الجامعة الوطنية
National University
كلية عمان البحرية الدولية
International Maritime College Oman

Final Exam
DPHYS-II: PHYSICS 2
Spring 2025

Points of attention:

- For each question, the maximum earned points are specified in the question.
- Write clearly! Answers that are not readable are not marked and don't earn marks!
- All answers should be written in English using **blue or black pens** only.
- Use the pencil only for diagrams and graphs.
- Show all the calculation steps in the given space.
- When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

Exam Duration: 2 hours
Instructor's Name: JAHANZEB KHAN BAHADUR
Exam Date: 23/06/2025
Program: DO

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Student Information			
Name:		ID:	
Signature:			

Invigilator			
Initials:		☐ Student ID checked	
Time received:			

Question 1 **[5 marks]**

MCQ questions – Each question carries ½ mark.

(i) Select the correct statement:

(a) If light rays enter from rare to denser it moves away from the normal and the velocity of light in denser medium will increase.
(b) If light rays enter from rare to denser it moves towards the normal and the velocity of light in denser medium will increase.
(c) If light ray travel from denser to rare it moves away from the normal and the velocity of light in rare medium will increase.
(d) If light ray travel from denser to rare it moves towards the normal and the velocity of light in rare medium will increase.

(ii) waves in which the particle of medium vibrates perpendicular to the direction in which the wave travels are called

(a) Transvers wave. (b) Longitudinal wave
(c) Mechanical wave (d) Electromagnetic wave

(iii) Select the correct statement:

(a) When waves move from deep water to shallow water the velocity and wavelength increase but frequency remains the same.
(b) When waves are moving from shallow water to deep water the velocity and wavelength of the waves will increase but frequency will remain same.
(c) When waves are moving from shallow water to deep water the velocity and frequency of the waves increases but wavelength remain the same.
(d) When waves are moving from deep water to shallow water the frequency and wavelength of the wave increases but the velocity remains the same.

(iv) To hear an echo, the minimum distance between the person and the obstacle must be

(a) 34 meter (b) 34 m and above
(c) 17 m (d) less than 17 m

(v) Direction of magnetic field around a current carrying conductor can be determined by

(a) Faraday's Law (b) Maxwell's Right Hand Rule
(c) Fleming's Left Hand Rule (d) Lenz's Law

(vi) If we place a current carrying coil inside the uniform magnetic field in perpendicular direction:

(a) The magnetic field will produce and induce emf in the coil.
(b) The magnetic field will produce a turning effect in the coil.
(c) The magnetic field will produce self induction in the coil.
(d) The magnetic field will produce mutual induction in the coil.

(vii) The working principle of AC and DC generator is

(a) Lenz's Law (b) Maxwell's Right Hand Rule
(c) Pascal's Principle (d) Faraday's Law

(viii) The working principle of Step-up and Step-down Transformer is

(a) Self Induction (bi) Mutual Induction
(c) Maxwell's Rule (d) Fleming's Rule

(ix) Select the correct statement for step-up transformers:

(a) $N_s > N_p \; and \; V_s < V_p$
(b) $N_s > N_p \; and \; V_s > V_p$
(c) $N_s < N_p \; and \; V_s > V_p$
(d) $N_s < N_p \; and \; V_s > V_p$

(x) An ideal step-up transformer attached with a DC source of 24 volt. If the number of turns in primary coil is 120 and the number of turns in secondary coil is 1200, the output secondary voltage will be

(a) 240 volt (b) 2.4 volt
(c) zero volt (d) 6 volt

Question 2 **[7 marks]**

(a) Define pressure and write all units used to express the pressure. (2 marks)

(b) The steam pressure in high pressure boilers is about 6×10^6 N/m^2. Express this pressure into kilo pascal (kPa) and in bar (1 mark)

(c) Sea water and light diesel are placed in two different steel tanks. The level of liquids in both tanks is same as 8 m. The density of given liquids is 1.03 g/cm^3 and 0.88 g/cm^{3,} respectively. Calculate the total pressure at the bottom of each tank. (4 marks)

Question 3 **[8 marks]**

(a) Define refraction of light. Draw a ray diagram and discuss the effect of light ray from rare to denser and denser to rare medium. (3 marks)

(b) Explain total internal reflection with the help of the ray diagram also discuss the conditions for total internal reflection. (3 marks)

(c) An ultrasonic signal sent to the submarine under the water. The speed of signal in air = 1580 m/s what will be the speed in the sea water if the refractive index of sea water 1.37? (2 marks)

Question 4 **[10 marks]**

(a) Discuss wave motion and differentiate between mechanical waves and electromagnetic waves with their examples. (4 marks)

(b) Draw a transverse wave and clearly indicate the following terminology over the wave (2 marks)

(i) Crest (ii) Trough (iii) Wavelength (iv) Wave height

(4 marks)

(c) A plane waves entering from a region of deep water into a region of shallow water. The waves have a speed of 0.46 m/s in deep water. Wave crests are 260 cm apart in deep water. If the velocity of the wave in shallow water is 0.33m/s then calculate the wavelength in the shallow water.

Question 5 **[10 marks]**

(a) Define sound and differentiate infrasonic, audible and ultrasonic sounds according to their frequencies. (4 marks)

(b) Ultrasonic waves are particularly useful for undersea communication and detection systems. Why are other waves not applicable even if their velocity is more than the ultrasonic pulses? (2 marks)

(c) The speed of sound in the air at normal temperature is 1236 km/h. If the wavelength of the sound is 450 mm calculate the frequency of the sound. (4 marks)

Formula Sheet

Pressure on the surface area: $P = \frac{F}{A}$

Pressure due to liquids: $P = \rho \times g \times h$

Absolute pressure = gauge pressure + Atmospheric Pressure

Refractive index $(\eta) = \frac{Sin\angle i}{Sin\angle r}$ (for rare to denser)

Refractive index $(\eta) = \frac{Sin\angle r}{Sin\angle i}$ (for denser to rare)

$$n = \frac{Speed\ of\ light\ in\ air}{Speed\ of\ \ light\ \ in\ medium}$$

Velocity of the waves $v = f \times \lambda$
(Speed of laser light, electromagnetic waves = speed of the light)