

Section A (+1 for correct answer & -0.25 for incorrect)

Only one option is correct.

1. Who put forward Corpuscular model of light?

- A) Christiaan Huygens
- B) Isaac Newton
- C) Thomas Young
- D) Louis de Broglie

(2) Which phenomenon is responsible for blue colour of sky?

- (A) Interference (B) Diffraction
- (B) Scattering (D) Polarization

(3) Which of the following describes that time varying magnetic field induces an electromotive force?

- A) Faraday's law
- B) Ampere's law
- C) Lenz rule
- D) Ampere's circuital law

(4) Phase difference π corresponds to path difference,

- A) $\frac{\lambda}{4}$
- B) $\frac{\lambda}{2}$
- C) λ
- D) 2λ .

(5) Which one of the following represents a wave?

- A) $y = A \sin(\omega t - kx)$
- B) $y = A \sin(\omega t)$
- C) $y = A \sin(kx)$
- D) $y = A \sin^2(at^2 - kx + c) + A \cos^2(at - kx)$

(6) The symbols, ϵ_0 and μ_0 represents permittivity and permeability of vacuum. Speed of light is calculated by,

- (A) $1/\sqrt{\mu_0/\epsilon_0}$
- (B) $\sqrt{\mu_0\epsilon_0}$
- (C) $\sqrt{\mu_0/\epsilon_0}$
- (D) $1/\sqrt{\mu_0\epsilon_0}$

(7) The main principle used in interference is:

- A) Fermi Principle
- B) Superposition Principle
- C) Heisenberg's Uncertainty Principle
- D) Huygens' Principle.

(8) When a light wave travels from air to glass, which of the following remains unchanged,

- A) velocity of light wave
- B) frequency of light wave
- C) wavelength of light wave
- D) All of the above

(9) Soap film exhibit brilliant colors in sunlight due to,

- A) Reflection of Light
- B) Refraction of Light
- C) Interference of Light

D) Diffraction of Light.

(10) What is the effect of fringe width of interference fringes on a Youngs double hole experiment if the screen is moved away from the plane of the holes.

- (A) Decreases (B) Remains Constant
- (C) Increases (D) None of the above

(11) An interference pattern is observed when monochromatic light passes through two holes. If the distance between the holes is halved, what happens to the fringe separation on the screen?

- (A) It doubles (B) It quadruples
- (C) It is halved (D) It remains unchanged

(12) What is the effect on fringe width in Youngs double hole experiment if the (monochromatic) source is replaced by another (monochromatic) source of shorter wavelength.

- (A) Decreases (B) Increases
- (C) No effect (D) None of the above

(13) Which of the following is not an example of interference through Division of wavefront?

- A. Fresnel biprism
- B. Young's Double hole experiment
- C. Michelson interferometer
- D. Fresnel mirrors

(14) Which of the following exhibit diffraction?

- A) Only matter waves
- B) Only light waves
- C) Both matter and light waves
- D) Neither matter nor light waves

(15) In a Young's double-hole interference experiment, if the path difference is half a wavelength, what will be observed?

- A) Constructive interference
- B) Destructive interference
- C) Both (D) No interference

(16) In single slit diffraction by monochromatic light, the central maximum is:

- A) Bright B) Dark
- C) Partially bright D) None of the above

Section B (+2 for correct answer & -0.5 for incorrect)

One or more than one options are correct.

(17) Which of the following phenomena demonstrates the wave nature of light?

- (A) Interference (B) Compton scattering
- (C) Diffraction (D) Photoelectric effect.

(18) Light travels from air (having refractive index 1) into a glass with a refraction index of 1.44. If the angle of incidence is 22 degrees, what is the angle of refraction inside the glass?

- (A) $\sin^{-1}(0.260)$ (B) $\tan^{-1}(0.260)$
- (C) $\sin^{-1}(0.130)$ (D) $\tan^{-1}(0.130)$

(19) To observe stationary interference pattern of light, interfering light waves should:

- A. have fixed phase relationship
- B. be monochromatic
- C. have equal or nearly equal amplitudes
- D. be from different light sources

(20) Which of the following are the examples of interference through Division of amplitude?

- A. Interference in thin films
- B. Young's Double hole experiment
- C. Michelson interferometer
- D. Newtons rings interference

(21) For constructive interference in a Michelson interferometer, the path difference between waves should be equal to,

- A. integer multiple of λ
- B. half-integer multiple of λ
- C. odd integer multiple of wavelength
- D. even integer multiple of wavelength

(22) For constructive interference in a Young's double-hole interference experiment, the path difference between waves should be equal to,

- A. integer multiple of λ
- B. half-integer multiple of λ
- C. odd integer multiple of wavelength
- D. even integer multiple of wavelength

(23) Which of the following conditions are true for a reflected light,

- A. phase change of 180 degree, if reflected from denser medium
- B. no phase change, it reflected from rarer medium
- C. phase change of 180 degree, if reflected from rarer medium
- D. no phase change, it reflected from denser medium

(24) Which of the following conditions are true for a refracted light,

- A. no phase change while traveling from rarer to denser medium
- B. phase change of 180 degree while traveling denser to rarer medium
- C. phase change of 180 degree while traveling rarer to denser medium
- D. no phase change while traveling from denser to rarer medium

(25) Which expression describes the intensity distribution in a single slit diffraction pattern? (The term $\beta = \pi b \sin \theta / \lambda$, where θ is angle that diffracted ray make with the normal to the slit, b is slit width, λ is wavelength, I_o is intensity at $\theta = 0$)

- (A) $I = I_o \frac{\sin^2 \beta}{\beta}$ (B) $I = I_o \frac{\sin \beta}{\beta}$
 (C) $I = I_o \frac{\sin^2 \beta}{\beta^2}$ (D) $I = I_o \frac{\sin \beta}{\beta^2}$

Section C (+3 for correct answer & 0 for incorrect)

(26) A viewing screen is separated from a double-slit source by 1.2 m. The distance between the two slits is 0.030 mm. The second-order bright fringe ($m=2$) is 4.5 cm from the center line. Then the wavelength of light is _____ nm. The distance between adjacent bright fringes is _____ cm.

(27) In Young's double hole experiment, two wavelengths $\lambda_1 = 780 \text{ nm}$ and $\lambda_2 = 520 \text{ nm}$ are used to obtain interference fringes. If the n^{th} bright fringe due to λ_1 coincides with $(n + 1)^{th}$ bright fringe due to λ_2 , then the value of n is _____.

Section D (+2 for correct answer & 0 for incorrect)

(28) Define following terms:

(i) Light:

(ii) Phase for waves:

(iii) Wave:

(iv) Wavefront:

(v) Diffraction: