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OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR

SECOND YEAR FIRSTSEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (PHYSICAL THERAPY)

COURSE CODE: BPT 211
COURSE TITLE: PRINCIPLES OF PHYSICS

DATE: 13TH DECEMBER, 2018 **TIME: 2.00 PM – 5.00 PM**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES **PLEASE TURN OVER**

BPT 211: PRINCIPLES OF PHYSICS

STREAM: BSC (PT) **DURATION: 3 Hours**

INSTRUCTIONS TO CANDIDATES

i. *Answer Question **ONE** and **TWO** in **SECTION A** and from **THREE** questions in **SECTION B**.*

ii. Density of water = 1.0 x 10^3kg/m^3,Density of blood = 1.06 x 10^3kg/m^3, Acceleration due to gravity g=9.8 m/s^2, Universal gravitational constant G=6.67 x$10^{-11}$$Nm^2kg^{-2}$, permittivity of free space $\epsilon_o = 8.85 \times 10^{-12} Fm^{-1}$, charge on an electron=1.6X10^{-19} C, K=1/(4πε$_o$) = 9*10^9, Mass of an electron, M_e=9.11×10^{-31}Kg, 1eV= 1.6×10^{-19}J, permeability of free space, μ_o=4π×10^{-7}Tm/A

SECTION A:

QUESTION ONE (12 Marks)

a) Distinguish between vector and scalar quantities and give an example of each **(2mks)**

b) If **a** = 2**i** + 3**j** + 4**k** and **b** = 5**i**+6**j**+7**k** find;

   a. **a+b**

   b. a vector **c** such that **a-b+c=0** **(2mks)**

c) An electron in a cathode ray tube (CRT) accelerates from 2.00x10^4m/s to 6.00x10^6m/s over 1.50 cm.

   (i) How long does the electron take to travel this 1.50 cm? **(2mks)**

   (ii) What is its acceleration? **(2mks)**

d) AM and FM radio waves are transverse waves that consist of electric and magnetic disturbances. They travel at the speed of light 3.0 x 10^8 m/s. A radio station broadcast on AM frequency of 1230 kHz and on FM of 91.9 MHz. Find the distance between adjacent crests in each wave. **(4mks)**

QUESTION TWO (12 Marks)

a) Distinguish between a basic physical quantity and a derived quantity **(2mks)**

b) A cart is pulled along at angle of 30°along the floor to a distance of 20 m in 30 s with a force of 750 N. Find the Power in Watt and horsepower. **(3mks)**

c) A stone is dropped from rest from the top of a tall building. Calculate the vertical displacement of the stone after 3.0s of free fall.**(2mks)**

d) Sketch a Displacement-Time graph for a body moving with

   (i) Constant velocity

   (ii) Zero velocity **(2mks)**

e) An aluminum stick of length 1.5 m is cooled from 20^0 C to -180^0 C. Find the final length if its coefficient of linear expansion is 2.3×10^{-6}/K? **(3mks)**

SECTION B:

QUESTION THREE (12 Marks)

(a) Differentiate between stress and strain **(2 mks)**

(b) A rod 4.0 m long and 12.0cm^2 in cross-sectional area is stretched 0.20 cm under a tension of 4.8 X 10^3N. Calculate;

(i) Stress and strain **(4mks)**

(ii)Young's modulus **(2mks)**

(c) Statethe equation of continuity **(2mks)**

(d) A neurysm is an abnormal enlargement of a blood vessel such as the aorta. Suppose the cross-sectional area A_1 of the aorta increases to a value $A_2 = 1.7A_1$. The speed of blood through the normal portion of the aorta is $\upsilon_1 = 0.4$ m/s. Determine the speed of the blood in the enlarged **(2mks)**

QUESTION FOUR (12 Marks)

a) Differentiate between the following terms

(i) Heat and temperature

(ii) Conduction and Convection. **(4 mks)**

b) Given that mercury in glass thermometer has a mercury thread of length 2cm and 10cm at ice and steam points respectively. Calculate the temperature at a length of 6cm in:

(i) degrees celcius

(ii) degrees Fahrenheit **(3 mks)**

c) Give the meaning of the following terms as used in thermodynamics:

(i) Thermodynamic system

(ii) Thermodynamic process **(2 mks)**

d) Calculate the energy released when 1.5 kg of water at 18 °C cools to 0 °C and then freezes to form ice, also at 0 °C. **(3 mks)**

QUESTION FIVE (12 Marks)

(a) State Hooke's law **(1mk)**

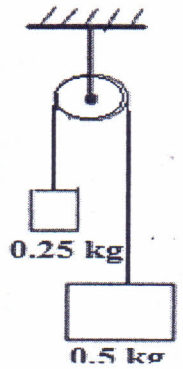
(b)A 0.12kg mass attached to a spring oscillates with amplitude A=0.075m and a maximum speed of 0.524m/s. Find;

(i) The spring constant **(2mks)**

(ii) The period **(2mks)**

(iii) The maximum acceleration **(2mks)**

(c) Two masses of 0.5 Kg and 0.25 Kg are connected by a light inextensible string, which passes over a smooth pulley as shown.



If the system is released from rest with the string taut, determine:

(i) The acceleration of the system **(2mks)**
(ii) The tension in the string **(2mks)**
(iii) The distance travelled in 0.5 s. **(1mk)**

QUESTION SIX (12 Marks)

(a) Distinguish between longitudinal and transverse waves giving an example of each **(4mks)**

(b) A harmonic wave propagating in the +x direction has amplitude A. Write the equation for the wave in terms of the wave number k and angular frequency ω. **(1mk)**

(c) The displacement of molecules in a sound wave travelling is given by $y(x,t) = 7 \times 10^{-8} sin(5.3x - 1800t)$ for x and y in metres and t in seconds.

i. Find the wavelength and the frequency of the wave. **(2mks)**
ii. Determine the maximum displacement of any molecule from its equilibrium position. **(1mk)**
iii. Find the speed of the wave. **(2mks)**

(d) State two applications of ultrasound **(2mks)**

QUESTION SEVEN (12 Marks)

(a) State the thin lens equation, defining each and every symbol used **(2mk)**

(b) A ray of light strikes a flat, 2.00 cm thick block of glass (n = 1.50) at an angle of 30° with respect to the normal.

(i) Find the angle of refraction at the top surface. **(3mks)**

(ii) Find the angle of incidence at the bottom surface and the refracted angle at this surface. **(3mks)**

(c). Identify any four fundamental components of NMR apparatus **(4mks)**

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