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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATION

For examiner's Use Only

Question	I.E	E.E
CAT		
EXAM		
TOTAL		

FOR THE DEGREE OF BACHELOR OF SCIENCE IN MICROBIOLOGY

SCHOOL: SCIENCE

COURSE CODE: PHY 105

COURSE TITLE: PHYSICS FOR LIFE SCIENCES

DATE: 14th December, 2017 **TIME:** 2.00pm-5.00pm

INSTRUCTION TO CANDIDATES: SEE INSIDE

THIS PAPER CONSISTS OF 22 PRINTED PAGES **PLEASE TURN OVER**

Insert the numbers of the questions you have answered in the order done

Student Admission No.....Exam Card No.....Signature.....

INSTRUCTIONS TO CANDIDATES

1. Write your **Admission Number**, **Exam Card Number** and **Sign** in the spaces provided at the bottom of each page of the Examination Booklet. DO NOT write your name anywhere in this booklet.
2. Write on both sides of the pages.
3. All rough work must be done in the Answer sheets and crossed through.
4. If supplementary pages are used, they must be fastened all together at the end of this Booklet. Supplementary pages should be used only after all the leaves in the booklet have been exhausted.
5. It is a serious examination offence to cheat or to have unauthorized materials including **MOBILE PHONES** (whether on or off) in the examination venue.
6. In no circumstances must Answer Booklet used or unused, be removed from the examination room by a candidate.
7. The Booklet is for **Examination use only** in a designated examination room. Unauthorized possession of the Answer sheets by a student or any other person constitutes an examination irregularity calling for stiff disciplinary action.
8. Do not pluck any page from this Booklet. Any extra/unused answer sheets should be returned to the **Examination Office.**
9. Candidates who come to examination room 30 minutes late will not be allowed to sit for the exam.
10. Candidates will not be allowed to leave the exam room once the exam commences.
11. Candidates are advised that importance is attached by examiners to accuracy and clarity of expression.
12. Committing any form of irregularity is prohibited and shall attract severe disciplinary action in accordance with Alupe University College Examination Regulations.

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INSTRUCTIONS TO CANDIDATES

Answer **QUESTION ONE and TWO** and **ANY OTHER THREE** questions.

Each QUESTION carries 12 marks.

You may need: 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}$, specific heat capacity of water=4200 J $kg^{-1}K^{-1}$, latent heat of fusion water= 330000 J/Kg

QUESTION ONE

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

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)**

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SECTION B: Answer any three questions in this section

QUESTION THREE

(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^{3}N. Calculate;

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

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

(c) State the equation of continuity **(2mks)**

(d) Aneurysm 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

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 Celsius

(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

(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)**

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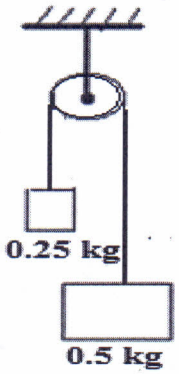
(c) Two masses of 0.5 Kg and 0.25 Kg are connected by a light inextensible string, which passes over a smooth pulley as shown.



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

(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

(a) The temperature of an ideal gas is a measure of the average kinetic energy of the molecules of the gas. Explain why the **average** kinetic energy is specified **(1 mk)**
(b) A gas is heated and allowed to expand doing some work equal to $1.01X10^5$J. If $3X10^5$J of heat is used to expand the gas. What is the change in internal energy of the gas. **(2mks)**
(c) Show that the work done by an ideal gas during an isothermal process is given by **(5 mks)**
(d) A quantity of an ideal gas at 10^0C and a pressure of 10KPa occupy a volume $2.5m^3$.
(i) How many moles of the gas are present in this volume of the gas **(2 mks)**
(ii) If the temperature is now raised to 30^0C and pressure raised 300KPa, how much volume will the gas now occupy **(2 mks)**

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