



(The University of choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

**YEAR TWO SECOND SEMESTER EXAMINATIONS
(Main examination)
ODEL**

BACHELOR OF SCIENCE FOOD SCIENCE AND TECHNOLOGY

COURSE CODE: APT 202

COURSE TITLE: Properties of Biological Materials

DATE: 9th April, 2024

TIME: 11:30-2:30 PM

Instructions:

- This paper consists of **5** questions
- Section **A** is **compulsory**, Answer any **2** questions from **Section B**
- Observe the regulations governing clean drawing production

SECTION A (25 marks)

Question One

- (a) With the aid of a diagram give the different classifications of rheology
(3 marks)
- (b) State and differentiate between the different types of food density
(4 marks)
- (c) Describe the principle of operation of a concentric cylinder viscometer
(5 marks)

Question Two

- (a) Define the term Equilibrium Moisture Content (EMC) and hence state its significance
(5 marks)
- (b) Discuss concisely citing examples, how size and shape are important in the food processing industry
(8 marks)

SECTION B (45 marks)

Question Three

- (a) By giving the respective equations, Outline the principle of determination of thermal conductivity using the
- Series model
 - Parallel model
 - Kopelman model
- (6 marks)**

<i>Pressure Drop (Pa)</i>	<i>Flow Rate (cm³/s)</i>
3840	0.01
4646	0.06
5762	0.13
6742	0.24
7798	0.37
10,454	0.72
11,760	0.94

- (b) The pressure drop versus volumetric flow rate data shown above is obtained for chocolate melt using a capillary viscometer with a pipe diameter of 1 cm and a length of 60 cm. Show that chocolate melt is not a Newtonian fluid.
(4 marks)

- (c) State the two models that are used to describe viscoelasticity, hence give their respective equations and examples of foods exhibiting the respective model behavior **(5 marks)**

Question Four

- (a) With the aid of equation describe the relationships between
- Temperature and water activity
 - Pressure and water activity
- (5 marks)**
- (b) Describe the principle of operation of the following textural measurement instruments
- Tenderometer
 - Warner Bratzler shear
- (4 marks)**
- (c) Describe the refraction phenomena and hence state how and which food product properties it can be used to determine **(6 marks)**

Question Five

- (a) Describe how a pycnometer can be used in the determination of the
- Liquid density
 - Density of a solid with irregular shape
- (6 marks)**
- (b) Distinguish between the following dough quality determination instruments
- Farinograph and mixograph
 - Extensograph and alveograph
- (4 marks)**
- (c) Distinguish giving examples, between recoil phenomenon and the Weissenberg effect **(5 marks)**

