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UNIVERSITY EXAMINATIONS 2024/2025

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN PUBLIC HEALTH

HPP 3112: PHYSICS FOR HEALTH SCIENCES

DATE: JANUARY 2025

TIME: 2 HOURS

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

QUESTION ONE (30 MARKS)

- a) Define the following terms. [3 Marks]
- Photoelectric effect
 - Polarization
 - Electromagnetic spectrum
 - Radioactivity
 - Inertia
 - Electric field
- b) How is presbyopia eye defect corrected? [1 Mark]
- c) State any three limitations of dimensional analysis [3 Marks]
- d) Distinguish between direct and alternating currents. [1 Mark]
- e) Define cathode ray oscilloscope and state any two of its uses. [3 Marks]
- f) Distinguish between soft and hard magnetic materials giving an example in each case? [2 Marks]
- g) Briefly discuss α , β , and γ radiations. [3 Marks]
- h) What are the three factors that determine the degree of blackening of radiographic film in radiology? [3 Marks]
- i) State any two assumptions of kinetic theory of ideal gases. [2 Marks]

- j) If the temperature of a monatomic gas changes by ΔT , show that its specific heat capacity at constant volume is $12.5 \text{ J. mol}^{-1} \text{ K}^{-1}$. [2 Marks]
- k) State the two postulates of Bohr model. [2 Marks]
- l) Can carbon-14 dating be used to measure the age of a stone? Why? [2 Marks]
- m) Why does the picture on a television screen become distorted when a magnet is brought near the screen? (You should not do this at home on a color television set, because it may permanently affect the television picture quality.) [2 Marks]
- n) Write down the Bernoulli's equation and define all the terms involved. [1 Mark]

QUESTION TWO (20 MARKS)

- a) Define the following terms. [4 Marks]
- i. Light
 - ii. Refractive index
 - iii. Sound
 - iv. Conservative force
- b) State any three characteristics of images formed by plane mirrors. [3 Marks]
- c) State the Newton's first law of motion. [1 Mark]
- d) State any three characteristics of an ideal fluid. [3 Marks]
- e) Distinguish between longitudinal and transverse waves. [2 Marks]
- f) A 77 kg diver drops from a board 10 m above the water surface. Use conservation of mechanical energy to find his speed 5 m above the water surface. [2.5 Marks]
- g) A 70 kg man normally uses about 10^7 Joules per day. The exact amount depends on his physical activity. Find his metabolic rate. [1.5 Marks]
- h) The heels on a pair of woman's shoes have radii of 0.5 cm at the bottom. If 30 % of the weight of a 50 kg woman is supported by each heel, find the stress on each heel. [3 Marks]

QUESTION THREE (20 MARKS)

- a) Define the following terms. [3 Marks]
- i. Half - life
 - ii. Frequency

iii. Capacitance

- b) State any three reasons why the X — ray tube is made of tungsten metal. [3 Marks]
- c) List the three categories of potential energy. [3 Marks]
- d) Distinguish between accuracy and precision as used in measurements. [2 Marks]
- e) What fraction of a radioactive sample has decayed after two half-lives have elapsed? [3 Marks]
- f) Calculate the energy of a photon having a wavelength in the X - ray range, 5 nm. [3 Marks]
- g) A particular nearsighted person cannot see objects clearly when they are beyond 50 cm (the far point of the eye). What focal length should the prescribed lens have to correct this problem? Find the power of the lens. [3 Marks]

QUESTION FOUR (20 MARKS)

- a) List down the three states of matter. [3 Marks]
- b) Distinguish between a conductor and an insulator. [2 Marks]
- c) With the help of a diagram, illustrate how a rainbow is formed. [4 Marks]
- d) What is an inductor? [1 Mark]
- e) Describe the occurrence of total internal reflection bringing out the necessary conditions. [5 Marks]
- f) Distinguish between constructive and destructive interference of two waves. [2 Marks]
- g) Find the speed of sound in water, which has a bulk modulus of about 2.1×10^9 Pa and a density of about 10^3 kg/m^3 . [3 Marks]