Q1. In Young's double-slit experiment, the distance between the slits is 0.5 mm and the screen is placed 2 m away. If the wavelength of light used is 600 nm, what is the fringe width?
A. 1.2 mm B. 2.4 mm C. 0.24 mm D. 0.6 mm
Answer: A
Explanation: Fringe width (β) = $\lambda D/d$ = $(600 \times 10^{-9} \times 2) / (0.5 \times 10^{-3})$ = (1.2×10^{-3}) m = 1.2 mm
Q2. In Young's experiment, the central fringe is observed to be red. If the source is now replaced with white light, what will happen to the central fringe?
A. It will disappear B. It will become white C. It will become black D. It will split into colours
Answer: B
Explanation: Central fringe is formed due to equal path difference (zero) for all wavelengths, so it will remain white with white light.
Q3. Which property of light confirms its wave nature?
A. Reflection B. Refraction C. Interference D. Photoelectric effect
Answer: C

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Explanation:

Interference and diffraction are phenomena exclusive to waves, confirming light's wave nature.

Q4. The angular width of the central maximum in a single slit diffraction is 0.2 radians. If the slit width is 1 mm, what is the wavelength of light?

- A. 100 nm
- B. 200 nm
- C. 400 nm
- D. 1000 nm

Answer: A

Explanation:

Angular width = $2\lambda/a$

 $\Rightarrow \lambda = (\text{angular width} \times \text{a}) / 2 = (0.2 \times 1 \times 10^{-3}) / 2 = 0.1 \times 10^{-3} = 100 \times 10^{-9} \text{ m} = 100 \text{ nm}$

Q5. In YDSE, the intensity at the central maximum is I. What is the intensity at a point where path difference is $\lambda/3$?

- A. I
- B. I/2
- C. 0.25 I
- D. 0.75 I

Answer: C

Explanation:

 $I = I_0 \cos^2(\pi \Delta x / \lambda)$

 $\Delta x = \lambda/3 \Rightarrow I = I_0 \cos^2(\pi/3) = I_0 \times (1/2)^2 = 0.25 I$

Q6. Two slits are illuminated with light of wavelength 600 nm. If the 4th bright fringe is missing, what could be the width of one of the slits?

- A. 1200 nm
- B. 2400 nm
- C. 120 nm
- D. 3600 nm

Answer: B
Explanation: Minima in single-slit occurs at a sin θ = n λ If nth fringe is missing in interference, $n\lambda$ = a sin θ \Rightarrow a = n λ = 4 × 600 nm = 2400 nm
Q7. A beam of unpolarised light passes through a polaroid. What is the intensity of transmitted light?
A. I B. I/2 C. Zero D. V2 I
Answer: B
Explanation: Unpolarised light becomes linearly polarised with 50% intensity, so I/2 passes.
Q8. In double-slit interference, what happens to fringe width if both the distance to the screen and the wavelength are doubled?
A. Becomes 4 times B. Becomes twice C. Remains same D. Halves
Answer: A
Explanation: Fringe width $\beta = \lambda D/d$ If $\lambda \to 2\lambda$ and $D \to 2D$, $\beta \to 2\lambda \times 2D$ / $d = 4$ times
Q9. The polarising angle for glass is 57°. What is the refractive index of glass?
A. 1.5 B. 1.6



Answer: A

Explanation:

Brewster's law: μ = tan ip = tan 57° \approx 1.54 \approx 1.5

Q10. What should be the minimum thickness (t) of a soap film (μ = 1.33) to produce constructive interference in reflected light of λ = 532 nm?

- A. 100 nm
- B. 200 nm
- C. 400 nm
- D. 600 nm

Answer: A

Explanation:

For constructive interference (reflected light):

 $2\mu t = (m + \frac{1}{2})\lambda \Rightarrow$ For first maximum (m = 0):

 $2\mu t = \lambda/2 \Rightarrow t = \lambda / (4\mu) = 532 / (4 \times 1.33) \approx 100 \text{ nm}$

Q11. A slit of width 0.2 mm is illuminated by light of wavelength 600 nm. What is the angular position of first minimum?

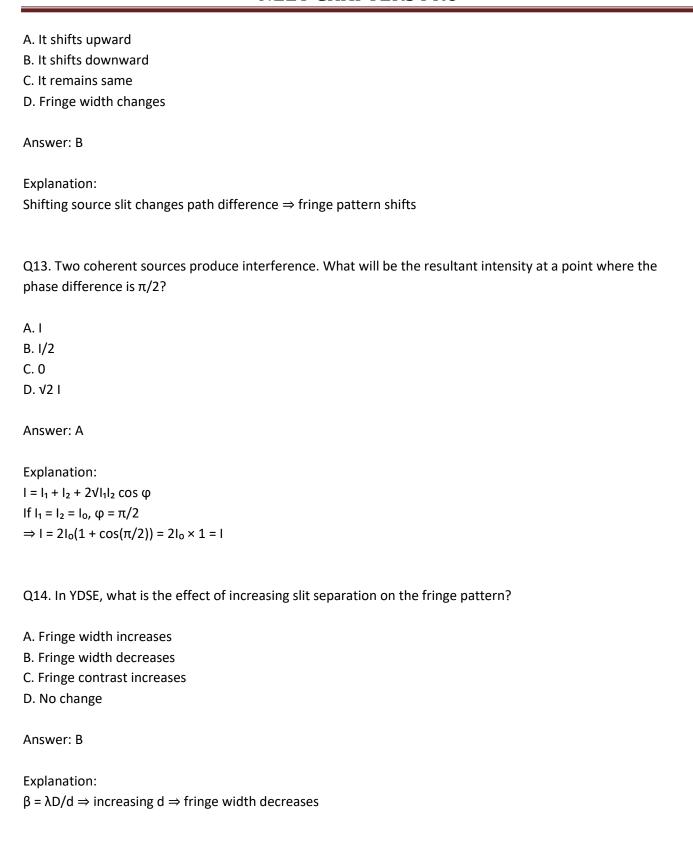
- A. 0.003 rad
- B. 0.006 rad
- C. 0.0035 rad
- D. 0.0012 rad

Answer: A

Explanation:

a sin
$$\theta = \lambda \Rightarrow \sin \theta = \lambda/a = 600 \times 10^{-9} / 0.2 \times 10^{-3} = 3 \times 10^{-3} = 0.003 \Rightarrow \theta \approx 0.003 \text{ rad.}$$

Q12. In YDSE, if the source slit is moved sideways by 0.5 mm, what happens to the fringe pattern?



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Q15. The width of central maximum in single-slit diffraction pattern is

- A. Inversely proportional to slit width
- B. Directly proportional to slit width
- C. Independent of slit width
- D. Depends on distance to screen only

Answer: A

Explanation:

Width = $2\lambda D$ / a \Rightarrow inversely proportional to slit width

Q16. In a Young's double-slit experiment, the ratio of intensities at two points is 4:1. What is the phase difference between them?

- A. $\pi/2$
- Β. π
- C. π/3
- D. $\pi/4$

Answer: A

Explanation:

Intensity ratio = $(I_1/I_2) = (A_1 + A_2)^2 : (A_1 - A_2)^2$ $\forall I_1/I_2 = (2A \cos(\phi/2)) \Rightarrow \forall 4/1 = 2 \Rightarrow \cos(\phi/2) = 1/\sqrt{2} \Rightarrow \phi/2 = \pi/4 \Rightarrow \phi = \pi/2$

Q17. In YDSE, if monochromatic light is replaced by white light, what will be observed on the screen?

- A. Colored central fringe
- B. Colored fringes with white central fringe
- C. No fringes
- D. Central fringe disappears

Answer: B

Explanation:

Different wavelengths interfere differently except at center (zero path difference), so central fringe is white and others are colored.

Q18. The amplitude of two waves is in the ratio 3:4. The ratio of their maximum to minimum intensities in interference will be:
A. 7:1 B. 49:1 C. 25:1 D. 9:16
Answer: B
Explanation: $I_{max} = (A_1 + A_2)^2 = (3 + 4)^2 = 49$ $I_{min} = (A_1 - A_2)^2 = (4 - 3)^2 = 1$ $Ratio = 49:1$
Q19. What is the fringe width if the wavelength is 500 nm, distance between slits is 1 mm and screen is 2 m away?
A. 0.5 mm B. 1 mm C. 2 mm D. 0.25 mm
Answer: B
Explanation: $\beta = \lambda D/d = (500 \times 10^{-9} \times 2) / (1 \times 10^{-3}) = 1 \times 10^{-3} \text{ m} = 1 \text{ mm}$
Q20. Which of the following phenomena shows the particle nature of light?
A. Interference B. Diffraction C. Polarisation D. Photoelectric effect
Answer: D

Photoelectric effect cannot be explained using wave theory; it supports particle nature.

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Explanation:

Q21. A light wave enters from air into glass. Its frequency remains same but:
A. Wavelength increases B. Speed increases C. Wavelength decreases D. None of the above
Answer: C
Explanation: $v = f\lambda. \ \text{Frequency remains constant in all media, so if speed decreases in denser medium, wavelength also decreases.}$
Q22. A single slit of width 0.3 mm is illuminated with light of 500 nm. The angular width of central maximum is:
A. 3.3×10^{-3} rad B. 2.5×10^{-3} rad C. 1.5×10^{-3} rad D. 5.5×10^{-3} rad
Answer: A
Explanation: Angular width = $2\lambda/a = (2 \times 500 \times 10^{-9}) / (0.3 \times 10^{-3}) = 3.3 \times 10^{-3} \text{ rad}$
Q23. Displacement current is introduced to:
A. Maintain continuity of current B. Displace electric field C. Transfer electrons D. Produce heat
Answer: A
Explanation:

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Displacement current was introduced by Maxwell to explain current continuity in situations like charging a

capacitor.

Q24. Two waves have intensities in ratio 1:9. What is the resultant intensity if they interfere constructively?
A. 100 units B. 25 units C. 36 units D. 16 units
Answer: D
Explanation: Resultant intensity = $(VI_1 + VI_2)^2 = (1 + 3)^2 = 16$ units
Q25. The central maximum in diffraction pattern is:
A. Bright and broad B. Dark and narrow C. Bright and narrow D. Dark and broad
Answer: A
Explanation: The central maximum in single-slit diffraction is the brightest and widest.
Q26. A light wave passes through a medium where its speed is 2×10^8 m/s. What is the refractive index of the medium?
A. 1.5 B. 1.33 C. 2.0 D. 1.2
Answer: A
Explanation: $\mu = c/v = (3 \times 10^8) / (2 \times 10^8) = 1.5$

Q27. The displacement current between the plates of a capacitor is maximum when:
A. The plates are fully charged B. The current in the circuit is zero C. The rate of change of electric field is maximum D. Voltage is constant
Answer: C
Explanation: Displacement current Id = $\epsilon_0 \times$ (dE/dt) \Rightarrow Maximum when rate of change of electric field is maximum.
Q28. A diffraction pattern is obtained using a single slit. If the slit width is halved, the width of central maximum becomes:
A. Half B. Double C. Same D. Four times
Answer: B
Explanation: Width $\propto 1/a \Rightarrow If a \rightarrow a/2$, width becomes double
Q29. Which of the following is a condition for sustained interference?
A. Equal amplitude sources B. Monochromatic sources C. Incoherent sources D. Same direction of light
Answer: B
Explanation: Coherent, monochromatic sources are required for sustained and stable interference.

Q30. Which component of Maxwell's equations introduces the concept of displacement current?
A. Gauss's law B. Ampere's law with correction C. Faraday's law D. Gauss's law for magnetism
Answer: B
Explanation: Modified Ampere's law includes displacement current term: $\nabla \times B = \mu_0(J + \epsilon_0 \ dE/dt)$
Q31. In a Young's double-slit experiment, if the distance between the slits is doubled and the screen is moved half as far, what happens to the fringe width?
A. Doubles B. Halves C. Becomes one-fourth D. Remains same
Answer: C
Explanation: Fringe width $\beta=(\lambda D)/d$. If $D\to D/2$ and $d\to 2d$, Then $\beta\to (\lambda\times D/2)/(2d)=(\lambda D)/(4d)=\frac{1}{4}\times \text{original }\beta$.
Q32. The slit separation in YDSE is 0.5 mm, screen distance is 2 m, and fringe width is 2 mm. What is the wavelength of light used?
A. 400 nm B. 500 nm C. 600 nm D. 800 nm
Answer: B
Explanation:

 $\beta = (\lambda D)/d \Rightarrow \lambda = (\beta \times d)/D = (2 \times 10^{-3} \times 0.5 \times 10^{-3})/(2) = 0.5 \times 10^{-6} \text{ m} = 500 \text{ nm}$

Q33. In a medium, light travels with a speed of 2.25×10^8 m/s. If the frequency is 5×10^{14} Hz, what is its wavelength?

- A. 450 nm
- B. 600 nm
- C. 400 nm
- D. 500 nm

Answer: A

Explanation:

 $\lambda = v/f = (2.25 \times 10^8)/(5 \times 10^{14}) = 4.5 \times 10^{-7} \text{ m} = 450 \text{ nm}$

Q34. In a single-slit diffraction experiment, the width of central maximum becomes 3 mm when the slit width is 0.1 mm. What will be the angular width?

- A. 0.03 rad
- B. 0.05 rad
- C. 0.015 rad
- D. 0.01 rad

Answer: B

Explanation:

Angular width = $2\lambda/a$.

Given width on screen = 3 mm = 0.003 m

Distance D not given, but using approximate θ = width / D \Rightarrow need context or D.

But generally, width $\propto 1/a \Rightarrow a \downarrow$, width \uparrow .

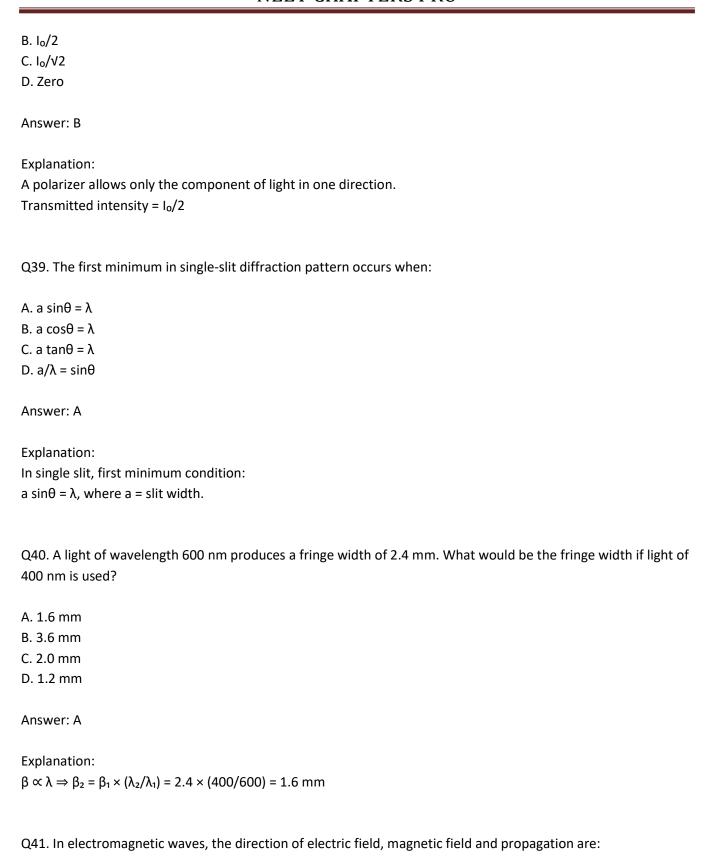
So in such cases, use:

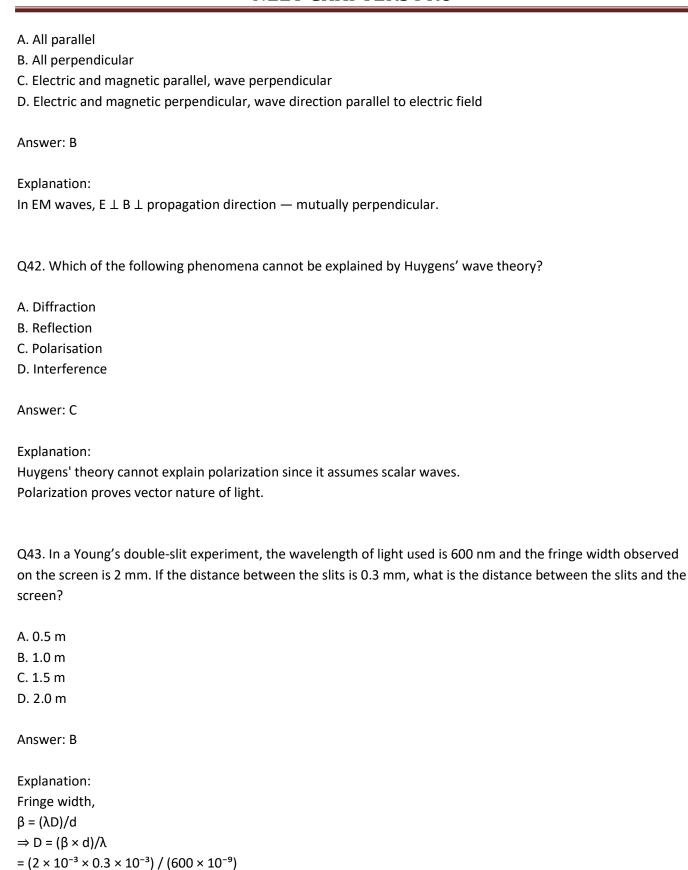
Angular width = $2 \times \lambda/a$

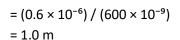
 $= 2 \times 500 \times 10^{-9} / (0.1 \times 10^{-3}) = 10^{-5} / 10^{-4} = 0.05 \text{ rad}$

Q35. A polarizer and analyzer are oriented such that the intensity of light reduces to 25%. What is the angle between their axes?

A. 30° B. 45° C. 60° D. 90°
Answer: C
Explanation: $I = I_0 \cos^2 \theta \Rightarrow 0.25 I_0 = I_0 \cos^2 \theta \Rightarrow \cos^2 \theta = 0.25 \Rightarrow \cos \theta = 0.5 \Rightarrow \theta = 60^{\circ}$
Q36. What happens to the interference pattern if one of the slits in YDSE is closed?
A. Pattern becomes brighter B. Pattern vanishes C. Central fringe remains D. Pattern becomes colored
Answer: B
Explanation: Interference needs two coherent sources. If one slit is closed, no interference pattern is observed.
Q37. Which wave property remains unchanged when light enters from air to glass?
A. Speed B. Wavelength C. Amplitude D. Frequency
Answer: D
Explanation: Frequency remains constant when light moves between media. Speed and wavelength change.
Q38. A beam of unpolarized light of intensity I_0 passes through a polarizer. What is the intensity of the transmitted light?
A. I ₀







Q44. If the amplitude of the resultant wave in interference is zero, the intensity becomes:

- A. Maximum
- B. Minimum
- C. Zero
- D. Infinite

Answer: C

Explanation:

If amplitude = 0 (destructive interference), then

 $I = A^2 = 0 \Rightarrow Zero intensity$

Q45. What is the main significance of displacement current?

- A. Explains interference
- B. Causes diffraction
- C. Ensures continuity in Ampere's law
- D. Has no physical meaning

Answer: C

Explanation:

Displacement current modifies Ampere's law to include changing electric fields in regions like capacitors, ensuring current continuity.