



**UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER**

PROGRAMME: BSC AGRIC 4 (CP), BSC HE 4, BSC HEE 4

COURSE CODE: LUM 404

TITLE OF PAPER: POST-HARVEST TECHNOLOGY

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.**

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GRANTED BY THE CHIEF INVIGILATOR**

SECTION ONE: COMPULSORY

QUESTION ONE

- (a) Define psychrometry. Briefly describe **FIVE** psychrometric properties of major interest in crop post-harvest handling. (12 Marks)
- (b) A bin of grain is to be chilled with air at 100% RH, dry bulb temperature of 4.4°C and an airflow rate of $1\ 699\ \text{m}^3/\text{hr}$. The ambient air conditions are 29.4°C (Tdb) and 21.1°C (Twb). Determine the amount of heat and moisture that has to be removed per hour from the inlet air by a grain chilling unit. (18 Marks)
- (c) Discuss the effects of temperature and relative humidity on grain preservation. (10 Marks)

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION TWO

- (a) The count and weigh grain loss assessment method involves comparison of the average weight of damaged and undamaged grain. From a grain sample, the visually damaged and undamaged grains are separated, counted and weighed. The difference in weight between the two is attributed to losses caused by feeding of insect pests. The following codes are to designate various parameters:

Number of damaged grain = **Nd**

Number of undamaged grain = **Nu**

Weight of damaged grain = **D**

Weight of undamaged grain = **U**

- (i) Determine the formula for total initial weight of grain. (5 Marks)
- (ii) Determine the formula for weight loss (5 Marks)
- (iii) Determine the formula for percentage weight loss (5 Marks)
- (iv) What are the weaknesses of this method? (5 Marks)
- (b) A maize crib measures 5m long, 3.5m wide and 2.5m high. It is used to store maize. If an average maize cob is 28cm long and 6cm in diameter, estimate the number of cobs, which can be stored in the crib. Assume 25% volume of the crib is occupied by air when full. (10 marks)

QUESTION THREE

- (a) Define the following:
- (i) Physiological maturity;
 - (ii) Post-harvest losses;
 - (iii) Critical moisture content;
 - (iv) Metamorphosis;
 - (v) Contact insecticide. (15 Marks)
- (b) Write notes on the maize grain weevil (*Sitophilus zeamais*). (15 Marks)

QUESTION FOUR

- (a) Briefly describe the operation of a wheat combine harvester. (12 Marks)
- (b) You are one of the students who visited the milling plant run by Dalcrue Agricultural Holdings in Malkerns.
- i) What agro-products are processed by this company? (4 Marks)
 - ii) Where are the products sourced from? (2 Marks)
 - iii) What by-products are handled by the company and how are they disposed? (6 Marks)

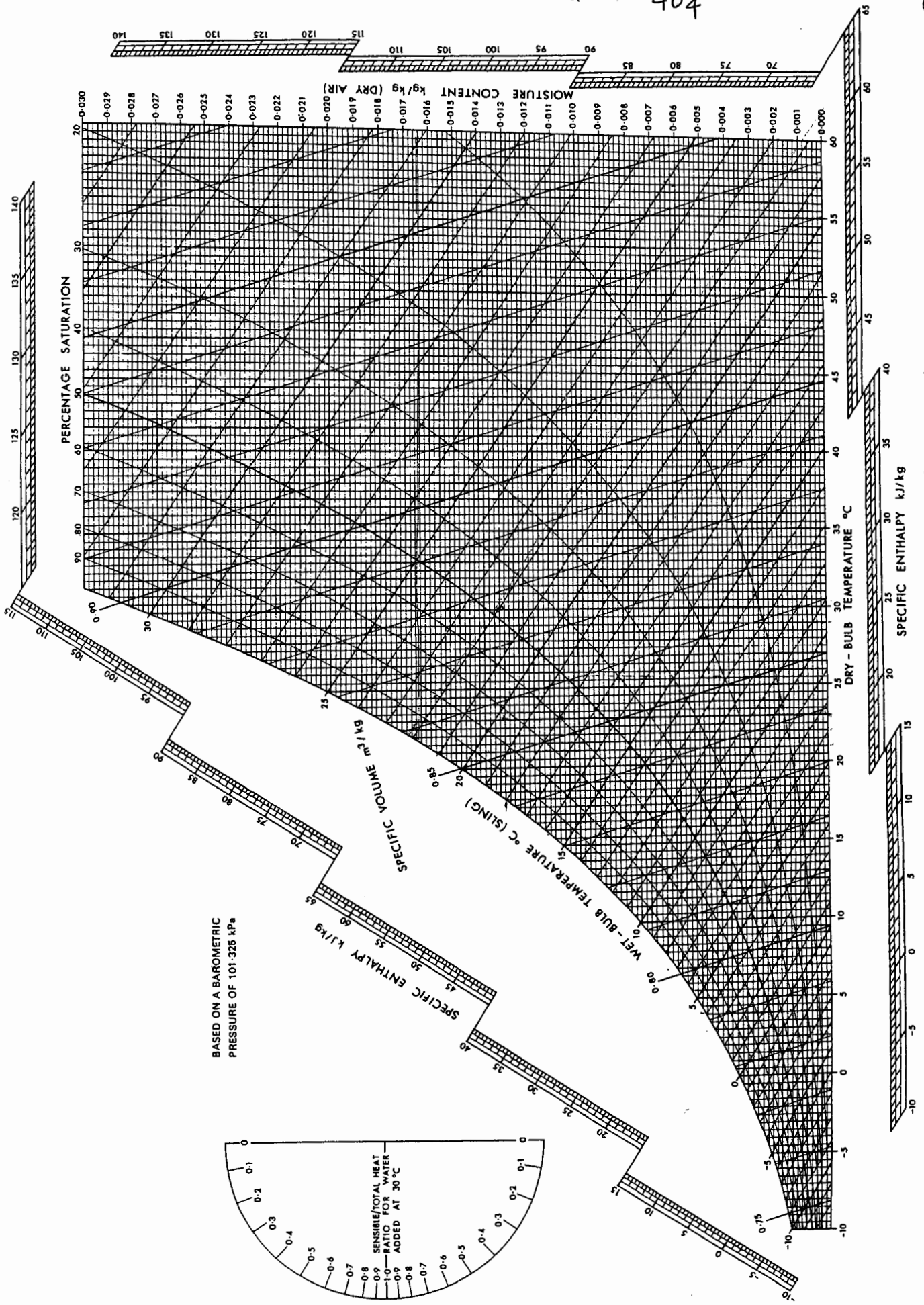
- (c) Table 1. below shows the results of an artificial grain drying experiment. Using the information given, determine:
- a. The moisture content at 55minutes after the experiment commenced. (2marks)
 - b. The equilibrium moisture content. (2 marks)
 - c. The critical moisture content of the grain. (2 marks)

Table 1. Data from artificial grain drying experiment

Time (min)	0	15	30	45	60	75	90	105	120	135	150
Moisture Content (%)	30	28.5	27.0	25.5	24.0	23.0	22.5	21.8	21.4	21.2	21.1

LUM 404

EA



BASED ON A BAROMETRIC PRESSURE OF 101.325 kPa

Psychrometric chart (Courtesy: The Chartered Institution of Building Services, from whom pads of A3-size charts may be obtained)