TEST

JEE Mains PYQs Ray Optics And optical instruments (Physics Master Academy)

QUESTIONS

SECTIONS

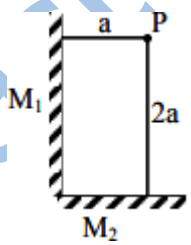
1. Section A - 25 Questions

Section 1 : Section A - 25 Questions

SECTION INSTRUCTIONS

This section contains 25 MCQs. +4 for every correct answer, -1 for every incorrect answer.

1 Two plane mirrors M_1 and M_2 are at right angel to each other as shown. A point source P is placed at a and 2a meter away from M_1 and M_2 respectively. The shortest distance between the images thus formed is: (Take $\sqrt{5} = 2.3$)



- 3a
- 4.6a
- 2.3a
- $2\sqrt{10}$ a

Correct: +4 · Incorrect: -1

2 An object is placed beyond the center of curvature C of the given concave mirror. IF the distance of the object is d, from C and the distance of the image formed isd_2 from C, the radius of curvature of this mirror is

- $\frac{2d_1d_2}{d_1-d_2}$
-

$\frac{2d_1d_2}{d_1+d_2}$

○ $\frac{d_1d_2}{d_1+d_2}$

○ $\frac{d_1d_2}{d_1-d_2}$

Correct: +4 · Incorrect: -1

3 The focal length f is related to the radius of curvature r of the spherical convex mirror by

○ f = + ½ r

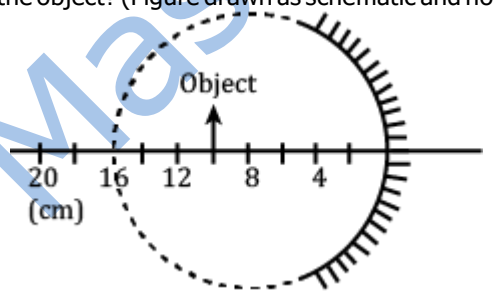
○ f = - r

○ f = - ½ r

○ f = r

Correct: +4 · Incorrect: -1

4 A spherical mirror is obtained as shown in kgure from a hollow glass sphere. If an object is positioned in front of the mirror, what will be the nature and magnikcation of the image of the object? (Figure drawn as schematic and not to scale)



○ Inverted, real and magniked

○ Erect, virtual and magniked

○ Erect, virtual and unmagniked

○ Inverted, real and unmagniked

Correct: +4 · Incorrect: -1

5 A concave mirror for face viewing has focal length of 0.4m. The distance at which you hold the mirror from your face in order to see your image upright with a magnikcation of 5 is

○ 0.24m

- 1.60m
- 0.32m
- 0.16m

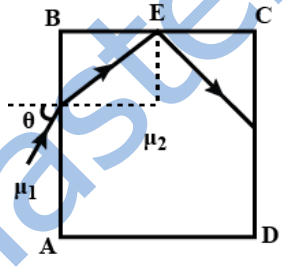
Correct: +4 · Incorrect: -1

6 A glass tumbler having inner depth of 17.5cm is kept on a table. A student starts pouring water (μ = 4/3) into it while looking at the surface of water from the above. When he feels that the tumbler is half klled, he stops pouring water. Up to what height, the tumbler is actually klled?

- 11.7cm
- 10cm
- 7.5cm
- 8.75cm

Correct: +4 · Incorrect: -1

7 A transparent cube of side d, made of a material of refractive index μ_2 is immersed in a liquid of refractive index μ_1 ($\mu_1 < \mu_2$). A ray is incident on the face AB at an angle θ (shown in kgure). Total internal reflection take place at point E on the face BC.

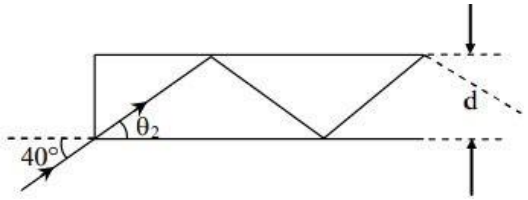


The θ must satisfy:

- $\theta < \sin^{-1}\frac{\mu_1}{\mu_2}$
- $\theta > \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2}-1}$
- $\theta < \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2}-1}$
- $\theta > \sin^{-1}\frac{\mu_1}{\mu_2}$

Correct: +4 · Incorrect: -1

8 In kgure, the optical kber is l = 2m long and has a diameter of d = 20μm. If a ray of light in incident on one end of the kber at angle θ_1 = 40°, the number of reflections it makes before emerging from the other end is close to: (refractive index of kber is 1.31 and sin 40° = 0.64)



- 55000
- 66000
- 45000
- 57000

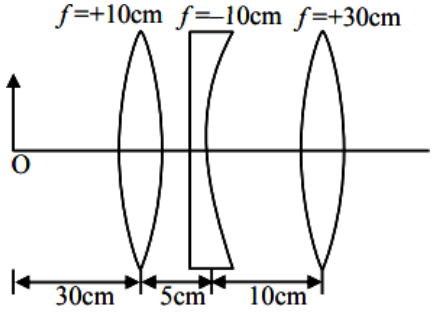
Correct: +4 · Incorrect: -1

9 Which of the following is used in optical kbers?

- total internal reflection
- scattering
- diffraction
- refraction

Correct: +4 · Incorrect: -1

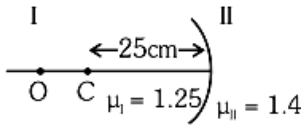
10 Find the distance of the image from object O formed by the combination of lenses in the kgure:



- 1, ∞
- very high, ∞
- ½, f/2
- ¼, f/4

Correct: +4 · Incorrect: -1

11 Region I and II are separated by a spherical surface of radius 25cm. An object is kept in region I at a distance of 40cm from the surface. The distance of the image from the surface is



- 55.44cm
- 9.52cm
- 18.23cm
- 37.58cm

Correct: +4 · Incorrect: -1

12 The distance between an object and a screen is 100cm. A lens can produce real image of the object on the screen for two different positions between the screen and the object. The distance between these two positions is 40cm. If the power of the lens is close to (N/100)D where N is integer, the value of N is____

- 476.19
- 474
- 470.25
- 470

Correct: +4 · Incorrect: -1

13 A point object in air is in front of the curved surface of a plano-convex lens. The radius of curvature of the curved surface is 30cm and the refractive index of the lens material is 1.5, then the focal length of the lens (in cm) is ____

- 30
- 40
- 50
- 60

Correct: +4 · Incorrect: -1

If the whole set up is immersed in water without disturbing the object and the screen positions, what will one observe on the screen?

- Image disappears
- Magniked image
- Erect real image
- No change

Correct: +4 · Incorrect: -1

15 A convergent doublet of separated lenses, corrected for spherical aberration has resultant focal length of 10cm. The separation between the two lenses is 2cm. The focal lengths of the component lenses

- 18cm, 20cm
- 10cm, 12cm
- 12cm, 14cm
- 16cm, 18cm

Correct: +4 · Incorrect: -1

16 A prism of refractive indeed μ and angle of prism A is placed in the position of minimum angle of deviation. If minimum angle of deviation is also A, then in terms of refractive index, A = ___

- $2\cos^{-1}\left(\frac{\mu}{2}\right)$
- $\sin^{-1}\left(\frac{\mu}{2}\right)$
- $\sin^{-1}\left(\sqrt{\frac{\mu-1}{2}}\right)$
- $\cos^{-1}\left(\frac{\mu}{2}\right)$

Correct: +4 · Incorrect: -1

17 A deviation of 2° is produced in the yellow ray when prism of crown and flint glass are achromatically combined. Taking dispersive powers of crown and flint glass as 0.02 and 0.03 respectively and refractive index for yellow light for these glasses are 1.5 and 1.6 respectively. The refracting angles for crown glass prism will be___° (in degree). (Round off to nearest integer)

- 10°

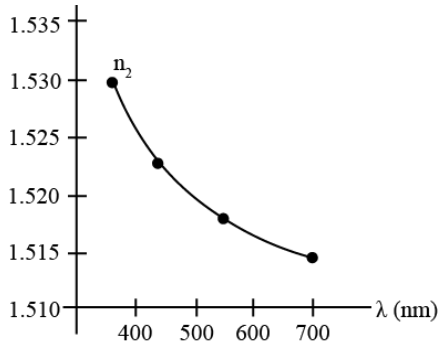
○ 11°

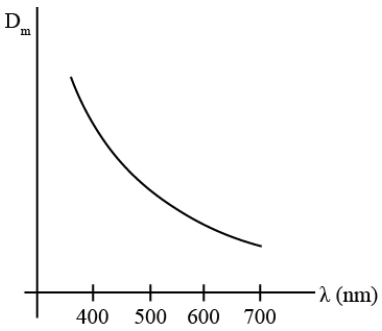
○ 12°

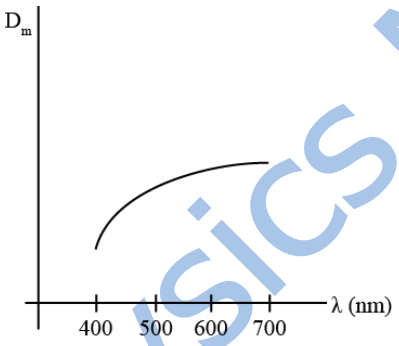
○ 13°

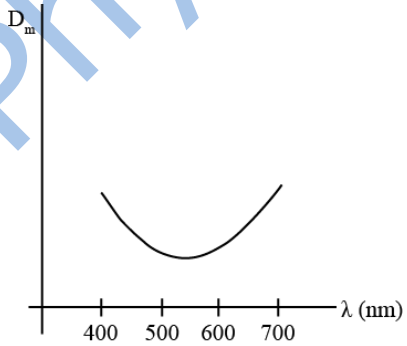
Correct: +4 · Incorrect: -1

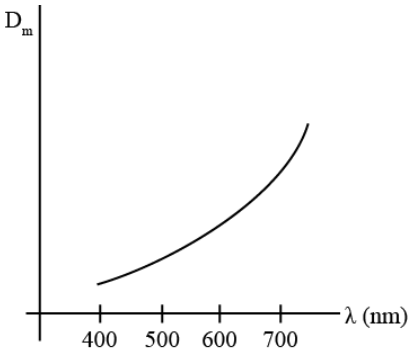
18 The variation of refractive index of a crown glass thin prism with wavelength of the incident light is shown. Which of the following graphs is the correct one of D_m is the angle of minimum deviation?



○ 

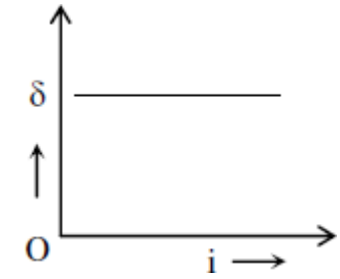
○ 

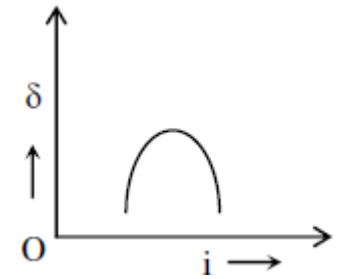
○ 

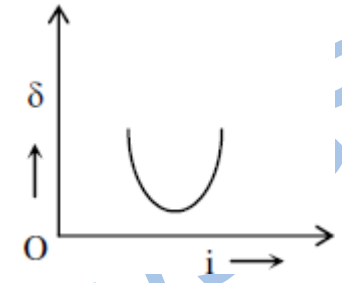


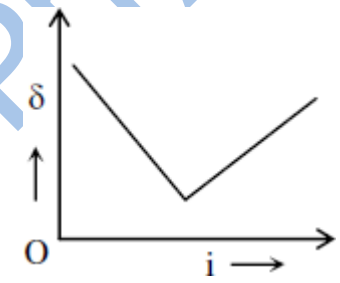
Correct: +4 · Incorrect: -1

19 The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by









Correct: +4 · Incorrect: -1

20 Which of the following processes play a part in the formation of a rainbow?
(i) Refraction (ii) Total internal reflection (iii) Dispersion (iv) Interference

- ○ (i), (ii) and (iii)
- ○ (i) and (ii)
- ○ (i), (ii) and (iv)
- ○ (iii) and (iv)

Correct: +4 · Incorrect: -1

21 The magnifying power of a telescope with tube length 60cm is 5. What is the focal length of its eye piece?

- ○ 20cm
- ○ 40cm
- ○ 30cm
- ○ 10cm

Correct: +4 · Incorrect: -1

22 An observer looks at a distant tree of height 10m with a telescope of magnifying power of 20. To the observer the tree appears

- ○ 20 times taller
- ○ 20 times nearer
- ○ 10 times taller
- ○ 10 times nearer

Correct: +4 · Incorrect: -1

23 The question has Statement 1 and Statement 2. Of the four choices given after the Statements, choose the one that best describes the two Statements:
Statement 1: Very large size telescope are reflecting telescopes instead fo refracting telescopes.
Statement 2: It is easier to provide mechanical support to large seize mirrors than large size lenses

- ○ Statement 1 is true and Statement 2 is false
- ○ Statement 1 is false and Statement 2 is true
- ○ Statement 1nad statement 2 are true and Statement 2 is the correct explanation of Statement 1

- ○ Statement 1nad statement 2 are true and Statement 2 is not the correct explanation of Statement 1

Correct: +4 · Incorrect: -1

24 An experiment is performed to knd the refractive index of glass using a travelling microscope. In this experiment distances are measured by

- ○ a vernier scale provided on the microscope
- ○ a standard laboratory scale
- ○ a meter scale provided on the microscope
- ○ a screw gauge provided on the microscope

Correct: +4 · Incorrect: -1

25 The image formed by an objective of a compound microscope is

- ○ virtual and diminished
- ○ real and diminished
- ○ real and enlarged
- ○ virtual and enlarged

Correct: +4 · Incorrect: -1

TEST

JEE Mains PYQs Ray Optics And optical instruments (Physics Master Academy)

ANSWERS

SECTIONS

1. Section A - 25 Questions

Section 1 : Section A - 25 Questions

1 4.6a

2 $\frac{2d_1d_2}{d_1-d_2}$

3 f = + ½ r

4 Inverted, real and unmagniked

5 0.32m

6 10cm

7 $\theta<\sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2}-1}$

8 57000

9 total internal reflection

10 1, ∞

11 37.58cm

12 476.19

13 60

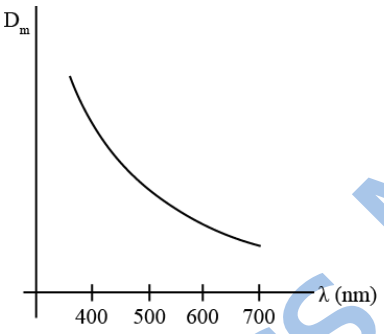
14 Image disappears

15 18cm, 20cm

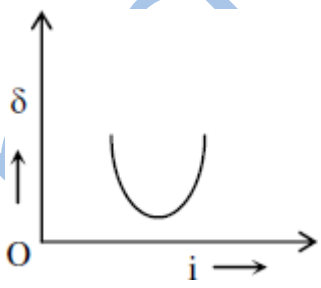
16 $2\cos^{-1}\left(\frac{\mu}{2}\right)$

17 12°

18



19



20 (i) , (ii) and (iii)

21 10cm

22 20 times nearer

23 Statement 1nad statement 2 are true and Statement 2 is the correct explanation of Statement 1

24 a vernier scale provided on the microscope

25 real and enlarged