



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
UNIVERSITY EXAMINATION FOR DIPLOMA IN BUILDING AND ENGINEERING
1ST YEAR 2ND SEMESTER 2016/2017 ACADEMIC YEAR
MAIN
REGULAR

COURSE CODE: SPH 2121

COURSE TITLE: PHYSICS II

EXAM VENUE:

STREAM: ENGINEERING

DATE:

EXAM SESSION:

TIME: 2:00 HRS

Instructions:

- 1. Answer question 1 (Compulsory) and ANY other 2 questions.**
- 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.**

Useful constants: Speed of light in air $c = 3.0 \times 10^8 \text{ ms}^{-1}$

SECTION A

QUESTION 1(30 MARKS)

- (a) Explain the nature and propagation of light. **(3 marks)**
- (b) Define the following terms.
- (i) Wavelength **(1 mark)**
 - (ii) Frequency **(1 mark)**
 - (iii) Convex mirror **(1 mark)**
- (c) Distinguish between the nature of focal length of a concave mirror and focal length of a convex mirror. **(1 mark)**
- (d) An object at the bottom of glass whose thickness is 3cm appears to be 2cm from the top side of the glass. Determine the velocity of light in glass. **(4 marks)**
- (e) State two types of lenses. **(2 marks)**
- (f) (i) Distinguish between the inverse square law and Lambert's cosine rule as used in photometry. **(2 marks)**
- (ii) Explain the application of photometry in building design. **(2 marks)**
- (g) (i) Explain the Doppler effect. **(2 marks)**
- (ii) A submarine (sub A) travels through water at a speed of 8ms^{-1} emitter a sound wave at a frequency of 1400Hz. The speed of sound in water is 1533ms^{-1} . A second submarine (sub B) is located such that the two submarines are travelling directly towards each other. The second submarine is moving at 9ms^{-1} . Determine the frequency detected by an observer riding on sub as the subs approach each other. **(3 marks)**
- (h) State the difference between intensity and loudness of sound. **(2 marks)**

(i) Charge of 3000 coulombs flows through a wire in 5 minutes. Calculate the electric current.

(2 marks)

(j) Define electric potential difference.

(1 mark)

(k) Calculate the value of a multiplier that can be used to convert 5mA milliammeter into a 10v voltmeter given that the resistance of its coil is 20Ω .

(3 marks)

SECTION B

Answer any TWO questions in this section

QUESTION 2(20 MARKS)

(a) Explain the light spectrum.

(4 marks)

(b) State the laws of reflection of light.

(2 marks)

(c) An object is placed 10cm in front of a concave mirror of focal length 15cm. Find the image position, magnification and characteristics.

(10 marks)

(d) By giving a reason in each case, state the use of concave and convex mirrors. **(4 marks)**

QUESTION 3 (20 MARKS)

(a) A light ray of wavelength 58nm traveling through air is incident on a smooth, flat slab of crown glass at an angle of 30° to the normal. Given that the refractive index of glass is 1.52.

(i) Determine the angle of refraction.

(4 marks)

(ii) Find the speed of light once it enters the glass.

(3 marks)

(iii) Calculate the wavelength of light in glass.

(3 marks)

(b) By constructing a ray diagram, determine the characteristics of the image formed by a concave mirror of radius of curvature 6 cm for an object placed 4 cm from the mirror. **(7 marks)**

(c) State three uses of lenses.

(3 marks)

QUESTION 4 (20 MARKS)

(a) Explain three types of sound.

(6 marks)

(b) Show that the fundamental frequency of a vibrating string is given by

$$f_1 = \frac{1}{2L} \sqrt{\frac{T}{\mu}}$$
 where the symbols have their usual meanings.

(10marks)

(c) Explain the importance of studying the acoustic properties of building materials. **(4 marks)**

QUESTION 5 (20 MARKS)

(a) State Ohm's law.

(2 marks)

(b) The radius of a copper wire is 1.63 mm. A potential difference of 60 V is applied across a 20 m length of wire. Given the resistivity of the wire $= 1.7 \times 10^{-8} \Omega m$, find

(i) its resistance.

(3 marks)

(ii) the current through the wire

(3 marks)

(c) (i) Derive the three alternative expressions for electric power.

(6 marks)

(ii) An electric heater is constructed by applying a potential difference of 120v across a nichrome wire that has a total resistance of 8.00Ω . Find the current carried by the wire and the power rating of the heater.

(6 marks)