DPYQ NEET Level Practice Test-5 for JEE Main & NEET Aspirants

Physics Galaxy — Telegram Test Series

Topic : EM WAVES, RAY & WAVE OPTICS **Time: 90Min** **Marking: +4 –1**

Section - A : All questions are compulsory MCQs

1. We know that radiation are emitted by the any living body. Which one of the following statements is true ?

(A) The radiation emitted is in the infrared region

(B) The radiation is emitted only during the day

(C) The radiation is emitted during the summers and absorbed during the winters

(D) The radiation emitted lies in the ultraviolet region and hence is not visible

2. The energy of the electromagnetic waves is of the order of 15 keV. To which part of the spectrum does it belong ?

(A) γ-rays (B) X-rays

(C) Infrared rays (D) Ultraviolet rays

3. The electric field associated with an electromagnetic wave in vacuum is given by $\vec{E} = \hat{i}\ 40\cos(kz - 18\times10^8 t)$, where E, z and t are in V/m, meter and second respectively. The value of wave vector k is :

(A) $2\ \text{m}^{-1}$ (B) $0.5\ \text{m}^{-1}$

(C) $6\ \text{m}^{-1}$ (D) $3\ \text{m}^{-1}$

4. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(A) $1 : c^2$ (B) $c : 1$

(C) $1 : 1$ (D) $1 : c$

5. A capacitor of capacitance 'C', is connected across as ac source of voltage V given by

$V = V_0 \sin 2\omega t$

The displacement current between the plates of the capacitor, would then be given by :

(A) $I_d = 2V_0\omega C\cos 2\omega t$ (B) $I_d = \dfrac{V_0}{2\omega C}\cos 2\omega t$

(C) $I_d = \dfrac{V_0}{\omega C}\sin 2\omega t$ (D) $I_d = \dfrac{V_0\omega C}{2}\sin 2\omega t$

6. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through a small angle θ, the spot of the light is found to move through a distance y on the scale. The angle θ is given by :

(A) $\dfrac{y}{2x}$ (B) $\dfrac{y}{x}$

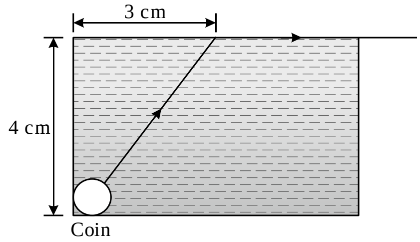
(C) $\dfrac{x}{2y}$ (D) $\dfrac{x}{y}$

7. The frequency of a light wave in a material is 2×10^{14} Hz and wavelength is 5000 Å. The refractive index of material will be :

(A) 1.50 (B) 3.00

(C) 1.33 (D) 1.40

8. A coin is placed on the bottom of a container filled with a liquid. A specific ray of light shown in figure from the coin travels upto the surface of the liquid and moves along its surface. How fast is the light travelling in the liquid ?



(A) 2.4×10^8 m/s (B) 3.0×10^8 m/s

(C) 1.2×10^8 m/s (D) 1.8×10^8 m/s

9. The angle of a prism is A. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence $2A$ on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index μ, of the prism is :

(A) $2\sin A$ (B) $2\cos A$

(C) $1/2\cos A$ (D) $\tan A$

10. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 30°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :

(A) $45°;\ \dfrac{1}{\sqrt{2}}$ (B) $30°;\ \sqrt{2}$

(C) $60°;\ \sqrt{3}$ (D) $30°;\ \dfrac{1}{\sqrt{2}}$

11. The refractive index of the material of a prism is $\sqrt{3}$ and the angle of the prism is 30º. One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is :

(A) 30º (B) 45º
(C) 60º (D) Zero

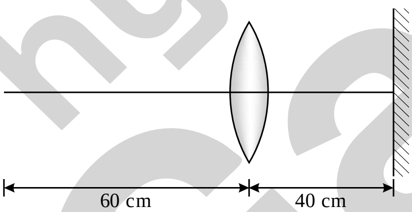
12. A biconvex lens has a radius of curvature of magnitude 20 cm. Which one of the following options best describe the image formed of an object of height 2 cm placed 40 cm from the lens ?

(A) Virtual, upright, height = 1 cm
(B) Virtual, upright, height = 0.5 cm
(C) Real, inverted, height = 4 cm
(D) Real, inverted, height = 2 cm

13. A convex lens *A* of focal length 30 cm and a concave lens *B* of focal 10 cm are kept along the same axis with a distance *d* between them. If a parallel beam of light falling on '*A*' leaves *B* as a parallel beam, then the distance *d* in cm will be :

(A) 20 (B) 15
(C) 50 (D) 30

14. An object is placed at a distance of 60 cm from a convex lens of focal length 30 cm. If a plane mirror were put perpendicular to the principal axis of the lens and at a distance of 40 cm from it, the final image would be formed at a distance of :



(A) 20 cm from the lens; it would be a real image
(B) 30 cm from the lens, it would be a real image
(C) 30 cm from the plane mirror, it would be a virtual image
(D) 20 cm from the plane mirror, it would be a virtual image

15. A thin prism having refracting angle 10º is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.6. This combination produces dispersion without deviation. The refracting angle of second prism should be :

(A) 7º (B) 6º
(C) 8º (D) 10º

16. Diameter of human eye lens is 2 mm. What will be the minimum distance between two points to resolve them, which are situated at a distance of 50 meter from eye ? (The wavelength of light is 6000 Å) :

(A) 2.32 m (B) 4.28 mm
(C) 1.25 cm (D) 1.5 cm

17. A telescope has an objective lens of 10 cm diameter and is situated at a distance of one kilometre from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 7000 Å, is of the order of :

(A) 0.8 cm (B) 8 m
(C) 8 mm (D) 8 cm

18. A microscope is focused on a mark on a piece of paper and then a slab of glass of thickness 4 cm and refractive index 2 is placed over the mark. How should the microscope be moved to get the mark in focus again :

(A) 1 cm upward (B) 4.5 cm downward
(C) 1 cm downward (D) 2 cm upward

19. A person can see clearly objects only when they lie between 50 cm and 200 cm from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be :

(A) convex, + 2.25 diopter (B) concave, – 0.25 diopter
(C) concave, – 0.5 diopter (D) convex, + 0.15 diopter

20. The ratio of resolving powers of an optical microscope for two wavelengths λ_1 = 4000 Å and λ_2 = 9000 Å is :

(A) 8 : 27 (B) 9 : 4
(C) 3 : 2 (D) 16 : 81

21. The magnifying power of a telescope is 6. When it is adjusted for parallel rays the distance between the objective and eyepiece is 14 cm. The focal length of lenses are :

(A) 10 cm, 10 cm (B) 12 cm, 2 cm
(C) 18 cm, 2 cm (D) 11 cm, 9 cm

22. For a normal eye, the cornea of eye provides a converging power of 30 *D* and the least converging power of the eye lens behind the cornea is 10 *D*. Using this information, the distance between the retina and the cornea eye lens can be estimated to be :

(A) 5 cm (B) 2.5 cm
(C) 1.67 cm (D) 1.5 cm

23. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 30º. For which of the following value of μ the ray can undergo total internal reflection ?

(A) μ = 1.25 (B) μ = 1.33
(C) μ = 2.10 (D) μ = 1.50

24. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 10 cm deep when viewed from one surface and 5 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is :

(A) 8 (B) 10
(C) 12 (D) 22.5

25. Two identical glass ($\mu_g = 3/2$) equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with a liquid ($\mu_l = 5/3$). The focal length of the combination is :

(A) $\frac{4f}{5}$ (B) f
(C) $\frac{4f}{3}$ (D) $\frac{3f}{4}$

26. A convex lens and a concave lens, each having focal length of 25 cm and 40 cm, are put in contact to form a combination of lenses. The power in diopters of the combination is :

(A) 15 (B) 50
(C) Infinite (D) 1.5

27. A boy is trying to start a fire by focusing light on a piece of paper using an double convex lens of focal length 20 cm. The diameter of the Sun is 1.2×10^9 m and its mean distance from the earth is 1.5×10^{11} m. What is the diameter of the Sun's image on the paper ?

(A) 6.5×10^{-5} m (B) 1.6×10^{-4} m
(C) 9.2×10^{-4} m (D) 6.5×10^{-4} m

28. In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wavelength of light used). The intensity at a point where the path difference is $\lambda/2$, will be :

(A) K (B) $K/4$
(C) $K/2$ (D) Zero

29. Two slits in Young's experiment have widths in the ratio 1 : 16. The ratio of intensity at the maxima and minima in the interference pattern, $\frac{I_{max}}{I_{min}}$ is :

(A) $\frac{4}{9}$ (B) $\frac{9}{4}$
(C) $\frac{25}{9}$ (D) $\frac{9}{25}$

30. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 6th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly :

(A) 1.25 (B) 1.33
(C) 1.69 (D) 1.78

31. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.07º. To increase the fringe angular width to 0.21º (with same λ and D) the separation between the slits needs to be changed to :

(A) 2.1 mm (B) 0.67 mm
(C) 1.8 mm (D) 1.7 mm

32. In a double slit experiment, when light of wavelength 500 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.4º. What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water? ($\mu_{water} = 4/3$) :

(A) 0.3º (B) 0.15º
(C) 0.05º (D) 0.1º

33. A beam of light of λ = 1000 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 6 m away. The distance between first dark fringes on either side of the central bright fringe is :

(A) 1.2 cm (B) 1.2 mm
(C) 2.4 cm (D) 2.4 mm

34. The condition for Brewsters angle i_b for an interface should be :

(A) $i_b = 90º$ (B) $0º < i_b < 30º$
(C) $30º < i_b < 45º$ (D) $45º < i_b < 90º$

35. In Young's double slit experiment, if the separation between coherent sources is doubled and the distance of the screen from the coherent sources is halved, then the fringe width becomes :

(A) One-fourth (B) Double
(C) Half (D) Four times

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Section - B : In actual NEET paper you will be given choice to attempt any 10 out of 15 questions in this section but for this test paper, students are advised to solve all question to compare their preparation with the provided benchmarking

1. An electromagnetic wave in a medium is represented by :

$E_x = 0$

$E_y = 2.5\frac{N}{C}\cos\left[\left(2\pi\times10^6\frac{\text{rad}}{m}\right)t+\left(\pi\times10^{-2}\frac{\text{rad}}{s}\right)x\right]$

$E_z = 0$

This electromagnetic wave is :

(A) Moving along –x-direction with frequency 10^6 Hz and wavelength 200 m

(B) Moving along y-direction with frequency $2\pi \times 10^6$ Hz and wavelength 200 m

(C) Moving along x-direction with frequency 10^6 Hz and wavelength 100 m

(D) Moving along x-direction with frequency 10^6 Hz and wavelength 200 m

2. In an electromagnetic wave in free space the root mean square value of the electric field is E_{rms} = 12 V/m. The peak value of the magnetic field is :

(A) 1.41×10^{-8} T (B) 2.83×10^{-8} T

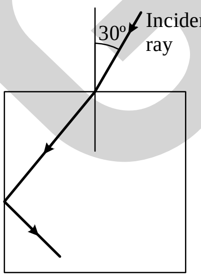
(C) 5.65×10^{-8} T (D) 4.23×10^{-8} T

3. An opaque plate is placed on a surface of pond which has refractive index 5/3. A source of light is placed 4 m below the surface of liquid. The minimum radius of disc needed so that light is not coming out is :

(A) ∞ (B) 3 m

(C) 6 m (D) 4 m

4. For the given incident ray as shown in figure, the condition of total internal reflection of this ray, the required refractive index of prism will be :



(A) $\frac{\sqrt{3}+1}{2}$ (B) $\frac{\sqrt{2}+1}{2}$

(C) $\sqrt{\frac{3}{2}}$ (D) $\sqrt{\frac{5}{4}}$

5. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of the combination is :

(A) $\frac{R}{2(\mu_1+\mu_2)}$ (B) $\frac{R}{2(\mu_1-\mu_2)}$

(C) $\frac{R}{(\mu_1-\mu_2)}$ (D) $\frac{2R}{(\mu_2-\mu_1)}$

6. When it is given that angle of minimum deviation of a prism is equal to its refracting angle, the prism must be made of a material whose refractive index :

(A) lies between 2 and $\sqrt{2}$ (B) is less than 1

(C) is greater than 2 (D) lies between $\sqrt{2}$ and 1

7. An astronomical telescope has objective and eyepiece of focal length 50 cm and 5 cm respectively. To view an object 400 cm away from the objective, the lenses must be separated by a distance :

(A) 37.3 cm (B) 62.14 cm

(C) 50.0 cm (D) 54.0 cm

8. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is $d = 10\lambda$, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 5d$?

(A) I_0 (B) $\frac{I_0}{4}$

(C) $\frac{3}{4}I_0$ (D) $\frac{I_0}{2}$

9. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 30° with that of P_1. The intensity of transmitted light through P_2 is :

(A) $\frac{I_0}{2}$ (B) $\frac{I_0}{4}$

(C) $\frac{I_0}{8}$ (D) $\frac{3I_0}{32}$

10. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $\frac{I_{max}+I_{min}}{I_{max}-I_{min}}$ will be :

(A) $\frac{\sqrt{n}}{n+1}$ (B) $\frac{2\sqrt{n}}{n+1}$

(C) $\frac{1+n}{2\sqrt{n}}$ (D) $\frac{2\sqrt{n}}{(n+1)^2}$

11. A rod of length 10 cm lies along the principal axis of concave mirror of focal length 10 cm in such a way that its end closer to the pole is 20 cm away from the mirror. The length of the image is :

(A) 15 cm (B) 2.5 cm

(C) 5 cm (D) 10 cm

12. The refractive index of the material of a prism is $\sqrt{3}$ and its refracting angle is 30º. One of the refracting surfaces of the prism is made a mirror inwards. A beam of monochromatic light entering the prism from the other face will retrace its path after reflection form the mirrored surface if its angle of incidence on the prism is :

(A) 60º (B) 0º

(C) 30º (D) 45º

13. Two similar thin equiconvex lenses, of focal length f each, are kept coaxially in contact with each other such that the focal length of the combination is F_1. When the space between the two lenses is filled with liquid (which has the same refractive index ($\mu = 1.5$) as that of glass) then the equivalent focal length is F_2. The ratio $F_1 : F_2$ will be :

(A) 2 : 1 (B) 1 : 2

(C) 2 : 3 (D) 3 : 4

14. In Young's double slit experiment, the slits are 4 mm apart and are illuminated by photons of two wavelengths λ_1 = 12000 Å and λ_2 = 15000 Å. At what minimum distance from the common central bright fringe on the screen 2 m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

(A) 8 mm (B) 6 mm

(C) 4 mm (D) 12 mm

15. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern, the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the midpoint of the slit is :

(A) $\frac{\pi}{8}$ radian (B) $\frac{\pi}{4}$ radian

(C) $\frac{\pi}{2}$ radian (D) π radian

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ANSWER KEY

SECTION-A

1. (A)	**2.** (B)	**3.** (C)	**4.** (C)
5. (A)	**6.** (A)	**7.** (B)	**8.** (D)
9. (B)	**10.** (C)	**11.** (C)	**12.** (D)
13. (B)	**14.** (D)	**15.** (A)	**16.** (D)
17. (C)	**18.** (D)	**19.** (C)	**20.** (B)
21. (B)	**22.** (B)	**23.** (C)	**24.** (D)
25. (A)	**26.** (D)	**27.** (B)	**28.** (D)
29. (C)	**30.** (B)	**31.** (B)	**32.** (A)
33. (B)	**34.** (D)	**35.** (A)	

SECTION-B

1. (A)	**2.** (C)	**3.** (B)	**4.** (D)
5. (C)	**6.** (A)	**7.** (B)	**8.** (A)
9. (C)	**10.** (C)	**11.** (C)	**12.** (A)
13. (B)	**14.** (D)	**15.** (D)	