



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

SUPPLEMENTARY EXAMINATION FOR
DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
DIPLOMA IN MECHANICAL ENGINEERING
DIPLOMA IN CIVIL ENGINEERING

SCU 100: PHYSICS

DATE:

TIME:

INSTRUCTIONS

1. Answer question one and any other two from section B
2. Use: (i) $g = 9.81 \text{ m s}^{-2}$
(ii) Density of water = 1000 kg m^{-3}

SECTION A

QUESTION ONE (30MARKS)

- a) Define the density. (3 marks)
- b) An empty 60 liters petrol tank has a mass of 10 kg. Calculate its mass when full of fuel of relative density 0.72. (3 marks)
- c) Distinguish between speed and velocity. (2 marks)
- d) A body starts with an initial velocity of 30 ms^{-1} and moves with a constant acceleration of 5 ms^{-2} for 50 seconds. Calculate the distance moved in meters. (2 marks)

- e) Derive the equation for the range in a projectile motion. (4 marks)
- f) An object is fired with a velocity of 100 ms^{-1} at an angle of 30° to the horizontal. Calculate its greatest height. (3 marks)
- g) From the definition of young's modules, deduce its quantitative expression. (4 marks)
- h) A Metallic wire of cross-sectional area 0.2 mm^2 is stretched through 0.2 mm by a 4 kg mass. If its original length is 20 cm , find
- (i) Tensile strain
 - (ii) tensile Stress
 - (iii) Young's Modules of the wire (9 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

QUESTION TWO (20 MARKS)

- a) Distinguish between elastic and plastic deformations. (3 marks)
- b) A length of a copper wire of square cross-section $1 \text{ mm} \times 1 \text{ mm}$ is stretched by a tension Of 100 N . Calculate the tensile stress. (3 marks)
- c) Define the term breaking stress for a non-brittle wire stretched by some forces attached from one end. (2 marks)
- d) Sketch a graph of stress against strain for a non-brittle wire in (b) above. On the sketch, label the elastic and plastic regions. (6 marks)
- e) Using kinetic theory of matter, explain the change of state from solid to liquid state. (3 marks)
- f) A wire originally 2 m long suffers 0.1% strain. Calculate its stretched length. (3 marks)

QUESTION THREE (20 MARKS)

- a) Distinguish between distance and displacement. (4 marks)
- b) Derive the second equation of linear motion. (4 marks)
- c) A body changes its velocity from 20 ms^{-1} to 30 ms^{-1} in 5 second , Calculate the acceleration. (3 marks)

- d) A body runs at a constant speed of 15ms^{-1} in 200 seconds and then accelerates uniformly to a speed of 30ms^{-1} over 30 seconds. This speed is maintained for 100 seconds before it decelerates uniformly to rest in 20 seconds.
- i) Sketch a velocity – time graph for the journey. (5 marks)
- ii) From the graph, determine the average speed (4 marks)

QUESTION FOUR (20 MARKS)

- (a) Using kinetic theory, explain the existence of the three states of matter. (2 marks)
- (b) Define the following terms
- i) Molar heat capacity
- ii) Specific heat capacity
- iii) Specific latent heat of fusion. (6 marks)
- c) The temperature of 500g of a certain solid is raised to 120°C and then placed in 300g of water at 20°C . If the final steady temperature rises to 25°C , calculate the specific heat capacity of the solid. (4 marks)
- d) An electric heater which produces energy at a rate of 4000W contains 1.5 kg of water. It takes 100 seconds to heat the water from 20°C to 100°C
- Calculate the difference in the heat produced by the kettle and heat taken in by water.
Suggest two reasons for the difference. (8 marks)

QUESTION FIVE (30 MARKS)

- a) Give three factors which the resistivity of a wire depends upon. (3 marks)
- b) State Ohm's Law (2 marks)
- c) Two resistors, $5\ \Omega$ and $10\ \Omega$ are connected in series to a battery. When a voltmeter is connected to a $5\ \Omega$ resistor it reads 4 V.
- (i) Draw the diagram for the circuit.
- (ii) Calculate: 1. Current in the two resistors
2. Reading of the voltmeter connected to $3\ \Omega$ resistor.
3. EMF of the battery. (10 marks)
- d) (i) Define Coulomb of charge.
- (ii) A current of 5 A passes through a circuit in 100 minutes. Calculate the number of coulombs. (5 marks)