Optics - 45 Marks

12th Standard CBSE

Date : 28-Dec-18

Reg.No. : | | | | | | |

Physics

"All The Best"

Ray & Wave Optics

Sec - A

1) What is critical angle for a material of refractive index $\sqrt{2}$? **1**

2) A glass lens of refractive index 1.45, when immersed in a transparent liquid, becomes invisible.Under what condition does it happen? **1**

3) what is a wavefront? **1**

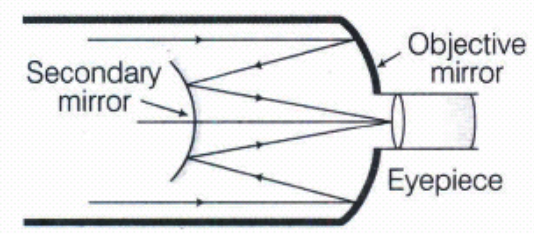
4) What type of wavefront will emerge from (i)a point source and (ii)distant light source? **1**

5) In diffraction due to a single slit, what is the condition for first minimum? **1**

Sec - B

6) Mark the statement true or false: (a)In Young's double slit expt, performed with a source of white light, only black and white fringes are observed. (b)Two slit in Young's double slit expt are illuminated by two different sodium lamps emitting light of same wavelength.No interference pattern will be obtained. **2**

7) A Cassegrain telescope uses two mirrors as shown in the figure.Such a telescope is built with the mirrors 20mm apart.If the radius of curvature of large mirror is 220mm and the small mirror is 140 mm, where will the final image of an object at infinity be? **2**



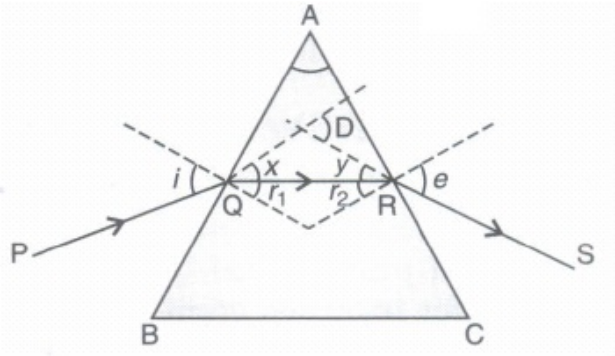
8) A binconvex has a focal length 2/3 times the radius of curvature of either surface.Calculate the refractive index of lens material. **2**

9) Yellow light ($\lambda = 6000A^{\circ}$) illuminates a single slit of $1 \times 10^{-4}m$. Claculate the distance between two dark lines on either side to the central maximum, when the diffraction pattern is viewed on a screen kept 1.5m away from the slit. **2**

10) Find an expression for intensity of transmitted light, when a polaroid sheet is rotated between two crossed polaroids. In which position of the polaroid sheet will thw transmitted intensity be maximum? **2**

11) What is the apparent position of an object below a rectangular block of glass 6 cm thick, if a layer of water 4 cm thick is on the top of the glass? Given, n_{ga} = 1.5 and n_{wa}=1.33. **2**

12) Figure shows a ray of light passing through a prism. If the refracted ray QR is parallel to the base BC, show that (i) $r_1 = r_2$ = A/2, (ii) angle of minimum deviation, D or Dm = 2i -A. **2**



Sec - C

13) Monochromatic light of wavelength 589 nm is incident from air on water surface. What are the wavelength, frequency and speed of (a) reflected and (b) refracted light? Refractive index of water is 1.33. **3**

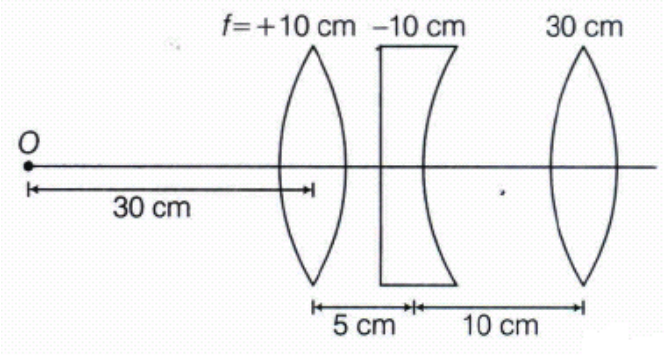
14) The focal lengths of the objective and eye piece of a microscope are 2cm and 5cm respectively, and the distance between them is 20cm.Find the distance of the object from the objective when the final image seen by the eye is 25cm from the eye piece.What is the magnifying power? **3**

15) In Young's double slit experiment, the ratio of slit widths is 4 : 1. What is the intensity ratio in the interference pattern? **3**

16) A biconvex lens has a focal length 2/3 times the radius of curvature of either surface.Calculate the refractive index of the lens material? **3**

17) The polarising angle of a medium is 60°. Calculate refractive index of the medium and angle of refraction. **3**

18) Find the position of the image formed of the object O by the lens combination given in the figure. **3**



19) (i) Draw a neat labelled ray diagram of a compound microscope. Explain briefly its working. (ii) Why must both the objective and the eye-piece of a compound microscope have short focal lengths ? **3**

Sec - D

20) (i)State Huygens' principle.Using this principle,draw a diagram to show how a plane wavefront incident at the interference of the two media gets refracted when it propagates from a rarer to a denser medium. Hence,verify Snell's law of reflection. (ii)Is the frequent of reflected and refracted light same as the frequency of incident light? **5**

21) (a) Draw a labelled ray diagram of an astronomical telescope to show the image formation of a distant object. Write the main considerations required in selecting the objective and eyepiece lenses in order to have large magnifying power and high resolution of the telescope. (b) A compound microscope has an objective of focal length 1.25 em and eyepiece of focal length 5 cm. A small object is kept at 2.5 em from the objective. If the final image formed is at infinity, find the I distance between the objective and the eyepiece. **5**

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