

# **THE UNIVERSITY OF ZAMBIA**

## **SCHOOL OF AGRICULTURAL SCIENCES**

### **POST GRADUATE MID YEAR EXAMINATIONS 2014-2015.**

1. AGC 6111 –Plant physiology
2. AGC 6121 – Physiology of field
3. AGC 6425- Horticulture
4. AGC 6715 –Agro climatology
5. AGE 6222 –International trade
6. AGG 6811 –Biostatistics in agriculture
7. AGS 6252 –Advanced soil and plant analysis
8. AGS 6715 –Applied soil physics



**UNIVERSITY OF ZAMBIA**

**School of Agricultural Sciences**

**DEPARTMENT OF PLANT SCIENCES**

**M.Sc. Agronomy Programme- Second term.**

**AGC 6111 PLANT PHYSIOLOGY, FINAL EXAMINATION**

**Date.** 3<sup>rd</sup> March 2015

**Time** 09:00 to 12:00 hrs

**INSTRUCTIONS**

Answer ANY 4 (FOUR) questions.

Duration- 3 hours.

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1. With examples describe mass and sensory pigments and their role in plant development. **[25 marks]**
  
  2. List the three important respiratory cycles and describe one of them in detail. In your answer describe the functions of this cycle and how it is regulated. **[25 marks]**
  
  3. What are secondary metabolites and with examples describe the roles of secondary metabolites in plants and animals. **[25 marks]**
  
  4. Describe the following plant development indices
    - i. Relative growth rate.
    - ii. What is climate change and what are the potential effects of higher atmospheric carbon dioxide concentrations on plant development. **[25 marks]**
  
  5. Relative to plants describe stress and give time based plant response to stress (consider the following phases; alarm phase, resistance phase and exhaustion phases). **[25 marks]**
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**END OF EXAMINATION**



**UNIVERSITY OF ZAMBIA**  
**School of Agricultural Sciences**  
**DEPARTMENT OF PLANT SCIENCES**  
**M.Sc. Agronomy Programme- Second term.**  
**AGC 6121 PHYSIOLOGY OF YIELD, FINAL EXAMINATION**

Date. 6<sup>th</sup> March 2015

Time 14:00 to 17:00 hrs

**INSTRUCTIONS**

Answer ANY 4 (FOUR) questions.

Duration- 3 hours.

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1. Explain the following;
    - 1.1. Contrast Leibig and Mitscherlich concepts of limiting factors.
    - 1.2. Crop system formation and product formation. **[25 marks]**
  2. In maize (*Zea mays*) what is the relative importance of storage (remobilization) and current (soil) nitrogen during vegetative and grain filling stages. What are the implications on fertilizer regime? **[25 marks]**
  3. Describe Farming systems and its relevance to improving productivity of small holder producers. Why is this concept widely used in developing and not developed counties? **[25 marks]**
  4. Explain the following;
    - 4.1. Describe at least four (4) factors that that determine carboxylation efficiency.
    - 4.2. Why does rice (*Oryza sativa*) a C3 plant have a higher photosynthetic rate and temperature tolerance, explain compared to wheat. **[25 marks]**
  5. As rice enters the high assimilate demand associated with panicle development the leaf number and photosynthetic rate declines, explain how the plant copes with this. **[25 marks]**

*Continued overleaf*

6. Of the following traits explain which three have been associated with recent improvement of yields in maize (*Zea mays*),
- a. Harvest index
  - b. Photosynthetic rate
  - c. LAI or leaf angle
  - d. Stay green effect or green leaf area duration
  - e. Increased plant density tolerance.
- [25 marks]**

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**END OF EXAMINATION**



**UNIVERSITY OF ZAMBIA**

**School of Agricultural Sciences**

**DEPARTMENT OF PLANT SCIENCES**

**M.Sc. Agronomy Programme- Second term.**

**AGC 6425 Horticulture, FINAL EXAMINATION**

Date. 6th February 2015

Time 14:00 to 17:00 hrs

**INSTRUCTIONS**

Answer ANY 4 (FOUR) questions.

Duration- 3 hours.

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1. Outline 4 major challenges to sustained utilization of indigenous horticultural plants. **[25 marks]**
  
  2. Describe at least 3 Disease identification systems and 2 methods of eliminating viral diseases from horticultural planting materials. **[25 marks]**
  
  3. You have been asked to develop an extension bulletin for COMMERCIAL farmers. In the manual describe production of oranges (*Citrus sinensis*), including in your answer the following;
    - 3.1. Ecological requirements,
    - 3.2. Planting materials and planting methods,
    - 3.3. Suitable varieties,
    - 3.4. Pest and diseases. **[25 marks]**
  
  4. Distinguish and describe Quality attributes and Quality components and their relevance to enhanced horticultural production. **[25 marks]**
  
  5. Describe any 2 (two) of the following;
    - 5.1. Nutrient film technique of hydroponics.
    - 5.2. The importance of diversification in sustainable agriculture systems.
    - 5.3. Two important diseases of mango (*Mangifera indica*). **[25 marks]**
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**END OF EXAMINATION**

**THE UNIVERSITY OF ZAMBIA**  
**SCHOOL OF AGRICULTURAL SCIENCES**  
**DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION**  
**2014/15 INTERNATIONAL TRADE (AGE 6222) MID TERM EXAMINATION**  
**DATE: 06/03/15 AM      DURATION: 3 HOURS**

**Instructions: Answer all questions**

1. Suppose that in Zambia 10 bags of maize can be produced with the same resources as 100 bags of sunflower. Suppose also that in Malawi 10 bags of maize can be produced with the same resources as 25 bags of sunflower.
  - a. **Define** the term opportunity costs of maize in terms of sunflower (4 Marks)
  - b. What is the difference between comparative and absolute advantage? Illustrate this using figures above (10 Marks)
  - c. Show that the two countries would gain from trading with each other (12 Marks)
2. Contrast Ricardian model from the Heckscher-Ohlin model of International Trade (10 Marks)
3. Explain in your own style but in English the importance of assumptions of the Heckscher-Ohlin International Trade model (12 Marks)
4. Critically analyse three (3) weaknesses of the Heckscher-Ohlin International Trade model (12 Marks)
5. Discuss the main elements of the Ricardian Model of International Trade? (16 Marks)
6. Distinguish monetary from fiscal policy while giving an example in each (12 Marks)
7. Briefly discuss how regional trade integration is defined. In your discussions, specify were each of the following fall: SADC, South African Custom Union (SACU), COMESA (12 Marks)



UNIVERSITY OF ZAMBIA  
UNIVERSITY FIRST HALF EXAMINATIONS-FEBRUARY, 2015

AGG 6715: AGROCLIMATOLOGY

**Time:** Three (3) Hours **Total Marks:** 100  
**Instruction:** Answer all Questions  
*Non-programmable calculators are allowed*

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1. Briefly define each of the following terms (25 marks)
  - a) Partial pressure
  - b) Solar constant
  - c) Wien's Law
  - d) Latent heat
  - e) Climate variability
  
2. The earth's atmosphere is composed of four distinct layers based on its thermal properties: (a) Describe briefly the main features of the lower and the upper most layers and (b) the three main causes of the thermal profile of the earth (25 marks)
  
3. Describe the main three energy transfer mechanisms that influence the energy balance of the earth (15 marks)
  
4. Describe the significance of the earth's axis in relation with the plane of its orbit and energy distribution. (15 marks)
  
5. Given the following meteorological data measured this year for Mount Makulu, Chilanga (28°15' E, 15°33' S and altitude 1213 m): Extra-terrestrial radiation=358.788 W m<sup>-2</sup>, Solar declination angle=0.233 radians, and convention factor of 1.0 MJ m<sup>-2</sup> day<sup>-1</sup> = 11.6 W m<sup>-2</sup>, (20 marks)

Determine:

  - a) The day and month of this measurement
  - b) Solar radiation in MJ m<sup>-2</sup> d<sup>-1</sup>
  - c) Sunset hour angle in degrees
  - d) Time of sun-rise and sunset on this day

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End of Exam



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

**FINAL EXAMINATIONS FIRST HALF OF 2014 ACADEMIC YEAR**

**COURSE:** AGG 6811: BIostatistics in Agriculture  
**DURATION:** THREE (3) HOURS  
**TOTAL MARKS** 100

**INSTRUCTIONS:** ANSWER QUESTIONS IN SECTIONS ONE (1) AND TWO (2) IN SEPARATE ANSWER BOOKS.  
ALL STATISTICAL TESTS SHOULD BE AT 5% SIGNIFICANCY LEVEL.

**SECTION ONE: ANSWER THE COMPULSORY QUESTION AND ONE OF THE ELECTIVE QUESTIONS**

**COMPULSORY QUESTION**

**QUESTION 1**

The following data (grams/day) were obtained from a feeding experiment at Batoka Ranch in Choma. The study was aimed at finding out how different breeds of beef animals respond to protein sources.

Breed	Protein Source	Blocks		
		1	2	3
Angoni	Fish meal	2.9	3.8	2.4
	Alfalfa	2.7	2.2	1.1
Boran	Fish meal	3.5	2.7	2.9
	Alfalfa	2.7	1.5	1.8
Hereford	Fish meal	4.3	4.9	3.5
	Alfalfa	2.2	1.0	1.2

- What design is this? (1 Mark)
- When would such a design be appropriate? (4 Marks)
- Give a comprehensive analysis of the above data with clear conclusions. (15 Marks)



**ELECTIVE QUESTIONS**

**QUESTION 2**

- a) List the experimental designs you have covered in class and give the statistical linear model for two of these explaining each term of the model (5 Marks). When would you use split-plot design? Clearly state the circumstances (5 Marks).
- b) What role do On-Farm experiments play in technology generation? (5 Marks). List five types of on-farm experiments commonly used in agriculture (5 Marks)

**QUESTION 3**

Write short notes on each of the following: (5 Marks each)

- a) Features of a Balanced Incomplete Block Design.
- b) Differences between Completely Randomized Design and Randomized Complete Block Design.
- c) Applications of Youden square Design.
- d) Factorial experiment.

**SECTION TWO: ANSWER THE TWO COMPUSORY QUESTIONS AND ONE OF THE ELECTIVE QUESTIONS**

**COMPULSORY QUESTIONS**

**QUESTION 4**

The prizing of cattle is based on live weight. However, many small scale farmers do not own a scale for weighing animal but they have tapes or strings which can be marked and be used to measure whither height. A postgraduate student decided to develop a function that can relate the whither height to weight of the animal. The following data was collected by the postgraduate student. Analyse this data as if it was your Masters Project and come up with the solution to the small scale farmers' challenge (20 Marks).

Body weight (kg)	26	50	10	35	72	16 +
Whither height (Units)	2	4	0.5	3	6	1 <del>16</del>

20 Points

**QUESTION 5**

You conducted a preliminary sorghum variety trial for your Masters Research Project. You had four (4) varieties, namely, local variety (D) and three imported varieties (A, B, C). Among the imported varieties, A was from South Africa and B and C were from CYMMIT. Assuming that all the other sources of variation were controlled apart from that of varieties and experimental error you obtained the following data. Analyse the data and make three important conclusions (20 Marks).

	Level of education VARIETY			
	A	B	C	D
Yield (Kg)	24	21	25	25
	21	18	28	23
	18	15	28	20
	20	19	24	24
	23	20	23	27

**ELECTIVE QUESTIONS**

**QUESTION 6**

- a) Differentiate between Analysis of Covariance and Multivariate Analysis. (4 Marks).
- b) Differentiate between Partial Correlation Analysis and Multiple Correlation Analysis. (4 Marks).
- c) Differentiate between Simple Linear Regression Analysis and Multiple Linear Regression Analysis. (4 Marks).
- d) Differentiate between a statistic and a parameter. (4 Marks).
- e) Differentiate between standard deviation and standard error (4 Marks).

**QUESTION 7**

A Masters Student, majoring in agronomy, measured both the plant height and grain yield on the same plant for maize. The student was interested in finding whether there is a relationship between the two variables. Her data is given below:

Plant Height (cm)	10.1	9.9	9.7	9.8	10.1	10.2	9.9	9.8	10.1	9.8	10.5	9.9
Grain Yield (gm)	8.3	7.8	7.6	7.0	7.5	8.9	8.0	7.7	8.6	7.9	8.4	8.7

- a) When the student analyzed this data did she find a significant relationship between the two variables? **(15 Marks)**.
- b) What kind of relationship did she find? **(2 Marks)**.
- c) What conclusions did she draw from this data? **(3 Marks)**.

**END OF EXAMINATION**

**THE UNIVERSITY OF ZAMBIA**  
UNIVERSITY SECOND HALF EXAMINATIONS – JULY 2014

**AGS 6252**  
**ADVANCED SOIL AND PLANT ANALYSIS**

TIME: 3 Hours

Marks: 100

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

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1. Soil and plant analysis is important in the evaluation of land for agricultural productivity or assessing the environmental status of land.
  - a. Describe briefly the methods you would use for the determination of following parameters:
    - i. Available P [2.5 Marks]
    - ii. Total N [2.5 Marks]
    - iii. Soil pH [2.5 Marks]
    - iv. CEC [2.5 Marks]
  - b. If you were presented with three (3) different soils with the following properties described below, **how** would you interpret the chemical status of the particular soil and **what** would you recommend to improve the chemical status of the soil?
    - i. Soil A – pH 4.2, Exchangeable Ca and Mg in trace levels [5 Marks]
    - ii. Soil B – pH 8.5, Exchangeable Na more than Ca and Mg put together [5 Marks]
    - iii. Soil C – pH 7.2, high levels of soluble Ca and Mg. [5 Marks]
2. Laboratory management is as important as the methods of analyses in the quest to produce accurate results.
  - a. Discuss clearly five (5) important aspects of laboratory management. [25 Marks]
  - b. As part of your practicals in Advanced Soil and Plant Analysis course, you visited a number of laboratories. Name one particular laboratory which you think was the best managed and state the reasons for your choice. [10 Marks]
3. Laboratory equipment such as a pH meter, Conductivity meter and AAS are essential in a Soil Science laboratory. Answer the following questions: [30 Marks]
  - a. What are pH meter, Conductivity meter and AAS used for in a Soil Science laboratory? [3 Marks]
  - b. What is the principle behind the development and use of each of the equipment mentioned above? [15 Marks]
  - c. State any two (2) procedures which are cardinal for the correct use of the three pieces of equipment mentioned in (a) above, without which you may not obtain the correct or accurate readings. [12 Marks]
4. Different rooms in a Soils laboratory are used for different purposes. Discuss how different five (5) specific rooms of your choice may be from each other. [10 Marks]

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**END OF EXAMINATION**



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

**AGS 6715**

**APPLIED SOIL PHYSICS**

**MID-YEAR EXAMINATIONS - 2015**

**ANSWER: ALL QUESTIONS**

**TIME: THREE (03) HOURS**

**MARKS: ALL QUESTIONS HAVE EQUAL MARKS.**

**TUESDAY 3<sup>RD</sup> MARCH 2015**

Q1. (a) Water enters the soil through the process called infiltration. The terms and phrases listed below are associated with infiltration. Define and explain these terms or phrases. Give as much information regarding their use in the study of infiltration.

- (i) Infiltration capacity
- (ii) Infiltration rate
- (iii) Infiltrability
- (iv) Cumulative infiltration
- (v) Explain why infiltration declines.

(b) In nature water infiltrates into the soil from rainfall. Discuss this infiltration relating your discussion to rain intensity and infiltrability. Explain carefully what happens and why.

What is understood by preponding, non ponding and rain pond infiltration. What happens during these conditions.

Q2. Recent studies show that when water is added to the soil in which plants are growing more frequently, the plants grow better than if it is less frequent.

Explain this observation using the soil-plant-atmosphere continuum concept. What are the critical things which happen to make water so essential? It is important to make reference to the properties of water.

Q3. Define and explain hysteresis and further define and explain field capacity as related to soil water.

Now describe how the two, hysteresis and field capacity influence soil moisture redistribution in the soil.

Q4. What are flow nets when discussing water flow in the soil. Two (02) words are associated with flow nets, these are "equipotential" and "streamlines."

Explain what each of the two words mean and how they are used. Describe how they are used specifically in the study of water movement in the soil.

- Q5. Sometimes it is necessary to use subsurface drains to keep water out of the root zone or to drain water from the root zone.

The underground drains method used was developed by the United States Conservation Service. The method assumes that the depth of the drained zone is selected in advance and the only factor to be calculated is the drains horizontal spacing  $S$ .

- (a) There are a number of limiting factors to the depth of the drain. List and explain three of these.
- (b) Once depth has been selected another three soil and profile measurements are required before the equation to calculate  $S$  the spacing is used. Describe the three.

$$S = \frac{\sqrt{4k h^2 + 2ah}}{q}$$

Explain the variables in this equation.

- Q6. Tillage is undertaken for very specific reasons. What are these?

Traditional tillage involved two (02) processes primary and secondary tillage. Explain what is involved in each and what the objective is.

Two (02) types of ploughs are generally used world wide to achieve the aim or objective of primary tillage. Name the two and describe how they work. Explain the suitability of each of the two.

Finally explain the common or modern methods of tillage management which is being proposed.