TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN MEDICAL LABORATORY SCIENCES (DMLS 13M)

APS 2106: MEDICAL PHYSICS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
     -   *Answer Booklet*
This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
<u>Maximum marks for each part of a question are as shown</u>

This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question One

a) Differentiate the following terms:
 (i) Error
 (ii) Discrepancy   **(2 marks)**

b) The initial temperature of thermometer is $12 \pm 0.2^{o}C$. The final temperature is $48 \pm 0.4^{o}C$. What is the possible error in this rise in temperature   **(4 marks)**

c) (i) Identify the three modes of heat transfer and explain how each is attained.   **(6 marks)**
 (ii) Explain why pieces of ice at 0ºC added to a drink at room temperature 5 more effective in cooling the drink than an equal mass of water at 0ºCine the following terms: **(3 marks)**

d) Given that the height of a mercury in a barometer rises to 76cm. Calculate the atmosphere pressure. Take the density of mercury as 13600kgm^{-3} (**5 marks**)

e) Explain the following:
 (i) Capacitance
 (ii) voltage
 (iii) resistivity   **(3 marks)**

f) Deduce the formula for resistance of resistance that are connected in parallel in a electric circuit.
                                                                                 (5 marks)
g) Explain what is meant by magnetic resonance imaging (MRT)   **(2 marks**)

SECTION B (Answer any TWO questions from this section)

Question Two

a) (i) State the Laws of refraction   **(2 marks**)

  (ii) State Swell's law   **(1 mark)**

b) A ray of light incident in water at an angle of 30o on water air plane surface. Find the angle of refraction in the air (n for water = 4/3)   **(4 marks)**

c) State what you understand by the following terms:
 (i) The apparent size of an object
 (ii) The magnifying power of a microscope   **(4 marks)**

d) (i) State the functions of a simple microscope in a medical laboratory   **(6 marks)**
  (ii) Draw a well labeled diagram to illustrate the of a simple microscope   **(7 marks)**

Question Three

a) Differentiate the following terms:
   (i) Heat capacity and specific heat capacity
   (ii) Latent heat of fusim and latent heat of vaporization **(4 marks)**

b) With an aid of a sketch, explain how a refrigerator works **(8 marks)**

c) Calculate the heat required to convert 10kg ice at -18°C to vapour at 100°C. Take the specific heat capacity of water as 4200Jkg^{-1}k^{-1} specific latent heat of fusion of ice as 3.4 x 105 Jkg-1 and specific latent heat of vaporization of water as 2.3 x 10^{6}Jkg^{-1} **(8 marks)**

Question Four

a) (i) State Lenz law **(1 mark)**
   (ii) State and explain any **THREE** factors that affect capacitance of a capacitor. **(6 marks)**

b) An electric heating element to dissipate 480N on 240V mains is to be from nichrome ribbon 1mm wide and thickness 0.05mm. Calculate the length of ribbon required if the resistivity of nichrome is 1.1 x 10^{-6} ohm **(7 marks)**

c) Explain briefly how the MRI test is done **(5 marks)**

d) State ohm's law **(1 mark)**

Question Five

a) Differentiate the following terms and state the SI units:
   (i) Distance and displacement
   (ii) velocity and speed **(4 marks)**

b) Derive the equations for linear motion **(4 marks)**

c) Sketch the following graphs.
   (i) Displacement time graph for a body moving under uniform acceleration
   (ii) Velocity time graph for a body decelerating **(4 marks)**

d) Briefly explain how a laboratory centrifuge works **(6 marks)**