



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF HEALTH**  
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN:**  
**PUBLIC HEALTH**  
**2018/2019 EXAMINATION**  
**KISUMU/MAIN**

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**COURSE CODE: HPD 3121**

**COURSE TITLE: PHYSICS FOR ENVIROMENTAL HEALTH**

**DATE: EXAM SESSION:**

**TIME: 2:00HRS**

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**Instructions:**

- 1. Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

(Planks constant  $h = 6.63 \times 10^{-34} \text{ js}$ , charge of an electron,  $e = 1.6 \times 10^{-19} \text{ C}$  and velocity of light  $c = 3.0 \times 10^8 \text{ ms}^{-1}$ ) Take  $h = 6.63 \times 10^{-34} \text{ js}$ ,  $m_e = 9.1$

**SECTION A**

## QUESTION ONE

- a) Define the following terms
- Viscosity
  - Elasticity
  - Entropy
  - Thermal equilibrium
- (4 marks)
- b) Given that  $\vec{A} = A_1\mathbf{i} + A_2\mathbf{j} + A_3\mathbf{k}$  and
- $$\vec{B} = B_1\mathbf{i} + B_2\mathbf{j} + B_3\mathbf{k}$$
- Prove that  $\vec{A} \times \vec{B} = \begin{pmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ A_1 & A_2 & A_3 \\ B_1 & B_2 & B_3 \end{pmatrix}$
- (4 marks)
- c) A turntable rotates at a rate of 45 rev/min. what is its regular velocity in  $\text{rads}^{-1}$
- (4 marks)
- d) List three properties of X- rays.
- (3 marks)
- e) With an aid of a diagram, explain two types of eye defects and how they can be corrected
- (4 marks)
- f) State the continuum assumption for fluid flow.
- (2 marks)
- g) Derive an expression for the terminal speed  $V$  of a sphere falling in a viscous fluid in terms of spheres radius  $r$  and density  $\rho$  and the fluid viscosity  $\mu$ , assuming that the flow is laminar.
- (5 marks)
- h) An X-ray tube has an accelerating potential difference of 100kv, what is the shortest wavelength in its X-ray beam?
- (3 marks)
- i) Distinguish between Ferromagnetic and paramagnetic materials.
- (2 marks)

## QUESTION TWO

- a) Demonstrate two methods of getting the cross product of vectors a and b with the vectors components;

$$\vec{a} = (2, 3, 4)$$

$$\vec{b} = (5, 6, 7)$$

Find  $\vec{a} \times \vec{b}$  **(6 marks)**

Find the angle between them **(6 marks)**

- b) State the three Newton's laws of motion **(3 marks)**

- c) A body moves 30cm due east in 2 seconds then 40cm due north in 4 seconds. Determine;

i. The displacement of the body **(2 marks)**

ii. The velocity and the direction of the velocity of the body **(3 marks)**

### QUESTION THREE

- a) With the aid of a diagram explain how cathode rays are produced in the cathode ray tube giving details on how the following components works
- i. The electron gun
  - ii. The grid
  - iii. Reflecting system
  - iv. Screen
- (8 marks)**
- b) State and explain any three applications of ultrasonic waves. **(6 marks)**
- c) The surface of a furnace is at 1500°C, how much heat is radiated by 2.0 m<sup>2</sup> of this furnace in one hour? Assuming it to be a black body ( $\alpha = 5.7 \times 10^{-8} \text{ w/m}^2/\text{k}$ ) **(3 marks)**
- d) A race car accelerates uniformly from 18.5m/s to 46.1m/s in 2.47 seconds. Determine the acceleration of the car and the distance travelled. **(3 marks)**

#### QUESTION FOUR

- a) Discuss how the following electric appliances apply the heating effect in the operation
- i. Electric bulb
  - ii. Electric iron
  - iii. Electric heater
- (9 marks)**
- b) State three applications of transistors
- (3 marks)**
- c) Arrange the electromagnetic waves according to their wavelengths
- (6 marks)**
- d) If a sound becomes louder, which wave characteristic is likely increasing – frequency, wavelength, amplitude, or speed?
- (2 marks)**

### QUESTION FIVE

- a) With the aid of a well labeled diagram;
- i.** Explain the production of X-rays **(8 marks)**
  - ii.** State one use of X-rays and one danger it can cause to our lives. **(2 marks)**
- b) Discuss five applications of radioactivity **(10 marks)**