UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMMES: AGRICULTURAL AND BIOSYSTEMS ENGINEERING

COURSE CODE: ABE 101

TITLE OF PAPER: PHYSICS

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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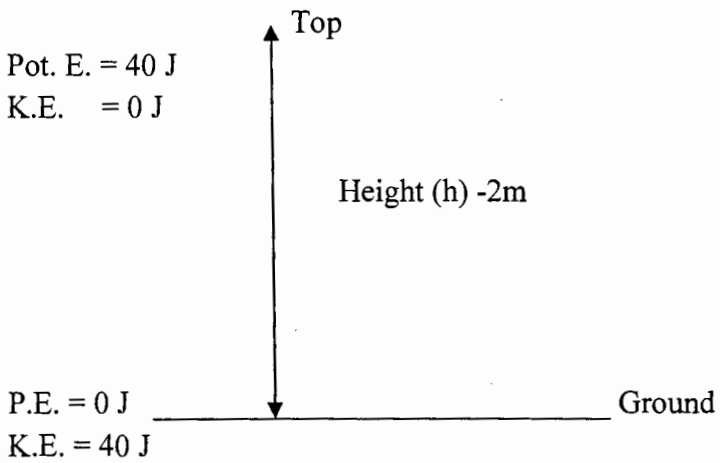
PHYSICS FINAL EXAMINATION

QUESTION 1: **COMPULSORY**

(a) State the principle of energy conservation and explain how this principle is applied when a ball is thrown vertically upwards, as shown on the diagram below. **[10 marks]**



(b) An electric motor that has 95% efficiency uses 20A at 110V.

(i) What is the power output? **[5 marks]**

(ii) How many Watts are lost in thermal energy? **[5 marks]**

(iii) How many calories of thermal energy are developed per second? **[10 marks]**

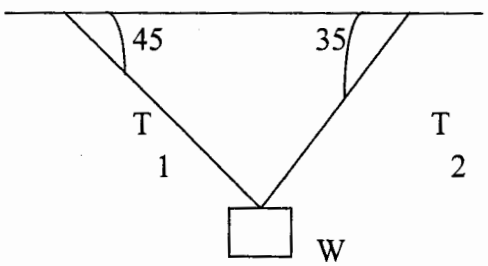
(c) Explain the characteristics of Resistance and how it differs between a series circuit and parallel circuit. **[5 marks]**

(d) Define Ohm's Law **[5 marks]**

QUESTION 2

(a) Circle the correct answer **[5 marks]**

A traffic light of weight (w) is suspended from two wires as shown. Then tensions in the wires have magnitudes T and T = as shown
1 2



Which statement is true?

(i) $T_1 = T_2 = W$

(ii) $T_1 = T_2 = W/2$

(iii) $T_1 + T_2 = W$

(iv) $T_1 + T_2 > W$

(b) A 5000w heater is used for 10 hours heating a chicken shed in winter. What is the daily cost of the electrical energy transferred into heat, assuming that electricity costs 80c per kilowatt-hour (kWh) **[10 marks]**

(c) An electric heating appliance should always be fitted with an earth connection for protection. What is protected by the earth connection? **[5 marks]**

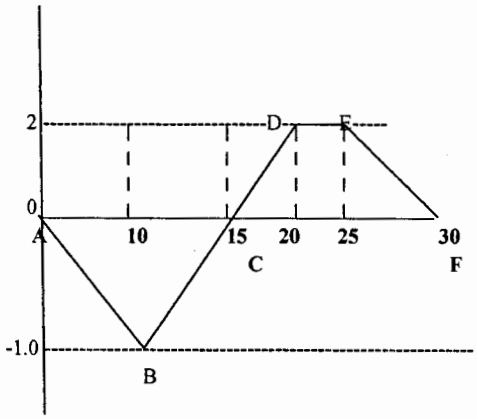
(i) The cable connecting the appliance
(ii) The fuse in the circuit
(iii) The heating element of the appliance
(iv) The person using the appliance

(d) Describe the following terms and give their dimensions;

(i) Speed **[2.5 marks]**
(ii) Velocity **[2.5 marks]**
(iii) Work **[2.5 marks]**
(iv) Electric charge **[2.5 marks]**

QUESTION 3

The following velocity-time graph represents the movement of a car that was initially Travelling towards the East.



(a) At which stage did the car have a constant velocity? **[5 marks]**

(i) A-B
(ii) B-C
(iii) C-E
(iv) D-E
(v) E-F

(b) What is the acceleration from E to F? **[5 marks]**

(i) 2.5 m/s
(ii) -2.5 m/s
(iii) 10.0 m/s
(iv) -0.4 m/s

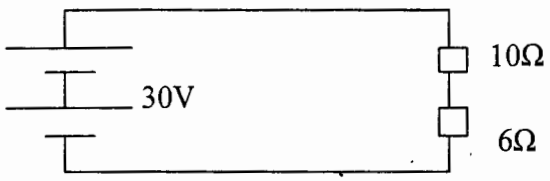
(c) Describe how you would attempt to make:-

(i) A permanent magnet **[5 marks]**
(ii) A temporary magnet **[5 marks]**

(d) State the laws of reflection of light. Show that the image of an object In a plane mirror is as far behind as it is in front. **[10 marks]**

QUESTION 4

Two resistors of 6Ω and 10Ω are connected in series with a battery of 30V terminal voltage as shown in fig below. Calculate – **[20 marks]**



(i)	Current passing through the circuit	**[5 marks]**
(ii)	Potential difference across each resistor	**[5 marks]**
(iii)	Power dissipated by each resistor	**[10 marks]**
(iv)	Total energy consumed in a 4-hr operation	**[5 marks]**
(v)	Total cost of operation for one (24 hrs) if E0-80 is the cost of 1 kWh	**[5 marks]**