



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF HEALTH
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN:
PUBLIC HEALTH
SPECIAL EXAMINATIONS NOV. 2020

COURSE CODE: HPD 3121

COURSE TITLE: Physics for Environmental Health

DATE:

EXAM SESSION:

TIME: 2:00HRS

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
- i. Impulse
 - ii. Viscosity
 - iii. Elastic limit
 - iv. Thermal equilibrium **(4 marks)**
- b) A bullet leaves a rifle with a muzzle velocity of 521m/s. While accelerating through the barrel of the rifle, the bullet moves a distance of 0.840m. Determine the acceleration of the bullet (assume a uniform acceleration) **(3 marks)**
- c) Find the cross product of the two vectors
- $$\begin{aligned}\vec{A} &= 2\mathbf{i} + 3\mathbf{j} + \mathbf{k} \\ \vec{B} &= -4\mathbf{i} + 2\mathbf{j} - \mathbf{k}\end{aligned}$$
- (4 marks)**
- d) State the three conservation principles considered when deriving equations of ideal fluids **(3 marks)**
- a) With an aid of a diagram, explain two types of eye defects and how they can be corrected **(4 marks)**
- b) State the continuum assumption for fluid flow. **(2 marks)**
- c) Derive an expression for the terminal speed V of a sphere falling in a viscous fluid in terms of spheres radius r and density ρ and the fluid viscosity μ , assuming that the flow is laminar. **(5 marks)**
- d) An X-ray tube has an accelerating potential difference of 100kv, what is the shortest wavelength in its X-ray beam? **(3 marks)**
- e) Distinguish between Ferromagnetic and paramagnetic materials. **(2 marks)**

QUESTION TWO

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

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

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

Find $\vec{a} \times \vec{b}$

(6 marks)

- b) (i) A car starts from rest and accelerates uniformly over a time of 5.21 sec for a distance of 110m. Determine the acceleration of the car

(3 marks)

(ii) Determine the centripetal force acting upon a 40-kg child who makes 10 revolutions around the Cliffhanger in 29.3 seconds. The radius of the barrel is 2.90 metres

(3 marks)

- c) Discuss 4 applications of radioactivity

(8 marks)

QUESTION THREE

- a) Discuss three modes of heat transfer **(6 marks)**
- b) Find the final temperature if a heater source rated 42W heats 50g of water from 20°C in five minutes. **(8 marks)**
- c) (i) An engineer is designing the runway of an airport, the lowest acceleration rate is likely to be 3m/s^2 the take off speed for this plane will be 65m/s. assuming this minimum acceleration, what is the minimum allowed length for the runway? **(3 marks)**
- (ii) The observation deck of tall skyscraper 370m above the street. Determine the time required for the penny to free fall from the deck to the street below? **(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 three applications of ultrasonic sound **(6 marks)**
- c) State four factors affecting sound velocity **(4marks)**