



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF EDUCATION (SPECIAL NEEDS EDUCATION)

BACHELOR OF EDUCATION (SCIENCE)

AGR 412: POST-HARVEST TECHNOLOGY

DATE: 16/8/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS:

Answer question ONE and any other TWO questions

QUESTION ONE (COMPULSORY - 30 MARKS)

- a) With the aid of a well-labelled diagram explain the **FIVE** phases of climacteric development during growth and development in a climacteric fruit (6 marks)
- b) The maturity of agricultural commodities has a good correlation to produce quality and postharvest handling practices:
 - i. Explain **FIVE** requirements for a maturity index (5 marks)
 - ii. Explain **FIVE** practical applications of maturity indices in postharvest technology practices (5 marks)
- c) A consignment of 1750 tonnes of maize was dried from an initial moisture content of 26% down to 13%. Calculate the final weight of the dried maize (4 marks)
- d) Quality is an important aspect in the marketing of agricultural commodities.
 - i. Name the **THREE** quality attributes associated with fruit ripening (1.5 marks)
 - ii. Explain the physical and chemical alterations that occur during fleshy fruit ripening contributing to the **THREE** major quality attributes in (i) above (4.5 marks)
 - iii. Explain **FOUR** importance of establishing quality standards in the marketing of harvested agricultural commodities (4 marks)

QUESTION TWO (20 MARKS)

- a) Respiratory metabolism plays a key role in the post-harvest handling of agricultural commodities.
- Explain **FIVE** effects of respiration in harvested agricultural commodities (5 marks)
 - Explain **FIVE** importance of measuring the rate of respiration in harvested agricultural commodities (5 marks)
- b) With the aid of relevant graphical illustrations for i) and ii) below:
- Describe **THREE** effects of exogenous ethylene treatment on the respiratory metabolism of climacteric fruits (4 marks)
 - Describe **THREE** effects of exogenous ethylene treatment on the respiratory metabolism of non-climacteric fruits (4 marks)
 - Explain **ONE EFFECT EACH** of exogenous ethylene treatment on the regulation of its own biosynthesis in climacteric and non-climacteric fruits (2 marks)

QUESTION THREE (20 MARKS)

- a) In the post-harvest handling of grains, it is important to determine the moisture content of the grains before storage. Assume that a sample of 72g of wheat grains is used to determine the moisture content and is dried to a constant weight of 63g:
- Calculate the moisture content of the wheat grain on a wet weight basis (3 marks)
 - Calculate the moisture content of the wheat grains on a dry weight basis (3 marks)
- b) Determination of total soluble solids (TSS) and total titratable acidity (TTA) is important in the fruit industry.
- With the aid of a well labelled graphical representation explain the quality impacts of the changes in TSS and TTA that occur during fruit ripening (3 marks)
 - Explain **TWO** importance of measuring both TTS and TTA in fruits (2 marks)
 - Describe the **TWO** methods used in the determination of TTA in fruits (4 marks)
- c) Assume that 10 ml of orange juice with a total soluble solids content of 14 °Brix requires 5.6 ml of 0.1N NaOH to reach end point. Given that the conversion factor of the predominant organic acid in orange juice is 0.0064, answer the following questions:
- Name the predominant organic acid in orange juice (1 mark)
 - Calculate the % total titratable acidity in the orange juice (3 marks)
 - Calculate the sugar:acid ratio in the orange juice (1 mark)

QUESTION FOUR (20 MARKS)

- a) Differentiate between controlled atmosphere and modified atmosphere storage systems (2 marks)
- b) Modified atmosphere packaging is increasingly being used for the storage of fresh horticultural commodities.
- i. With the aid of a well labelled graphical illustration for each, describe the **TWO** methods used to create modified atmosphere conditions (6 marks)
- ii. Explain **SEVEN** positive effects of film packaging other than creation of modified atmosphere conditions (7 marks)
- c) Explain **FIVE** factors that influence the adoption of controlled atmosphere and modified atmosphere storage systems (5 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the term 'post-harvest loss' (2 marks)
- b) Discuss **FIVE** factors that lead to post-harvest loss of horticultural commodities in Kenya (10 marks)
- c) Explain the principle behind browning of banana fruit upon wounding and subsequent darkening of the skin upon ripening (4 marks)
- d) Explain **FOUR** objectives of the KS 1758-2:2016 Code of Practice/Standard (4 marks)