



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN MEDICAL LABORATORY SCIENCES (DMLS 12J/12S)

APS 2106: MEDICAL PHYSICS

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Calculator*

This paper consist of **FIVE** questions in **TWO** sections **A & B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages
SECTION A (COMPULSORY)

Question One

- a) (i) Differentiate the following terms:
- i. Error
 - ii. Discrepancy
- (ii) The initial temperature of a thermometer is $12 \pm 0.2^\circ\text{C}$. The final temperature is $48 \pm 0.4^\circ\text{C}$.
What is the possible error in the rise of temperature? (7 marks)
- b) (i) Define the following
- (i) Pressure
 - (ii) Gauge pressure
 - (iii) Absolute pressure
 - (iv) Briefly explain why blood pressure is measured and how it is measured. (4 marks)
- c) (i) Define the following state the SI units of each. (8 marks)
- (i) Capacitance
 - (ii) Resistivity
 - (iii) Resistance
 - (iv) Voltage
- (ii) Deduce a formula for the resistance of a number of resistors connected in parallel. (6 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

- a) Differentiate the following terms:
- (i) Heat capacity and specific heat capacity
 - (ii) Latent heat of fusion and latent heat of vaporization (4 marks)
- b) Explain why pieces of ice at 10°C added to a drink room temperature is more effective in cooling the drink than an equal mass of water at 0°C (3 marks)
- c) The temperature of 500g of a certain metal is raised to 100°C and it is then placed in 200g of water at 15°C . If the final steady temperature rise to 21°C . Calculate the specific heat capacity of the metal. Take specific heat capacity of water as $4200\text{JKg}^{-1}\text{k}^{-1}$ (6 marks)
- d) Briefly explain how a refrigerator works (7 marks)

Question Three

- a) (i) State the Laws of reflection

- (ii) State Snell's Law (3 marks)
- b) A ray of light is incident in water at an angle of 30° on water air plane surface. Find the angle of refraction in the air (n for water = $4/3$) (6 marks)
- c) (i) State what you understand by the following terms:
- The apparent size of a an object
- The magnifying power of a microscope (4 marks)
- (ii) Draw a labeled ray diagram to illustrate the action of a simple microscope. (7 marks)

Question Four

- a) (i) With the aid of diagrams explain the following properties of waves.
i. Reflection
ii. Refraction
iii. Diffraction
iv. Interference (8 marks)
- (ii) State the **TWO** main types of waves. (2 marks)
- b) (i) With an aid of a sketch, explain the Doppler effect. (5 marks)
- (ii) Explain what you understand by ultrasound giving example where it is used in your field. (5 marks)

Question Five

- a) Define the following terms giving SI units of each:
(i) Displacement
(ii) Velocity
(iii) Acceleration (6 marks)
- b) An object is released from a height, it hits the ground 5 seconds later.
(i) At what velocity does it hit the ground?
(ii) Determine the height at which it was released. (5 marks)
- c) (i) Differentiate between linear and circular motion (2 marks)
(ii) Explain what a laboratory centrifuge is used for.
(iii) Briefly explain how the laboratory centrifuge works. (7 marks)