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Department:	Physics	Examination Time:	120 min.
Year/Specialization:	First year / Science	Total Marks:	60 marks
Course Title:	General Physics	Number of Pages:	4 pages
Course Code:	Phys. 102	Academic Year/Semester:	2nd Term 2025-2026

Answer All the Following Questions

MULTI CHOICE QUESTIONS (28 marks, 60 minutes):

1. For all transparent material substances, the absolute refractive index is	a) less than 1.	b) greater than 1.
	c) equal to 1.	d) none of the previous answer.
2. Assume that a convex lens has a focal length of +20 cm. The optical power of the lens for an object placed at a distance of 7 cm is	a) 2.86 D	b) 7 D
	c) 140 D	d) 5 D
3. Lenses form images by of the light.	a) diffraction	b) refraction
	c) reflection	d) none of the previous answers
4. Light travels from air to a medium of refractive index n . If the angle of incidence is twice the angle of refraction, then the refractive angle will be [$\sin(2x) = 2\sin(x)\cos(x)$]	a) $\cos^{-1}(\frac{2}{n})$	b) $2\sin^{-1}(\frac{1}{n})$
	c) $2\cos^{-1}(\frac{1}{n})$	d) $\sin^{-1}(\frac{2}{n})$
5. When an object is placed in between the center of curvature and the focus of a converging mirror, the image magnification is	a) larger than 1.	b) tends to zero.
	c) equal to 1.	d) smaller than 1.
6. A ray of light travels from a denser medium to a rarer medium. If the angle of incidence is zero, the angle of reflection will be	a) equal to the angle of incidence.	b) equal to the angle of refraction.
	c) both a) and b) are correct.	d) none of the previous answers.
7. A light ray travels from an optically denser medium to an optically rarer one, if the angle of incidence and refraction at the point of incidence are θ_i and θ_r respectively, the angle of deviation in terms of θ_i and θ_r is	a) $\theta_i - \theta_r$	b) $\theta_i + \theta_r$
	c) $\theta_r - \theta_i$	d) $\theta_i + \theta_i$
8. The equation $f = \frac{p \cdot q}{q - p}$ is called	a) thin lens equation.	b) mirror equation.
	c) both a) and b) are correct.	d) none of the previous answer.

9. An object located at infinity from a concave mirror forms an image at	a) the focal point of the mirror.	b) the focal point of the lens.
	c) greater than the focal point of the mirror.	d) greater than the focal point of the lens.
10. The speed of light in media M_1 and M_2 is 1.8×10^8 and 2.4×10^8 , respectively, and the light ray enters from M_1 to M_2 . If the ray suffers total internal reflection, the value of the incidence angle will be	a) $= \sin^{-1}(\frac{2}{3})$	b) $> \sin^{-1}(\frac{4}{3})$
	c) $< \sin^{-1}(\frac{2}{3})$	d) $> \sin^{-1}(\frac{3}{4})$
11. If you have a spherical mirror that has a radius of curvature of +24 cm. The image position for an object located at a distance of 12 cm from the mirror will be at	a) zero.	b) infinity.
	c) +24 cm.	d) 12 cm.
12. The image formed by a plane mirror is always	a) virtual and upright.	b) real and inverted.
	c) real and erect.	d) virtual and inverted.
13. The equation $\frac{\sin \theta_1}{\sin \theta_2} = \frac{n_1}{n_2}$ is called	a) Snell's law.	b) reflection law.
	c) refraction law.	d) none of the previous answers.
14. If light travels in a medium of refractive index 1.75 through a distance of 200 m in a given time interval, then how much distance will it cover in a medium of refractive index 1.4 during this period?	a) 150 m	b) 200 m
	c) 400 m	d) 250 m
15. Two protons (p_1 and p_2) and an electron (e) lie on a straight line, as shown in the blow figure. The directions of the force of (P_1) on (e), the force of (P_2) on (e), and the total force on (e) are, respectively.		
	a) $\leftarrow, \rightarrow, \leftarrow$	b) $\leftarrow, \rightarrow, \rightarrow$
	c) $\rightarrow, \leftarrow, \leftarrow$	d) $\rightarrow, \leftarrow, \rightarrow$
16. The unit of the electric field is	a) N/C^2	b) N/C^2
	c) C/m^1	d) N/C
17. The unit of k_e is	a) N^2C^2	b) Nm^2/C^2
	c) N^2m^3/C^2	d) Nm/C
18. The amount of electric charge per unit area is called charge density.	a) linear	b) surface
	c) volume	d) natural
19. The electric field inside an insulating solid sphere of radius (a) has a uniform volume charge density ρ and carries a total charge (Q) is	(considering the radius of Gaussian surface is r).	
	a) $E = 0$	b) $E = k \frac{Q}{r^2}$
	c) $E = k \frac{Q}{r^2}$	d) $E = k \frac{Q}{r^3} a$

20. The total number of electric field lines passing through the normal surface area is the...	a) electric flux	b) potential
	c) work	d) permittivity
21. The electric field inside a conducting sphere of radius (a) has a uniform volume charge density ρ and carries a total charge (Q) is (considering the radius of Gaussian surface is r)	a) $E = 0$	b) $E = k \frac{Q}{a^2} r$
	c) $E = k \frac{Q}{r^2}$	d) $E = k \frac{Q}{r^2} a$
22. Work done by external force (equal and opposite to the electric force) to move a unit positive charge between two points is	a) potential energy difference	b) potential difference
	c) pressure	d) force
23. Work done by an external force (equal and opposite to the electric force) to move charge (+q) between two points in an electric field is	a) potential energy difference	b) potential difference
	c) pressure	d) force
24. A farad is the same as a	a) J/V	b) V/J
	c) V/C	d) C/V
25. The capacitance of a parallel-plate capacitor with plate area A and plate separation d is given by	a) $\epsilon_0 d/A$	b) $\epsilon_0 d/2A$
	c) $\epsilon_0 A/d$	d) $\epsilon_0 A/2d$
26. To charge a 1 F capacitor with 2 C requires a potential difference of	a) 2 V	b) 0.2 V
	c) 5 V	d) 0.5 V
27. A current of 5 A exists in a 20 Ω lamp. The applied potential difference is	a) 25 V	b) 100 V
	c) 4 V	d) 0.4 V
28. The magnetic force that acts on a charge q moving with a velocity v in a magnetic field B is:	a) $F_B = qv \cdot B$	b) $F_B = qv/B$
	c) $F_B = qv \times B$	d) $F_B = qvB$

TRUE OR FALSE STATEMENTS (14 marks, 20 minutes):

1. Dimensions describe the nature of a physical quantity in terms of base quantities.	()
2. Units describe the type of a physical quantity, while dimensions express it numerically.	()
3. Elasticity is the property of a material that allows it to return to its original shape after the force is removed.	()
4. Plastic deformation is temporary and disappears when the force is removed.	()
5. Hooke's Law states that force is directly proportional to extension within the elastic limit.	()

6. Pascal's law states that pressure applied to an enclosed fluid is transmitted equally throughout the fluid.	()
7. Bernoulli's equation relates pressure, kinetic energy, and potential energy.	()
8. Latent heat causes a temperature change during a phase change.	()
9. Water requires less energy than copper to raise the temperature of 1 kg by 1°C.	()
10. Two objects in thermal contact always exchange energy, even if they have the same temperature.	()
11. The Zeroth Law of Thermodynamics is known as the law of equilibrium.	()
12. One calorie is equal to 4.184 joules.	()
13. During a phase change, heat can be added without changing the temperature.	()
14. The Kelvin temperature scale can have negative temperatures.	()

Essay Questions:

(18 marks, 40 minutes)

Q₁: Discuss the six ray diagrams for the converging mirrors. (6 marks)

Q₂: An electron and a proton are at a distance of 10^{-9} m from each other in a free space. Calculate the electric force between them ($K_e = 9 \times 10^9$, $e = 1.6 \times 10^{-19}$). (3 Marks)

Q₃: A parallel plate air filled capacitor having area 0.4 m^2 and plate spacing 10^{-3} m is charged to a potential difference of 600 V. Find (a) the capacitance (b) the magnitude of the charge of each plate (c) the stored energy. ($\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2/\text{Nm}^2$). (3 Marks)

Q₄: Find heat needed to melt 2 kg of ice at 0°C . (given: $L = 3.33 \times 10^5 \text{ J/kg}$) (3 Marks)

Q₅: A wire of length 5 m extends by 1 mm under stress $5 \times 10^7 \text{ N/m}^2$. Find Young's modulus? (3 Marks)

With our best regards

صلي علي النبي