormone is lacking in your cow? **(2 marks)**

c) Which endocrine gland secretes this hormone? **(2 marks)**

d) In which part of the cell are the receptor sites for this hormone located? **(2 marks)**

e) Describe the hormonal mechanism of action for this hormone. **(10 marks)**

f) What is the most potent factor in the regulation of the secretion of the hormone in question? Explain. **(7 marks)**

Q2. Sodium (Na$^+$) and Potassium (K$^+$) are critically important ions in excitable cells for the transmission of impulses. Discuss this statement in an unmyelinated post-synaptic neuron, beginning with the events at the neuronal junction. **(20 marks)**

SECTION B

Q1. Blood is a body fluid with specific functions. Give examples of the functions of blood in the animal body and explain how the animal body defends itself against changes in H$^+$ ion concentration. **(25 marks)**

Q2. The ruminant digestion system is characterized by fore stomachs preceding the true stomach where food is soaked and subjected to microbial digestion before passing through the digestive tract. Explain in detail the occurrences in each of the fore stomachs indicating the end products of each event. **(25 marks)**

SECTION C

Q1. Reproduction serves for perpetuation of species. It involves female and male physiological activities. **Briefly** define the following terms used in the study of reproduction **(3 marks each = 40 marks)**.
   i)   Spermiogenesis
   ii)   Puberty
   iii)   Testosterone
   iv)   Cleavage
   v)   Postpartum period
   vi)   Colostrum
   vii)   Galactopoesis
   viii) Fertilization
   ix)   Estrus
   x)   Polyspermy
   xi)   Parturition
   xii)   Fertile life of sperm and ova
   xiii) Milk ejection Reflex – (4 points)

Q2. Trace the passage of sperm in the male and female reproductive tract indicating what happens to the sperm in its journey and where fertilization occurs (20 points)

   OR

Q3. Respiration serves many functions in the body (20 points).
   a) What are its functions?
   b) How is respiration regulated?
   c) How does respiration regulate body temperature in animals?

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END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2011/12 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGA 332: APPLIED ANIMAL NUTRITION

TIME   : THREE (3) HOURS
INSTRUCTION   : ATTEMPT ALL QUESTIONS

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1. A well preserved hay can make good dry season feed for beef animals. Discuss two processing/storage related factors that can reduce the feeding value of hay.

   (15 marks)

2. Briefly explain the following:
   a. The effect of age on the feeding value of a grass.
   b. Problems associated with raw soybean feeding in non-ruminants.
   c. How Non-Protein –Nitrogen is utilized in ruminants.
   d. Potential dangers associated with use of antibiotics as feed additives.
   e. The difference between dehydrated herbage and green chop.

   (20 marks)

3. Identify and explain the main limitations of the following as ingredients in poultry feed:
   a. Sorghum meal
   b. Blood meal
   c. Ferric oxide
   d. Milk powder
   e. Maize bran

   (15 marks)

4. Using ingredients given, formulate a 1000 kg quantity of layer feed supplying 2,900 kcal/kg ME, 18% crude protein, 0.80% lysine, 0.35% methionine, 3.00% calcium and 0.75% phosphorus. Use millet meal at 12% level of inclusion, and the combined vitamin and trace mineral premix at 1% level.

Ingredient	MEkcal/kg	CP%	Lysine%	Methionine%	Ca%	P%
Maize meal	3,350	8.0	0.24	0.20	0.20	0.28
Millet meal	2,700	10.0	0.25	0.22	0.20	0.25
Soybean meal	2,400	44.0	2.80	0.60	0.25	0.60
Oil	8,000	-	-	-	-	-
Limestone	-	-	-	-	38	-
Dical. Phosph .	-	-	-	-	22	18
Methionine	-	-	-	98	-	-
Lysine	-	-	89	-	-	-
Salt	-	-	-	-	-	-
Premix*	-	-	-	-	-	-

*The premix was formulated for inclusion in the feed at a rate of 1%.

(20 marks)

5. If you have the ingredients given below with indicated composition, how would you prepare a supplement for a beef herd that would supply 12.00% crude protein, 1.00% calcium and 0.60% phosphorus?

Available Materials and their Composition

Material	Crude protein (%)	ME (Mcal/kg)	Calcium (%)	Phosphorus (%)
Maize bran	9.0	1.9	0.02	0.05
Cotton seed meal	32.0	2.0	0.02	0.06
Limestone	-	-	38.00	-
Dicalcium phosphate	-	-	26.00	18.00

(15 marks)

6. Calculate the following:
   a. Amount of biotin source added to 800 kg feed that has 0.5 mg biotin per kilogram if the source contains 25,000 mg biotin per kilogram.
   b. Amount of ferrous sulphate required in 1000 kg feed that has 80 mg Fe per kilogram if ferrous sulphate has 33% Fe.
   c. Amount of vitamin D_3 in 5 g of the source if it has 800,000 IU of D_3 per gram.
   d. Kilograms of protein in a mixture of 1,200 kg soybean meal and 500 kg cotton seed meal if soybean has 42.0% crude protein and cotton seed meal has 28.0% crude protein.
   e. Percentage of crude protein in a mixture of 480 kg maize meal and 350 kg sunflower meal if maize meal has 9.0% crude protein and sunflower meal has 25.0% crude protein.

(15 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

THE SCHOOL OF AGRICULTURAL SCIENCES

2011 Academic Year – Second Semester Examinations

Course AGA 342 – Principles of 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.

Q. 1 a) 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 F_1 flies were wild type. The researcher then crossed the F_1 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 coefficient of coincidence.

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

Q. 2 a) If, in a population of Tonga cattle, the narrow sense heritability of maturation weight is 0.5, the phenotypic variance is 100 kg, the total genetic variance is 50 kg, and the epistatic variance is 0; calculate the dominance genetic variance and the environmental variance.

   b) State the Hardy-Weinberg Law. In a closed and randomly mating population, the frequencies of AA = 20%, Aa = 65% and aa = 15%, is this population at Hardy Weinberg equilibrium?

1

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

Q. 4   Write notes on the following:

   a)   Any five (5) mutagens;
   b)   The Laws of Inheritance;
   c)   Sex determination and sex linkage; and
   d)   Multiple allelism and co-dominance.

Q. 5 a)   Given that the genes X, Y and Z are linkage group with 15% recombination between X and Y, and 25% recombination between Y and Z; and that the Coefficient of Coincidence is 0.6, what are the expected frequency of phenotypes from a test cross whose progeny are 1000?

      b)   From the data below, plot a scatter diagram to show the association between diameter of onion bulbs (cm) and weight of onion bulbs (g) in a new onion variety that has been grown at the Department of Plant Science Field Station; and calculate the correlation coefficient (r) between the two variables:

Diameter (cm)	51.0	66.2	69.2	69.5	56.9	67.1	58.1	53.9	63.0	60.0
Weight (g)	63.4	115.3	146.6	132.6	80.7	125.6	80.0	78.7	112.8	96.2

Q. 6   Write notes on Chromosomal and Point Mutations.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

END OF SECOND SEMESTER EXAMINATIONS
MAY/JUNE 2012

COURSE AGA 412 –   APPLIED ANIMAL PRODUCTION

TIME ALLOWED: THREE (3) HOURS

INSTRUCTION TO CANDIDATES:

  i.   **Answer all questions.**

Q1   Imagine you are the leader of a group of graduates who have been given a loan to set up a 200-sow-piggery:
  a. Describe the structures or facilities you will include in the farrowing unit to ensure piglet survival, health and good growth rates? Give reasons for the inclusion of each structure or facility described.   **(10 marks)**
  b. Explain how you will proceed to locate and identify suitable male and female pigs to use as breeding animals?   **(10 marks)**
  c. At what age will you wean the piglets? What is the significance of weaning the piglets at the stated age?   **(10 marks)**

Q2   Chemical disinfection is one method of ensuring a disease free environment for housed birds and animals. Certain disinfectants are best used in specific situations. Give reasons for your choice of disinfectant, indicating the active ingredient and trade name of the disinfectant on the Zambian market, for:
  a. A farrowing pen to be occupied by a pregnant sow a week before delivery;
  b. A neglected drainage furrow running outside a building in which pigs are being reared;
  c. A house that has just been emptied of a batch of broilers which had a gumboro (Infectious Bursal Disease) outbreak.   **(15 Marks)**

Q3   Write on the stages that an incubated fertile egg passes through from the time it is laid to the time a chick emerges from it. Include the changes that take place inside the egg during each stage.   **(20 Marks)**

Q4   Explain how feather development in the first moult of chicks is related to environmental temperature regulation. How is brooder temperature control achieved?   **(15 Marks)**

Q5   There are two main systems for rearing egg producing chickens. These are (i) the 'deep-litter' system; and (ii) the 'battery' or 'cage' system of layer management. Write on the advantages and disadvantages of each of these layer management systems.   **(20 Marks)**

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCOOL OF AGRICULTURE

2011 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 422: GAME RANCHING

TIME: THREE HOURS

INSTRUCTIONS: ANSWER QUESTIONS **ONE** AND **TWO** AND ANY OTHER
THREE QUESTIONS. USE ILLUSTRATIONS WHERE NECESSARY.

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1. **(a)** A rodent survey in the ranch area used a capture-recapture method to determine
the distribution and habitat preference of the Cane Rat (*Thryonomys swinderianus*).
The technique however requires that before a large number of traps can be set, it was
important to test the behavioural pattern of the rat. Therefore, seven (7) traps were set
at different points in the area for 15 days, and each captured rat was marked and
released. The following data were obtained:

Table 1: Trial capture to test location of traps

Traps	A	B	C	D	E	E	G
Rats caught	7	3	21	11	15	0	5

From the data provided, determine whether or not the capture of each rat was
independent of the location of the trap

(b) In the same area, a census of the same species involved setting up of a number of
traps at different points along each transect in the area for two occasions, and each
captured was marked and released. The data in Table 2 were obtained.

Table 2: A detailed census of the rat

TRANSECTS	A	B	C	D	E	F	G
Initial Capture	5	7	17	23	16	9	5
Second Capture	10	16	13	13	12	6	11
Recaptures	3	4	11	8	12	3	4

(i) Using the Lincoln – Petersen index method, calculate the populations of the rats
in the area.
(ii) Discuss the limitations of this method in estimating wildlife populations.

2. Samaki Farms Ltd is considering establishing a game sanctuary in Kalomo District
along the Nazhila stream. Initial investigations show that the range is suitable for
Impala, Zebra, Wildebeest, Kudu and Buffalo. The range is relatively flat, well
watered and nearly all the range is within 3.5km from water. Based on the

information from the Ministry of Agriculture and Cooperatives in Choma, the soils are generally fersiallitic and suitable for a game sanctuary. The average rain fall is 800mm and the vegetation is dominated by Acacia-Combretum woodland and dry miombo. And also results from your preliminary investigations indicate that the production of key forage species averages about 100kg/ha of dry matter per year. The proposed Sanctuary is 10,000 ha in size. Assuming that allowable use is 25% and daily dry matter intake is 2% of the animal body weight,

    (a) Determine the number of 204 kg Hartebeest you would stock as your base herd in the area
    (b) Discuss the limitations of this method in estimation the stocking rate of wildlife species.

3. Describe the main characteristics of a wildlife habitat and relate these to the ecology of the following species:
(a) Tsessebe (*Damaliscus lunatus*)
(b) Bush buck (*Tragelaphus scriptus*)

4. Discuss features that would indicate that a wildlife species population was being over exploited in the ranch and prescribe measures most significant in reversing the trend.

5. Discuss animal species suitability for a game farm in Zambia and discuss difficulties associated with the translocation and restocking operations in Game Ranching.

6. Discuss the management application of the following methods as used in wildlife and range management:

(a) Parker 3-step method.
(b) King Census method.
(c) Point centered method.
(d) Biomass estimation

7. Discuss the values of wildlife and give reasons why wildlife species are rapidly declining in Zambia.

8. Summarize the following:
(a) Species territory.
(b) Aldo Leopold.
(c) A Game Management Area.
(d) Artiodactyla.

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES

2011 ACADEMIC YEAR: SECOND SEMESTER
FINAL EXAMINATIONS

AGA 442: INTEGRATED AQUACULTURE AND FISH NUTRITION
THEORY PAPER

TIME: THREE HOURS

INSTRUCTIONS: ANSWER **FIVE** QUESTIONS. ANSWER QUESTIONS **1, 2 AND 5.**
ANSWER **TWO** QUESTIONS **FROM EACH SECTION** AND THE **FIFTH** QUESTION
FROM EITHER SECTION. USE DIAGRAMS AND OTHER ILLUSTRATION AS
APPROPRIATE. USE **SEPERATE ANSWER BOOKS** FOR EACH SECTION.

SECTION A: Integrated Aquaculture

1. Justify the following practices or regulations in semi intensive aquaculture in Zambia:
   (a) Use of the common Carp (*Cyprinus carpio*).
   (b) Mono-sex aquaculture.
   (c) Preventing the farming of *Oreochromis niloticus* in the Mweu - Luapula Basin.
   (d) Keeping fish ponds dry for two weeks in between production cycles.
   (e) Discouraging disposal of water from fish ponds directly into streams and rivers.

2. A former Agriculture Extension Worker based in Shesheke, Western Province, has decided to
   start fish farming using semi-intensive fish cum pig farming methods after failing to become a
   member of parliament in the 2011 elections. A preliminary survey of his farm indicated that
   he could use 3,000 m^2 for the production ponds. The topography of the area where the
   production ponds are to be located is such that it is possible to have fish production ponds of
   the same size.
   (a) Indicate the **number** and **sizes** of production ponds that you would recommend for the
       intending fish farmer. Give reasons for the number and sizes of fish ponds recommended.
   (b) Estimate the area that would be required for **breeding** and **nursery** ponds.
   (c) Estimate the number of **fingerlings** per year and pigs needed for all the ponds.
   (d) Approximate the total annual water requirement for the **entire** fish farm.

3. *Oreochromis andersonii*, the three spot bream, is a cichlid species that is recommended for
   integrated farming in most parts of Zambia particularly in the Zambezi River Basin.
   Summarise the reasons for strongly recommending this fish species for aquaculture.

4. At Global level aquaculture is the fastest growing food production system with growth rate of
   9.2 % per year. In Zambia aquaculture is still a small industry with an estimated annual
   out put of 8,000 tonnes. Summarise the reasons that contribute to the slow growth of
   aquaculture in Zambia and suggest possible solutions.

TURN OVER

SECTION B: Fish Nutrition

5. Discuss the following, highlighting all the key parameters as related to fish nutrition or aquaculture:
   (a) Factors that enhance an effective fish feed formulation diet plan.
   (b) Major threats on fish feed in storage and possible solutions.
   (c) Natural fish foods with reference to zooplanktonic organisms
   (d) Types of fish feeds that may be used in commercial an aquaculture production venture.

6. Discuss in detail the digestion of Carbohydrates, Protein and Lipids in Fish Nutrition.

7. Compare and contrast fish meal and other alternative sources of protein of your choice that may be selected in the formulation of complete diets.

8. (a) Discuss the information you would need to know as a fish nutritionist before embarking on a fish feed formulation programme.
   (b) There are no differences between supplementary and complete feeds in fish nutrition. Discuss this statement whether it **true or false** and give details to support your answer.

END OF THE EXAMINATION

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

FIRST SEMESTER FINAL EXAMINATIONS

DATE: 23rd NOVEMBER 2011, 14:00 HRS
COURSE AGA 511: TECHNIQUES IN ANIMAL SCIENCE

TIME: 3 Hours
INSTRUCTIONS: ANSWER EACH PART IN A SEPARATE ANSWER BOOK.

Read Questions carefully there are parts and be brief. Good Luck

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Section I: Project Planning Cycle and Effective Proposal Writing

Question 1 (20 Marks)

a) As part of the degree requirements, you are tasked to do a research project. Briefly explain and use flow chart format(s) on what considerations and procedures you would undertake to ensure that the project is done efficiently and successfully?
   (10 Marks)

b) Define and state the importance of **five (5)** of the following terms:
   i) A mission statement
   ii) Situation analysis or literature review
   iii) Stakeholder analysis
   iv) SWOC Analysis
   v) Four Phases of Strategy
   (10 Marks)

Section II: Project Proposal Analysis
Question 2 (10 marks)

a) Explain briefly the difference between an experiment and a survey.
b) What is the purpose of preparing a research protocol? Give an example.

Section III: Research Experimental Designs
Question 3 (15 Marks)

a) Clearly explain:

      i)   What Blocking means in the Design of experiments

      ii)   What it aims to achieve and

      iii)   Give three (3) examples how you would apply the concept of Blocking in Animal Science   **(9 marks)**

b)   A third year student has difficulty in understanding what the Test of Significance means in the analysis of experiments.
Explain **in detail** to the student what is meant by Test of Significance in data analysis of planned experiments and give examples from the field of animal science **(6 marks)**

Section IV: Enterprise Development, Feeding Standards and Regulations, Sampling

Question 4 (20 Marks)

a) As an employee at an institutional laboratory specialized in nutrient analysis, you are sent by your supervisor to follow-up a complaint concerning a feed miller who is selling moldy feed. You are required to go and collect a sample from the feed miller's premises to verify whether the complaint is genuine.

      i.   What sampling plan will you utilize to ensure proof of the presence or absence of mold in the feed? Give reasons for selecting the particular sampling plan.
          (5 Marks)

      ii.   Explain, giving reasons, how you are going to store the sample to avoid changes which may affect results of analysis.
          (3 Marks)

b) (i) Define 'feeding standards' and (ii) Write briefly on the considerations made in applying feeding standards for animal growth.
    (5 Marks)

c) Imagine that you have been given a contract to develop a 400-sow pig enterprise by a Non-Governmental Organization to raise funds for a community of vulnerable people by selling baconers to meat processors.

      i.   What stages do you expect to take the enterprise through toward its establishment?

      ii. Summarize the activities that are expected to take place at each stage.
        (7 Marks)

Section V:
Question 5 (10 Marks) Importance of blood
  a) The life of the flesh is in the blood. Mention the components of blood and explain their importance in giving life to animals.
     (4 Marks)
  b) What is the economical, social and spiritual importance of blood
     (3 Marks)
  c) How would you use the knowledge of blood you have acquired if you were employed as a Livestock Officer in the Department of Livestock **(3 Marks).**

Questions 6 (15 Marks) Animal Draft Power
Answer sub questions **a) and b) then c) or d)**
  a) Cattle have been a source of animal draft power for a long time. Mention and explain the important factors to consider when selecting cattle for animal draft power **(5 marks).**
  b) Proper feeding watering and sound management are required to keep animals in good working condition. Mention and explain the feeding strategies for work cattle **(5 marks).**
  c) Why would you encourage the use of donkeys for animal draft power in Zambia? **(5)**
  d) What are some of the drawbacks of using the donkey for draft power compared to other animal species **(5 marks)**

Question 7 (10 marks) Body Condition Scoring (BCS)

Body Condition Scoring (BCS) is a subjective assessment that is very useful in monitoring the extent to which cattle are affected by nutrition, disease and other environmental factors. Research has, however, indicated that BCS is a better assessment of the condition of cattle and their reproductive performance as compared to the use of weigh scales or the weigh band.

  i. Discuss the reasons why farmers prefer to use BCS instead measuring weight changes in cattle.

  ii. It is recommended that beef and dairy farmers should evaluate the body condition of their cattle as often as possible. At what stages of both the beef and dairy cycles is it recommended to carry out BCS?

  iii. What would be the condition score of beef cattle in Figures 1 and 2? Discuss the factors that you took into consideration to arrive at the scores.

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ANIMAL SCIENCE
2012 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATION

AGA 542: ANIMAL HEALTH

TIME: THREE HOURS

INSTRUCTIONS:
1. Please read the instructions and each question carefully.
2. Answer ALL questions.
3. Write the answers to each question in a separate examination answer book.
4. All questions carry equal marks.

....

1. Diseases caused by helminthes (worms) are a major cause of reduced livestock production in most parts of Zambia though less attention is given to their control.
   a) List **three (3)** major groups of helminths. **(3 marks)**
   b) Give **one (1)** example of each helminth group. **(3 marks)**
   c) Outline a typical life cycle of each of the three groups of helminthes. **(12 marks)**
   d) Outline **two (2)** general methods of controlling helminth parasites. (**2 marks**)

2. You are the Livestock Officer in Sesheke. It is towards the end of December and a farmer calls you to his farm complaining of suddenly losing several animals which did not show signs of being sick previously. At the farm, you find some sick animals showing the following clinical signs: dullness, reluctance to move, respiratory distress and serous nasal discharge, edematous swelling from neck to brisket region and congested mucous membranes. Use the following questions to help you discuss the situation on the farm:
   a) What is your tentative diagnosis? **(2 marks)**
   b) What is your differential diagnosis? **(4 marks)**
   c) How can you confirm your diagnosis? **(4 marks)**
   d) How is this condition transmitted? **(4 marks)**
   e) What control measures would you suggest to prevent further outbreaks? **(6 marks)**

3. You are appointed as animal health coordinator of an NGO formed to promote livestock production in the newly established Muchinga Province. One of the leading farmers, Mr Julius Sata, calls you to attend to his herd of cattle experiencing an outbreak of what he calls a "strange disease." When you get to his farm, you confirm the outbreak of the disease characterised by Raised, circular, firm, coalescing nodules on head, neck, udder, perineum, legs and cores of necrotic material. Most animals have rhinitis, conjunctivitis and show signs of lameness.

a) What is your tentative diagnosis? (**2 marks**)
b) <u>List</u> **three** (**3**) differential diagnoses. (**6 marks**)
c) How would you confirm your diagnosis of the condition stated in (a) above? (**6 marks**)
d) How would you prevent occurrence of this disease on other farms? (**6 marks**)

4. Write short notes on any **four** (**4**) of the following (**5 Marks each**)
   a) The aetiology and clinical signs of East Coast fever
   b) Rhipicephalus appendiculatus.
   c) Measures of the effects of disease on livestock production.
   d) Livestock movement control.
   e) Indirect costs associated with infestation of cattle by ticks.

5. Mr Victor Mwala, a poultry farmer near Lake Tanganyika, calls you to his farm. He has lost almost all his point-of-sale broiler flock over a period of 48 hours. When you get to the farm, you examine the few surviving and very sick birds and you record the following signs: coughing, sneezing, rales, lacrimation, ruffled feathers, diarrhoea, swelling of the head/face region, severe haemorrhages of bird feet and nervous symptoms. Briefly discuss the following:
   a) Your tentative diagnosis. (**2 marks**)
   b) Your differential diagnosis. (**4 marks**)
   c) How you can confirm your tentative diagnosis. (**4 mark**)
   d) Transmission dynamics of this condition. (**6 marks**)
   e) Control measures against the condition. (**4 marks**)

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END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES
2011/2012 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGA 552
ANIMAL PRODUCTS AND BY-PRODUCTS

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:
1) ANSWER <u>ALL</u> QUESTIONS
2) WRITE EACH SECTION IN SEPARATE ANSWER BOOKS

SECTION A (Meat)

QUESTION 1 [20 marks]
Chilling is one of the quickest preservation methods of meat and in large meat operations, rapid chilling of the product is a real practical consideration. While it may be desirable in these operations to chill the meat as rapidly as possible from a business point of view, the current scientific understanding and technology is such that meat can only be chilled at a certain rate in order to maintain the desired quality. Discuss this statement and state the difference between the meat with bone in and boneless meat.

QUESTION 2 [15 marks]
Water Holding Capacity (WHC) is an important attribute of meat quality since it defines the ability of meat to retain its water during the application of external forces such as cutting, heating, grinding or pressing. Discuss how the "Net Charge Effect" as a biochemical factor in muscle affects WHC.

QUESTION 3 [15 marks]
Briefly discuss how Sodium Nitrate ($NaNO_3$) biochemically works in the process of meat preservation.

SECTION B (Milk)

QUESTION 1 [15 marks]
Dairy products are nutritious and widely consumed.
  a) Explain with aid of a flow diagram the manufacturing process of Cheese. **(8)**
  b) Give the four major nutrients found in cheese.**(2)**
  c) A cheese processor approaches you with a problem of high moisture content in his product. Explain the causes and offer the possible solutions.**(5)**

QUESTION 2 [15 marks]
   a) Explain with illustrations the growth cycle of bacteria. **(8)**
   b) Discuss the difference between stirred and set yoghurt. **(4)**
   c) Briefly describe the milk separation process. **(3)**

SECTION C (Eggs)

QUESTION 1 [15 marks]
An egg is considered one of the most nutritious food in the world. Being a fresh natural food, eggs suffer from several quality issues.
   a) How is egg quality measured? **(5)**.
   b) What are the factors that affect egg quality? **(10)**

SECTION D (Hides and Skins)

QUESTION 1 [20 marks]
As a by-product of the meat industry and due to natural deaths of animals, a large number of hides and skins are produced by smallholder farmers but because of poor livestock management and lack of technical know-how, most of these hides and skins are of very poor quality, wasted or under processed.
   a) Mention and explain the causes of the damage to the skins and hides which makes it difficult for the tanners to buy these hides and skins for procession into leather. How can these defects be avoided? **(8)**
   b) Why is it important to cure hides and skins? Give an example of any one appropriate method of curing hides and skins for the smallholder farmers in Zambia. **(8)**
   c) Why is it important to grade skins and hides? **(4)**

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END OF EXAMINATION

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF PLANT SCIENCE

SECOND SEMESTER FINAL EXAMINATIONS 2011/12 ACADEMIC YEAR

COURSE NAME:	**CROP PROTECTION**
COURSE CODE:	**AGC 312**
TIME ALLOWED:	**THREE (3) HOURS, 14:00 – 17:00 HOURS**
DATE:	**FRIDAY 31ST MAY 2012**
VENUE:	**UPPER DINING HALL**

Instructions: *This paper has three sections, A, B and C. In each section, answer question 1 as it is compulsory and any other question. Each Section should be answered in a **SEPARATE** booklet. Points for each question are indicated.*

SECTION A

WEED SCIENCE (30%)

Q1 (20 points)

a) *"Weeds are the most underestimated pest in tropical agriculture!"* Discuss.
b) Define preventive weed control and list eight of its facets.

Q2 (10 points)

Although weeds have many undesirable features, there are some that are useful. Describe five (5) of these useful features with concrete example for each weed (by scientific name) with such features.

Q3 (10 points)

Compare and contrast cultural and biological weed control strategies. What are the advantages and disadvantages of each method?

SECTION B

PLANT PATHOLOGY (40%)

Q1 (20 points)

The key to understanding plant diseases and subsequently their management partly lies in a clear understanding of the disease triangle.

a) Define a plant disease triangle
b) Explain the role of the various elements of the plant disease triangle in disease development

Q2 (20 points)

a) Complete the following table

Organism	Disease name and crop affected	Scientific name of causal organism
Fungi		
Bacteria		
Viruses		
Parasitic higher plants		
Nematodes		

b) Explain the following terminologies as used in plant pathology
   i. Disease cycle
   ii. Damping off
   iii. Koch's postulate
   iv. Capsid
   v. Susceptible

Q3 (20 points)

A wide array of disease management tools is available to the farmer. However, it is recommended that an integrated approach to disease management be adopted.

a) What is integrated disease management?
b) List the six (6) basic components of integrated disease management.
c) How are plant viruses managed?

SECTION C

ENTOMOLOGY (30%)

Q1. **(20 points)**

The insect circulatory system is different from the mammalian one. With the aid of diagram, describe the insect circulatory system. Discuss the salient differences between the insect and mammalian circulatory systems.

Q2. **(10 points)**

What is metamorphosis? Describe the types of metamorphosis found in insects.

Q3. **(10 points)**

Insects play important ecological roles that support human life. Elaborate.

End of Examination

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

PROGRAMME: BACHELOR OF AGRICULTURAL SCIENCES- THIRD YEAR

2011/2012 ACADEMIC YEAR, SEMESTER II

AGC 332: INTRODUCTORY PLANT PATHOLOGY

FINAL EXAMINATION

DATE: 5ᵗʰ June, 2012   TIME: 09:00 – 12:00Hrs   VENUE: Other Rooms

INSTRUCTIONS:

1) ANSWER **QUESTIONS 1, 2** AND **ANY OTHER 3** QUESTIONS,
2) EACH QUESTION CARRIES **20 MARKS**.
3) DURATION OF EXAM IS 3 (THREE) HOURS

QUESTION 1.

a) Indicate whether the following statements are true or false **[10 marks]**
   (i)   All plant viruses are facultative biotrophs.
   (ii)   Orobanche, Striga, and Heterodera are all genera of parasitic higher plants
   (iii)   Bacterial spores can sometimes be spread by wind
   (iv)   *Phytophthora infestans* is a bacterium.
   (v)   Leaf diseases of common beans may infect Soya beans.
   (vi)   An avirulent pathogen is not pathogenic.
   (vii)   Ascospores are always 6 in number in the fruiting body.
   (viii) Root knot nematode has a narrow host range.
   (ix)   Plant viruses are predominantly DNA based.
   (x)   Disease incidence is the measure of damage done by a plant.

b. Explain the following terminologies as used in plant pathology: **[10 marks]**

   i.   Vertical resistance.
   ii.   Alternate host.
   iii.   Disease triangle
   iv.   Sign
   v.   Susceptible

QUESTION 2.

Integrated Disease Management (IDM) is an approach that aims at effectively managing a disease with minimum damage to the environment. Explain, in chronological order, how you would apply the 6 basic components of an IDM to manage a plant disease. [20 marks]

QUESTION 3.

Correct management of viral diseases depends on a clear understanding of viral characteristics, viral disease symptoms options and the options available for their management.

a. Explain how the following are used in virus classification. [12 marks]
   i. Particle morphology

   ii. Serological properties

   iii. Genome properties

   iv. Biological properties

b. How would you know that your crop has a viral disease? [4 marks]
c. Explain the options available for management of viral diseases. [4 marks]

QUESTION 4.

a. Complete the following table by indicating disease reaction that will result in each of the 4 scenarios and explain each of the 4 (four). [10 marks]

	Resistance or susceptibility genes in the plant	
Virulence or avirulence genes in the host	R (resistant) dominant	r (susceptible) recessive
A (avirulent) dominant		
a (virulent) recessive		

b. Define plant disease cycle. Describe the 5 (five) stages of the disease cycle. [10 marks]

QUESTION 5.

a) List 5 genera of bacteria and give one disease example of each.[10 marks]

b) Describe five major symptoms of bacterial diseases. [5 marks]

c) How are bacterial diseases managed? [5 marks]

QUESTION 6.

Complete the following table [**20 marks**]

	DISEASE NAME AND CROP AFFECTED	SCIENTIFIC NAME OF CAUSAL ORGANISM
FUNGI		
BACTERIA		
VIRUSES		
PARASITIC HIGHER PLANTS		
NEMATODES		

END OF EXAM

The University of Zambia

School of Agricultural Sciences

Department of Crop Science

Third Year Examinations for the Degree of Bachelor of Agricultural Sciences

AGC 322: Forage Crop Production

Second Semester, 2012

Date: May 24, 2012   Time: 09.00 – 12.00hrs

Instruction to Candidates

Answer any five questions. All questions carry equal marks

1. Proper feeding of ruminant animals is a major challenge to small scale livestock farmers in Zambia because of the seasonal variations in the quality and quantity of the available forage
    a). Draw a graph to show the pattern of forage availability during the year. Please clearly label all parts of the graph (6marks).
    b). Explain the meaning of the graph (4 marks).
    c) Explain what should be done to ensure continuous supply of adequate forage throughout the year (10 marks).

2. Browse trees are an important component of natural grazing resources in the rangelands in many countries in Africa.
    a). What is the importance of these browse trees in grazing areas?(6 marks).
    b). What are the problems associated with use of these fodder trees as feed for the grazing animals (6 marks).
    c). How should they be managed to improve their productivity (8 marks).

3. Climate change and variability is having a negative impact on the productivity of rangelands in Africa through decreased rainfall increased temperature, extended periods of spells, wet spells rainfall pattern etc.
    a). What products of economic important can we get from rangelands? (6 marks)
    b). What are the characteristics of rangelands that make it a big challenge for Governments in African to mitigate these effects of climate change and variability? (4 marks)
    c). indicate the management practices that should be carried out in rangelands to mitigate the effects of climate change and variability (10 marks).

1

4. a) Differentiate between hay and silage. (3 marks)
    b) Mention and explain the necessary steps involved in hay making that you would recommend to small scale farmers in rural areas in Zambia (7 marks).
    c) What are the characteristics if good quality hay. (10 marks

5. a). Outline the botanical differences between pasture grasses and pasture legumes (10 marks).
    b). what are the advantages of having the following pasture grasses and legume on a beef farm.

i)	Rhodes grass	ii).	Napier grass
iii)	Siratro	iv).	Star grass

(10 marks)

6. The quantity and digestibility of feed ingested are the major factors affecting animal productivity. Tropical pastures differ in yield of dry matter, vertical development and density or compactness of the herbage, leaf stem ratio, arrangement and accessibility of leaves, ease of prehension and removal of herbage from the plant. Herbage ingested by grazing animals may differ markedly in botanical and chemical composition from that on offer be cause of selective grazing.
    a) What is selective grazing and why does it occur in grazing animals (4 marks)
    b) mention and explain any three factors that affect grazing time (6 marks)
    c) describe the grazing system that you would recommend in an improved beef rearing system. Give reasons to support your answer.   (10 marks)

7   a). How much grazing land (Natural grazing land) would a farmer require for the following herd of cattle; 4 Boran bulls, 4 Tong bulls, 30 Barotse cows, 50 Angoni cows, 5 Jersey cows,25 Africander heifers and 30 simmental steers. (14 marks)
    b). would the grazing land requirement be less or more if the improved pasture grasses were planted. Give reasons to support your answer. (6 marks).
    Take 1 livestock unit = 5 hectares. Show all the calculations
(20 marks)

Livestock Units of Different Breeds of Cattle

Breed	Cow	Bull	2-3 Years	1-2 Years	5-11 Months	0-5 Months
Brahman, Simmental	1.5	1.8	1.5	0.8	0.4	0.2
Hereford, Sussex, South Devon	1.3	1.6	1.3	0.7	0.3	0.2
Africander, Boran, Friesian	1.2	1.4	1.2	0.6	0.3	0.2
Barotse, Gurnsey	1.0	1.2	1.0	0.5	0.3	0.1
Tonga, Angoni, Jersey	0.9	1.1	0.9	0.5	0.2	0.1

END

2

THE UNIVERSITY OF ZAMBIA

School of Agricultural Sciences

Department of Plant Science

Third Year Examinations for the Bachelor of Agricultural Sciences

AGC 342: Fundamentals of Crop Production

Second Semester 2011/2012 Academic Year

Date: 8th JUNE, 2010 .... Time: 09:00 –12:00 hrs

Instructions:

1. Answer all questions
2. Marks as indicated
3. Time: 3 hours

QUESTION 1 (15 Marks)

i) What are the different soil structures found in Zambian soils? **(3 Marks)**

ii) How are centers of origin or diversity of plants distinguished? **(3 Marks)**

iii) What triggers flowering in monocarpic plants? **(3 Marks)**

iv) Explain the causes of low adoption rates of Agroforestry technologies in Zambia. **(3 Marks)**

v) What are the distinguishing features of Crassulacean acid metabolism (CAM) group of plants? **(3 Marks)**

QUESTION 2 (25 Marks)

A.

i) What is soil water storage? **(2 Marks)**

ii) What is root zone water balance? **(2 Marks)**

iii) Briefly describe the 2 indirect methods of measuring soil moisture content. **(3 Marks)**

iv) What are the advantages and disadvantages of each of the methods?   **(3 Marks)**

B.

The water distribution profile in the crop of cucumbers was measured with a neutron probe and is given in Table 1. Given that the drainage and runoff was insignificant during the period of growth:

i) Determine the effective rooting depth of the crop with the different water regimes.
(5 Marks)

ii) Determine the evapotranspiration. **(5 Marks)**

iii) If the reference evapontranspiration was 50 mm, what was the stage of development of the crop? **(5 Marks)**

Table 1: Soil water storage under different water regimes

DEPTH (cm)	SI (mm)	SRF (mm)
15	9.87	9.49
30	10.61	10.26
45	10.46	10.31
60	11.62	10.67

Key

SI   -   Soil water storage under irrigation

SRF   -   Soil water storage under rainfed conditions

QUESTION 3 (20 Marks)

A.

The manager of a Greenhouse is required to supply plant nutrients from the pump house to a crop of roses and snap beans in the greenhouse.

    i)   What system of irrigation should he use to supply plant nutrients? **(2 Marks)**

    ii)   Explain the category (s) of plant nutrients the manager is required to supply. **(5 Marks)**

    iii)   If the same manager was growing rice, what additional category of plant nutrients is he required to supply. **(3 Marks)**

B.

    i)   Explain the functions of nitrogen, magnesium and zinc in plant growth and development. **(5 Marks)**

    ii)   How are their deficient symptoms presented in maize? **(5 Marks)**

QUESTION 4 (20 Marks)

Given a promising provenance of Jatropha (*Jatropha curcas*) with desirable traits of high seed and oil yield.

    i)   How would you proceed to have this planting material rapidly multiplied and disease free to supply to farmers? **(10 Marks)**

    ii)   Suggest how you would also proceed through use of biotechnology to have the desirable traits of this provenance transferred to other Jatropha provenancies with low oil yield? **(10 Marks)**

QUESTION 5 (20 Marks)

The crops groundnuts, common beans and cabbage are important to the economy of the country.

    i)   What families do these crops belong to? **(3 Marks)**

    ii)   What are their scientific names? **(3 Marks)**

    iii)   What are their places of origin **(2 Marks)**

    iv)   Describe four of their morphological features. **(6 Marks)**

    v)   How are these crops important in the national economy giving examples of four important economic uses? **(6 Marks)**

END OF EXAM
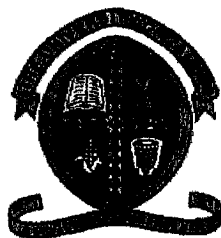
UNIVESITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

PLANT SCIENCE DEPARTMENT

FIRST SEMESTER EXAMINATIONS

AGC 521 ADVANCED PLANT BREEDING.

Programme: Bachelor of Agricultural Sciences, Fifth Year.

Date 24th November 2011   **Time** 09:00- 12:00

INSTRUCTIONS

Answer Question No. 1 and any other THREE.

Marks for each question are indicated in brackets.

Time: 3 hours.

Question 1

(a) Given the information below, answer the following questions.

Source	DF	SS	EMS
Replications	2	145.78	
Treatments	24	65.24	$\sigma^2_e + m\sigma^2_g$
Error	48	23.85	σ^2_e
Total	74	234.87	

    i)   What mating design would give such Analysis of Variance?   **(2 points)**.

    ii)   Give the strategy to create the experimental population form such a mating **(3 points)**

    iii) Estimate the components of Variance (σ^2_e and σ^2_g)   **(6 points)**.

    iv) Estimate the heritability.   **(4 points)**

(b) For the data provided below, clearly

    i.   Show the steps you would follow to test for epistasis   **(15 points)**

    ii.   Estimate the genetic variances   **(10 points)**

Hybrids	Replication 1	Replication 2	Replication 3
L1 x P1	8.3	8.2	8.0
P2	4.1	3.9	4.0
F1	6.0	6.1	6.3
L2 x P1	7.4	7.0	7.1
P2	3.2	3.8	3.3
F1	4.0	5.8	5.0
L3 x P1	6.7	6.1	6.4
P2	2.9	2.9	3.4
F1	5.0	5.9	4.9

Question 2

a) Define selection.   (5 points).

b) Describe three of the five responses to selection you know and explain the underlining factors to the nature of the response.   (15 points)

Question 3.

From a field study of length of awns in barley it was realized that a single dominant gene 'P' controls this trait. Genetic analysis revealed the following from a population of barley plants totalling 16,000.

	Genotypes		
	PP	**Pp**	**pp**
Frequency (%)	72.6	25.1	2.3

Answer the following questions:

i.   What are the frequencies of the two alleles?   (5 points)

ii.   Is this population in equilibrium?   (5 points)

iii. How many plants constituted each genotype?   (5 points)

iv.   What would be the gene frequencies in the subsequent generation after one cycle of random mating?   (5 points)

Question 4.

Give a comprehensive explanation to the figure presented. What is it depicting with regards to effectiveness of selection?   (20 points)

Change in Gene frequnecy
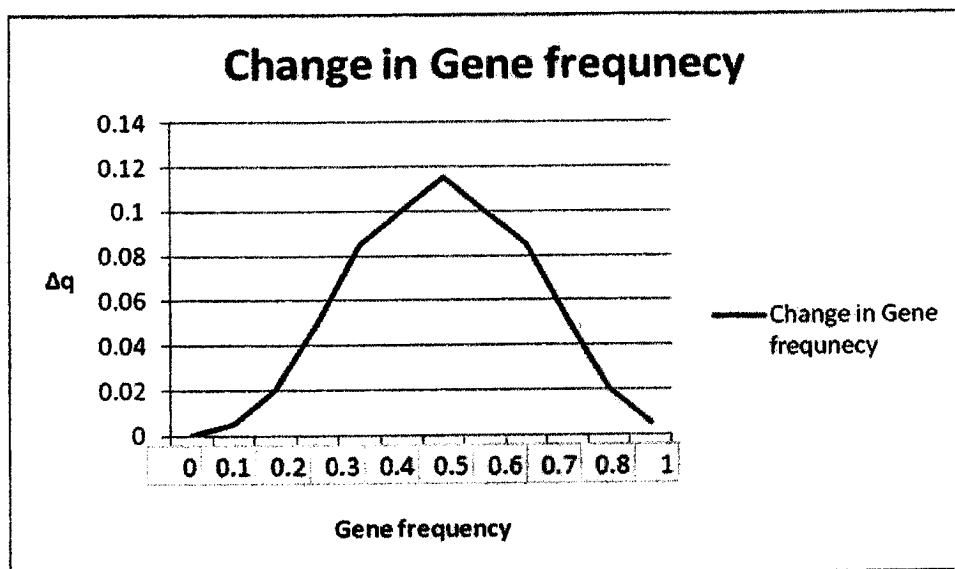
Question 5. Write short notes on the following:

a. Strategy used to develop an experimental population for the North Carolina Design I and North Carolina Design II. Show similarities and differences. **(5 points)**

b. Five types of non-allelic gene actions Improvement of gain from selection. **(5 points)**
c. Sources and types of genetic variation. **(5 points)**
d. Centres of Origin. **(5 points)**

END OF EXAMINATION
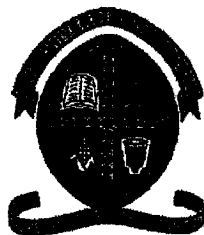
UNIVERSITY OF ZAMBIA
School of Agricultural Sciences
Department of Plant Science
Fifth Year Examinations for Bachelor of Agricultural Sciences
AGC 542: Integrated Pest Management
Second Semester 2011/12

Date: 21st May, 2012   Time: 09:00-12:00h   Venue: Other Rooms

INSTRUCTIONS: Answer five (5) questions only
                    Marks are as indicated

Q1.   (a) What are the four (4) phytosanitary measures that deal with issues of integrated pest management? **(4 Marks)**

(b) Discuss quarantine legislation in relation to integrated pest management systems **(8 Marks).**

(c) What are the four (4) fundamental pre-requisites of an effective plant quarantine unit/section? **(8 Marks).**

Q2.   What is antibiosis? Describe the antibiotic symptoms that may be manifested by insects? **(20 marks).**

Q3.   Suppose there is an outbreak of an exotic insect pest in Luangwa Valley and it has been decided that the most feasible control method is to use bio-control. Explain how you would implement the bio-control programme of this exotic **pest (20 marks).**

Q4.   (a). Though not as spectacular as insecticides in their effects, cultural pest control methods assist in the goal of establishing modern ecologically sound pest management systems. List twelve (12) cultural pest control methods and explain how they are used to achieve some levels of pest control **(12 Marks).**

(b) Although emphasis in integrated pest management is to limit dependence on chemical pesticides, there are many pest problems for which the use of chemicals provides the only acceptable solution. What are the eight (8) advantages of using insecticides to control insects compared to the non-chemical pest control methods **(8 Marks).**

Q5.   (a) Discuss the problems associated with the use of insecticides **(15 Marks).**

(b) Provide five (5) requirements of a successful integrated pest management programme **(5 Marks)**

Q6.   (a) Discuss factors that make a natural enemy a good biological control agent **(10 marks).**

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(b) What are the advantages and disadvantages of biological control in pest management programmes? **(10 Marks)**

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxEND OF EXAMxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF PLANT SCIENCE

Fifth Year Bachelor of Agricultural Sciences Programme, Final Examinations

AGC 552: HORTICULTURAL SCIENCE

Second Semester 2011/2012

Date: 29ᵗʰ May 2012   **Time 14:00 to 17:00 hrs**

INSTRUCTIONS
i.   Answer ANY 4 questions.
ii. Duration- Three (3) hours.

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1. Explain the general principles of pruning and what are the possible differences between pruning evergreen and deciduous species?   **[25 marks]**

2. Describe the following:
   a. Epigenetic causes of clonal variation;
   b. Advantages of using micropropagation.   **[25 marks]**

3. Describe the cellular functions that are under control of cytokinins and practical uses of cytokinins in horticulture.   **[25 marks**

4. Describe a general framework of how to propagate plants from cuttings. In your answer also suggest how rooting can be increased in a difficult to root tree species.   **[25 marks]**

5. Describe key elements of mango (*Mangifera indica*) production. In your answer include environmental requirements, cultivars, ecological requirements, interaction of mango fruitfulness and the environment, varieties and yield.   **[25 marks]**

END OF EXAMINATION

UNIVERSITY OF ZAMBIA

School of Agricultural Sciences

DEPARTMENT OF CROP SCIENCES

B. AGRIC. SCI. PROGRAMME- SECOND SEMESTER FINAL EXAMINATIONS

AGC 572: POST HARVEST TECHNOLOGY

Date: 25ᵗʰ May 2012
Time: 14:00 to 17:00 hrs.

INSTRUCTIONS

1. Answer EACH SECTION in a different booklet
2. Answer a total of 5 **(FIVE)** questions.
3. Duration- **3 (THREE)** hours.

SECTION A- ANSWER ANY 2

1. Describe inter relationship between shelf life improvement by suppressing respiration and sensory quality reduction of aromatic compound production. **[20 marks]**

2. Explain briefly the following

   a. Physiological changes associated with stored products and how they can be reduced.

   b. Describe quality and its relationship to Food Safety.

   c. Environmental parameters associated with product deterioration.
   [20 marks]

3. Explain concisely what factors determine quality and what quality components are?
   [20 marks]

SECTION B –ANSWER ALL QUESTIONS

1. An Investor is interested in setting up greenhouses for growing roses. As a Postharvest Specialist, give advice to the Investor on how she can maintain quality from the first stage of postharvest handling up to the time the flowers leave the packinghouse.
   (35 marks)

2. Discuss the packinghouse operations bananas have to undergo once they arrive at the packinghouse up to the point they are ready to be packed. In your answer, clearly outline the personnel involved. **(15 marks)**

3. Stem end rot is a postharvest disease of citrus.

   List the causal organism(s). **(3 marks)**

   When does infection occur?. **(2 marks)**

   Which part of the plant gets infected? **(2 marks)**

   How can the disease be prevented and controlled? **(3 marks)**

END OF EXAMINATION

The University of Zambia
School of Agricultural Sciences
Department of Plant Science
Second Year Examinations for the Bachelor of Agricultural Sciences
AGC 2022: Plant Physiology
Second Semester 2012

Date: 23 May, 2012   **Time: 09.00 – 12.00hrs**   **Venue: GLT**

INSTRUCTIONS:

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

Q1.   Explain various types of stress experienced by plants   (10)

Q2.   Give a brief explanation of following concepts:
   a. Photosensitivity   (2)
   b. Phytochrome   (2)
   c. Senescence   (2)
   d. Stamen   (2)
   e. Embrogenesis   (2)
   f. Autotrophic plants   (2)

Q3.   a. Briefly describe the major roles of hormones in plants   (10)
          b. Give at least one agricultural application for each one of them   (5)

Q4.   Briefly describe the major carbon dioxide reactions that take place during the   (9)
          process of photosynthesis

Q5.   a. Distinguish essential from non-essential elements in plants   (6)
          b. Describe general symptoms associated with Nitrogen deficiency in plants   (8)

END OF EXAMINATION

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

Question 1

(a) Consider the production function $Y = 70 + 2X - 0.02X^2$

    i.   Find the level of X at which Y is a maximum **(5 marks)**
    ii.   Calculate the Elasticity of production, Average Physical Product and Marginal Physical Product when X=10, 20, 30, 40, and 50 **(5 marks)**

(b) State the law of Diminishing Returns. Why is this law useful? **(2x3 marks)**

(c) State the law of Diminishing Marginal Returns. **(4 marks)**

Question 2

(a) Suppose that the production function is $Y = 4X^{0.5}$, the price of the input is $4 per unit, and total fixed costs are $150. Find the functions that represent the following;
    i.   Marginal Physical Product
    ii.   Average Physical Product
    iii.   Total Cost
    iv.   Average Total Cost
    v.   Marginal Cost
(2x5 marks)

(b) Consider the production function; $Y = X_1^{1/5} X_2^{4/5}$; $P_{X1} = 5$, $P_{X2} = 3$. Find the Least Cost Combination of the two inputs that will produce 24 units of Y.
(10 marks)

Question 3

Define the following
    i.   Depreciation
    ii.   Returns to Scale
    iii.   Long run expansion path
    iv.   Economies of outlays
(4x5 marks)

Question 4

Describe and illustrate how the Long Run Equilibrium is achieved in a constant cost industry. **(2x10 marks)**

Question 5

a) As the cost of durable inputs such as machinery increases, a Farm Operator would decide not to purchase the input but would often consider alternative methods of obtaining machinery services. Two such methods are Leasing and Custom Hiring.

     i.   What is Leasing? **(3 marks)**

    ii.   What is a Custom Hire? **(3marks)**

   iii.   What are some of the factors a Farm Operator would take into consideration when making a decision on whether to lease, custom hire or own durable inputs? **(4 marks)**

b) A farmer intends to invest in a Groundnut Sheller with a life span of 4 years. It will cost him K 850, 000. After 4 years, he intends to sell it for K 150, 000. He knows that from year 1 to year 4, the added revenue from the machine is K 400,000, K 200, 000, K 150, 000 and K 50, 000. The rate of interest obtaining on the market is 6%. Is it worth investing in the hay Sheller? **(10 marks)**

Groundnut

END OF EXAMINATION

2

SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF AGRICULTURAL ECONOMICS
INTERMEDIATE AGRIBUSINESS MANAGEMENT – AGE 452
2011/2 ACADEMIC YEAR FINAL EXAMINATIONS

DATE: 22/05/12   **TIME: 14:00HRS**   **DURATION THREE (3) HOURS**

SECTION A – ANSWER ALL QUESTIONS   [MARKS]

1. Briefly explain what HACCP is, and list three (3) of the seven principles of HACCP?   **4**

2. Define the term operational management in agribusiness, and list its two (2) main components?   **4**

3. Define and distinguish the following terms?
   a. Entrepreneurship and Intraprenuership.
   b. Innovation and creativity.   **4**

4. List four (4) core values of entrepreneurship?   **4**

5. List the seven (7) sources of innovation according to Peter Drucker (1984)?   **4**

6. Briefly define experiential learning, and list the four (4) stages of the experiential learning cycle?   **4**

7. List four (4) characteristics that distinguish Entrepreneurs from Small Business Owners?   **4**

8. Define the term strategic management, and list three (3) components of a strategic plan?   **4**

9. List four (4) limitations of the BCG Matrix?   **4**

10. Define the term Value Chain, according to Michael Porter, and briefly explain how a firm can use Value Chain Analysis to achieve: (i) a cost advantage; (ii) a differentiation advantage?   **4**

TOTAL MARKS   **[40]**

SECTION B – ANSWER ALL QUESTIONS

[MARKS]

1. Give a detailed account of the current issues in operational management in Agribusiness? **[15]**

2. Give a detailed account of the functional approach to studying agribusiness marketing? **[15]**

3. Outline and give a detailed description of the components of the business plan? **[15]**

4. As a Senior Marketing Manager for Parmalat Zambia Limited, the board has asked to advise it on the marketing strategies for the year 2013, for the products highlighted in the table below.

   In preparation for the board meeting, your team decided to use the BCG Matrix to come up with different marketing strategies for the highlighted products in 2013. Therefore in order to use the BCG Matrix, product sales data (i.e., in Millions of ZMK) highlighted in the table was collected.

	PARMALAT SALES		ZAMBEEF SALES	
Products	Y1=2011	Y2=2012	Y1=2011	Y2=2012
Fresh Milk	400	600	1000	750
Long Life	500	750	500	1875
Chedder	700	1120	600	1400
Mabisi	300	480	900	960
Organic Cheese	200	360	200	450

[15]

As the Marketing Team for Parmalat, you have established the following:
   a. ZAMBEEF is the single major rival for the products highlighted in the table above.
   b. Decided that high performance products will have a Relative Market Share and Market Growth Rate of more than or equal to 60%.
   c. Decided that Low performance products will have a Relative Market Share and Market Growth Rate of less than 60%.

Given the above information, please answer the following:
   i. Classify the products highlighted in the table above, using the BCG Matrix. Clearly show your calculations **[10 marks]**
   ii. Briefly advise the board on the different marketing strategies for each product(s). **[5 Marks]**

TOTAL MARKS **[60]**

GOOD LUCK!!!!

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
Department of Agricultural Economics Extension and Education

2011/2 Academic Year Final Examinations

Course: AGE462 Agricultural Marketing and Pricing

Date: 28th May, 2012

Venue: Other Rooms

Duration: 3 Hours

Total Marks: 100

Instructions

Answer all the questions.

For each of the statements in this section, indicate whether true or false by crossing (X) the answer of your choice.

1. When a farmer and a buyer sign a marketing contract for tomatoes, both the farmer and the buyer are liable for any losses incurred due to disease outbreak in the tomatoes.

   True/False

2. The demand for a commodity is usually more price elastic than the demand for different grades of the commodity because grades of a commodity usually have small cross price elasticities. **True/False**

3. In monopolistic competition, the profit maximizing price equals the marginal cost and marginal revenue. **True/False**

4. Storage will only occur if the anticipated storage costs are less than the differential between the expected future price less the current price. **True/False**

5. The relationship between total income and the quantity purchased is sometimes referred to as an Engel curve. **True/False**

Section B (90 Marks)

1. Briefly discuss the following concepts:
   a. Total elasticity
   b. Derived supply
   c. Price rigidity in oligopoly
   d. Market boundary
   e. Vertical integration **(25 marks)**

2. An agricultural cooperative is a cooperative where farmers pool their resources in certain areas of activity.

   a. Briefly explain two (2) motivations to form an agricultural cooperative.

   (6 marks)

   b. Compare and contrast two types of selling arrangements that exist between cooperatives and their members. **(10 marks)**

3. Mr. Mwale is a small-scale dairy farmer producing milk in Chongwe district. Suppose a new firm is established that uses milk to produce a specialized type of cheese, resulting in an increase in the price per liter of milk. However, the firm is forced to shut down due to food safety concerns, resulting in a decline in the price of milk. Use the supply response concept to explain how Mr. Mwale is likely to respond to the increase and subsequent decline in the price of milk. **(9 marks)**

4. Suppose the annual value of sales in pineapple industry in Zambia are as follows:

producer	value of sales in billions of kwacha
A	6
B	4
C	8.1
D	8
E	5.5
F	2.9
G	6.3
H	3
I	10

   a. Calculate the CR_6 ratio **(4 marks)**

   b. What type of market structure does the pineapple industry in Zambia exhibit? Explain with the aid of an appropriate ratio .**(4 marks)**

   c. Based on your answers to a. and b. above, comment on pricing efficiency in the pineapple industry in Zambia. **(2 marks)**

3

5. Suppose the following equations represent demand and supply for milk in two regions of Zambia;

Region A: Demand: $Q = 30 - 2P$

Supply: $Q = 15 + 3P$

Region B: Demand: $Q = 90 - 8P$

Supply: $Q = 30 + 2P$

Where Q and P represent quantity in liters and price in Zambian Kwacha respectively, for each region.

    a. What would be the market clearing price and quantities in each region if there is NO trade between the two regions? **(10 marks)**

    b. If transfer costs are equal to K2 per liter of milk, will trade occur between the two regions? Explain your answer. **(5 marks)**

    c. What is the mathematical expression for excess supply for the region that has the lowest price according to your answer in part a)? **(5 marks)**

    d. What is the mathematical expression for excess demand for the region that has the highest price according to your answer in part a)? **(5 marks)**

    e. Using your answers for parts c. and d., determine the price at which the regions will trade and volume of trade assuming there are no transfer costs. **(5 marks)**

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

THE UNIVERISITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2011/2012 ACADEMIC YEAR FIRST SEMESTER FINAL EXAMINATIONS
AGE 521: PRINCIPLES OF FARM MANAGEMENT
TIME: THREE (3) HOURS
INSTRUCTIONS: ANSWER ALL FIVE QUESTIONS

Question 1

a) Groundnuts have an expected yield of 6 tons per hectare and a production cost of K2,500,000 per hectare. Expected market prices are K500, 000 per ton for groundnuts and K650, 000 per ton for soybeans. Soybeans has a production cost of K4,500,000 per hectare. At what yield (s) per hectare would soybeans generate the same gross margin per hectare as groundnuts? **(4 marks)**

b) Suppose soybean yield is estimated at 9 tons per hectare, at what price (s) per ton would soybeans generate the same gross margin per hectare as groundnuts? *Use some information from (1a) above* **(4 marks)**.

c) Explain the characteristics of decisions that may affect how you solve a specific problem **(10 marks)**.

d) Why is goal setting important in a farm management? **(2 marks)**

Question 2

a) How long would it take for K10, 000,000 earning 9% a year to grow to K40, 000,000? **(4 marks)**

b) Briefly explain what the Internal Rate of Return is used for, its advantages and disadvantages and the decision rules to apply when using it **(6 marks)**.

c) A farmer wishes to save K200 million over the next 8 years at 9% interest. What uniform annual amount must he deposit at the end of each year to accomplish his objective? **(4 marks)**

d) Explain how risk affects farm investments and how one can incorporate risk in investment analysis **(6 marks)**.

Question 3

Make a projection of total revenue for a dairy cow using the assumptions in Table1 below **(20 marks)**

Table 1 Assumptions for the dairy herd:

Main Product is Raw Milk	305 milking days
5% death loss	15 liters of milk/cow/day
10% culling rate	2% milk loss /day/cow
86 % calving rate	4 liters of milk/day/calf/60 days is consumed
50% chance of being heifer and 50% bull	Manure: 4 kg/cow/days for 365 days
A share of heifers held as replacements	Artificial insemination is used
Calves sold after 60 days at 50kg lwt for K10,000/kg	Milk sold at K2500/litre
Culled cow sold at 550kg lwt for K12,000/kg	Manure price: K15,000/50kg bag

Question 4

Mr. Wamusheke keeps Malaysian ducks at his farm and sells them when they reach a weight of 40 kg for K12, 500 per kg. By-products include manure (15% body weight) valued at K4, 500 per kg and feathers (2% body weight) valued at K6,500 per kg. The cost of raising Malaysian ducks include; feeding at K50,000, labor at K100,000; vet and health at K150,000 and depreciation of the housing shelter at K30,000. Recently Mr. Wamusheke attended a meeting where he learnt of the availability of hybrid ducks weighing 60kg with, 30% of body weight manure and feathers production with 5% of body weight. Going into hybrid ducks requires a bigger shelter which will cost him K200, 000 and can last for 10 years with no residual value; feed at K90,000; labor at K250,000 and extra water costing K50,000. **Note:** *Product prices remain the same.*

a) Prepare a partial budget for the proposed change **(12 marks)**
b) What would you advise Mr. Wamusheke to do and why? **(3 marks)**
c) Suppose duck raising is a risk business and Mr. Wamusheke is a risk averse farmer and has a low risk bearing ability, explain the decision rule he might use in the choice of duck production **(5 marks)**

Question 5

a) List four (4) uses of farm records **(8 marks)**

b) Asset valuation is an important task of managing farm accounts. Outline various methods used and give an example of an asset that can be valued under each method **(10 marks)**

c) What is the use of a cash flow statement to the producer? **(2 marks)**

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2012 ACADEMIC YEAR SECOND SEMESTER

FINAL EXAMINATION

AGE 552: AGRICULTURAL EXTENSION EDUCATION

TIME: THREE HOURS

INSTRUCTION: ANSWER ALL QUESTIONS, EACH WORTH 25%

Questions

1. a)   "Research studies on the diffusion of innovation have shown that relatively very few people adopt an idea at once and that the adoption rate varies from person to person"
    i.   Define the terms diffusion, innovation and adoption
    ii.   Using a bell –shaped normal curve, categorize adopters on the basis of innovativeness
    iii.   Describe the characteristics of behavior the adopter categories have in terms of attitudes and values, abilities and farm business.

    b)   Identify the successive steps of the adoption process and give the extension methods you would want to use for each step in your attempt to encourage farmers adopt an innovation.

2. With your knowledge on participatory approach, discuss what Professor Rolings meant when he said "extension can be effective only through voluntary change".

3. The planning process in agricultural extension is usually considered as a series of steps or "functions". With a diagram, outline and explain in detail what is involved in each step.

4. It is often said that Audio –Visual Aids "do not replace a teacher" but help him/her to communicate and diffuse extension messages effectively. Support this view with a discussion on the use of three named Audio –Visual Aids which you as an extension worker can use.

END

THE UNIVERISITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011/12 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGE 562: INTERMEDIATE FARM MANAGEMENT

TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER ALL FOUR QUESTIONS

Question one

a. Labor management requires an understanding of the unique characteristics of labor that affect its use and management on the farm. Outline these characteristics **(4 marks)**

b. Improving managerial capacity is one of the ways to improve labor efficiency on the farm, outline all the various ways in which a manager can improve his/her capacity **(6 marks)**

c. Disciplining of employees is a manager's response to problem behaviors and misconduct. No matter how carefully one structures the management on his or her farm there are inevitable dilemmas and predicaments with employees that will require discipline. Using the "hot stove" rule or analogy, explain how disciplining can be conducted **(10 marks).**

Question two

a. List 7 key factors to consider in choosing among different land transfer methods **(7 marks)**

b. Successful farm management involves making land use decisions that considers short run and long run environmental effects, farming systems analysis and off-farm effects; discuss each one of these **(10 marks).**

c. Mr. Inambao is considering purchasing 160 hectares of land from Mwembeshi area. Estimate the *total value* and *value per hectare* of this land using the income approach at a 4% capitalization rate, given the following budgeting information **(6 marks).**

Possible Enterprises	Hectares	Yield (50kg-bags)	Price/ 50kg bag	Expenses/ha
Cowpeas	100	135	K25,000	2, 000,000
Cotton	50	40	K67,000	2, 500,000

Question three

a. Mr. Inambao chose to buy 160 hectares of land in Chalimbana at the market price of K15, 000, 000/ hectare. He has a 30 % down payment and the balance will be financed by a 20% balloon loan from Cooperative bank at 12% interest, with equal principal payments made annually for 5 years.

    i.   Show the repayment schedule in each of the years i.e., interest, principal, total payments, outstanding balance **(14 marks)**

    ii.   How much interest is paid along with *periodic principal* and how much interest is paid from *the balloon*? **(4 marks)**

Assuming Mr. Inambao's cash inflow for years one through five is as shown below.

Year	One	Two	Three	Four	Five
Cash receipts	400,000,000	450,000,000	600,000,000	650,000,000	750,000,000
Cash expenditures	200,000,000	180,000,000	150,000,000	160,000,000	158,000,000
Family withdrawls	30,000,000	28,000,000	29,000,000	26,000,000	34,000,000
Personal taxes	6,000,000	7,000,000	5,600,000	6,000,000	8,500,000

    i.   Do a financial feasibility analysis and indicate whether the purchase of this land is financially feasible **(10 marks)**

    ii.   Outline options available to meet the negative cash flows **(4 marks)**

Question four

a) What is the field capacity for a 28-foot wide tandem disk operated at 5mph with 85% efficiency? **(2 marks)**

b) What factors are to be considered in machinery replacement decisions? **(7 marks)**

c) Use the information for Mr. Tick's farm to compute the following farm business ratios.

Net Farm Income: K108 million	Average Assets: K1080 Million
Average equity: K660 million	Interest Expense: K33 million
Opportunity cost of labor: K48 million	Opportunity cost of capital: 10%
Opportunity cost of management: K24 million	Taxes: K12 million
Family living expenses: K60 million	Depreciation: K95 million
Total Revenue K478 million	Interest rate charge: 12%
Gain/loss in the sale of capital assets= K8 million	Off-farm income: K10 million

    i.   Maximum debt to asset ratio at which the farm can safely borrow **(4 marks)**

    ii.   Operating expense ratio **(4 marks)**

    iii.   Return to Management **(4 marks)**

    iv.   Asset Turn Over ratio **(4 marks)**

THE UNIVERISITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011/12 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGE 562: INTERMEDIATE FARM MANAGEMENT

TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER ALL FOUR QUESTIONS

Question one

a. Labor management requires an understanding of the unique characteristics of labor that affect its use and management on the farm. Outline these characteristics **(4 marks)**

b. Improving managerial capacity is one of the ways to improve labor efficiency on the farm, outline all the various ways in which a manager can improve his/her capacity **(6 marks)**

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a. List 7 key factors to consider in choosing among different land transfer methods **(7 marks)**

b. Successful farm management involves making land use decisions that considers short run and long run environmental effects, farming systems analysis and off-farm effects; discuss each one of these **(10 marks).**

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    i. Show the repayment schedule in each of the years i.e., interest, principal, total payments, outstanding balance **(14 marks)**

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Total Revenue K478 million	Interest rate charge: 12%
Gain/loss in the sale of capital assets= K8 million	Off-farm income: K10 million

    i. Maximum debt to asset ratio at which the farm can safely borrow **(4 marks)**

    ii. Operating expense ratio **(4 marks)**

    iii. Return to Management **(4 marks)**

    iv. Asset Turn Over ratio **(4 marks)**

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
2011/12 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGE 572: AGRICULTURAL POLICY ANALYSIS
TIME: THREE HOURS
INSTRUCTIONS: Answer all questions

1.   a) Illustrate and explain by use of a Production Possibility Frontier diagram
        the implications of policy interventions regarding the following for a two
        commodity economy producing rice and wheat: (12 marks)
        i)   Efficiency and inefficiency.
        ii) Attainable and unattainable.
        iii) Possible shifts (changes) in the production combination of the two
             commodities.

        b) Illustrate and explain by use of a diagram how an economic change
        such as an increase in population can trigger changes (shifts) in supply
        and demand for food. (8 marks)

2.   a) The conventional treatment of externalities begins from the proposition
        that the market is said to fail when there is a technological externality or a
        non-market spillover. Explain and illustrate by use of examples and a
        diagram the economics of this type of failure as well as the correction of
        the externality. (10 marks)

        b) The Bank of Zambia recently announced the introduction of a policy
        interest rate set at 9% per annum (i.e. as a base rate) and the Minister of
        Agriculture and Livestock also recently announced the ban of the export of
        maize and wheat bran:

        i)   Contrast the nature and type of these two policy instruments (4
                marks)
        ii)   Explain and discuss the implications of the implementation of the
                two policy interventions on the agriculture sector. (6 marks)

3.   a) The PAM is an accounting framework which disaggregates the
        economics of a commodity system into its sources of private and social
        profitability. Explain briefly the methodological issues to be considered by
        the policy analyst concerning the representative budget and social prices
        for domestic resources when applying the PAM. (10 marks)

        b) Explain and discuss briefly the instances/situations when policy makers
        might use the PAM. (10 marks)

4. a) A suggested redefined pricing role of Food Reserve Agency (FRA) could be one of guaranteeing and defending producer price floors and consumer price ceilings in order to perform this function more effectively. Explain and illustrate by use of a diagram how such a new, limited market function of FRA would work. You may make appropriate assumptions in your explanation if appropriate. (14 marks)

    b) What is pan-seasonal food crop pricing? What are the arguments which have been advanced in favour of a marketing agency using intra-seasonal price variation for food crops? (6 marks)

5. a) It has been argued that basic research is almost by definition a non-commercial activity since appropriability is expected to be low. Explain and illustrate by use of a diagram why this is so. (12 marks)

    b) What are the main reasons that have been advanced for the private sector to under-invest in agricultural research and what are the other pertinent reasons that underpin public intervention in agricultural research? (8 marks)

END OF EXAMINATION

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

Question 1

You are hired as an External Evaluator to conduct a Mid-Term Evaluation for an agricultural project. The project's overall goal is to improve wheat production among smallholder farmers in Banji Camp, and its deliverables are: Construction of dam; Installation of 1 ha Irrigation systems among 200 farmers; Provision of training services in wheat production and irrigation maintenance. **Highlight** and **discuss** the items you would examine in a comprehensive Mid-term Evaluation. (20 marks)

Question 2

Monitoring and Evaluation (M&E) is usually conducted at project, sectoral and national levels. At the sectoral level, it involves conducting a sectoral analysis (which is also called a sectoral review).
(a) What is a sectoral analysis? (5 marks)
(b) What is the importance of a sectoral analysis? (5 marks)
(c) Outline the features of a typical sectoral analysis. (10 marks)

Question 3

Over the past four years, AgriAID had been funding rural based agricultural projects in the Eastern province. They would like to continue working in the same area for an additional two years with three of the six local Community Based Organizations (CBO's) they worked with in the just ended project implementation period. You have been engaged as a consultant by AgriAID to carry out an institutional assessment of all six CBO's and submit recommendations on three of them. **List** and **discuss** the factors you would include in the institutional assessment. (20 marks)

Question 4

(a) What is an indicator? Discuss the criteria for effective indicators. (10 marks)
(b) What is an Observation Guide? What are its advantages and disadvantages? (10 marks)

Question 5

List and **discuss** the conceptual and methodological issues or problems associated with defining and measuring demographic data, income and employment in an impact evaluation. (20 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2010/2011 ACADEMIC YEAR SECOND SEMESTER EXAMINATIONS

AGE 2022: FUNDAMENTALS OF MACRO-ECONOMICS

TIME: THREE (3) HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTIONS A, B AND C.

SECTION A

ANSWER ALL QUESTIONS

Multiple Choice Questions: Tick or circle the correct answer on the question paper and hand it in together with the answer booklet – (one mark each)

1. The circular flow diagram illustrates that:
   (a) National income equals national product
   (b) The payments made by buyers equal the payments received by sellers
   (c) For every kwacha of value created in the business sector, a kwacha of income is made available for payment to the household sector
   (d) All of the above are true

2. The government will have a balanced budget
   (a) Whenever it is not borrowing from anyone
   (b) Whenever transfers equal tax collections
   (c) Whenever the budget is not in surplus.
   (d) None of the above.

3. If the quantity of each final good and service produced in a year were known:
   (a) Nominal GNP could be computed exactly.
   (b) Nominal GNP could be computed only if final goods and services prices are also known
   (c) Choice (b) is right but in addition we need to know how much of the production was sold.
   (d) We need to know how much of all goods and services were produced this year not just the final goods and services

4. Pick the incorrect statement from the following statements below;
   (a) NNP equals GNP minus capital consumption allowance

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(b) Disposable income equals personal income minus personal taxes

(c) Personal income can be smaller than disposable income if transfer payments are large enough

(d) NNP equals national income plus indirect business taxes plus statistical discrepancy.

5. If an economy experiences an 8% growth rate in nominal GNP, then;
   (a) Real GNP must be growing at a rate less than 8%
   (b) The potential growth rate must be less than the actual growth rate
   (c) The consumers in the economy must experience increased welfare
   (d) All of the above
   (e) None of the above

6. Which of the following does not affect consumption?
   (a) Disposable income
   (b) Past accumulation of savings
   (c) Whether income is expected or unexpected
   (d) All of the above affect consumption

7. The graph relating consumption and nominal national income is;
   (a) Unaffected by changes in taxes
   (b) Shifted upward if wealth decreases
   (c) An important component of the aggregate demand graph
   (d) Shifted upward as people become more pessimistic

8. A decrease in the marginal propensity to save;
   (a) Increases the multiplier
   (b) Decreases the multiplier
   (c) Has no effect on the multiplier
   (d) Increases autonomous consumption
   (e) Decreases autonomous consumption

9. If the marginal propensity to consume (MPC) is 0.20;
   (a) The multiplier will be higher than if the MPC is 0.75
   (b) The multiplier will be 4
   (c) The multiplier will increase as consumption increases
   (d) All of the above
   (e) None of the above

10. If the economy is in equilibrium at a national income of K100, the marginal propensity to save (MPS) = 0.25 and planned investment rises by K50, the new equilibrium level of national income is;
    (a) K200
    (b) K300
    (c) K167
    (d) K267

11. The economy will be more stable;
    (a) The more stable the components of aggregate supply
    (b) The larger is the multiplier
    (c) The smaller is the multiplier
    (d) None of the above is relevant
    (e) Choices (a) and (c) are correct.

12. Unplanned inventory accumulation at the target level of national income is an indication of a(n)
    (a) Equilibrium
    (b) Contractionary gap
    (c) Expansionary gap
    (d) Multiplier effect
    (e) Accelerator

13. If the marginal propensity to consume (MPC) is 0.75 and a contractionary gap of K100 exists;
    (a) The government should decrease net taxes by K100
    (b) The government should increase the size of its budget by increasing taxes and spending by K100
    (c) The government should decrease government spending by K100
    (d) The government should increase government spending by K100

14. The best fiscal policy uses changes in;
    (a) Government spending because these changes are the most potent
    (b) Net taxes because people are taxed too much
    (c) The size, but not the balance of the government's budget because everyone should try to balance the budget
    (d) None of the above

15. The difference between M_1 and M_2 is;

3

(a) Demand deposits

(b) Currency and coins not circulating but in collections

(c) Time deposits at commercial banks

(d) Any account earning interest

16. If the required reserve ratio was 20% and bank reserves were increasing by K100, then the money supply could;
    (a) Increases by as much as K20
    (b) Increases by as much as K100
    (c) Increases by as much as K500
    (d) None of the above, the money supply would decrease

17. The crowding out effect
    (a) Must be considered as a possibility in partial equilibrium analysis
    (b) May reduce the effectiveness of fiscal policy
    (c) Cannot occur unless the government has to borrow money
    (d) All of the above
    (e) None of the above

18. Which of the following is counted in the labour force?
    (a) A 15 year old high school dropout looking for a job
    (b) A housewife who spends 10hours a week working not for pay in the family restaurant and is not looking for other work
    (c) A captain in the Zambian army.
    (d) An unemployed male

19. Given that Muleya can read 300 words per minute and write 100 words per minute while Banda can read 200 words per minute and write 150 words per minute, then;
    (a) Muleya has a comparative advantage and absolute advantage in reading and writing respectively.
    (b) Muleya has a comparative advantage in reading
    (c) Muleya has an absolute advantage in reading
    (d) Choices (b) and (c) are correct.

20. If a truck costs the same as a car in country A but a truck costs the equivalent of $1\frac{1}{2}$ cars in country B, then:
    (a) Country A should export cars
    (b) Country A should export trucks
    (c) We cannot determine the trade patterns

Section B: True or False. Answer all questions from this section by ticking or circling T or F. (One mark each)

1. The condition necessary for equilibrium in an economy is that total investment and planned investment are equal. T/F

2. When the government sector has a deficit in its budget, the government must borrow from somewhere. T/F

3. Disposable income is the amount of income received by households after personal income taxes are deducted. T/F

4. Nominal Gross National product measures the current value of all newly produced goods and services, even the goods produced this year but are as yet unsold. T/F

5. If real *GNP* is growing rapidly, then real *GNP* per capita must be growing rapidly. T/F

6. Human capital measures the amount of machines each worker has at his disposal. T/F

7. The permanent Income Hypothesis would say that you tend to consume a greater portion of a permanent pay raise than you would out of a one time bonus. T/F

8. The marginal propensity to consume is found by dividing the kwacha spent on consumption by disposable income. T/F

9. When the marginal propensity to save is .25, the multiplier is $\frac{1}{4}$. T/F

10. If savings plus net taxes exceeds planned investment plus government spending, unplanned inventory depletion will take place. T/F

11. The Bank of Zambia increases the monetary base when it purchases Treasury bills. T/F

12. An increase in Zambia's exports shifts *IS* right-ward. T/F

13. When investment is interest-sensitive, an increase in government spending has a weak crowding-out effect. T/F

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14. Unplanned inventory accumulation at the target level of national income is an indication of a contractionary gap. T/F

15. Open market purchases decrease bank reserves. T/F

16. Frictional unemployment is a term applied to someone who has been unemployed for a long period, perhaps because the skills possessed by the person are no longer needed. T/F

17. If the opportunity cost of cars in terms of trucks is higher in country A than in country B, then country A should export cars. T/F

18. If a truck costs the same as a car in country A but a truck costs the equivalent of $1\frac{1}{2}$ cars in country B, then country A should export trucks. T/F

19. To keep the unemployment rate below the natural rate of unemployment requires continuously more and more expansionary fiscal and monetary policy. T/F

20. The downturn is also known as contraction.

SECTION C: Answer all questions from this section

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

Consumption = $200 + 0.5$ Yd
Investment   = $150 - 10i$
Government   =   200
Exports   =   100
Tax   = $10 + 0.05$ Y
Imports   = 0.02Yd
Yf   =   1000

(i)   Find the equation for the *IS* curve? **(2 marks)**

(ii)   If interest rate is 10%, what is the equilibrium level of national income?
(2 marks)

(iii)   Is there a budget surplus or budget deficit at the equilibrium level of income?
(2 marks)

(iv)   Is the balance of trade in deficit or surplus at the equilibrium level of income?
(2 marks)

(v)   Is the government pursuing an expansionary or contractionary policy? **(2 marks)**

(b)   The following supply and demand for unskilled labour is present in a
country.

Wage Rate	Demand for labour	Supply of labour
K 150	1000	2200
200	1200	1800
250	1400	1400
300	1600	1000
350	1800	600

(i)   What is the equilibrium wage rate? **(2 marks)**

(ii)   If this is the only labour market how many people are in the labour force?
(2 marks)

(iii)   What is the unemployment rate? **(2 marks)**

(iv) Now suppose a minimum wage of *K*300 was instituted, what has happened to the labour force? **(2 marks)**

(v) What is the total amount of employment? **(2 marks)**

2. (a) Here is a balance sheet for a monopoly bank. Assume that the required reserve ratio is .25 .

Assets		Liabilities and Net worth	
Reserves	K 1000	Demand Deposits	K4000
Loans	4500	Net worth	1500
Total	K5500	Total	K5500

(i) Does the monopoly bank have any excess reserves? **(2 marks)**

(ii) Suppose the Central Bank made a *K*100 open market purchase from a customer of the bank. The customer deposits the Central Bank cheque in the bank. This gives the bank *K*100 more reserves at the Central Bank. What is the new excess now? **(3 marks)**

(iii) Fill in the balance sheet that would result if the maximum deposit expansion took place using information above. **(3 marks)**

Assets		Liabilities and Net worth	
Reserves	-------------------	Demand Deposits K	----------------
Loans	-------------------	Net worth	-----------------
Total	-------------------	Total	----------------

(iv) What is the total deposit expansion? **(2 marks)**

(b) Suppose there were potential trading regions called East and West that produced and consumed only two products, wheat and steel. The labour input for production of the products is as follows.

Units of labour per unit of output		
	Wheat	**Steel**
East	3	6
West	1	3

(i)   If trade took place which region would export steel? **(2 marks)**

(ii)   Which region would export wheat? **(2 marks)**

(iii)   Which region has the comparative advantage in the production of steel? **(2 marks)**

(iv)   What would be the maximum amount of wheat this exporter could hope to get for a unit of steel? **(2 marks)**

(v)   Explain the difference between comparative advantage and absolute advantage? **(2 marks)**

3. (a)   During a recession, interest rates may fall even if the Central Bank takes no action to expand the money supply. Why? Use a sketch graph to explain. **(5 marks)**

    (b)   What is a discretionary fiscal policy? What are the three problems with discretionary fiscal policy? **(5 marks)**

    (c)   Explain the tools that the Central Bank uses to control money supply. **(5 marks)**

    (d)   Explain briefly what you understand by the following concepts:

        (i)   Crowding out effect. **(1 mark)**

        (ii)   Transactions demand for money. **(1 mark)**

        (iii)   Phillips curve. **(1 mark)**

        (iv)   Open market operations. **(1 mark)**

        (v)   Automatic stabilizer. **(1 mark)**

GOOD LUCK

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011 ACADEMIC YEAR FIRST SEMESTER EXAMINATIONS

AGF 311

CHEMICAL TECHNIQUES IN FOOD ANALYSIS

TIME: Three(3) 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

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1   (a)   Describe the steps involved in a sampling operation of a food sample.

       (b)   Explain the differences, if any, between primary and secondary sampling.

       (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)   Ultrafiltration is sometimes used to perform cold sterilization. Explain the meaning of this phrase giving relevant examples (3 marks)

(i)   What determines the effectiveness of precipitation as a chemical method in food analysis? (2 marks).

(j)   What is the minimum value of D that will allow the extraction of 99.0% of a food sample from $75.0cm^3$ of water with four successive extractions by $75.0cm^3$ quantities of ether? (5marks)

(k) Discuss in detail the importance of molecular filtration in food science and how the process differs from dialysis.(3 marks).

(l) 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)

(m)   Explain the two types of errors that would affect the accuracy and precision of experimental results. (4 marks)

(n)   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).

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(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 $50.0cm^3$ of 0.60M $AgNO_3$ 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

3

4 (a) (i) Write down the van Deemter equation explaining all the terms in it. (4marks)

(ii) Explain how a Van Deemter plot of column efficiency is used to select the optimum mobile phase velocity (6marks)

(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.

END OF EXAMINATION

4

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011 ACADEMIC YEAR FIRST SEMESTER FINAL EXAMINATION

AGF 321 – Food Chemistry (Practical)

Instructions:

This paper has a total of **Five (5)** questions and you are required to answer **Four (4) questions.**

Answer **Question one (1) (Compulsory)** and **any other Three (3) Questions** of your choice. All questions carry equal marks. All marks allocated to each question are indicated at the end of each question.

Time allowed: **Three (3) Hours**

QUESTION 1 (Compulsory)

Imagine that you have just graduated and have been recruited by a food manufacturing company as a Quality Control Officer. The company manufactures different types of food products. The company would like to set up a new laboratory to be carrying out laboratory analyses on the proximate composition of the raw materials, intermediate and finished food products. The proximate composition analyses will involve analyzing moisture, crude protein, carbohydrate, fat (oil), crude fibre and ash contents. Your Managing Director (MD) tasks you to write a report on what is required to set up such a laboratory. **Excluding human resource and reagent requirements**, write a report on what is required to set up such a functioning laboratory, that is, in terms of infrastructure and laboratory equipment. Justify to your MD (who is not a scientist) why you are proposing the items you have outlined in your report **(20 marks).**

QUESTION 2

(a) Assume you were in-charge of a laboratory determining moisture content of food and food products. A Non-governmental Organization has brought to your lab a high energy protein supplement (HEPS) to determine the moisture content. In order to determine the moisture content, you weighed a dry dish with its cover (27.5234g). To the weighed dish, you placed 2.0078g of HEPS in the dry dish. After loosening the cover, you placed the dish in an oven for 1 hour at 120°C. Thereafter, you removed the dish from the oven, tightened the cover quickly and cooled it in a desiccator for 1 hour. You weighed the dish with the cover again giving a weight of 29.3505g.

    (i) Calculate the moisture content (in %) on wet basis (wb)   **(2 marks)**

    (ii) Calculate the moisture content (in %) on dry basis (db)   **(1 mark)**

(b) Later, the same NGO asked you to determine the oil content of the same HEPS in Q2(a) above. In order to determine the oil content, you carefully ground and homogenized the HEPS. You gently mixed the HEPS prior to weighing the test portion. You weighed 5.0056g of HEPS and transferred the HEPS into the extraction thimble. You plugged lightly the mouth of the thimble with cotton wool. The oil was extracted with 250ml of petroleum ether for about 7 hours in a previously dried and weighed extraction flask, 27.1235g. After 7 hours of soxhlet extraction, you evaporated the solvent with a rotor evaporator. You then dried the extracted content at 60°C for 30 minutes and placed it in the dessicator to cool. After cooling for 1 hour, you weighed the extraction flask and its content, 27.6241g. The oil content was also determined on the same HEPS using a standard method. It was found that the fat content was 18.3% on dry basis.

    (i) Calculate the oil content (%) in the HEPS   **(2 marks)**

    (ii) Calculate the oil content (in %) on dry basis (db)   **(1 mark)**

    (iii) Express the oil content on wet basis as $gH_2O/100g$ HEPS and kgH_2O/kg HEPS

                (1 mark)

    (iv) What is the recovery rate of the soxhlet method, and comment on the recovery rate of the soxhlet method?   **(1 mark)**

(v) What difference would you expect on the oil content if you used a methanol:chloroform (1:1) organic solvent mixture to extract the oil in the soxhlet method? Explain your answer. **(1 mark)**

(vi) What other method would you use to determine the oil content in the HEPS? **(1 mark)**

(c) The same NGO asked you to determine the crude fibre content of the same HEPS in Q2(a) above. In order to determine the crude fibre content, you weighed 2.0015g of sample and placed it in a clean graduated 250ml capacity conical flask. You then added 150ml of 1.25% sulphuric acid and brought the conical flask and its contents to boil, and continued boiling gently for exactly 30 minutes. The content was mixed with a glass rod and the particles were rinsed from the sides of the flask. The content was filtered through the sintered crucibles and the residue was rinsed with 100ml hot water. The filtration apparatus consisted of a conical flask with a side arm for the attachment to a suction pump, and a filter funnel with it's stem pushed through a rubber bung which fits into the flask. You then washed back the residue into the flask with about 10ml 1.25% sodium hydroxide. Thereafter, *you* added 150ml of 1.25% Sodium hydroxide and brought the flask and it's content to the boil again, and continued boiling gently for another 30 minutes. The content was again mixed with a glass rod and the particles rinsed back from sides of the flask. The content was filtered through the sintered crucibles and the residue was rinsed with 100ml hot water. Thereafter, you dried the crucible in the oven for 4 hours in an oven at 105^0C. The crucible was cooled in a desiccator and weighed, 9.24018g. After weighing you placed the crucible in a muffle furnace at about 550^0C for approximately 1 hour. After cooling, you weighed the crucible, 8.9999g.

i) From the data in the narration, calculate the crude fibre content in % (wet basis)
(2 marks)

ii) Convert the crude fibre content in (i) to g fibre/kg food **(1 mark)**

iii) What was the purpose of:

    a. Boiling in 1.25% sulphuric acid **(1 mark)**

    b. Boiling in 1.25% sodium hydroxide **(1 mark)**

    c. Placing the crucible contents in a muffle furnace **(1 mark)**

iv) Assume all materials were available to perform both crude and dietary fibres, which of the two would you have recommended to the NGO and why?

(2 marks)

v) State and explain 4 major differences between crude and dietary fibres **(2 marks)**

QUESTION 3

What do you understand by the following terms? With at least a food example, explain their importance in the laboratory:

(a) Colorimetric methods   **(4 marks)**

(b) Water activity   **(4 marks)**

(c) Reducing sugars   **(4 marks)**

(d) Crude protein   **(4 marks)**

(e) Thiobarbituric acid number   **(4 marks)**

QUESTION 4

One of the simple methods to determine a moisture sorption isotherm of a food material in the laboratory is known as the microclimate method. The microclimate uses saturated salts to determine the moisture sorption isotherm of a food. Describe and explain how the microclimate method is conducted in the laboratory, that is, you should explain the purpose of every stage you describe   **(20 marks).**

QUESTION 5

Imagine you are running a food laboratory. A client who produces fatty foods brings a sample to you and claims that his/her customers are complaining that the food has a rancid odor. What quality properties (5 relevant properties) would you recommend to determine in your laboratory in order to prove or disapprove that rancidity is responsible for the customer's complaints. Explain why you have chosen each of the qualities you have mentioned and how they will show whether the food is rancid or not **(20 marks).**

................End of Exam......................

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATIONS

AGF 332 METHODS IN FOOD ANALYSIS I

TIME: **THREE HOURS**

INSTRUCTIONS

Answer any **four** questions. Questions carry equal marks.

Question 1

(a)   In absorption spectroscopy what are the materials used for cells for the UV, VIS and IR ranges? What are the differences between them?

(b)   The ultraviolet spectrum of a food sample shows a primary absorption band at 224nm and a secondary band at 271nm.

    (i)   If a solution of the food sample in water, whose concentration is 1×10^{-4}, is examined at a wavelength of 224nm, the absorbance is determined to be 1.30. What is the molar absorptivity of this absorption band?

    (ii)   If the same solution is examined at 271nm, what will be the absorbance reading ($\varepsilon = 1000$)? What will be the intensity ratio, I_o/I?

(c)   (i)   Explain the difference between isocratic and gradient elution in HPLC.

    (ii)   Draw a well labelled block diagram of an HPLC equipment. Briefly describe what happens in each of the labelled parts.

(d)   Sketch the instrumentation for a Capillary Electrophoresis (CE)

Question 2

(a)   Discuss in detail the types of mobility and factors that cause mobility of food solutes in capillary electrophoresis.

(b)   What type of species can be separated by HPLC but not by Gas liquid chromatography?

(c) Nitrite ion, NO_2^-, is used as a preservative for bacon and other foods. It has been a centre of controversy because it is potentially carcinogenic. A spectrophotometric detewrmination of NO_2^- was performed on a sample. To 50ml of unknown solution containing nitrite wads added 1.00ml sulfanilic acid solution. After 10 minutes, 2.00ml of 1-aminonaphthalene solution and 1.00ml of buffer were added. After 15 minutes the absorbance was read at 520nm in a 5.00cm cell. The absorbance was 0.622. the molar absorptivity, ε, of the coloured product was $4.97 \times 10^4 \, M^{-1} cm^{-1}$. How many microgrammes of NO_2^- were present in 50.0ml of food extract? RAM: N = 14.01; O = 16.

(d) You are performing HPLC and your stationary phase is a polar non ionic functional group. What type of chromatography is this?

Question 3

(a) Briefly outline spectrophotometric Methods for the determination of the stoichiometry of a coloured food complexes.

(b) You need to determine the concentration of an analyte in a food sample using UV/Visible spectroscopy. At what wavelength would you analyze the sample and what precautions would you take when determining the concentration of the analyte?

(c) In a capillary electrophoresis system, the protein horse heart myoglobin (MW 13,900) has electrophoretic mobility μ_{ep} of $0.65 \times 10^{-4} \, cm^2/Vs$ in a pH 8.5 buffer and its diffusion coefficient Dm = $1 \times 10^{-6} \, cm^2/s$ at 30,000V. Calculate the number of theoretical plates for the protein on this system.

(d) State three factors that would cause a positive or negative deviation from Beer's law.

Question 4
(a) Explain what is meant by the following:

  (i) Positive and negative deviation from Beer's law.

  (ii) Molar absorptivity and absorbance.

(b) A food sample is suspected to contain cobalt and chromium. The food sample is wet ashed using nitric acid and diluted to a suitable volume. The absorbances of Co^{2+} and Cr^{3+} are additive over the visible spectrum. It is desired to analyse a solution simultaneously spectrophotometrically for both Co^{2+} and Cr^{3+}; wavelengths of 400 and 505nm are chosen for this analysis using a 1.00cm cell. The results together with some other relevant data are as follows:

  $A_{400} = 1.167$

  $A_{505} = 0.674$

Absorptivities, $dm^3\ mol^{-1}cm^{-1}$

$\varepsilon Co_{400} = 0.530$

$\varepsilon Co_{505} = 5.07$

$\varepsilon Cr_{400} = 15.2$

$\varepsilon Cr_{505} = 5.60$

Calculate the concentration of Cr^{3+} and Co^{2+} in the food sample.

(c)   In more expensive UV/VIS spectrophotometers you can change the slit width of the monochromator. What are the implications of increasing the slit width in terms of sensitivity and selectivity of the instrument?

Question 5

(a)   Describe the mechanism of absorption of radiation by a molecule or atom in a food sample.

(b)   Show that the difference between two absorbance values, A_1-A_2, is equal to the log of the inverse ratio of their transmittances, $\log (T_2/T_1)$. food analysis?

(c) Outline the calibration methods used in molecular absorption spectroscopy stating briefly the circumstances under which each may be used.

(d)   A 5.5g food sample containing a trace concentration of zinc dimethyldithiocarbamate pesticide was decomposed by wet ashing and then diluted to 250ml in a volumetric flask (solution A). The analysis was completed by treating aliquots of the solution A as follows:

   (i)   50ml solution A + 20ml ligand solution + 30ml water to give an absorbance of 0.220 at 520nm in a 1.00cm cell.

   (ii) 50ml solution A + 20ml ligand solution + 25ml of water to give an absorbance of 0.625 at 520nm in a 1.00cm cell.

Calculate the %Zn in the original food sample.

Briefly list possible ligands that could be used to determine zinc at 520nm as above.

END OF EXAMINATION

AGF 342: FOOD TOXICOLOGY
EXAMINATION: Second Semester, May/June 2012   TIME: Three (3) Hours
INSTRUCTIONS:
  (i)   There are five questions in this paper. **Question 1 is compulsory**. Out of questions 2 to 5, answer **any three** questions.
  (ii)   All questions carry **20 marks** each

Question 1 (Compulsory)

(a) Define the following terms and state their importance in food toxicology:

(i) Metastasis, (ii)Forensic toxicology, (iii) PCBs, (iv) Epigenetic carcinogens, (v) Teratogenesis, (vi) Frequency-response relationship, (vii) Mycotoxins, (viii) Toxic- substance, (ix) No Observed Effect Level, and (x) Epidemic disease.   **[10 marks]**

(b) The compounds stated below may be found in foods. Write short notes on important toxicological aspects about these compounds [*your points should be concerning what they are, food processing conditions producing them or their toxicants, susceptible foods and explain their toxicological significance*].

(i) HAAs, (ii) Acrylamides, (iii) Oxalates and phytates, and (iv) Enzyme inhibitors.**[10 marks]**

QUESTION 2

(a) Explain with the help of examples how each of the following factors affects the incidence of cancer in humans: (i) Sex, (ii) Age, and (iii) Race   **[10 marks]**

(b) Cyanogens are one of the classes of toxicants of plant origin. Write about cyanogens': (i) form of occurrence, (ii) food sources, (iii) with the help of chemical reactions, explain what makes them toxic, and (iv) three ways in which they are detoxified   **[10 marks]**

QUESTION 3

(a) Define the term biotransformation and explain fully, with vivid examples, its importance in toxicological effects in human beings   **[15 marks]**

(b) What factors (4) lead to pesticides or residual pesticides contaminating foods? How can this problem be overcome?   **[5 marks]**

QUESTION 4

(a) Mention three main routes or systems of excretion in human beings. Out of the three, state and explain one selected route or system that is important in food toxicology for toxicants that can be absorbed in the blood stream.   **[15 marks]**

(b) What is the difference between food allergy and food intolerance?   **[1.5 marks]**

(c) State two classes of foods implicated in food allergy and/or intolerance and, briefly state and explain the most probable causes of food allergy and/or intolerance in two foods of each class you mention   **[3.5 marks]**

QUESTION 5

(a) Mention three major routes of exposure due to accidental or intentional exposure of humans to toxicants?   **[3 marks]**

(b) Out of these, select one which is considered to be a more important route to food toxicology and give details of how the different parts of this selected route determines the proportion of toxicant that could be absorbed into the blood stream?   **[17 marks]**

………………………*End of Examination*…………………………..
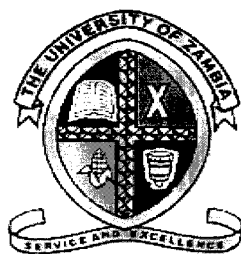
THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

2011/12 ACADEMIC YEAR SECOND SEMESTER FINAL EXAMINATION

AGF 352 – FOOD MICROBIOLOGY

TIME ALLOWED: 3 HOURS

INSTRUCTIONS

o   Answer **question 1** and any other **four (4)** questions.
o   All questions carry **20 marks.**

1.   a.   Define the following terms:

   i.   D-value   **(2 marks)**

   ii.   Z-value   **(2 marks)**

   b.   State whether the following statement is true or false.

       Both the *Clostridium botulinum* and the *Mycobacterium tuberculosis*
       bacteria have the same D-Value.   **(2 marks)**

   c.   A certain species of bacteria was exposed to pasteurization at 72°C and
       the numbers obtained from samples by the plate count method at equal
       intervals of time are shown in the table below:

Time (seconds)	0	5	10	15	20
Number of bacteria (N)	1.5×10^5	4×10^4	1×10^3	2×10^2	p

Using the information in the table, calculate the following:
   i.   The D_{72} **(3 marks)**

   ii.   The slope (k) of the plot of log N versus time (you do not need to plot
       the given information).   **(3 marks)**

1 |

iii. Find the value of p, the number of microorganisms after 20 seconds.
(3 marks)

iv. Calculate the number of log cycles by which the number of microorganisms decreased from 5 seconds to 10 seconds. **(5 marks)**

2. Write short notes on each of the following food preservation methods:
   a. Pascalisation **(5 marks)**
   b. Emulsification **(5 marks)**
   c. Freezing **(5 marks)**
   d. Lactic fermentation **(5 marks)**

3. a. State the factors which enable Gram-positive bacteria to survive in air and dust for a long time. **(4 marks)**

   b. Give two examples of such microorganisms which can survive in the air. **(4 marks)**

   c. Explain why fish from temperate waters or regions as compared to fish from tropical waters, cannot be kept for a longer period in ice. **(6 marks)**

   d. Briefly explain why meat does not easily get spoiled compared to fish. **(6 marks)**

4. a. Give one reason why vegetables are more susceptible to spoilage than fruits. **(4 marks)**

   b. A certain small-scale vegetable processor bought vegetables and potatoes for sale from a small-scale farmer. Later on, she observed that the some vegetables have soft rot while potatoes had a ring rot.

      i. State the possible cause of the observed defect in each of the product **(4 marks)**

      ii. If the processor decided to sell the vegetables as minimally processed vegetables, describe the treatments she needs to apply to make the vegetables safe for human consumption. **(6 marks)**

   c. Discuss the possible type of food poisoning expected from home canned fruit products. **(6 marks)**

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DEPARTMENT OF FOOD SCIENCE & TECHNOLOGY

AGF 362: FOOD EVALUATION

EXAMINATION: Second Semester, May/June 2012　　　　　**TIME:** Three (3) Hours

INSTRUCTIONS:

(i)　　There are five questions in this paper. **Question 1 is compulsory**. Out of questions 2 to 5, answer **any three** questions.

(ii)　　All questions carry **20 marks** each

(iii)　　Find also attached **table T4** – Upper α-probability points of student's t-distribution, **table T5** – Upper α-probability points of χ^2-distribution and **table T6**-Upper α-probability points of F-distribution

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QUESTION 1 (Compulsory)

A yoghurt manufacturer plans to increase the viscosity of their yoghurt. You as a hired Product Researcher has proposed two (2) prototypes of yoghurt which you label as sample **Y1** and sample **Y2**. The two prototypes have shown that they are more viscous in texture than the regular yoghurt (control). Sample **Y1** requires more force to initiate flow/movement while sample **Y2** initially flows easily but has higher overall viscosity. The manufacturer wishes to know how different the prototypes are from the regular yoghurt (control) as perceived by his/her consumers. In order to achieve this, you as a product researcher decided to carry out a sensory evaluation test. A pre-weighed amount of yoghurt is placed in a cup. The same amount is weighed out for each sample. The test is performed by evaluating the pourability/flowability of the yoghurt from a cup at a given height into an empty cup. The evaluation is limited to two samples at a time. All panelists receive the labeled control first and the test (prototype) sample second. The test uses 10 panelists who evaluate all the three possible pairs, which may be:

> ➤ Control vs product **Y1**
> ➤ Control vs product **Y2**
> ➤ Control vs Blind Control

The results obtained are shown in the table below.

Panelist	Blind Control	Prototype Y1	Prototype Y2
1	1	4	5
2	4	6	6
3	1	4	6
4	4	8	7
5	2	4	3
6	1	4	5
7	3	3	6
8	0	2	4
9	6	8	9
10	7	7	9

(a) State with reason(s) what kind of sensory test you carried out to obtain this kind of data **[2 marks]**

(b) Are the prototypes, sample **Y1** and sample **Y2**, significantly different from the regular yoghurt, (blind control sample)? **[5 marks]**

(c) Which sample is significantly more different from the regular yoghurt, sample **Y1** or sample **Y2**? **[5 marks]**

(d) Did the panelists show significant differences in their scores? **[5 marks]**

(e) What decision(s) can you as a product researcher advise the yoghurt manufacturer to make from these results? **[3 marks]**

QUESTION 2

(a) For each of the scenarios below, state what kind of data (whether nominal, ordinal, interval or ratio data) you are dealing with:

(i) Perceived sweetness coded as: 0=same sweetness, 1=2 times sweeter, 2=3 times sweeter, 4=4 times sweeter **[1 mark]**

(ii) Sex coded as: 0=female and 1=male **[1 mark]**

(iii) Liking of a food product coded as: -4, -3, -2, -1, 0, +1, +2, +3, +4

where 0= Neither like nor dislike, -1 to -4 = dislike slightly, dislike moderatley, dislike very much, dislike extremely, and +4 to +1 = Like extremely, like very much, like moderately, like slightly **[1 mark]**

(iv) Type of meals coded as: 1=breakfast, 2=lunch, 3=supper and 4-snacks **[1 mark]**

(v) Perceived sweetness of wine coded as: 1=Slight sweet, 2=moderately sweet, 3=sweet, 4=very sweet **[1 mark]**

(b) State the similarities and differences between the following:

    (i)   Grading vs ranking in quality evaluation   **[3.5 marks]**

    (ii)   Ordinal vs interval data   **[3.5 marks]**

    (iii)   Category vs linear scaling   **[3 marks]**

(c) In the Duo-trio-test, two forms of the test exist. Mention the two and explain the difference between the two forms of the test?   **[5 marks]**

QUESTION 3

(a) You have recently developed a soup powder which is likely to be popular among consumers. Before, you launch it on the market, you are requested to fully describe its perceivable attributes. For a prepared soup (ready-to-consume):

    (i)   Identify four major (main) attributes and define each of these major attributes **[4 marks]**

    (ii)   For each of the four identified major attributes, state and define three (3) sub-attributes which can be used to measure your main attributes   **[6 marks]**

(b) There are six major sensorial perceptions, namely, vision, touch, olfaction, trigeminal, gustation and hearing. Questions (a) and (b) below only refer to the four of these sensorial perceptions, i.e., vision, olfaction, trigeminal and gustation.

    (i)   For each of the four, briefly define what it is   **[4 marks]**

    (ii)   For each of the four, state and explain some of the sensory concerns about these perceptions which can affect the abilities of the panelists to evaluate food**[6 marks]**

QUESTION 4

Ten (10) panelists assessed for the quality of three (3) maheu products from different manufacturers (Xamaheu, Yamaheu and Zamaheu) on a given scale. Each panelist tested the three maheu brands. The panelists involved in the sensory evaluation were Abel, Bob, Cynthia, Derick, Emery, Fordson, Gibbson, Harriate, Ian and Janet. Each of the panelists scored: 13, 14 and 13; 14, 15 and 12; 14, 15 and 13; 12, 14 and 12; 14, 14 and 12; 15, 13 and 13; 13, 15 and 12; 13, 12 and 12; 14, 14 and 12; and 15, 14 and 13, for the Xamaheu, Yamaheu and Zamaheu, respectively. Assume the scores to come from normally distributed data and having come from populations with the same variance.

(a) Based on the above results, would consumers perceive the three maheu brands to be different in quality?   **[8 marks]**

(b) Which maheu brands would be considered different by consumers, if any?   **[4 marks]**

(c) Would you use the panelists used in this test again? Give reason(s) why you would or would not use them again   **[8 marks]**

QUESTION 5

New investors in Zamanita (Zambia) intend to modernize the cooking oil plant by replacing an old solvent extraction equipment with a new model. The cooking oil from the old solvent extraction plant is labeled **"Cooking oil A"** while that in the new extraction plant is labeled **"Cooking oil B"**. The original, **cooking oil A**, has a slight beany flavour which has a carryover effect. In previous market surveys it was, however, proven that the consumers like this slight beany flavour. The Plant Manager hires you as a Sensory Evaluation Consultant. To provide the Plant Manager with the information to his queries given below, you conducted a sensory test. In this sensory test, you obtained a total of 60 responses, 30 matched pairs and 30 unmatched pairs, collected from 60 panelists. Each panelist evaluated either a matched pair (cooking oil A/cooking A or cooking oil B/cooking oil B) or unmatched pair (cooking oil A/cooking oil B or cooking oil B/cooking oil A) in a single session. The sensory test was conducted in the booth area under red lights. For the matched pairs, 17 panelists said the samples were the same and 13 panelists said the samples were different. On the other hand, in the unmatched pairs, 9 panelists said the samples were the same and 21 panelists said the samples were different.

(i) State with reason(s) what kind of sensory test you carried out to obtain this kind of data [3 marks]

(ii) Why was the test performed under red light? **[2 marks]**

(iii) Give advice, outlining your basis, to the Plant Manager regarding his two queries below [12 marks]

    a. The Plant Manager would like to know if the cooking oil produced in the new extraction equipment **(Cooking oil B)** is the same as that made in the old solvent extraction plant **(Cooking oil A)**.

    b. Secondly, the Plant Manager would like you to determine if the new solvent extraction equipment can be used in place of the old solvent extraction equipment.

(iv) In your opinion, what decision is the Plant Manager likely to make? **[3 marks]**

USEFUL INFORMATION

LSD = t*SQRT(2*MS$_E$/n)

where t= is the t-value for the level of significance of the ANOVA, SQRT= Square root, MS$_E$= Error Mean Square for the ANOVA and degrees of freedom being equal to the degrees of freedom of the error term (df$_E$).

...................*End of Examination*.............................

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

2011 ACADEMIC YEAR FIRST SEMESTER
FINAL EXAMINATIONS

AGF 411: UNIT OPERATIONS IN FOOD ENGINEERING 1
TIME: THREE HOURS
INSTRUCTIONS:
1. Please read the instructions and each question carefully.
2. Answer **four (4)** questions. Answer **question 1** and **any three** questions.
3. **ALL** questions carry equal marks.
4. Some formulas are provided on the last page.

1) Mango juice containing 25% solids was concentrated in a two stage evaporation process in which water was removed from the juice. In the first stage, it was concentrated to 40% solids and in the second stage to 45% to produce the final product.

    a) Draw and clearly label the process flow diagram   **(6 points)**

    b) Calculate the amount of feed stock in kilograms.   **(6 marks)**

    c) Calculate the total amount of water removed during the process in kilograms.

    (6 marks)

    d) State the law of conservation of mass and indicate whether this holds for the above process? Show by performing a check either on a component or on the overall process.   **(7 marks)**

2) The batch and CSTR reactors are commonly used in the brewing industry.

    a) Describe each in **few words** and state their two advantages and two disadvantages.

    (8 marks)

    b) Give the two problems that occur during handling, storage and transportation of powdered products?   **(4 marks)**

    c) Give the two parameters considered in powder storage and explain their effect on the storage of powders?   **(6 marks)**

    d) How can the effects in (d) be avoided?   **(2 marks)**

e) Centrifugal separations are commonly used in the food industry, describe the principal and give examples of food products that can be separated by this method.

(5 marks)

3) a) The **power law equation** $\tau = k(dv/dz)^n$ is a deviation from Newton's equation so that the general equation can be applicable to those types of fluids that do not conform to the simple relationship of the equation proposed by Newton which is $\tau = \mu(dv/dz)$

   i) Give one fluid that obeys the equation $\tau = \mu(dv/dz)$.   **(1 mark)**

   ii) Use the power law equation to define the different types of **fluids** with examples.

(9 marks)

   iii) Explain the importance of knowing the type of fluid used in food processing?
(3 marks)

   b) Define the following terms and state their application or importance in food engineering.

   i) Fluidisation **(4 marks)**

   ii) Hurdle technology **(4 marks)**

   iii) Reynolds number **(4 marks)**

4) a) Consider a simple separation in which a liquid containing 8% fat is concentrated to 40%, the other stream, P, is to be fat free. The separator produces the high-fat product, C.

   i) Illustrate and clearly label the process flow diagram   **(3 marks)**

   ii) Calculate the weight of the fat free product P, and the weight of the high fat

   product, C.   **(6 marks)**

   iii) Explain the importance of mass/material balance in the above situation.

(4 marks)

   b) The pressure in a vacuum evaporator was measured by using U-tube containing mercury. It was found to be less than atmospheric pressure by 25 cm of mercury. The atmospheric pressure is 75.4 cm of mercury and the specific gravity of mercury is 13.6, and the density of water is 1000 kg m^{-3}.

   i) Calculate the extent by which the pressure in the evaporator is below

   atmospheric pressure (i.e. the vacuum in the evaporator) in kPa.   **(5 marks)**

   ii) Calculate the absolute pressure in the evaporator.   **(5 marks)**

   iv) Define Absolute Pressure.   **(2 marks)**

5) a) Discuss the aims of food processing and explain why food processing should be handled accordingly by a food technologist. **(13 marks)**

b) In a pneumatic conveying system for transporting solids such as flour and sugar, the products can be conveyed over long distances by connecting the systems in series. Discusss the three basic designs of pneumatic transport systems and identify the parameters that differentiate them. **(12 marks)**

List of equations

$P = F/A = Ps + Z \rho g$

$P = Z \rho g$

$\rho 1 A 1 v 1 = \rho 2 A 2 v 2$

$D^2 N^2 r (\rho_p - \rho_f)/1640\mu$

$t / (V/A) = [\mu r w/2\Delta P] \times (V/A) + \mu r L/\Delta P$

$F = APs + Z \rho Ag$

$P = F/A = Ps + Z \rho g$

$P = Z \rho g$

$\rho 1 A 1 v 1 = \rho 2 A 2 v 2$

$Z1g + v12/2 + P1/\rho 1 = Z2g + v22/2 + P2/\rho 2$

$v22 = 2 P1 / \rho 1$

$V = \sqrt{} \; 2 P_1 / \rho_1$

$\eta = k(dv/dz)^n$

UNIVERSITY OF ZAMBIA
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DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

2011/2012 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATIONS

AGF 422 NUTRITION.

TIME: THREE (3) HOURS

INSTRUCTIONS

ANSWER <u>ALL</u> QUESTIONS IN SECTION A AND <u>ANY 2</u> FROM SECTION B
EACH QUESTION CARRIES <u>20 MARKS</u>
<u>ANSWER EACH QUESTION IN SECTION B IN A SEPARATE ANSWER BOOKLET</u>

SECTION A

QUESTION 1

Briefly explain the following

  i.   Osteoporosis
  ii.   Hypertension
  iii. Type II diabettes
  iv.   Complete protein.
  v.   Secretin
  vi.   BMR
  vii. Trypsinogen
  viii. Facilitated Transport
  ix.   Glyceamic index
  x.   Diverticulosis
  xi.   Hypercholesteroleamia

QUESTION 2

State (with examples and brief explanations) the functions of the following;
  i.   Vitamin A
  ii.   Minerals
  iii. Large intestines
  iv.   Stomach acids.

QUESTION 3

Obesity is an emerging problem for the developing countries like Zambia affecting both children and adults. State and briefly explain the risk factors associated to this problem.

SECTION B

QUESTION 4

In general lipids, are part of a normal diet and contributes to the health of individuals.
I.   Briefly explain the digestion, absorption and transport of lipids.
II. State the function of lipids both in diet and in the body.

QUESTION 5

Iron deficiency is a major public health problem, affecting women and children in Zambia. Describe how iron is absorbed/ balanced in the body and discuss the major factors influencing the bioavailability of iron.

QUESTION 6

Whole wheat bread (Fiber, Starch and lactose) is being recommended as a health food for certain individuals in the population.
I.   Briefly explain the process of digestion and absorption/transport (after digestion) of whole wheat bread upon consumption.
II. What are the possible health benefits (disease prevention) that can be associated with the consumption of this food?

QUESTION 7

You are a nutritionist at a primary health facility (With a doctor and paediatric ward) in peri-urban area and a mother presents a child with severe PEM.
I.   What clinical signs are you likely to observe?
II. What treatment regime would you recommend for the full recovery of the infant

GOOD LUCK!!!!

THE UNIVERSITY OF ZAMBIA
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DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

2011/12 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATION

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 mercury thermometer having a first-order dynamics with time constant is placed in a bath at a certain temperature until it reaches steady state.
   a) Derive the first-order dynamic model for a mercury thermometer in the bath. **[8 marks]**
   b) Draw a sketch showing the variation of the thermometer reading with time. **[5 marks]**
   c) Outline the differences between the negative feedback and positive feedback systems, and of these two is the most preferred system in food processing. **[2 marks]**
   d) Solve the following mathematical models

   i.
   $$5\frac{dy}{dt} + 4y = 2$$
   Condition: $y(0) = 1$ **[2.5 marks]**

   ii.
   $$\frac{dx}{dt} + x = 1$$
   Condition: $x(0) = 0$ **[2.5 marks]**

i

2. Consider a liquid-level system of a water treatment tank of a cross section area, flow resistance R. Assume that q_o, the volumetric flow through R is related to the head h by $q_o = h/R$. constant density ρ.
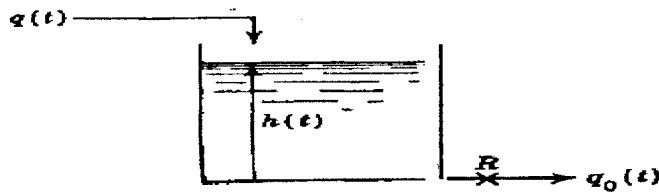
Figure 1

a) State the conservation law of mass. [3 marks]

b) Develop the process model for the system. [5 marks]

c) Determine the transfer control function. [1 marks]

d) A mercury thermometer having a first-order dynamics with a time constant of 60s 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.

    I.   Draw a sketch showing the variation of the thermometer reading with time. [5 marks]

    II.   Calculate the thermometer reading at t = 30 s and at t = 120 s. [3 marks]

    III.   What would be the reading at t = 6 s if the thermometer had only been immersed in the 40°C bath for less than 1 s before being returned to the 35°C bath? [3 marks]

3. The bottling processes of producing *Cola* drinks involve mixing of a concentrate, pure sugar, treated water, carbon dioxide in correct proportion. Assume a stream of sugar flows at constant volumetric flow rate q into a tank of constant hold up volume V. concentration of sugar entering the stream, χ (mass.sugar/vol) varies with time.
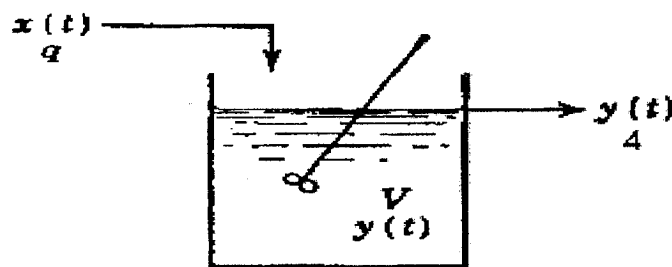
Figure 2.

a) Determine the transfer function relating outlet concentration γ to inlet concentration χ. [5 marks]

b) Determine the process model given that the input is a unit step function. [5 marks]

c) You have just received a notice that there will be a management meeting tomorrow at 14:00hrs and one of the topics on the agenda is 'Reduce funding towards process control operations by 10% in next year's budget'. Please come up with the justification to present during the management meeting why process control is an important part of the company's operations. **[5 marks]**

d) Provide the block diagram for each of the following control functions:

i. $$\frac{Y(s)}{U(s)} = G(s)$$

ii. $$\frac{Y(s)}{U(s)} = G_1(s)G_2(s)G_3(s)$$

iii. $$\frac{Y(s)}{U(s)} = G_1(s) + G_2(s)G_3(s)$$

iv. $$\frac{Y(s)}{U(s)} = \frac{G_1(s)G_2(s)}{1 + G_1(s)G_2(s)}$$

[5 marks]

4. The diagram below shows the control system of the higher order.
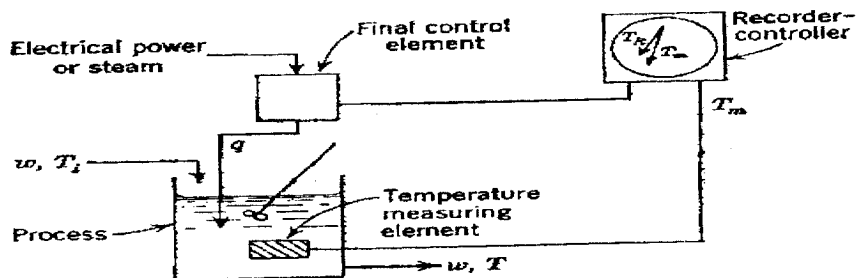
a) Draw the block diagram representing the control system above.
[5marks]

b) Describe how the error is generated and controlled. **[3 marks]**

c) State the unsteady state balance of the system. **[1 marks]**

d) State the steady state balance of the system. **[1 marks]**

e) Determine the transfer function and describe how the system operates.
[10 marks]

3

5. The R&D department of the company you are working for is trying to develop a new concentrated mango juice by blending a pure component A and a mixture of (A and B) using a stirred tank blending system as shown in figure 1.3 below. The following notions are used:
   - w_1, w_2 and w are mass flow rates
   - x_1, x_2 and x are mass fractions of component A.

It is assumed that:
   1. w_1 is constant,
   2. x_2 = constant = 1 (stream 2 is pure A),
   3. Perfect mixing in the tank.

Your control objective is to keep x of the product coming out of the blender at the desired value (or 'set point') x_{sp}, despite variations in x_1. Flow rate w_2 can be adjusted for this purpose.

   a. What value of w_2 is required to have x = x_{sp}?   **[7 marks]**
   b. Outline the possible control strategies for the system.   **[5 marks]**
   c. Categorize these strategies so that the management can easily understand them during your presentation in the management meeting. **[5 marks]**
   d. Which of the variable in the system would be considered as a disturbance or load variable?   **[3 marks]**
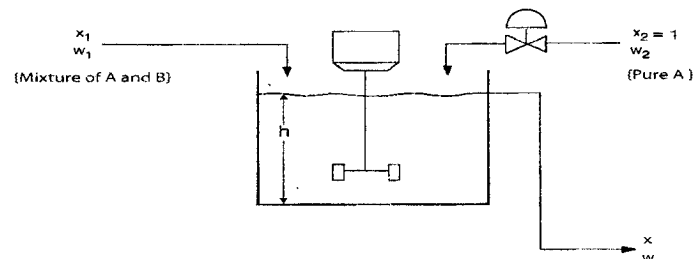
Figure 1.3. Stirred-tank blending system.

Annex: Laplace Transforms

	Functions of time, $f(t)$	Laplace Transforms of $f(t)$, $L\{f(t)\}$
1	$f(t)$	$F(s)$
2	$x(t) + y(t)$	$X(s) + Y(s)$
3	$k\,f(t)$	$k.F(s)$
4	$df(t)\,dt$	$sF(s) - f(0)$
5	$d^n f(t)\,dt^n$	$s^n F(s) - s^{n-1} f(0) - s^{n-2} f^1(0) - \ldots - f^{n-1}(0)$
6	$\int_0^t f(t)\,dt$	$F(s)\,s$
7	1	$1\,s$
8	t	$1\,s^2$
9	e^{-at}	$\dfrac{1}{(s+a)}$
10	$t e^{-at}$	$\dfrac{1}{(s+a)^2}$
11	$1 - e^{-at}$	$\dfrac{a}{s(s+a)}$
12	$f(t-a),\ t>a$	$e^{-as} F(s)$

5

AGF 441: WATER AND FOOD WASTE MANAGEMENT

TIME: THREE HOURS

INSTRUCTIONS:

1. Please read the instructions and each question carefully.
2. Answer all questions.
3. **ALL** questions carry equal marks.

---

1) a) Briefly explain the main purpose of cleaning and disinfection? **(2 marks)**

   b) As a food technologist, how would you clean food processing equipment and explain what needs to be done afterwards? **(9 marks)**

   c) Give the ingredients used for cleaning and discuss how their efficiency can be determined. **(14 marks)**

2) Genetically modified organisms (GMOs) are living organisms that have been altered through genetic engineering.

   a) Discuss in detail, the tools that are used in genetic engineering. **(12 marks)**

   b) Discuss in detail the process design for composting system. **(13 marks)**

3) a) A design engineer approaches you in regard to the use of a trickling filter system for the cleaning of waste. As a food engineer, explain the advice that you would give him regarding:

   i) Designing the trickling filter **(9 marks)**

   ii) Possible problems associated with the use of the trickling filter system and how these can be avoided. **(12 marks)**

   b) Explain how the developing world has managed to deal with waste management at household level? **(4 marks)**

4) a) With the aid of a diagram, explain how an activated sludge system operates.

   (8 marks)

   b) Apart from cleaning waste, give the other benefits of activated sludge?

   (4 marks)

   c) Define the following terms "chlorine demand and breakpoint chlorination?

   (4 marks)

   d) Describe how residual chlorine can be monitored?   **(9 marks)**

END OF EXAM
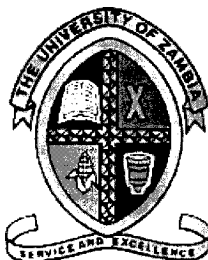
INSTRUCTIONS

ANSWER **ALL** QUESTIONS.
EACH QUESTION CARRIES 20 MARKS

---

1. In MAP, combinations of gases are used to maintain the original product quality as well as to extend the shelf life of packaged products.
   a) Give five ways in which gases function to achieve this. **(5 marks).**
   b) When using MAP, there is always a risk/benefit. With the aid of a diagram, explain this statement when a low oxygen atmosphere is providing the benefit.
   (4 marks)
   c) Discuss the aseptic filling zone in relation to aseptic packaging. **(5 marks)**
   d) Define flexible plastic films and give at least two of their properties? **(3 marks)**
   e) Name 3 metals that are associated with the production of glass. **(3 marks)**

2. A food company is looking for an ideal package to package candy and has come to you for advice.
   a) Write a report on what you think should be the best package for the product and why. **(10 marks)**
   b) Apart from the food itself and the environmental factors, discuss the factors that need to be considered when selecting a package system for a given food product. **(10 marks)**

3. Migration refers to the transfer of matter from the package into the packaged food staff.
   a) Discuss the different modes of product-package interaction. **(6 marks)**
   b) Describe how mass transfer phenomenon can occur in a packaged food product.
   (3 marks)
   c) Classify packaging based on migration. **(3 marks)**
   d) In food packaging, define additives and give examples. **(8 marks)**

4. Each food product has its unique requirements in terms of packaging.
   a) Give at least 2 reasons in each case why factors such as light, temperature, oxygen and moisture are of major concern in packaged foods. **(8 marks)**
   b) Differentiate sugar bloom and fat bloom. **(4 marks)**
   c) Give five modes of deterioration to be considered when selecting suitable packaging materials for breakfast cereals. **(5 marks)**
   d) Give three modes of deterioration to be considered when selecting suitable packaging materials for biscuits. **(3 marks)**

5. Governments worldwide regulate foods with two general objectives which are to ensure the safety and wholesomeness of the food supply hence the health of the public and to prevent economic fraud or deception.
   a) Discuss food adulteration according to the federal food, drug and cosmetic act of the US. **(5 marks)**
   b) Discuss misbranding according to the federal packaging and labeling act of the US. **(5 marks)**
   c) Give requirements to be met for additives according to the US law. **(2.5 marks)**
   d) Differentiate the US and EU laws. **(2.5 marks)**
   e) Give three parameters that affect migration of packaging compounds.
   (3 marks)
   f) List the four categories of packaging waste. **(2 marks)**

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011 ACADEMIC YEAR SECOND SEMESTER FINAL

EXAMINATIONS

AGF 452 METHODS IN FOOD ANALYSIS II

TIME: **THREE HOURS**

INSTRUCTIONS

Answer any **four** questions. Questions carry equal marks.

Question 1

(a)   What are liquid-junction potentials and how do they arise? How can they be eliminated or minimized?

(b)   When samples are analyzed by potentiometry, a high impedance Voltmeter is used when measuring the potential difference. The use of this voltmeter ensures that negligible current flows during the measurement. List the reasons why this trait is desirable in Potentiometric measurements.

(c)   Briefly explain the roles of the working, counter and reference electrode in the potentiostatic electrolytic cell.

Question 2

(a)   A calcium ion selective electrode is immersed in a sample at 25°C and the potential is measured. Theoretically, what should happen to the signal if the sample were diluted exactly 20-fold?

(b)   Explain in some detail the mechanism by which analyte concentration determines the signal in Voltammetry.

(c) Voltammetry was used to determine the zinc content of a breakfast cereal. A 2.314g sample was digested in boiling concentrated nitric acid. After the sample dissolved, it was diluted to 100ml. A 5.00ml portion of this solution was analyzed by differential pulse polarography, giving a current of 2.31μA. when 50.0μL of 100ppm zinc standard was added to this solution, the current was 2.99μA. what is the concentration of zinc in the cereal?

Question 3

(a) An unknown amount of Co^{2+} ions in a food sample produces a faradic current of 12.3μA on a normal pulse voltammogram. After 0.100ml of $1.0 \times 10^{-3}M$ Co^{2+} is added to the original volume of 5.00ml, the new current is 28.2μA. Calculate the original amount of cobalt in the food sample.

(b) Solute is transported to an electrode by diffusion, convection and electrostatic attraction. In polarography, we want the current to be limited by diffusion. Explain how convective and electrostatic attractions are minimized.

(c) Calculate the percentage (w%) of glucose in a new developed food drink if the tube is 150mm long, t = 25°C, α = 2.537°, ρ = 1.0435. Specific rotation of glucose is [α] = 52.5°.

Question 4

(a) Explain how you would determine the molar conductivity at infinite dilution for a strong and weak electrolyte in a food sample

(b) You have a sample of mineral fortified spaghetti sauce. You want to determine the amount of Ca, K, Fe, Zn, Cu and selenium in the sample. What would be the preferred type of atomic spectroscopy to use (justify the type of atomic spectroscopy you select).

(c)   Sodium benzoate, a salt of benzoic acid (a weak acid), is widely used as a food preservative. You wish to determine the ionization constant of benzoic acid and you choose to use conductometric method for your determination. You find that the equivalent conductance of a 0.002612M benzoic acid solution is found to be 35.25 at 25°C. Calculate the degree of dissociation of benzoic acid at this concentration, and calculate the ionization constant. Given that the Limiting Equivalent conductance of some ions in water at 25°C are:

Cations	λ^0_+	Anions	λ^0_-
H^+	349.8	OH^-	198.6
Na^+	50.1	Benzoate	35.4

Question 5
(a)   The determination of riboflavin in vitamin formulations can be carried out polarographically because it is more easily reduced than other vitamin B factors. A 250.1 mg vitamin tablet is dissolved to form a 100.00ml solution. a 10.0ml aliquot of this solution was added to a 0.1M phosphate supporting electrolyte at pH 7.2 and diluted to 50ml. The diffusion limited current was 0.28 μA. a 50.0ml standard 4.10ppm riboflavin solution in the same electrolyte gave a diffusion limited current of 0.45μA. calculate the riboflavin concentration in the diet supplement.

(b)   Distinguish between X-ray fluorescence and X-ray absorption measurements. Calculate the wavelength limit for an x-ray operated at 30kV

(c)   (i)   Briefly describe the principle behind electron spectroscopy for chemical analysis (ESCA).

        (ii)   Explain the difference, if any, between polarimetric and refractometric methods used in food analysis.

END OF EXAMINATION

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

SECOND SEMESTER EXAMINATION MAY/JUNE 2012

TECHNOLOGY OF MEAT AND FISH PRODUCTS

AGF 512

INSTRUCTIONS: 1) Answer all questions in both sections

2) Use separate answer books for either section

3) Time: 3 hours

Section A: Answer both questions

Question 1

a) Libonda Fish company is a Lusaka based company that is specialised in selling frozen Mongu Bream. The company has captured a market for smoked tilapia fillets abroad and hires you as a technical expert to make a detailed presentation on the various stages involved in the manufacture of this product to its Board members.

   i.   Identify the key processes involved from capture (at the Zambezi river) to the final market. **[3 marks]**

   ii.   Explain in detail each of these process steps. **[14 marks]**

   iii.   Give the critical control points to ensure the production of a safe product. **[3 marks]**

Question 2

a) Discuss the electrical and water based thawing methods used to thaw fish. **[12 marks]**

b) Explain the autolytic breakdown of ATP. **[5 marks]**

c) Give the heat process conditions for different types of canned fish products. **[3 marks]**

1

Question 1

Clearly state the stages involved in the conversion of muscle to meat and discuss their effect on meat quality **[20 marks]**

Question 2

a) Clearly mention and briefly explain eight (8) important factors used to establish quality grades of meat? **[10 marks]**

b) A batch of cured meat was packaged in a transparent and, water and oxygen permeable packaging material. After a few days of storage time, it was observed that the characteristic cured meat colour was gradually lost. Some of the packages in the batch developed an undesirable brownish-gray colour. Other packages within the same batch developed an undesirable greenish colour. For each of the two undesirable colours which gradually developed:

   i) State possible cause(s) for their development **[5 marks]**

   ii) What measure(s) would you take to avoid the development of these two undesirable colours? **[5 marks]**

Question 3

a) Clearly mention and briefly explain eight (8) pre-slaughter factors affecting the meat quality? **[10 Marks]**

b) (i) What is smoking of meat and meat products? **[2 marks]**

   (ii) Briefly describe three (3) possible methods of smoking meat and meat products? **[6 marks]**

   (iii) Give 4 advantages of each method of smoking mentioned in b(ii) above **[2 marks]**

End of Exam

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

SECOND SEMESTER EXAMINATION MAY/JUNE 2012

TECHNOLOGY OF MEAT AND FISH PRODUCTS

AGF 512

INSTRUCTIONS: 1) Answer all questions in both sections

2) Use separate answer books for either section

3) Time: 3 hours

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    i.   Identify the key processes involved from capture (at the Zambezi river) to the final market.   **[3 marks]**

    ii.   Explain in detail each of these process steps.   **[14 marks]**

    iii.   Give the critical control points to ensure the production of a safe product.   **[3 marks]**

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a) Discuss the electrical and water based thawing methods used to thaw fish. **[12 marks]**

b) Explain the autolytic breakdown of ATP.   **[5 marks]**

c) Give the heat process conditions for different types of canned fish products.   **[3 marks]**

SECTION B: Answer all questions

Question 1

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(ii) Briefly describe three (3) possible methods of smoking meat and meat products? **[6 marks]**

(iii) Give 4 advantages of each method of smoking mentioned in b(ii) above **[2 marks]**

End of Exam

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

2011 ACADEMIC YEAR FIRST SEMESTER FINAL EXAMINATION

AGF 521 - Principles of Food Technology II

Instructions:

This paper has a total of **Seven (7)** questions and you are required to answer a total of **five (5)** questions

Answer **Question one (1) (Compulsory)** and **any other four (4)** questions of your choice. Questions 2 to 7 carry equal marks

All marks allocated to each question are indicated at the end of each question

Time allowed: **Three (3) Hours**

Question 1 (Compulsory)

You are a R&D officer of a food manufacturing firm in Lusaka. The marketing department has identified two liquid drinks, which they think if blended in a certain ratio, would produce a highly selling product. However, the two drinks are immiscible. The two drinks are labeled X and Y. Drink X is denser than Y. Drink Y is non-polar whereas X is polar. The blend of drink X and Y is envisaged to be sensorially liked by consumers if its blended in the ratio of X:Y – 10:1 by volume, respectively. The drink is also going to contain the following additives: xanthan, β-carotene, sodium caseinate, sucrose and tocopherol.

    (a) How do you propose to blend X and Y into one blended drink with its additives (propose a flow-sheet to explain your answer, give reasons for each step in the flow-sheet). **(10 marks)**

    (b) Using the principles of colloids you have learnt, also state which one is likely to be the continuous phase and why? **(10 marks)**

    (c) State and briefly, discuss three important destabilizing factors of your blend **(10 marks)**

Question 2

(a) Write short notes on the following:

    i.   Marangoni effect

    ii.   Laplace pressure

    iii. Critical micelle concentration

    iv. Spreading coefficient of liquid droplets

    v.   Zeta potential   **(10 marks)**

  (b) Describe the disruption of a liquid droplet in a homogenizer under laminar flow conditions   **(10 marks)**

Question 3

(a)   (i) Define van der waals interactions

       (ii) State and briefly explain three types of van der waals forces

       (iii) Which of the three types is prominent and why?   **(10 marks)**

(b) A new firm has embarked on producing a salad dressing. During their product development stage, they noted that on letting the salad dressing to stand, creaming was experienced after a period of twenty (20) hours. Their Research & Development (R&D) Manager advised them to include a polysaccharide, **Dextran**, as a stabilizer to stop the creaming. Initially, he advised them to use 0.05% of dextran but still experienced creaming within fifteen (15) hours. After further consultations, the R&D Manager advised them to increase the concentration to 0.25% at which the creaming was completely halted.

(i) Explain the reason for the creaming during the initial stage of product development

                                                     (3 marks)

(ii) Explain the reason for the creaming experienced after addition of 0.05% dextran

                                                     (3 marks)

(iii) Give the possible reason and the phenomenon responsible for stopping the creaming after addition of 0.25%   **(4 marks)**

Question 4

a. Colloidal classification can depend on the continuous phase. State three major classes of colloids depending on that classification. Out of the three, pick one and give three sub classes with a typical example of a food for each sub-classs **(10 marks)**

b. A colloidal mill is one of the homogenizers used in the food emulsion industry to produce food emulsions. Explain how the colloidal mill works and state what type of raw material is suitable for the colloidal mill? **(10 marks)**

Question 5

(a) Discuss the extended EDL model, the so called, Stern + Gouy-chapman Model

(10 marks)

(b) In a micro-electrophoresis experiment, a spherical particle of diameter $0.5\mu m$ dispersed in 0.1 mol/dm^3 aqueous solution of KCl at $25°C$ takes 8 seconds to cover a distance of 120 μm, the potential gradient being 10 V/cm. Assume D=78.55 and the viscosity (η) of water at $25°C$ to be 0.89 Pa.s. Calculate

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

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

Question 6

(a) In a tree-form, show the classification of liquids based on rheology. Briefly, define each classification you mention **(10 marks)**

(b) What is the relevance of this classification to a food scientist? **(4 marks)**

(c) What are viscoelastic materials? In your definition, illustrate with an example

(6 marks)

Question 7

(a) Explain what causes good and poor wetting behaviour of liquids on solid surfaces

(8 mark)

(b) Calculate the required value of the stability ratio of Intra-lipid emulsions used for parenteral feeding in order to have a half-life of at least 2 years. These commercially available emulsions contain 20 g of purified soybean oil (δ=925 kg/m^3) as well as 1.2 g of purified egg lecithin (δ=1050 kg/m^3) per 100 ml of emulsion. The volume-equivalent particle diameter is 220 nm. It may be assumed that all lecithin is adsorbed to the O/W interface. The continuous phase is aqueous. **(12 marks)**

End of Exam *(FORMULAE AND CONSTANTS OVERLEAF)*

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

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

$$\Sigma = 1/\Gamma$$

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

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

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

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

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

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

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

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

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

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

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

$$t_{1/2, \text{rapid}} = 3^*\eta/(4^*k^*T^*N_o) = 2*10^{17}/N_o \text{ at } 25°C \text{ in water}$$

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

F = 96485 C / Mole

e = 1.602 * 10^{-19} C

R = 8.314 J / (mole.K)

ε_o = 8.85 * 10^{-12} F/m

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

N_A = 6.023 x 10^{-23}

δ_{H2O} at 22°C ≈ 1000kg/m3

g = 9.81m/s
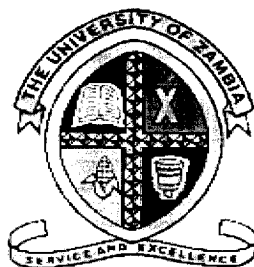
π = 3.14

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

2011/12 ACADEMIC YEAR SECOND SEMESTER
FINAL EXAMINATION

TECHNOLOGY OF FERMENTED PRODUCTS AGF 522

TIME: THREE (3) HOURS

INSTRUCTIONS

ANSWER ALL QUESTIONS.
ALL QUESTIONS CARRY EQUAL MARKS

---

1. Fermentation of food products involves the breakdown of various substrates by microorganisms via different metabolic pathways.

    a. Explain the importance and differences between the glycolitic and phosphoketolase pathways. **(10 marks)**

    b. With aid of a flow diagram, describe the process of manufacturing sauerkraut. **(15 marks)**

2. Koji making is an important process in the manufacturing processes of many types of oriental foods.

    a) Explain the koji making process in soya sauce. **(9 marks)**

    b) With aid of a flow diagram, describe the manufacturing process of Tempeh. **(8 marks)**

    c) Briefly explain the differences between Sake and Tape. **(8 marks)**

3. Fermented milks are quite popular products in many parts of the world.

   a. Discuss the differences and similarities in the characteristics and manufacturing processes of Kefir and koumiss. **(15 marks)**

   b. Explain the concept of antibiosis and factors that influence quality of the end product. **(10 marks)**

4. Wine is important alcoholic drink that is consumed widely globally. There is red, white and rose type of wine available on the market.

   a. Explain the classification system of wine. **(4 marks)**

   b. Describe the changes in microflora during wine fermentation. **(8 marks)**

   c. White wine has brownish color, tastes stale and has a low alcohol content. Diagnose the problem and offer possible solutions. **(8 marks)**

   d. You are having dinner with your partner and you are asked what the difference is between wine and a lager beer? **(5 marks)**

End of Examination

GOOD LUCK!!!!!

AGF 531:   **TECHNOLOGY OF PLANT PRODUCTS I**

TIME: **THREE (3) HOURS**

INSTRUCTIONS:

ANSWER ALL <u>FOUR</u> QUESTIONS.

ANSWER EACH QUESTION IN A SEPARATE ANSWER BOOKLET.

Question 1

Explain the following terms (Maximum 5 lines) where possible with diagrams;

     i.   Gluten

     ii.   Dunst

     iii.   Compound imbibition

     iv.   Touching angle (in rollers)

     v.   Cyanogenic glucosides (in Cassava)

     vi.   Semolina

     vii.   Amylopectin

     viii.   Melanin (in sweet potatoes)

     ix.   Brabender Farinogram

     x.   Sizings

(20 Points).

Question 2

Corn snacks and Corn flakes are emerging as important food products on the Zambian market.

For either corn snacks (Jiggies) or Corn Flakes, describe in detail the technology behind their manufacturing.

(20 Points).

Question 3

From the choice of a sugar alcohol,

(i)   Give the name and structure of the sugar alcohol

(ii)   The principle of how its produced

(iii)   Chemical, physical properties

(iv)   Use/function/application in food systems

(20 Points).

Question 4

In their efforts to control costs, Natural Milling Corporation wish to start producing their own raw materials for Sorbitol production. Describe in detail how they can obtain this product from maize. (Show the process flow diagrams).

(40 Points).

END OF EXAMINATION

The University of Zambia

School of Agricultural Sciences

Academic Year 2012

First Semester Examination

Soil Survey Techniques - AGS 311   Duration: **3 hours**   Marks: **85**

1. A prospective farmer is looking for a piece of land for development of fish ponds. He is doubting whether he needs a soil survey. Convince him that a soil survey is needed. (10 marks)

2. a. Explain the two approaches in soil survey. (5 marks)

   b. Explain the different types of soil surveys. (10 marks)

3. What is a soil map unit? (10 marks)

4. Explain what is involved in the first phase of a soil survey. (10 marks)

5. a. What is soil variability? (4 marks)

   b. A soil unit is defined on the bases of sand content. The sand content in a certain map unit is measured at five randomly selected locations as given below. Comment on the accuracy of this mapping unit given that the maximum soil variability must not exceed 10%. (6 marks)

Location	Sand content (%)
1	15
2	12
3	24
4	30
5	8

6. Explain the structure of the Zambian land Capability Classification System. (10 marks)

7. Explain the following land Capability Classes: (10 marks)
   a. C_1d
   b. Gd
   c. S_3r
   d. S_4d
   e. C_2dw

8. Explain the following soil survey terms:
   a. Traverse (5 marks)

   b. Soil catena (5 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

UNIVERSITY SECOND SEMESTER EXAMINATIONS

JUNE 2012

AGS 422: SOIL MICROBIOLOGY

TIME: 3 HOURS

MARK: 100

INSTRUCTIONS: ANSWER ALL QUESTIONS

1. Nitrogen in the soil undergoes many different transformations. Indicate whether the following reactions involve the oxidation or reduction of nitrogen and give reasons to support your answer. *(10)*

   a. $NH_4^+ \longrightarrow NO_2^-$ [2.5]

   b. $N_2 \longrightarrow NH_3$ [2.5]

   c. $NO_3^- \longrightarrow NO$ [2.5]

   d. $NO_3^- \longrightarrow NH_3$ [2.5]

2. Microorganisms are classified according to their ability to utilize particular nutrients or live in a given environment. Give a detailed discussion on the classification of soil microorganisms based on their nutrition and ability to grow in the absence of oxygen. *(20)*

3. Decomposition of plant and animal residues is important because it ensures recycling of elements in the environment. Discuss the following: *(20)*

   a. The three overlapping steps involved in the decomposition of organic matter [7]

   b. Why the initially high C/N ratios of crop residues narrow as decomposition of the residues proceeds [3]

   c. How and why liming an acidic soil would change the rate of organic matter decomposition [4]

   d. The procedure one would follow in the chemical fractionation of soil organic matter [6]

4. Discuss how the following agricultural practices can affect biological nitrogen fixation: *(15)*

   a. Liming [7.5]

   b. Addition of nitrogen fertilizers [7.5]

5. There are several relationships between organisms necessitated by competition for growth factors in their habitat.

   a. Describe each one of the following microbial relationships:

      i. Neutralism [3]

      ii. Symbiosis [3]

      iii. Protocoorperation [3]

      iv. Commensalism [4]

      v. Ammensalism [3]

      vi. Competition [3]

b. What is the importance of these relationships in soil ecology? [4]

6. In microscopy, what do the following terms mean? *(15)*
   a. Parfocal [3]
   b. Resolution [3]
   c. Resolving power [3]
   d. Numeral aperture [3]
   e. Total magnification [3]

~END OF EXAMINATION~

THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS – MAY 2012

AGS 522
SOIL AND PLANT ANALYSIS

TIME: 3 HOURS   Marks: 100
INSTRUCTIONS: **ANSWER ALL QUESTIONS AND WRITE LEGIBLY**

1. Soil, plant and water analysis is an important tool in the management of land resources. Discuss briefly and clearly, why this tool is so important for each of the resources you will consider. [20 Marks]

2. Collecting samples of plant materials is an important exercise as collecting soil samples. List ten (10) things you would need to consider when collecting plant samples and briefly indicate why each one of them is important. [20 Marks]

3. Different extractants are used to extract elements of interest from the soil. Using examples, discuss the characteristics that make a good extractant. [10 Marks]

4. What are the differences between the "efficiency level of available nutrients" and "basic cation saturation ratio" approaches when making K, Ca and Mg recommendations? What is the relative merit of each? [10 Marks]

5. Below is the data for a top soil from Chongwe District in Lusaka Province.

Depth	Bd	pH	Total N	Mineral N	Textural Class	DW_{105}	DW_{550}
(cm)	g/cm^3	$CaCl_2$	g/100g soil	g/100g soil	(USDA)	g	g
0-20	1.25	5.8	0.175	0.09	Loamy Sand	121.9	119.3

Use the data above to answer the following questions:

    a. Would you expect Al^{3+} toxicity to be a problem in this soil? Give reasons to support your answer. [3 Marks]

1

b. Show by way of balanced equation(s) how Al^{3+} contributes to soil acidity. [4 Marks]

c. Calculate the organic carbon content (%) and the amount of organic matter (kg) in 1 lima of this soil. [5 Marks]

d. What are the limitations of the method that was used to determine the organic carbon content in this soil? [3 Marks]

e. Indicate whether there would be net mineralization or immobilization of N in the soil and give reasons to support your answer. [5 Marks]

6. Soil samples from Kasama, Northern Province are brought to the laboratory for analysis. The client wants total N and available P to be determined.

a. How would you convince the client that available N would be the best indicator of N status in soil for plant uptake as opposed to total N? [3 Marks]

b. What are the roles of $CuSO_4$ and Se in the determination of total N? [2 Marks]

c. Given the Bray and Olsen's methods, which one would you use to determine available P in this soil and briefly describe the method and principle behind the method selected. [7 Marks]

d. With the aid of a diagram, illustrate the evolution of chemical species of P in soils in response to soil pH. [8 Marks]

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

2011/2012 ACADEMIC YEAR

SECOND SEMESTER FINAL EXAMINATIONS

AGF 532:   TECHNOLOGY OF PLANT PRODUCTS II

TIME: THREE (3) HOURS

INSTRUCTIONS:

ANSWER ALL QUESTIONS.

ALL QUESTIONS CARRY MARKS

ANSWER EACH SECTION IN A SEPARATE ANSWER BOOKLET.

Section A: Answer question one and any other

Question 1

Bleaching, in the refining of soya bean crude vegetable oil, is an important unit operation. Describe in detail the aim of this operation and how it can be achieved.

[25 marks]

Question 2

Crude oleins have found their use as a major ingredient in salad oils and they can be obtained by a fat modification process called fractionation.

Describe in detail how the crude oleins can be obtained from refined sunflower oil by this process.   **[25 marks]**

Section B: Answer both questions.

Question 1

a. Explain the manufacturing process of Moringa powder with aid of a flow diagram and highlight the importance of each step and the associated equipment.

[18 marks]

b. Explain the principle of osmotic dehydration and give examples of its application.

[7 marks]

Question 2

a. Discuss the difference between dry cleaning and washing and state the type of equipment used and give at least two examples of products that employ these processes. **[8 marks]**

b. Give two critical parameters used to test the quality of jam and state the equipment used to measure them. **[4 marks]**

c. Compare and contrast the manufacturing process of coffee and cocoa using illustrations. **[8 marks]**

d. Explain the application of the blanching process in fruit and vegetable processing.

[5 marks]

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

2011/2012 ACADEMIC YEAR

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THE UNIVERSITY OF ZAMBIA
UNIVERSITY SECOND SEMESTER EXAMINATIONS – MAY 2012

AGS 522
SOIL AND PLANT ANALYSIS

TIME: 3 HOURS   Marks: 100
INSTRUCTIONS: **ANSWER ALL QUESTIONS AND WRITE LEGIBLY**

1. Soil, plant and water analysis is an important tool in the management of land resources. Discuss briefly and clearly, why this tool is so important for each of the resources you will consider. [20 Marks]

2. Collecting samples of plant materials is an important exercise as collecting soil samples. List ten (10) things you would need to consider when collecting plant samples and briefly indicate why each one of them is important. [20 Marks]

3. Different extractants are used to extract elements of interest from the soil. Using examples discuss the characteristics that make a good extractant. [10 Marks]

4. What are the differences between the "efficiency level of available nutrients" and "basic cation saturation ratio" approaches when making K, Ca and Mg recommendations? What is the relative merit of each? [10 Marks]

5. Below is the data for a top soil from Chongwe District in Lusaka Province.

Depth (cm)	Bd g/cm^3	pH CaCl$_2$	Total N g/100g soil	Mineral N g/100g soil	Textural Class (USDA)	DW$_{105}$ g	DW$_{550}$ g
0-20	1.25	5.8	0.175	0.09	Loamy Sand	121.9	119.3

Use the data above to answer the following questions:

    a. Would you expect Al^{3+} toxicity to be a problem in this soil? Give reasons to support your answer. [3 Marks]

1

b. Show by way of balanced equation(s) how Al^{3+} contributes to soil acidity. [4 Marks]

c. Calculate the organic carbon content (%) and the amount of organic matter (kg) in 1 lima of this soil. [5 Marks]

d. What are the limitations of the method that was used to determine the organic carbon content in this soil? [3 Marks]

e. Indicate whether there would be net mineralization or immobilization of N in the soil and give reasons to support your answer. [5 Marks]

6. Soil samples from Kasama, Northern Province are brought to the laboratory for analysis. The client wants total N and available P to be determined.

a. How would you convince the client that available N would be the best indicator of N status in soil for plant uptake as opposed to total N? [3 Marks]

b. What are the roles of $CuSO_4$ and Se in the determination of total N? [2 Marks]

c. Given the Bray and Olsen's methods, which one would you use to determine available P in this soil and briefly describe the method and principle behind the method selected. [7 Marks]

d. With the aid of a diagram, illustrate the evolution of chemical species of P in soils in response to soil pH. [8 Marks]

END OF EXAMINATION

Figure 5.15   Relation between topographic factor LS and slope length
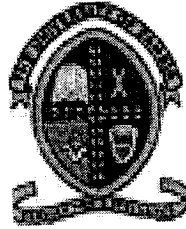
UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES

UNIVERSITY FIRST SEMESTER EXAMINATIONS: NOVEMBER 2011

AGS 531: LAND EVALUATION AND IMPROVEMENT

INSTRUCTION: Answer all questions   TIME: 3 Hours

1.   a) Given that a proposed agricultural project for which you are the manager will involve large scale commercial irrigated wheat production. List at least six (6) land qualities that would be of interest to this venture. (6 Marks)

b) For each of the stated land qualities list at least five (5) land characteristics that can be used to estimate it. (10 marks)

2. With suitable examples explain the concepts of:
 a) Adaptation   (5 Marks)
 b) Land improvement (5 Marks)
 c) Land quality   (5 Marks)
 d) Matching   (5 Marks)

3. a) Why should the scale and level of decision making be clearly defined prior to land evaluation.   (6 Marks)

b) What are the three main functions of land that need to be clearly understood whenever a land evaluation is to be done? (9 Marks)

c) Should the land use requirements of the land utilization types be set up before or after mapping and description of the project land utilization types? Explain   (9 Marks)

4. A multi-billion Kwacha cattle ranching investment has been proposed in one of the sections of the Kafue River plain. What are the potential environmental impacts of this project? (10 marks)

5. The USDA Land capability Classification is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants.

a. What are the main limitations of the USDA Land Capability Classification system? (5 marks)

b. Characterize the arable and non-arable soil classes in the USDA Land Capability Classification system (7marks)

c. What added value do capability subclasses give to the USDA Land Capability Classification system? (3 marks)

6.

Factor	Factor rating (0-100 points)
Land Capability Class	46
Storie Index	67
Project size	35
Water resource availability	77
Surrounding agricultural Lands	40
Protected resource lands	59

Using information in the LESA model provided in the table above, answer the following questions:

a. What is the weighted factor rating for each of the factors in the LESA model (4 marks)

b. What is the total LESA Score for the project area (4 marks)

c. What is the scoring decision (determination of significance) (4 marks)

d. What is the significance of the Surrounding Agricultural Lands Rating in the site assessment of the LESA model? (3 marks)

END OF EXAM

The University of Zambia

Academic Year 2012

Second Semester Examination

AGS 542-Soil Genesis and Classification

Marks: 70   Duration: 3 hours

1. Describe the enviroment conditions that would favours the formation of the following,
   a. Histic epipedon (5 marks)
   b. Oxic horizon (5 marks)

2. Explain how the climate has influenced the formation of soils in Zambia. (10 marks)

3. Explain how the parent material influences soil formation. (10 marks)

4. Describe the following terms
   a. Cumulization (2 marks)
   b. Illuviation (2 marks)
   c. Leaching (2 marks)
   d. Lessivage (2 marks)
   e. Podolization (2 marks)

5. You are provided with a profile description of a soil on a separate sheet, using the key to soil Taxonomy, classify the given soil upto the family level. (10 marks)

6. A soil is classified at subgroup level as Rohdic Kandiustalf.
   a. Describe the general characteristics of the soil. (5 marks)
   b. Discuss its agricultural potential and limitation. (5 marks)

7. Give the main characteristics of the US Taxonomy. (10 marks)

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF ANIMAL SCIENCE

B.Sc. Hunan Nutrition Programme
P.O BOX 32379, LUSAKA; Tel: 260-1-295422; Cell: 260-977 809 404

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COURSE: AN 212: HUMAN ANATOMY II

DATE : FINAL EXAMINATION MAY 29TH 2012

TIME: 14:00-1700 HOURS (THREE (3) HOURS)

Lecturer Coordinator: Dr. Egide Shirimpaka

This three hour exam has three parts. Please read carefully and understand each question before answering. The total marks: 250

GOOD LUCK

Part I

This part has 20 multiple choice questions worthy 100 marks. Each Multiple choice question carries 5 marks and total duration for part one should not be more than 30 minutes

1. a. Because the right ventricle has to pump the same volume of blood to the smaller area of the lungs, it has a   thicker wall than the left ventricle

   b. All the heart valves have papillary muscles to prevent eversion

   c. The heart muscle acts as a functional syncytium because electrical impulses travel between communicating cells enabling them to function as a single contractile unit

   d. The mediastinun contains all the thoracic viscera except the lungs

   e. The posterior boundary of the superior mediastinum is the upper four thoracic vertebral bodies

2. a. The anterior attachment of the vocal cords is to the hyoid cartilage

   b. The front half and back half of the tongue have different sensory nerve supply

   c. A bronchiole has no cartilage

   d. In adults the right and left main bronchi lie at equal angles to the vertical

   e. There are nearly no anatomical differences between lobes in both right and left lungs.

3. a. The zygomatic arch is a single strut arising from the zygomatic bone

   b. There are seven cervical vertebrae and 8 cervical nerves

   c. The cervical vertebrae are concave forwards

   d. Lymph nodes in the lower third of neck are likely to be due to pathology in the head or neck

   f. Pitting of the breast skin seen in cancer of the breast is caused by the lengthening of suspensory ligaments

2

4. Linea alba:

a. The linea alba spans between two bones

b. The linea alba spans between two muscles

c. Means grey line

d. Has a relatively reach blood supply

e. Is lateral to the rectus abdominis

5. The following statements are correct

a. The pudendal block can be used to repair a uterine cervical tear

b. The genital branch of the genitofemoral nerve supplies the labium minus

c. The pudendal nerve innervate the testis

d. The pudendal block can be achieved by injecting an local anaesthetic just lateral to the ischial tubersosity at the sacrospinous ligament

e. The pudendal nerve emerges from the lumbosacral area

6. Nerves supply

a. The vagus nerve innervates the appendix vermiform

b. Pain in the stomach is not mediated through the vagus nerve

c. The cranial nerve X (10) has no sympathetic flow to the liver

d. The descending colon parasympathetic supply comes from the pelvic plexus

e. Cholecystitis (inflammation of the gallbladder) nociception is mediated through somatic sensory to T6-9.

7. Muscles of the posterior abdominal wall

a. The lumbar plexus is anterior to the major psoas muscle

b. The quadratum lamborum helps in bending the back

c. The ureter crosses anterior to the psoas major muscle but posterior to the common iliac artery

d. The psoas major muscle is engaged when a woman is squatting

e. The psoas major inserts on the greater trochanter of the femur

8. Abdominal wall layers

a. The transversalis fascia is found between the internal oblique muscle and the tranversus abdominis

b. When a man is stabbed on the left side of the abdomen, the 4th layer entered by knife is the external oblique

c. The internus obliquus (internal oblique muscle) originates from the costal margin

d. The recti abdomini muscles are separated by the linea semilunalis

e. The transversalis fascia constitutes the anterior wall of the inguinal canal

9. The follow statements are true

a. The thyroid derives from the foregut

b. The celiac artery supplies the distal duodenum

c. The stomach rotates 90^0 anti clockwise during its embryological development

d. The pyrolic sphincter closes the distal oesophagus

e. The liver arises from the mesoderm

10. The gut embryology

a. The primitive stomach is seen as a fusiform dilatation for the first seen at four weeks

b. The hindgut is supplied by the superior mesenteric artery

c. The midgut is supplied by the celiac artery

d. Both right and left sides of the stomach growth is equitable

e. The septum transversum lying between the liver and the abdominal wall becomes the falciform ligament in an older foetus

11. GIT embryology

a. The liver is closely related to the diaphragm embryologically

b. The liver is a site of blood cell production from early foetal life to late childhood

c. In the second trimester of foetal life the bile is produced for the first

4

d. The ventral pancreatic contribute a comparatively smaller proportion to the formation of the final pancreas than the its dorsal counterpart

e. The Uncinate process of the pancreas derives from the proximal end of the dorsal pancreatic bud

12. The embryo

a. The embryo starts producing its own insulin at twelve weeks

b. The dorsal pancreatic bud might produce the duct of Wirsung

c. The main pancreatic duct is known as duct of Santorini

d. The major papilla is the entrance of the combined bile duct and the duct of santorini

e. The pancreatic duct and bile duct fail to fuse and drain separately in the duodenum in about 25% of individuals

13. The midgut

a. The proximal half of the duodenum is not original of the midgut

b. No part of the descending colon is from the midgut

c. The midgut is drained by the superior mesenteric vein

d. It is the longest part of the foetal gut

e. the vitelline duct connects the midgut to the yolk sac

14. Gut herniation and retraction

a. Bowel herniation is caused by the rapid elongation of the hindgut

b. The physiological umbilical herniation takes place in the 6th week of development

c. The rotation of the bowel involves both the midgut and the hindgut

d. The midgut rotates 180^0 while herniated

e. After the bowel repatriation back into the abdominal cavity, the midgut rotates another 90^0

15. Retraction of herniated bowel loops

a. The reduced growth rate of the liver is a contributing factor

b. The appendix vermiform is formed while the coecum is still herniated

c. The ileum is the first bowel to re-enter the abdomen

d. The rapid elongation of the bowel contributes to hastened intestinal re-entry

e. After re-entry, the jejunum lies more to the left in the abdominal cavity

16. The Hindgut

a. The whole anal canal arises from the hindgut

b. The bladder and urethral epithelia derive from the hindgut

c. The hindgut contribute the distal 2/3 to the transverse colon

d. Persistence of the cloacal membrane causes imperforate anus

e. The proximal anus is supplied by the pudendal artery

17. The mouth

a. The vestibule receives saliva from the sabmandibular salivary gland

b. The uvula is the posterior part of the hard palate

c. The soft palate is devoid of minor salivary glands

d. Teeth formation begins with the first twelve weeks of foetal life

e. The deciduous teeth are 20 in total

18. Teeth

a. The premolars are functionally similar to canines and different from the molars

b. The molars, being the biggest teeth have the longest roots

c. Eruption of the first molar in an eight year old child causes pain

d. The canines are shed off at about 7 to 8 year of age

e. The dentition starts at 8 months of age in majority of babies

19. Ribs

a. The costal groove is on internal surface of the superior border of a rib

b. The floating ribs have scalene tubercles

c. The first rib is distinguished from other ribs by the presence of the anterior groove caused by the subclavian artery and the posterior groove caused by the subclavian vein

d. All the ribs have got two articular surfaces

e. The crest separates the head from the tubercle

20. The thoracic cage

a. The thorax is largely drained by the azygos venous system

b. The thoracic wall is supplied by the posterior and anterior intercostal arteries

c. The intercostal arteries segregatively arise from the internal thoracic arteries that also arise from the subclavian arteries

d. The intercostal nerves only innervate the thorax

e. The intercostal nerves arise from the anterior rami of spinal nerves from T1 to T11

Part II

This part carries 25 marks and it should take not more 25 minutes to answer

Fill in the blanks (question 1-13) and follow given clear instructions to answer question14-20

1. The forward flow of blood through the heart is ensured by.................. ....

2. Blood from the lower body returns to the right atrium in the............... ....

3. The intrinsic pacemaker of the heart is called the...

4. The thoracic duct drains into the..................................or....................................

5. The abdominal aorta ends by division into the .... and ....

6. The dividing line between the upper and lower airways is ....

7. The parenchyma of the lung obtains its oxygen supply from ....

8. Between the anterior and posterior triangles of the neck is the ....

9. There are .... pairs of lumbar nerves

10. In the adult the average ending of the spinal cord is at ....

12. The nerves to the diaphragm are called the ....nerves. These nerves originate at .... vertebral level

13. The visual cortex is in the ....

14. Crossing the first rib, place these in order from anterior to posterior:

   Subclavian artery, Brachial plexus, Subclavian vein, Scalenus anterior,

15. Put the following vessels in order moving away from the heart towards the periphery

brachial, ulnar, subclavian, axillary

1 .... 2 .... 3 .... 4 ....

16. Out of options in bold font CIRCLE THE CORRECT ANSWER

The arytenoid cartilages are at **the back / the front** of the larynx and are **above / below** the cricoid cartilage

17. Out of options in bold font CIRCLE THE CORRECT ANSWER Which of the following allows the planning and production of speech?

a) Premotor area b) Primary motor area c) Broca's area d) Wernicke's area e) common integrative area

18. How many synapses are there between the motor cortex and a muscle?

19. The posterior communicating artery connects which two vessels?

20. What and where are fontanelles? How may they be clinically useful?

Part III

Each question carries 10 marks and should take not more than 12 minutes to answer. The total marks is 10, the duration is 120 minutes

1. Make notes on extradural haematoma (following head not spinal trauma)

2. Describe cerebrospinal fluid, its production, location, circulation and absorption

3. Describe the fifth and the sixth cranial nerves in terms of;

a) Where these cranial nerves emerge from the brainstem

8

b) Foramen that these cranial nerves pass through

c) Their main functions

4. Describe the course taken by the pain and temperature pathway through the spinal cord, brain stem and brain.

5. Describe the inguinal canal.

6. How do diaphragmatic and chest wall movements contribute to the breathing? (5 pts)

7. Give a detailed description of the blood circulation to the diaphragm, both arterial supply and venous drainage

8. Write short notes on the mediastinum: its subdivisions and contents

9. Describe the upper thoracic aperture

10. The sternal angle (angle of Louis) is an important anatomical landmark: explain

THE UNIVERSITY OF ZAMBIA
School of Agriculture
2011/2012 ACADEMIC YEAR 29/11/11
FIRST SEMESTER EXAMS (Human Nutrition Class)
BC 211- General Biochemistry

Time 3 hours

Comp. No. ....

Instructions

There are three sections.

Section 1 has five essay type questions.
You must answer **question 1** which is **compulsory** and comprises four short answer questions (5 marks each).
From the remaining four, answer **any two** questions (15 marks each).

Section 2 has 50 multiple choice questions. Each question has five options for an answer. There is only one correct answer. **Circle** the most appropriate answer (35 marks).

Section 3 has 10 multiple choice questions. Each question has one or more correct answers from the five options given. **Circle** the correct answer or answers. Half a mark will be deducted for each wrong answer (15 marks).

Put your computer number on the top right corner of each and every page

Good Luck

Section 1
You must answer question 1

1. a) Explain the importance of biological buffers in the body(5 marks) .

    b) Name fat soluble vitamins and briefly explain the function of each one of them   (5 marks).

    c) Outline the main functions of carbohydrates (5 marks).

    d) Explain why amino acids like valine, phenylalanine and leucine tend to be found in the interior of folded proteins (5 marks).

Answer <u>any two</u> questions below

2. What is the difference between simple lipids and complex lipids? Describe the main functions of lipids (15 marks).

3. Describe four types of noncovalent forces that help determine three dimensional structure of macromolecules (15 marks).

4. Explain how enzymes increase the rates of biological reactions (15 marks).

5. Describe the four levels of protein structure (15 marks).

1. Water molecules
    a in solution always repel each other
    b have a slight tendency to ionize
    c have four hydrogen atoms
    d dissolve nonpolar substances
    e None of the above is correct

2. Hydrogen bonds give water
    a low heat of evaporization
    b high specific heat
    c higher density in solid state than in liquid state
    d faster evaporization than liquids of comparable mass
    e low melting point

3. Which amino acid is positively charged at neutral pH?
    a Lysine
    b Cysteine
    c Glutamine
    d Tyrosine
    e Glycine

4. Which amino acid substitution most likely causes a change in a protein's tertiary structure?
    a Leucine to alanine
    b Arginine to lysine
    c Aspartic acid to glutamic acid
    d Serine to threonine
    e Aspartic acid to phenylalanine

5. In an helix, the side chains (R groups) on the amino acid residues
    a alternate between the outside and the inside of the helix
    b are found on the outside of the helix spiral
    c stack within the interior of the helix
    d generate the hydrogen bonds that form the helix
    e have no role in determining the secondary structure of protein

6. An enzyme
    a increases the K_{eq}
    b decreases the K_{eq}
    c increases the rate and decreases the activation energy of the reaction
    d increases the rate and increases the activation energy of the reaction
    e makes the ΔG more negative for the reaction

7. How many oxygen atoms are in one water molecule?
   a 4
   b 3
   c 1
   d 2
   e 0

8. Which one below is affected by an enzyme during a reaction?
   a Temperature
   b Amount of final product
   c Keq
   d ΔG
   e Length of time to attain equilibrium

9. In comparing several substrates for a given enzyme, the k_{cat}/K_m ratio expresses

   a the susceptibility of the enzyme to inhibition.
   b the rate constant for an enzyme-catalyzed reaction at saturating substrate
   c the increase in efficiency of the enzyme when more than one substrate is present.
   d a constant reflecting the substrate preference of an enzyme.
   e the equilibrium constant for the binding of the substrate.

10. Most common cofactors are
    a folates
    b niacin derived nucleotides
    c riboflavin derived nucleotides
    d metal ions
    e fat soluble vitamins

11. Which of the following vitamin derivatives does **NOT** act as a carrier for carbon (in any form)?
    a Biotin
    b Cobamide coenzymes
    c Tetrahydrofolate
    d Nicotinamide adenine dinucleotide
    e Thiamine pyrophosphate

12. ATP, Acetyl-CoA and nicotinamide adenine dinucleotide (NAD) share many structural and functional properties. Which of the following statements is **TRUE** about ATP, Acetyl-CoA and NAD?
    a They can all be described as B vitamins.
    b All contain a pyranose sugar.
    c All of them contain an adenine structure.
    d Each acts as a carrier of carbon chains.
    e All three utilize a thiol group as an active site.

13. The pH of a neutral solution is
    a 7
    b 1
    c 6
    d 14
    e 10

14 Biological buffers
    a have no roles in physiological systems
    b are solutions of strong acids
    c increase pH changes on addition of acid or base
    d resist changes in pH on addition of acid or base
    e are effective at any pH

15 Which solution below has the highest concentration of H^+?
    a Solution 1 with pH of 14
    b Solution 2 with pH of 7
    c Solution 3 with pH of 10
    d Solution 4 with pH of 2
    e Solution 5 with pH of 5

16. Hydrophobic interactions
    a have no role in cell membrane structure
    b are stronger than covalent bonds
    c are due to intrinsic attractions between molecules
    d are due to formation of ionic bonds
    e None of the above is correct

17. Which amino acid pair can form an ionic bond?
    a Lysine and glutamine
    b Aspartate and asparagine
    c Serine and histidine
    d Proline and glycine
    e Arginine and aspartate

18. Which amino acid plays an important role in covalent modification of enzymes
     through phosphorylation?
    a Tryptophan
    b Phenylalanine
    c Threonine
    d Methionine
    e Valine

19. Histidine can act both as a weak acid or base on active sites of enzymes because
    a it is hydroxylated
    b   is non polar
    c it has the longest side chain
    d the pKa of its side chain is near neutral pH
    e it has an indole ring

20. An enzymatic reaction works best at pH values between 6 and 8. This is compatible with the assumption that the reaction mechanism requires two ionizable amino acid chains that are of the opposite charge in the active site of the enzyme. The MOST LIKELY candidates for these two amino acids are
    a arginine and lysine
    b asparagine and threonine
    c methionine and proline
    d aspartic acid and glutamic acid
    e aspartic acid and lysine

21. For enzymes that obey Michaelis-Menten kinetics
    a plots of reaction rate versus substrate concentration are sigmoidal
    b the reaction rate is independent of enzyme concentration
    c the greater the affinity of enzyme for substrate, the smaller the value of Km
    d the maximum rate depends on the overall free energy change for the reaction
    e Vmax is the velocity of the reaction at [S] = Km

22. A 'ping –pong' mechanism is often observed in
    a catalysis by proximity
    b catalysis by strain
    c covalent catalysis
    d acid-base catalysis
    e None of the above is correct

23. During a drug screening program, you find a chemical compound that decreases the activity of the enzyme monoamine oxidase. A fixed dose of the drug reduces the catalytic activity of the enzyme by the same percentage at all substrate concentrations, with a decrease in Vmax. Km is unaffected. Which of the following best describes this drug?
    a Allosteric positive effector
    b Competitive inhibitor
    c Feedback inhibitor
    d Noncompetitive inhibitor
    e Substrate activator

24. Isoniazin and penicillamine can precipitate deficiency of
    a vitamin C
    b vitamin D
    c pyridoxine
    d thiamin
    e All of the above

25. The clinical signs of folate deficiency are caused by
    a increase in DNA synthesis
    b impairment of DNA replication in dividing cells
    c denaturation of DNA
    d increase in RNA synthesis
    e None of the above is correct

26. A guanidine group is found in
    a histidine
    b proline
    c cysteine
    d aspartate
    e arginine

27. Which amino acid below are you **unlikely** to find in the interior of folded proteins?
    a Leucine
    b Lysine
    c Valine
    d Isoleucine
    e Phenylalanine

28. Which amino acid below has three dissociable groups?
    a Asparagine
    b Valine
    c Methionine
    d Threonine
    e Glutamine

29. An aromatic ring is found in
    a proline
    b arginine
    c glycine
    d valine
    e None of the above is correct

30. In a dipeptide two amino acids are linked through
    a hydrogen bonds
    b a peptide bond
    c a disulfide bond
    d a glycosidic bond
    e dipole-dipole interactions

31 Which amino acid below is polar but not charged at neutral pH?
    a Arginine
    b Lysine
    c Glutamine
    d Glutamate
    e Aspartate

32. The primary structure of a protein
    a is the number of polypeptide chains of a protein
    b is the molecular weight of a protein
    c is the amino acid sequence of the polypeptide
    d is the three dimensional shape of a protein
    e is the non amino acid component

33. Proteins function as
    a growth factors
    b biological catalysts
    c transport molecules
    d antibodies
    e All of the above are correct

34. Which protein structural feature can elucidate evolutionary tree?
    a Quaternary structure
    b Secondary structure
    c Primary structure
    d Tertiary structure
    e The presence of disulfide bonds

35. In hydrogen bonds which stabilize the three dimensional structure of proteins, which amino acid can serve as both a hydrogen donor and acceptor?
    a Tryptophan
    b Asparagine
    c Arginine
    d Valine
    e Phenylalanine

36. In a protein α-helix, the CO group of each amino acid is hydrogen bonded to the NH group of the amino acid that is located
    a six residues ahead in the linear sequence
    b four residues ahead in the linear sequence
    c two residues ahead in the linear sequence
    d ten residues ahead in the linear sequence
    e one residue ahead in the linear sequence

37. Which statement below is not correct about proline?
    a Contains an indole ring
    b Has an aliphatic side chain
    c Has a side chain which is bonded to both the nitrogen and α carbon atoms
    d It commonly occurs on bends of polypeptides
    e Its rarely found in the α-helix

38. Each complete turn of a protein α-helix is about
    a 5.4 Å in length
    b 10.4 Å in length
    c 4.5 Å in length
    d 4.0 Å in length
    e 1.5 Å in length

39. A protein α–helix can be **destabilized** by
    a a long block of glutamic acid residues
    b a short block of glutamic acid residues
    c a short block of lysine residues
    d negatively charged amino acids near the amino terminus of the α–helix
    e positively charged amino acids near the carboxyl terminus of the α–helix

40. In addition to phosphoric acid, which of the following are the products of hydrolysis of lecithin?
   a Glycerol, fatty acids, serine
   b **Glycerol, fatty acids, choline**
   c Sphingosine, acetic acid, inositol
   d Glyceraldehyde, fatty acids, choline
   e Glyceraldehyde, fatty acids, ethanolamine

41. Which one below shows the correct positions of double bonds in arachidonic acid?
   a $\Delta^{9,12}$
   b $\Delta^{,9,12,15}$
   c $\Delta^{5,8,11,14}$
   d $\Delta^{5,8,15,18}$
   e $\Delta^{8,11,14,17}$

42. Which vitamin requires intrinsic factor for absorption?
   a Niacin
   b Riboflavin
   c Cobalamin
   d Biotin
   e Pyridoxine

43. Vegetable oils are liquids at room temperature because
   a they have very long fatty acid chains
   b **they have unsaturated fatty acids**
   c they crystallize at room temperature
   d they have very short fatty acid chains
   e they form helical structures at room temperature

44. Which one below is found only in foods of animal origin?
   a Folate
   b Cobalamin
   c Niacin
   d Ascorbic acid
   e Riboflavin

45. Which one below is a polysaccharide?
   a Sucrose
   b Glucose
   c Fructose
   d Mannose
   e None of the above is correct

46. The most abundant ketose is
   a fructose
   b galactose
   c mannose
   d glucose
   e glycogen

47. The main storage polysaccharide in animals is
    a hyaluronic acid
    b amylopectin
    c glycogen
    d dextran
    e maltose

48. Which linkages occur in glycogen at branching points of the chains?
    a α-1,4
    b α-1,6
    c β-1,3
    d β-1,4
    e β-1,6

49. Tocopherols function primarily as
    a steroid hormones
    b paracrine hormones
    c **biological antioxidants**
    d protein kinase inhibitors
    e visual pigments

50. Some carbohydrates convert Cu^{2+} ions to Cu^+ ions. This property is related to their ability to act as
    a reducing agents
    b oxidizing agens.
    c biological catalysts
    d both reducing and oxidizing agents
    e neither reducing nor oxidizing agents.

Section 3

1. None covalent forces incluse
    a hydrogen bonds
    b hydrophobic interactions
    c peptide bonds
    d disulfide bonds
    e ionic bonds

2. At equilibrium
    a the rates of the forward and reverse reactions are zero
    b the concentrations of reactants and products remain constant
    c all molecular motion has stopped
    d the rates of the forward and reverse reactions are equal
    e free energy change is zero ·

3. In the protein α-helix
    a each residue is related to the next by a rise of 3.5 Å along the axis
    b there are approximately 3.6 amino acid residues per turn
    c each complete turn is about 4.5 Å in length
    d each residue is related to the next by a rotation of 90 degrees
    e each residue is related to the next by a rotation of 200 degrees

4. Enzymes
    a do not affect ΔG^0
    b increase K_{eq}
    c decrease K_{eq}
    d accelerate attainment of equilibrium in a reaction
    e are mostly RNA molecules

5. Glycogen
    a is branched
    b is the main storage polysaccharide in plants
    c is less branched than starch
    d is a a homopolysaccharide
    e is a disaccharide

6. Disaccharides include
    a galactose
    b sucrose
    c maltose
    d lactose
    e dextran

7. Which amino acids below have charged side chains at physiological pH?
    a Arginine
    b Lysine
    c Aspartate
    d Glutamine
    e Serine

8. Megaloblastic anemia can be caused by deficiency of
   a ascorbic acid
   b vitamin E
   c vitamin B_{12}
   d folic acid
   e riboflavin

9. Hormonal precursors include
   a vitamin K
   b biotin
   c vitamin C
   d vitamin D
   e niacin

10. Cobalamin
    a is found only in foods of animal origin
    b is a polysaccharide
    c is found only in foods of plant origin
    d is fat soluble
    e is found in foods of animal and plant origin

End of the Exam
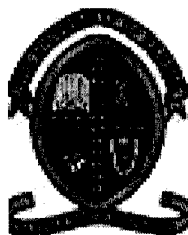
1. a) Explain the main ways in which you would classify the vegetation using air photo interpretation. (10 marks)

b) What are the differences in the appearance of vegetation features on aerial photographs taken with a black and white panchromatic film and a black and white infra red film? (5 marks)

c) What accounts for the differences highlighted in 'b' above? (5 marks)

2. A set of aerial photographs was taken from a height of 600m. The two aerial photographs were arranged into a stereo pair. The distance between the tops of a multi-storey building appearing on both photos was 210mm, and the distance between the bases of the same building was 212mm. Given that the distance between the photo centers was 300mm, calculate:
a) Parallax of the foot point of the building.   (5 marks)
b) The height of the building.   (5 marks)

3. Outline the basic differences between an aerial photograph and a topographic map. (10 marks)

4. Given that two points on a topographic map are also appearing on an aerial photograph, the scale of the topographic sheet is 1:20,000 and the measured distance between the two points on the map is 35.2mm and 82.1mm on the aerial photograph respectively.

a) Find the scale of the aerial photograph and the length of a road that measures 27.4mm on the photograph. (6 marks)

b) Find the ground area of a rectangular field measuring 8.3cm long and 4.7cm wide on this photograph (6 marks)

c) A flooded area is covered by 230 dots on a 25-dot/cm^2 grid on a photo taken at a scale of 1:30,000, determine the actual area covered by the flooded area. (6 marks)

d) Given that the relief displacement of a tower on an aerial photograph is 3.01mm and the radial distance from the center of the photograph to the top of the tower is 54.44mm, find the height of the tower if the flying height is 1400m above the base of the tower. (6 marks)

e) What assumptions apply to the height calculated in "d" above in order for it to be a true representation of the tower's height? (5 marks)

6. Land encroaching and disputes have become common especially in urban areas. Explain how you would help to resolve a conflict (using aerial photography and air photo interpretation) when a farmer complains that his 500 ha of land has been encroached upon and the settlers have destroyed his orchards and fish ponds. (10 marks)

7. Define environmental impact assessment and explain how you would use aerial photographs to determine sulphur emission from the mines located in Mufulira district. (5 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA

The School of Agricultural Sciences
DEPARTMENT OF FOOD NUTRITION

UNIVERSITY EXAMINATIONS

SEMESTER II – 23 MAY 2012

ITSS-319

INFORMATION TECHNOLOGY AND STUDY STILLS

TIME : *Three (3) hours*

INSTRUCTION : Answer *any three Questions.*

Each Question carries equal

marks

1.

(a) Write a function named "sum_from_to" that takes two integer arguments, call them "first" and "last", and returns as its value the sum of all the integers between first and last inclusive.

(b) Write a function named "enough" that takes one integer argument, call it "goal" and returns as its value the smallest *positive* integer n for which 1+2+3+. . . +n is at least equal to goal.

(c) An arithmetic series is defined by a+(a+d) +(a+ad)+(a+3d)+....+(a+(n-1)d)

Where a is the first term,d is the common difference ,and **n** is the number of terms to be added. With this information. write a program that uses a ***while loop or for loop*** to display each term and to determine the sum of the arithmetic series having a=1, d=3,and n=100.make sure that your program displays the value it has calculated.

2.

Write a function named "location_of_target" that takes as its arguments the following:

- An array of integer values;

- An integer that tells how many integer values are in the array;

- An integer "target value".

The function should determine whether:

a) The given target value occurs in any of the cells of the array, and if it does, the function should return the subscript of the cell containing the target value.

b) If more than one of the cells contains the target value, then the function should return the largest subscript of the cells that contain the target value. If the target value does not occur in any of the cells, then the function should return the sentinel value -1.

3.

You are to write a program using 2 functions as well as main.

The main function should:
1. Prompt the user to enter an integer greater that zero.
2. Pass this integer to a function named isPositive (the function returns a boolean) and only continue if the number entered is greater than 0. If not the user should be re-prompted to enter a positive integer.
3. Pass this integer to another function called **addNumbers**.
4. Print out the total returned from the **addNumbers** function.
5. Allow the user to repeatedly enter integers until they wish to stop.

4.

(a) The loop shown below has been written by an inexperienced C/C++ programmer. The behavior of the loop is not correctly represented by the formatting.

```
int n = 10;
  while (n > 0)
      n /= 2;
         cout << n * n << endl;
```

1) What is the output of the loop as it is written?
2) Correct the syntax of the loop so that the *logic* of the corrected loop corresponds to the *formatting* of the original loop. What is the output of the corrected loop?

3) Correct the formatting of the (original) loop so that the new format reflects the logical behavior of the original loop.
4) The following loop is an *endless* loop: when executed it will never terminate. What modification can be made in the code to produce the desired output?

```
cout << "Here's a list of the ASCII values of all the upper"

<< " case letters.\n";

char letter = 'A';
while (letter <= 'Z')
cout << letter << " " << int(letter) << endl;
```

Question 5

a. Write a function that returns the maximum and the minimum of 3 integers.

- have the user enter them

- generate them randomly

The main function should pass the 3 integers to the function called *maxOfThree*.

You are to write a program using 2 functions as well as main. ***The main function*** should:

- Prompt the user to enter an integer greater that zero.

- Pass this integer to a function named *isPositive* (the ***function*** returns a Boolean) and only continue if the number entered is greater than 0. If not the user should be re-prompted to enter a positive integer

- Pass this integer to another ***function*** called *addNumbers*.

- Print out the total returned from the *addNumbers* ***function***.

- Allow the user to repeatedly enter integers until they wish to stop.

The *isPositive* ***function***

- determines if the integer is valid i.e. positive non zero, and returns a Boolean true or false to the main function

The *addNumbers* ***function*** should:

- Add the total of all integers from 1 to the number received as a parameter inclusive, and return this value to the main function

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END OF ITSS-319 EXAMINATION

Time: Three hours

Instructions: Answer any five questions.

All questions carry equal marks

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1. List and describe the methods of membrane transport. Indicate what type of substances are transported by each method, and state whether each is passive or active transport.

2. What are the compartments of body fluid? Explain the differences between extracellular and intracellular fluid.

3. Define the following terms:

    (a) Blood coagulation
    (b) Deglutition
    (c) Indicator dilution technique
    (d) Sodium-potassium pump
    (e) Action potential
    (f) Ectopic foci
    (g) Myogenic pacemaker
    (h) Anti-trypsin inhibitor
    (i) Bile
    (j) Chemical synapse

4. The importance of a healthy human liver cannot be over emphasised. Discuss.

5. (a) Describe the neuromuscular junction with a suitable diagram.
    (b) Explain the neuromuscular transmission.

6. Define cardiac cycle. Describe various events of cardiac cycle.

7. (a) What are different types of salivary glands?
    (b) Describe the composition and functions of saliva.

8. Describe the excitation-contraction coupling process in skeletal muscle

END OF EXAM