



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (AGRICULTURAL EDUCATION AND EXTENSION)

AGR 412: POSTHARVEST TECHNOLOGY

DATE: 7/12/2021

TIME: 8:30 – 10:30 AM

INSTRUCTIONS: Answer question ONE and any other TWO questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain the contributions of postharvest technology practices and procedures to each of the following:
- i) The harvested agricultural produce (3 marks)
 - ii) The socio-economic development of a nation (3 marks)
- b) From respiratory and ethylene metabolisms view point explain the implications of storing climacteric fruits in an anaerobic condition on:
- i) Physiological processes of the fruit (2 marks)
 - ii) The quality of the fruit (2 marks)
 - iii) The postharvest shelf-life of the fruit (2 marks)
- c) In relation to postharvest technology management procedures of horticultural commodities, answer the following questions:
- i) With the aid of a well labelled diagram for each, explain the postharvest behaviour of the **TWO** classes of fleshy fruits (6 marks)
 - ii) Explain the hypotheses/facts that have been advanced to explain the physical and chemical alterations that occur during the ripening of fleshy fruits and lead to the associated quality attributes (6 marks)

- d) An experiment was conducted on the determination of total titratable acidity by titration method and total soluble solids in orange fruit and the following data were obtained:

Total soluble solids content = 11° Brix

Volume of 0.1N NaOH used to reach end point = 14.2 ml

Total titratable acidity = 0.61%.

Conversion factor of the predominant organic acid in orange fruit = 0.0064

Given the above data answer each of the following questions:

- i) Calculate the volume of orange juice used in the experiment (4 marks)
- ii) Calculate the sugar:acid ratio in the orange fruit (2 marks)

QUESTION TWO (20 MARKS)

- a) Maturity establishment and harvesting are key steps in the agricultural production and value chain.
- i) Define the **TWO** classes of maturities encountered in agricultural commodities (2 marks)
- ii) Explain **FIVE** requirements of a maturity index (5 marks)
- iii) Explain **FOUR** guiding principles that have to be followed while harvesting a fruit or vegetable (4 marks)
- iv) Explain **SIX** functions of harvest aids (6 marks)
- b) Explain **FIVE** factors that affect the rate of cooling of harvested agricultural commodities (5 marks)

QUESTION THREE (20 MARKS)

- a) Describe **FIVE** methods that are used in the control of water loss in the postharvest handling procedures of perishable commodities (5 marks)
- b) A consignment of 4500 tonnes of wheat was dried from an initial moisture content of 25% down to 12%. Calculate the final weight of the dried wheat (4 marks)

- c) You have been supplied with the following data regarding the conditions inside an agricultural commodity store:

Specific humidity = 0.014 kg/kg

Wet bulb temperature = 26°C

Using the Psychrometric Chart provided, answer the following questions:

- i) State how dew point is determined using the Psychrometric Chart and its importance in postharvest operations (4 marks)
 - ii) Determine the dry bulb temperature in the store (1 mark)
 - iii) Determine the relative humidity in the store (1 mark)
 - iv) Determine the water vapour pressure in the store (1 mark)
- d) Describe hydrocooling as a method used in the cooling of harvested perishable commodities (4 marks)

QUESTION FOUR (20 MARKS)

- a) Quality of harvested agricultural commodities has an important bearing to postharvest shelf-life and in agribusiness enterprises:
- i) Explain the term quality with respect to harvested agricultural commodities (2 marks)
 - ii) Explain **SEVEN** reasons why establishment of quality standards in harvested agricultural commodities is important (7 marks)
- b) Global-GAP is key in the survival of agribusiness enterprises involved in fresh agricultural produce export trade:
- i) Explain the term 'Global-GAP' (2 marks)
 - ii) Explain **ANY SIX** principles on which Global-GAP is based (6 marks)
 - iii) Outline **SIX** benefits that are accrued from Global-GAP certification in the context of agricultural industry in Kenya (3 marks)

QUESTION FIVE (20 MARKS)

- a) Harvested agricultural produce have to be stored at various points in the postharvest supply chain.
- i) Explain **FIVE** goals of storing harvested agricultural commodities (5 marks)
 - ii) Explain **FOUR** parameters that a grain store must satisfy in order to achieve the objectives of grain storage (4 marks)
- b) Discuss the need for rapid and proper temperature management in postharvest handling procedures of agricultural commodities (6 marks)
- c) Explain **FIVE** factors that influence the adoption of controlled atmosphere or modified atmosphere as alternative methods for storage of harvested horticultural commodities. (5 marks)

PSYCHROMETRIC CHART

