

Final Exam
DPHYS – II: PHYSICS – 2
Spring 2026

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 &
RANJITH VASUDEVAN
Exam Date: 12/05/2026
Program: DO

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Student Information

Name:

ID:

Signature:

Invigilator

Initials:

Time received:

☐ Student ID checked

Question 1**[05 marks]**

Circle the correct answer/ Fill in the blank/ True or False wherever required for each question given below:

- (i) In the normal human ear, the sensation of sound persists for a duration of _____. (1/2 mark)
(a) 0.01 seconds (b) 0.1 minute
(c) 0.1 seconds (d) 0.01 minute
- (ii) Effect of magnetic field on a current carrying conductor inside the uniform magnetic field can be determined by (1/2 mark)
(a) Faraday's Law (b) Maxwell's Right Hand Rule
(c) Fleming's Left Hand Rule (d) Lenz's Law
- (iii) The wavelength of AM radio wave with frequency 770 kHz is _____. (1/2 mark)
- (iv) If we place a current carrying conductor inside the uniform magnetic field in parallel direction: (1/2 mark)
(a) The magnetic field will produce induced emf in the conductor.
(b) The magnetic field will produce a turning effect on the conductor.
(c) The current carrying conductor will remain static.
(d) Magnetic field will exert a force on current carrying conductor.
- (v) The working principle of fiber optic is: (1/2 mark)
(a) Interference (b) total internal refraction
(c) total internal reflection (d) total internal diffraction
- (vi) The threshold frequency for human ear is _____. (1/2 mark)
(a) 20 kHz (b) 20 Hz
(c) Between 10Hz to 20 Hz (d) Above 20kHz

- (vii) Direction of magnetic field around the current carrying conductor can be determined by, (1/2 mark)
- (a) Faraday's Law (b) Maxwell's Right Hand Rule
(c) Fleming's Left Hand Rule (d) Lenz's Law
- (viii) Select the correct statement: (1/2 mark)
- (a) Radio Waves are used in RADAR and can travel with speed of light and refracted from the object.
(b) Radio Waves are used in RADAR and can travel at speed of light and reflect from the object.
(c) Radio Waves are used in RADAR and can travel at speed of light and product interference after reflection from the object.
(d) Radio Waves are used in RADAR and can travel at speed of light and diffracted from the object.
- (ix) The speed of ultrasonic signals in air is 1540 m/s. If the refractive index of sea water is 1.39 the speed in the sea water will be _____. (1/2 mark)
- (a) 10.17 m/s (b) 2140 m/s
(c) 1107.9 m/s (d) 11.07 m/s
- (x) Select the correct statement: (1/2 mark)
- (a) If the waves are traveling from shallow water to deep water the frequency will decrease by wavelength and velocity will remain same.
(b) If the waves are traveling from shallow water to deep water the frequency will remain same by wavelength and velocity will increase.
(c) If the waves are traveling from shallow water to deep water the frequency will remain same by wavelength and velocity will decrease.
(d) If the waves are traveling from shallow water to deep water the frequency and velocity will remain same by wavelength will decrease.

Question 2**[9 marks]**

- (a) Define pressure. Differentiate between gauge pressure and absolute pressure with suitable examples.

(3 marks)

- (b) Calculate the absolute pressure exerted by a force of 50kN on a surface area of 3 cm². Express your answer in bar.

(3 marks)

(c) A cylindrical shaped oil storage tank has an area of 8 m^2 . The depth of oil in the tank is 10m. The oil has a density of 0.87 g/cm^3 .

(i) Calculate the pressure exerted by the oil at the base of the tank. (1.5 marks)

(ii) By using the answer of part (i) estimate the weight of the oil inside the tank. (1.5 marks)

Question 3**[9 marks]**

- (a) State Pascal's Principle and explain its application in a hydraulic brake system with the help of a clearly labelled diagram.

(4 marks)

- (b) In a hydraulic brake system, the cross-sectional area of master piston is 2.8 cm^2 . A force of 120 N is applied to the master piston.

The space between the force piston and the slave pistons is filled with incompressible fluid. The area of each slave piston is 4.8 cm^2 .

- (i) The cross-sectional area of each slave piston is 4.8 cm^2 . Calculate the force exerted to the brake shoes by both slave pistons.

(2.5 marks)

- (ii) Compare the force applied at the master piston with the force developed at the slave piston. Explain the reason for the difference between these forces. (1.5 marks)

- (iii) Due to some leakage in pistons seals some air entered in the brake fluid. State the effect of air bubbles in hydraulic brake system. (1 mark)

Question 4**[9 marks]**

- (a) Discuss wave motion and differentiate between longitudinal waves and transverse waves with their examples. (3 marks)

(b) Draw a wave pattern of transverse wave with frequency 6.5 Hz and represent the following terminology over the wave. (3 marks)

- (i) Crest (ii) Amplitude (iii) wavelength (iv) time period

(c) In a ripple tank the waves are travelling at a speed of 30 cm/s and the wavelength is 8 cm. As they are passing into the region of shallow water by placing a concrete block inside the ripple tank, it has been observed that the wavelength will decrease to 5 cm.

(i) Calculate the original frequency of the waves. (1.5 marks)

(ii) Calculate the speed of the wave in shallow water. (1.5 marks)

Question 5**[9 marks]**

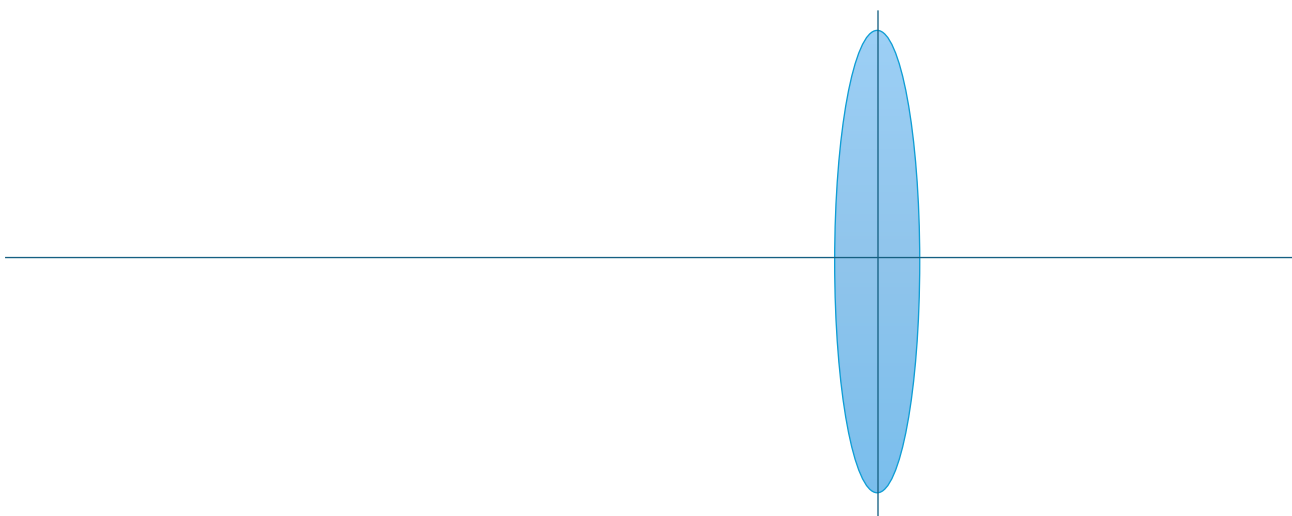
- (a) Write two fundamental conditions for total internal reflection and explain Total internal reflection with ray diagram. (3 marks)

- (b) A signal of laser light is travelling from air to a glass slab at an angle of 43° .
The angle of refraction inside the glass is observed as 23° .

- (i) Calculate the refractive index of glass used in this experiment. (2 marks)

- (ii) Estimate the speed of laser light inside the glass. (2 marks)

- (c) Draw the ray diagram for image formation when object is placed (2 marks)
between principle focus and optical centre in front of a convex lens.



Question 6**[9 marks]**

- (a) Discuss the magnetic field produced by the current carrying conductor and write all the factors upon which the strength of magnetic field depends.

(3 marks)

- (b) State and explain Maxwell's Right Hand Rule.

(2 marks)

- (c) Draw a neat, labelled diagram of a DC motor, explain its working principle, (4 marks)
and discuss the factors affecting the speed of the motor.

Formula Sheet

1. Pressure on the surface area: $P = \frac{F}{A}$
2. Pressure due to liquids: $P = \rho \times g \times h$
3. Refractive index with reference to direction is given by;

$$(\eta) = \frac{\sin \angle i}{\sin \angle r} \qquad (\eta) = \frac{\sin \angle r}{\sin \angle i}$$
4. Refractive index with reference to speed of light in different mediums

$$n = \frac{\text{Speed of light in air}}{\text{Speed of light in medium}}$$
5. Velocity of the waves $v = f \times \lambda$
6. (Speed of laser light, all electromagnetic waves = speed of the light)

CONVERSION OF PHYSICAL QUANTITIES

Conversion of Length		Conversion of Mass		Conversion of Time	
1 km	10^3 m	1 Kg	10^3 g	1 year	365 days
1 m	10^{-3} km	1 g	10^{-3} Kg	1 month	30 days
1 m	10^2 cm			1 day	24 hours
1 cm	10^{-2} m	1 g	10^3 mg	1 hour	60 minutes
1 m	10^3 mm	1 mg	10^{-3} g	1 minute	60 seconds
1 m	$10^6 \mu\text{m}$	1 Kg	10^6 mg	1 second	10^3 ms
1 μm	10^{-6} m	1 mg	10^{-6} Kg	1 ms	10^{-3} seconds
1 nm	10^{-9} m	1 g	$10^6 \mu\text{g}$	1 second	$10^6 \mu\text{s}$
1 m	10^{12} pm	1 μg	10^{-6} g	1 μs	10^{-6} seconds
1 mile	1.60934 Km	1 Kg	$10^9 \mu\text{g}$	1 second	10^9 ns
1 Km	0.621371 miles	1 μg	10^{-9} Kg	1 ns	10^{-9} seconds
1 mile	0.868976 nautical miles	1 Tonne	10^3 Kg	1 second	10^{12} ps
1 nautical mile	1.852 Km	1 Kg	10^{-3} Tonne	1 ps	10^{-12} seconds
1 Km	0.5399 nautical mile				