

## Topic :- RAY OPTICS AND OPTICAL INSTRUMENTS

- A point object is placed at the centre of a glass sphere of radius 6 cm and refractive index 1.5. The distance of the virtual image from the surface of the sphere is  
a) 2 cm                      b) 4 cm                      c) 6 cm                      d) 12 cm
- The angle of prism is  $5^\circ$  and its refractive indices for red and violet colours are 1.5 and 1.6 respectively. The angular dispersion produced by the prism is  
a)  $7.75^\circ$                       b)  $5^\circ$                       c)  $0.5^\circ$                       d)  $0.17^\circ$
- Light takes  $t_1$  second to travel a distance  $x$  in vacuum and the same light takes  $t_2$  second to travel  $10x$  cm in a medium. Critical angle for corresponding medium will be  
a)  $\sin^{-1}\left(\frac{10t_2}{t_1}\right)$                       b)  $\sin^{-1}\left(\frac{t_2}{10t_1}\right)$                       c)  $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$                       d)  $\sin^{-1}\left(\frac{t_1}{10t_2}\right)$
- The focal length of a convex mirror is 20 cm its radius of curvature will be  
a) 10 cm                      b) 20 cm                      c) 30 cm                      d) 40 cm
- Which of the following is not correct regarding the radio telescope  
a) It can not work at night  
b) It can detect a very faint radio signal  
c) It can be operated even in cloudy weather  
d) It is much cheaper than optical telescope
- When a glass slab is placed on a cross made on a sheet, the cross appears raised by 1 cm. The thickness of the glass is 3 cm. The critical angle for glass is  
a)  $\sin^{-1}(0.33)$                       b)  $\sin^{-1}(0.5)$                       c)  $\sin^{-1}(0.67)$                       d)  $\sin^{-1}(\sqrt{3}/2)$
- An object is placed at 15 cm in front of a concave mirror whose focal length is 10 cm. The image formed will be  
a) Magnified and inverted                      b) Magnified and erect  
c) Reduced in size and inverted                      d) Reduced in size and erect
- A hollow double concave lens is made of very thin transparent material. It can be filled with air or either of two liquids  $L_1$  and  $L_2$  having refractive indices  $n_1$  and  $n_2$  respectively ( $n_2 > n_1 > 1$ ). The lens will diverge a parallel beam of light if it is filled with  
a) Air and placed in air                      b) Air and immersed in  $L_1$   
c)  $L_1$  and immersed in  $L_2$                       d)  $L_2$  and immersed in  $L_1$

9. Which of the following is not the case with the image formed by a concave lens?
- It may be erect or inverted
  - It may be magnified and diminished
  - It may be real or virtual
  - Real image may be between the pole and focus or beyond focus
10. A short sighted person can see distinctly only those objects which lie between 10 cm and 100 cm from him. The power of the spectacle lens required to see a distant object is
- +0.5 D
  - 1.0 D
  - 10 D
  - +4.0 D
11. A lens of refractive index  $n$  is put in a liquid of refractive index  $n'$ . If focal length of lens in air is  $f$ , its focal length in liquid will be
- $\frac{fn'(n-1)}{n'-n}$
  - $\frac{f(n'-n)}{n'(n-1)}$
  - $\frac{n'(n-1)}{f(n'-n)}$
  - $\frac{fn'n}{n-n'}$
12. A concave lens of glass, refractive index 1.5, has both surfaces of same radius of curvature  $R$ . On immersion in a medium of refractive index 1.75, it will behave as a
- Convergent lens of focal length 3.5 R
  - Convergent lens of focal length 3.0 R
  - Divergent lens of focal length 3.5 R
  - Divergent lens of focal length 3.0 R
13. The light gathering power of a camera lens depends on
- Its diameter only
  - Ratio of diameter and focal length
  - Product of focal length and diameter
  - Wavelength of light used
14. The plane faces of two identical plano convex lenses, each with focal length  $f$  are pressed against each other using an optical glue to form a usual convex lens. The distance from the optical centre at which an object must be placed to obtain the image same as the size of object is
- $\frac{f}{4}$
  - $\frac{f}{2}$
  - $f$
  - $2f$
15. Check the correct statements on scattering of light
- S1 : Rayleigh scattering is responsible for the bluish appearance of sky
- S2 : Rayleigh scattering is proportional to  $1/\lambda^4$  when the size of the scatter is much less than  $\lambda$
- S3 : Clouds having droplets of water (large scattering objects) scatter all wavelengths are almost equal and so are generally white
- S4 : The sun looks reddish at sunset and sunrise due to Rayleigh scattering
- S1 only
  - S1 and S2
  - S2 and S3
  - S1, S2, S3 and S4
16. A ray of light travelling inside a rectangular glass block of refractive index  $\sqrt{2}$  is incident on the glass-air surface at an angle of incidence of  $45^\circ$ . The refractive index of air is 1. Under these conditions the ray
- Will emerge into the air without any deviation
  - Will be reflected back into the glass
  - Will be absorbed
  - Will emerge into the air with angle of refraction equal to  $90^\circ$
17. The spectrum obtained from a sodium vapour lamp is an example of
- Absorption spectrum
  - Emission spectrum
  - Continuous spectrum
  - Band spectrum

18. A short linear object of a length  $b$  lies along the axis of a concave mirror of focal length  $f$  at a distance  $u$  from the pole of the mirror. The size of the image is equal to

- a)  $b\left(\frac{u-f}{f}\right)^{1/2}$       b)  $b\left(\frac{f}{u-f}\right)^{1/2}$       c)  $b\left(\frac{u-f}{f}\right)$       d)  $b\left(\frac{f}{f-u}\right)$

19. Rising and setting sun appears to be reddish because

- a) Diffraction sends red rays to earth at these times  
b) Scattering due to dust particles and air molecules are responsible  
c) Refraction is responsible  
d) Polarization is responsible

20. An astronomical telescope has a magnifying power 10, the focal length of the eye-piece is 20 cm. The focal length of the objective is

- a)  $\frac{1}{200}$  cm      b)  $\frac{1}{2}$  cm      c) 200 cm      d) 2 cm

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