



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2023/2024

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR THE DIPLOMA IN  
INFORMATION TECHNOLOGY

### SPS 2216: BASIC PHYSICS

DATE: APRIL 2024

TIME: 1<sup>1</sup>/<sub>2</sub> HOURS

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#### INSTRUCTIONS:

1. Answer Question ONE, and any other TWO
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#### QUESTION ONE (30 MARKS)

- a) List any three effects of force (3 Marks)
- b) State the principle moments (3 Marks)
- c) List the three states of equilibrium (3 Marks)
- d) Differentiate between heat and temperature (2 Marks)
- e) Briefly provide two applications of electromagnetic induction (4 Marks)
- f) Differentiate between magnetic and non-magnetic materials (2 Marks)
- g) Define humidity (2 Marks)
- h) Derive an equation for Newton's second law that net force is equal to mass times acceleration (3 Marks)
- i) State three scales of temperature (3 Marks)
- j) State the zeroth law of thermodynamics (2 Marks)
- k) A truck with a mass of 5 kg is accelerated by an average force of 20 N along a horizontal 3 m track. Calculate the truck's kinetic energy and its speed at the end of the track (3 Marks)



## QUESTION TWO (15 MARKS)

- a) State Hooke's Law (2 Marks)
- b) A cube suspended freely from the end of a spring causes it to stretch by 5.0 cm. A 500 g mass suspended from the same spring stretches it by 2.0 cm. If the elastic limit is not exceeded:
- Calculate the weight of the metal cube (3 Marks)
  - By what length will the spring stretch if a mass of 1.5 kg is attached to its end (3 Marks)
- c) Differentiate between heat capacity and specific heat capacity (2 Marks)
- d) A copper solid of mass 3 kg at  $100^{\circ}\text{C}$  is fully immersed in liquid of mass 2 kg at  $200^{\circ}\text{C}$  in copper calorimeter of mass 500 g. The final steady temperature of the content is  $80^{\circ}\text{C}$  after stirring. Calculate the specific heat capacity of the liquid. (Specific heat capacity of copper =  $400\text{ J/kgK}$ ) (5 marks)

## QUESTION THREE (15 MARKS)

- a) Differentiate between linear displacement and angular displacement and angular displacement. (2 marks)
- b) Define angular velocity (2 marks)
- c) State three factors that affect centripetal force (3 marks)
- d) A stone is whirled at constant speed in a horizontal circle of radius 10 cm. if it takes 10 seconds to describe an arc length 8 cm. calculate. (2 marks)
- The regular displacement
  - Angular velocity

A care of mass 100kg moves round a circular track of radius 100 cm with a linear speed of 20m/s. calculate: (6 marks)

- The angular velocity
- The centripetal force
- Centripetal acceleration

#### QUESTION FOUR (15 MARKS)

a) Define the terms (5 marks)

(i) Lens

ii) Principal axis

iii) Principal focus

iv) Focal length

v) Focal plane

b) Differentiate between interference, diffraction and polarization of light (3 marks)

c) State the lens formula (1 Mark)

d) An object is placed 30 cm in front of a convex lens with focal length 10 cm and then moved 5 cm in front of the lens. Determine the nature, position and the magnification of the image (3 marks)

e) List three uses of optical microscopes (3 marks)