PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

UNIT TEST 07

Mcqs

1. Which of the following electromagnetic waves has the longest wavelength ?

A. Radiowaves

B. Infrared radiation

C. Microwaves

D. X-rays

Answer: A

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2. Which of the following electromagnetic waves emit- ted by the sun is responsible for

heating the earth's atmosphere due to greenhouse effect ?

A. Visible light

B. Infrared radiation

C. Ultraviolet rays

D. γ-rays

Answer: B

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3. The speed of electromagnetic waves in a vacuum is given by :

A. $\frac{1}{\mu_0 \varepsilon_0}$

B. $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

C. $\mu_0 \varepsilon_0$

D. $\sqrt{\mu_0 \varepsilon_0}$

Answer: B

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4. In an electromagnetic wave travelling in air, the amplitudes E_0 and B_0 of the electric and magnetic fields are related as (here c is the speed of the wave in air) :

A. $E_0 = cB_0$

B. $E_0 = \frac{B_0}{c}$

C. $E_0 = c^2 B_0$

D. $E_0 = B_0$

Answer: A

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5. When a plane electromagnetic wave travels in vacuum, the average electric energy density is given by (here E_0 is the amplitude of the electric field of the wave) :

A. $\frac{1}{4}\varepsilon_0 E_0^2$

B. $\frac{1}{2}\varepsilon_0 E_0^2$

C. $2\varepsilon_0 E_0^2$

D. $4\varepsilon_0 E_0^2$

Answer: A

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6. The amplitude of the electric field of a plane electro- magnetic wave in air is $6.0 \times 10^{-4} Vm^{-1}$. The amplitude of the magnetic field will be:

A. $1.8 \times 10^{5} T$

B. $5.0 \times 10^{3} T$

C. $2.0 \times 10^{-4} T$

D. $2.0 \times 10^{-12} T$

Answer: D

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7. An electromagnetic wave is produced by oscillating electric and magnetic field E and B. Choose the only incorrect statement from the following.

A. E is perpendicular to B

B. E is perpendicular to the direction of propagation of the wave

C. B is perpendicular to the direction of propagation of the wave

D. E is parallel to B.

Answer: D

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8. Which of the following pairs of space and time varying

$E = \left[\hat{i}E_x + \hat{j}E_y + \hat{k}E_z\right]$ and

$B = \left[\hat{i}B_x + \hat{j}B_y + \hat{k}B_z\right]$

would generate a plane electromagnetic wave travelling in the z-direction ?

A. E_x, B_z

B. E_y, B_z

C. E_z, B_x

D. E_x, B_y

Answer: D

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9. The displacement current flows in the dielectric of a capacitor when the potential difference between its plates :

A. is changing with time

B. is changing with distance

C. has assumed a constant value

D. become zero

Answer: A

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10. The potential difference between the plates of a parallel plate capacitor is changing at the rate of $10^6 Vs^{-1}$. If the capacitance is $2\mu F$, the displacement current in the dielectric of the capacitor will be :

A. 1 A

B. 2 A

C. 3 A

D. 4 A

Answer: B

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11. In Young's double slit experiment, the intensity of the maxima is I. If the width of each slit is doubled the intensity of the maxima will be:

A. $\frac{I}{2}$

B. I

C. 2I

D. 4I

Answer: C

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12. In Young's double slit experiment, the 10th maximum of wavelength λ_1 is at a distance y_1 from its central maximum and the 5th maximum of wavelength λ_2 is at a distance y_2 from its central maximum. The ratio y_1 / y_2 will be:

A. $\frac{2\lambda_1}{\lambda_2}$

B. $\frac{2\lambda_2}{\lambda_1}$

C. $\frac{\lambda_1}{2\lambda_2}$

D. $\frac{\lambda_2}{2\lambda_1}$

Answer: A

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13. White light is used to illuminate the two slits in Young's double slit experiment. The separation between the slits is d and the distance between the screen and the slit is D (

$> > d$). At a point on the screen directly in front of one of the slits, certain wavelengths are missing. The missing wavelengths are (here m= 0, 1, 2, ... is an integer):

A. $\lambda = \frac{d^2}{(2m+1)D}$

B. $\lambda = \frac{(2m+1)d^2}{D}$

C. $\lambda = \frac{d^2}{(m+1)D}$

D. $\lambda = \frac{(m+1)d^2}{D}$

Answer: A

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14. A thin film of variable thickness is illuminated by a parallel beam of white light. The colour of the film at a certain point depends upon :

A. the thickness of the film at that point

B. the refractive index of the film

C. the angle of incidence

D. all the above factors.

Answer: D

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15. When a thin wedge-shaped film is illuminated by a parallel beam of light of wavelength $6000\dot{A}$, 7 fringes are observed in a certain region of the film. How many fringes will be observed in the same region of the film if light of wavelength $4200\dot{A}$ is used ?

A. 6

B. 10

C. 14

D. 18

Answer: B

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16. The fact that light can be polarized confirms that light:

A. is a transverse wave

B. is a longitudinal wave

C. is a photon of energy

D. has a de Broglie wavelength

Answer: A

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17. When a ray of light is incident on a glass slab at an angle of 60°, the angle between the reflected and refracted rays is 90°. The refractive index of glass is :

A. 1.5

B. $\sqrt{2}$

C. $\sqrt{3}$

D. 2

Answer: B

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18. A double slit apparatus is immersed in a liquid of refractive index 1.33. It has slit separation of 1 mm and distance between the plane of slits and screen 1.33 m. The slits are

illuminated by a parallel beam of light whose wavelength in air is $6300\dot{A}$. What is the fringe width?

A. (1.33×0.63) mm

B. $\frac{0.63}{1.33}$ mm

C. $\frac{0.63}{(1.33)^2}$ mm

D. 0.63 mm

Answer: C

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19. In a Young's double slit experiment, 12 fringes are observed to be formed in a certain region of the screen when light of wavelength 600 nm is used. If the light of wavelength 400 nm is used, the number of fringes observed in the same region of the screen will be:

A. 12

B. 18

C. 24

D. 8

Answer: B

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20. In a two slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by a distance of 5×10^{-2} m towards the slits, the change in the fringe width is 3×10^{-5} m. If the separation be. tween the slits is 10^{-3} m, the wavelength of light used is :

A. 5×10^{-7} m

B. 6×10^{-7} m

C. 7×10^{-7} m

D. 6×10^{-6} m

Answer: B

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21. White light is used to illuminate the two slits in Young's double slit experiment. The distance between the slits is b and the screen

is at a distance d ($>$ $>$ b) from the slits. At a point on the screen directly in front of one of the slits, certain wavelengths are missing. Some of the missing wavelengths are :

A. $\lambda = \frac{b^2}{2d}$

B. $\lambda = \frac{2b^2}{d}$

C. $\lambda = \frac{b^2}{3d}$

D. $\lambda = \frac{2b^2}{3d}$

Answer: C

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22. Two waves of intensities I and 4I superpose, then the maximum and minimum intensities are :

A. 5I, 3I

B. 9I, I

C. 9I, 3I

D. 5I, I

Answer: B

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23. A parallel beam of monochromatic light is incident nor- mally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of the incident beam. At the first minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of the slit is:

A. zero

B. $\frac{\pi}{2}$

C. π

D. 2π

Answer: D

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24. A string of length 0.4 m and mass 10^{-2} kg is rigidly clamped at its ends. The tension in the string is 1.6 N. Identical wave pulses are produced at one end at equal intervals of time Δt. The minimum value of Δt which allows

constructive interference between successive pulses is :

A. 0.05 s

B. 0.10 s

C. 0.20 s

D. 0.40 s

Answer: B

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25. Yellow light is used in a single slit diffraction experiment with a slit of width 0.6 mm. If yellow light is replaced by X-rays, then the observed pattern will reveal:

A. that the central maximum is narrower

B. more number of fringes

C. less number of fringes

D. no diffraction pattern

Answer: A

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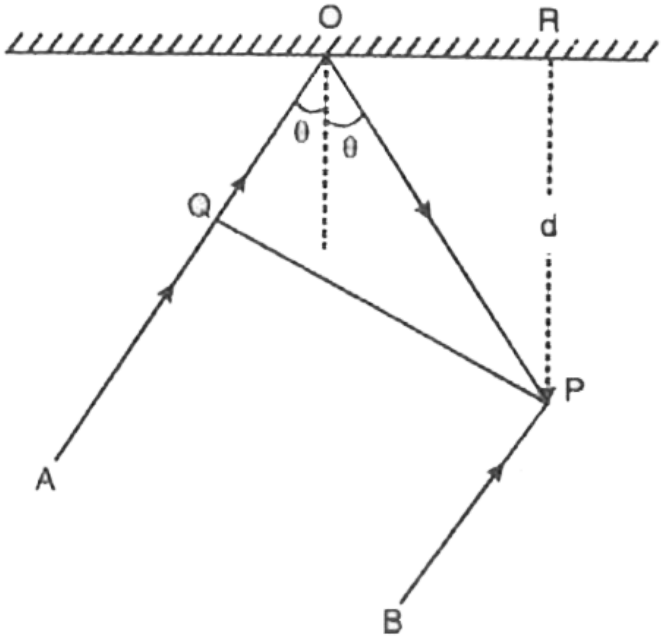
26. In Fig., PQ represents a plane wavefront and AO and BP the corresponding extreme rays of monochromatic light of wavelength λ. The value of angle θ for which the ray BP and the reflected ray OP interfere constructively is

given by :



A. $\cos\theta = \frac{\lambda}{2d}$

B. $\cos\theta = \frac{\lambda}{4d}$

C. $\sec\theta = \frac{\lambda}{3d}$

D. $\sec\theta = \frac{2\lambda}{3d}$

Answer: B

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27. The difference in the number of wavelengths, when yellow light (of wavelength $6000\dot{A}$ in vacuum) propa- gates through air and vacuum columns of the same thickness is one. If the refractive index of air is 1.0003, the thickness of the air column is:

A. 1.8 mm

B. 2 mm

C. 2 cm

D. 2.2 cm

Answer: B

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28. The question contains statement I and statement II. Of the four choices given, choose one that best describes two statements.

Statement I: For free space $(\varepsilon = 0, I = 0)$

$$\oint \vec{E} \cdot \vec{dl} = -\frac{d}{dt} \oint \vec{B} \cdot \vec{ds}$$

Statement II: For steady state

$$\oint \vec{E} \cdot \vec{dl} = \oint \vec{B} \cdot \vec{ds} = 0$$

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. Statement I and II both are true but statement I is correct explanation of that of II.

D. Statement I and II are both true but statement I is not correct explanation of

I.

Answer: C

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29. The magnetic field in plane e.m. wave is given by

$$B_y = 2 \times 10^7 \sin\left(0.5 \times 10^3 x + 1.5 \times 10^{11} t\right)$$

Tesla.

Wavelength of e.m. wave is

A. 1.26 cm

B. 10.2 cm

C. 12.6 cm

D. 31.4 cm

Answer: A

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30. The magnetic field in plane e.m. wave is given by

$$B_y = 2 \times 10^7 \sin\left(0.5 \times 10^3 x + 1.5 \times 10^{11} t\right)$$

Tesla.

The peak value of electric field is

A. $50Vm^{-1}$

B. $60Vm^{-1}$

C. $65Vm^{-1}$

D. $70Vm^{-1}$

Answer: B

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