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PHYSICS

BOOKS - CHETAN PHYSICS (TAMIL ENGLISH)

REFRACTION OF LIGHT

Fill In The Blanks And Rewrite The Completed Statements

1. The refractive index of a medium is dependent on the _____ .

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2. The change in the _____ of light rays while going from one medium to another is called refraction.

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3. The refractive index of air goes on _____ while coming to the earth surface.

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4. The splitting up of white light into colours is called _____.

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5. In the dispersion of sunlight through glass prism the _____ light deviates the most.

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6. When the light ray is incident normal to the interface between any two media, the angle of incidence is _____ .

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7. When the ray of light passes from denser medium to rarer medium obliquely, it bends _____ the normal.

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8. When the value of 'r' is 90°, then the 'I' for it is called as _____ .

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9. When light travels from denser medium to rarer, then the partial _____ takes place.

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10. The refractive index ${}_2n_1 = \frac{n_1}{\_\_\_\_}$

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11. The refractive index of diamond is _____ .

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12. When the light passes through glass prism, the _____ light deviates the least.

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13. The scientist _____ used the glass prism for obtaining spectrum from the sunlight.

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14. The wavelength of visible light range for human is between _____ .

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15. The wavelength of _____ light is the least which is _____ .

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16. 1 nm = _____ m.

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17. The wavelength of violet light is _____

.

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18. When the angle of incidence is more than critical angle _____ takes place.

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Find The Odd Word Out

1. Mirage, twinkling of stars, scattering of light, apparent position of stars

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2. Find the Odd one out:

Critical angle, angle of incidence, angle of refraction, alternate angle

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3. Find the Odd one out:

Reflection, dispersion, refractive index, refraction

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4. Find the odd one out:

Brown, blue,green, red

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Complete The Analogy

1. Refractive index of water : 1.33 :: Refractive index of air : .....

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2. Stars : Point source of light : : Plants : .....

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3. Diamond : Denser medium : : Air : .....

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4. Least deviation : Red : : Maximum deviation : .....

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5. Spectrum : Dispersion : : Twinkling of stars : .....

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6. Refractive index of Ice : 1.31 : : Refractive index of Water : .....

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7. Maximum refractive index : Violet : : Minimum refractive index : .....

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8. $_2n_1 = \frac{v_1}{v_2} : : {}_1n_2 :$ .....

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9. $\angle i <$ critical angle : Partial reflection : : $\angle i >$ critical angle : .....

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10. Lens : Transparent : : Mirror : .....

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Answer In One Sentence

1. What is the refractive index of water ?

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2. Write the ratio of velocity of light in first medium to the velocity of light in the second medium.

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3. What is dispersion?

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4. What is critical angle and total internal reflection?

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5. What is refraction of light ?

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6. What is the value of angle of refraction if angle of incidence is 0° ?

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7. When sunlight passes through glass prism which light deviates the least ?

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8. What is critical angle and total internal reflection?

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9. What is partial reflection ?

Watch Video Solution

10. What is absolute refractive index ?

Watch Video Solution

11. What is reflection?

Watch Video Solution

12. Have you seen a mirage which is an illusion of the appearance of water on a hot road or ion a desert ?

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Match The Pairs

1.

Column A	Column B
(1) Diamond	(a) 1.5
(2) Air	(b) 2.42
(3) Alcohol	(c) 1.77
(4) Benzene	(d) 1.36
	(e) 1.0003

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2.

Column A	Column B
(1) Formation of rainbow	(a) Total internal reflection
(2) Twinkling of stars	(b) Dispersion
(3) Mirage	(c) Dispersion, refraction, reflection
(4) Spectrum	(d) Atmospheric refraction

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3.

Column A	Column B
(1) Refraction	(a) With respect to vacuum
(2) Refractive index	(b) Change in direction of light
(3) Absolute refractive index	(c) Spectrum
(4) Dispersion	(d) $\frac{\sin i}{\sin r}$
	(e) Mirage

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True Or False

1. TRUE or FALSE:

Light has different velocities in different media.

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2. TRUE or FALSE:

The speed of violet light is less than that of red light.

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3. TRUE or FALSE:

Incident ray and refracted rays are parallel to the normal.

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4. TRUE or FALSE:

The refractive index of the medium depends on the wavelength of light.

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5. TRUE or FALSE:

When light rays travel rarer to denser medium, it bends towards the normal.

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6. TRUE or FALSE:

When light ray travels from denser medium to rarer medium, it travels parallel to the normal.

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7. TRUE or FALSE:

If angle of incidence is zero, then the angle of refraction is 90°.

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8. TRUE or FALSE:

When light travels obliquely from glass to air, it bends away from the normal.

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9. TRUE or FALSE:

The splitting of white light into its component colours is called dispersion.

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Name Of Following

1. The splitting up of white light into colours is called _____.

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2. A material whose refractive index is 2.42.

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3. A star appears twinkling in the sky because of _____ by the atmosphere .

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4. The ratio of sine of angle of incidence to the sine of angle of refraction.

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5. Which colour of light deviates the least in the spectrum obtained with a prism ?

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6. Phenomenon behind formation of rainbow.

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7. The unit of refractive index.

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8. Refractive index of kerosene.

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Choose And Write The Correct Option

1. What is the reason for the twinkling of stars ?

A. Explosions occuring in the stars from time to time

B. Absorption of light in the earth's atmosphere

C. Motion of stars

D. Changing refractive index of the atmospheric gases

Answer: D

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2. If the refractive index of glass with respect to air is $\frac{3}{2}$, then the refractive index of air with respect to glass ..... .

A. $\frac{1}{2}$

B. 3

C. $\frac{1}{3}$

D. $\frac{2}{3}$

Answer: D

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3. We can see the sun even when it is little below the horizon because of ..... .

A. Reflection of light

B. Refraction of light

C. Dispersion of light

D. Absorption of light

Answer: B

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4. When light ray passes from air to glass slab then it ..... .

A. bends towards normal

B. bends away

C. does not bend

D. turn back

Answer: A

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5. When light passes through glass slab, the incident ray and emergent ray are ..... .

A. intersecting

B. parallel

C. making an angle

D. touching

Answer: B

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6. When light ray travels from denser medium to rarer, then it ..... .

A. bends towards normal

B. bends away from normal

C. goes undeviated

D. deviates randomly

Answer: B

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7. The velocity of light in air is .....m/s.

A. 3×10^{10}

B. 3×10^{8}

C. 1.5×10^{8}

D. 0.3×10^{8}

Answer: B

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8. Rakesh performs the experiments on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He observes that in all cases

A. $\angle i > \angle r$ but $\angle i = \angle e$

B. $\angle i < \angle r$ but $\angle i = \angle e$

C. $\angle i > \angle e$ but $\angle i = \angle r$

D. $\angle i < \angle e$ but $\angle i = \angle r$

Answer: A

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9. When a ray of light travels from air to glass and strikes the surface of separation at 90°, then it ..... .

A. bends towards the normal

B. bends away from the normal

C. passes without bending

D. reflects to air

Answer: C

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10. A ray of light incident from a denser medium passes through a rarer medium in a straight line. What should be angle of incidence ?

A. 0°

B. 30°

C. 60°

D. 120°

Answer: A

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11. The ray of light gets deviated when it passes from one medium to another medium because ..... .

A. the colour of light changes

B. the frequency of light changes

C. the velocity of light changes

D. None of these

Answer: C

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12. A ray of light strikes the glass slab at an angle of 50°. What is the angle of incidence ?

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13. A glass-slab is placed in the path of convergent light. The point of convergence of light ..... .

A. moves towards the slab

B. moves away from slab

C. remains at the same point

D. undergoes lateral shift

Answer: B

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14. What is the speed of light in a transparent medium having absolute refractive index 1.25 ?

A. $1.25 \times 10^8 m/s$

B. $2.4 \times 10^8 m/s$

C. $3.0 \times 10^8 m/s$

D. $1.5 \times 10^8 m/s$

Answer: B

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15. Which colour of light deviates the least in the spectrum obtained with a prism ?

A. Red

B. Yellow

C. Violet

D. Blue

Answer: A

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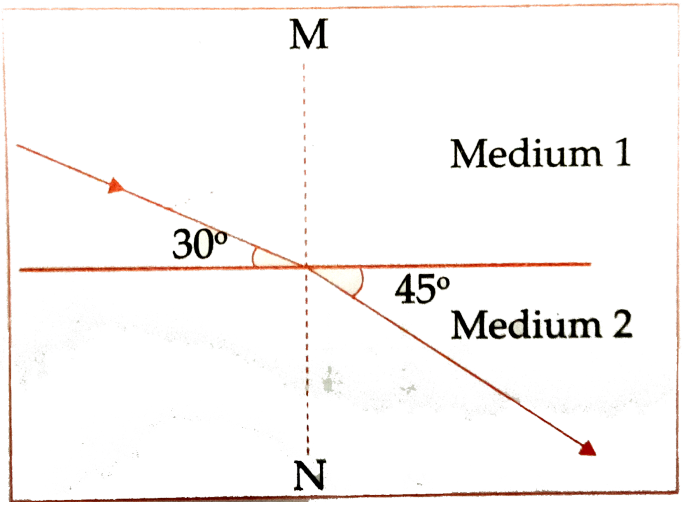
16. The figure shows the path of ray of light propagating from medium 1 to medium 2. The refractive index of medium 1 with respect to medium 2 is ..... .



A. $\frac{\sin 45^\circ}{\sin 60^\circ}$

B. $\frac{\sin 60^\circ}{\sin 45^\circ}$

C. $\frac{\sin 45^\circ}{\sin 30^\circ}$

D. $\frac{\sin 30^\circ}{\sin 45^\circ}$

Answer: B

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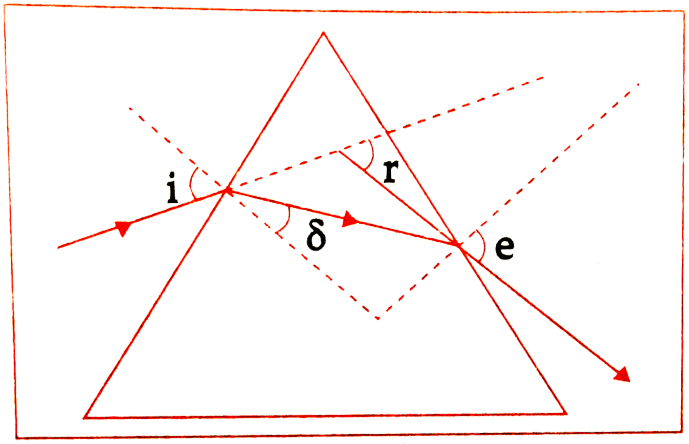
17. After tracing the path of a ray of light through a glass prism, a student marked the angle of indicence $(\angle i)$, angle of emergence $(\angle e)$ and the angle of deviation $(\angle D)$ as shown in the diagram.

The correctly marked angles are :



A. $\angle i$ and $\angle r$

B. $\angle i$ and $\angle e$

C. $\angle i, \angle e$ and $\angle \delta$

D. $\angle i, \angle r$ and $\angle e$

Answer: B

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18. Will the light travel through soapy water with the same velocity as it travels through air ?

A. Yes

B. No

C. Depends on the conditions

D. None of these

Answer: B

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19. In an experiment to trace the path of a ray of light passing through a rectangular glass slab, four students tabulated their observations as given below. Which student is

correct.

(a)

S.N.	∠i	∠r	∠e
1.	30^0	20^0	30^0
2.	45^0	29^0	43^0
3.	60^0	36^0	60^0

(b)

S.N.	∠i	∠r	∠e
1.	30^0	15^0	38^0
2.	45^0	20^0	53^0
3.	60^0	28^0	67^0

(c)

S.N.	∠i	∠r	∠e
1.	30^0	30^0	20^0
2.	45^0	45^0	29^0
3.	60^0	60^0	36^0

(d)

S.N.	∠i	∠r	∠e
1.	30^0	20^0	20^0
2.	45^0	29^0	29^0
3.	60^0	36^0	36^0

A. a

B. B

C. c

D. d

Answer: A

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20. If n_v, n_r, n_b are the refractive indices of violet, red and blue light respectively, in a

given medium then which of the following is true ?

A. $n_v = n_b = n_r$

B. $n_v > n_b > n_r$

C. $n_v > n_b < n_r$

D. $n_v > n_r > n_b$

Answer: B

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21. V_V, V_R, V_G are the velocities of violet, red and green lights respectively, passing through a prism after dispersion of white light. Which among the following is a correct relation ?

A. $V_V = V_R = V_G$

B. $V_V < V_G < V_R$

C. $V_V > V_R > V_G$

D. $V_V < V_R = V_G$

Answer: B

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Solve The Following

1. The absolute index of water is 1.36. What is the velocity of light in water ? (velocity of light in vacuum is $3 \times 10^8 m/s$)

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2. Light travels with a velocity $1.5 \times 10^8 m/s$ in a medium. On entering 2^{nd} medium its

velocity becomes $0.75 \times 10^8 m/s$. What is the refractive index of the 2^{nd} medium with respect to the first medium.

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3. If the speed of light in a medium is $1.5 \times 10^8 m/s$, what is the absolute refractive index of the medium ?

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4. If the absolute refractive indices of glass and water are $3/2$ and $4/3$ respectively, what is the refractive index of glass respect to water ?

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5. If the refractive index of second medium with respect to first medium is $_2n_1$ and that of third medium with respect to second

medium is ${}_3n_2$. What and how much is ${}_3n_1$?

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6. If the angle incidence and angle of emergence of a light ray falling on a glass slab are i and e respectively, then prove that, i=e.

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Numericals For Practice

1. The speed of light in a transparent medium is $2.5 \times 10^8 m/s$. Find the absolute refractive index of that medium.

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2. The refractive index of benzene is $\frac{3}{2}$ and that of water is $\frac{4}{3}$. Find the refractive index of water with respect to benzene.

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3. The refractive index of water is $\frac{4}{3}$ and speed of light in air is $3 \times 10^8 m/s$. Find the speed of light in the water.

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4. Solve and fill in the blanks

Sr. No.	Velocity of light in the first medium v_1	Velocity of light in the second medium v_2	Refractive Index ${}_2n_1$	Refractive Index ${}_1n_2$
(1)	3×10^8 m/s	1.2×10^8 m/s		
(2)		2.25×10^8 m/s	$\frac{4}{3}$	
(3)	2×10^8 m/s			1.5

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Define Write The Laws

1. What is refraction of light ?

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2. What is dispersion?

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3. What is spectrum?

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4. Define Angle of incidence

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5. Define Angle of refraction

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6. State the laws of refraction

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7. State the laws of reflection.

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Write The Short Note

1. What is dispersion?

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2. Define refractive index of a medium.

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3. Partial reflection and Total internal reflection.

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4. Mirage or have you seen mirage which is an illusion of water on a hot road or desert. Explain

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5. Rainbow formation or Prove that a rainbow is the combined effect of the refraction, dispersion and total internal reflection of light.

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Give Scientific Reasons

1. Stars twinkle due to

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2. why do the Planets not twinkle?.

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3. We can see the sun even when it is little below the horizon because of ..... .

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4. Why Red colour is used in danger signal?

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5. is it possible to enjoy a rainbow at fountain in any season.

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6. Will light travel through a glass slab with the same velocity as it travels in air ?

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7. Will the velocity of light be same in all media ?

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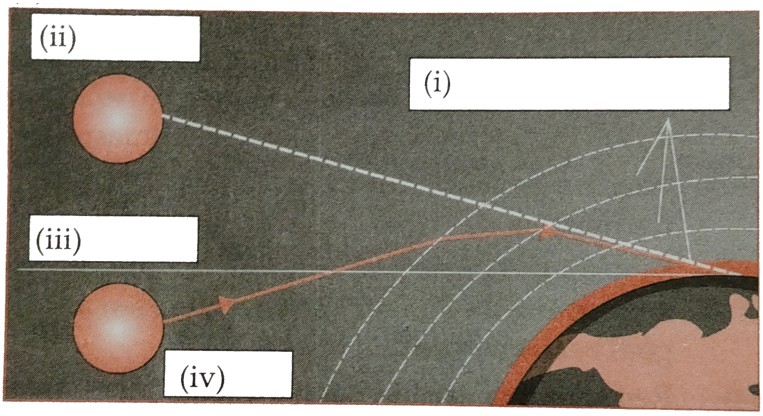
Label The Diagram

1. Fill in the blanks



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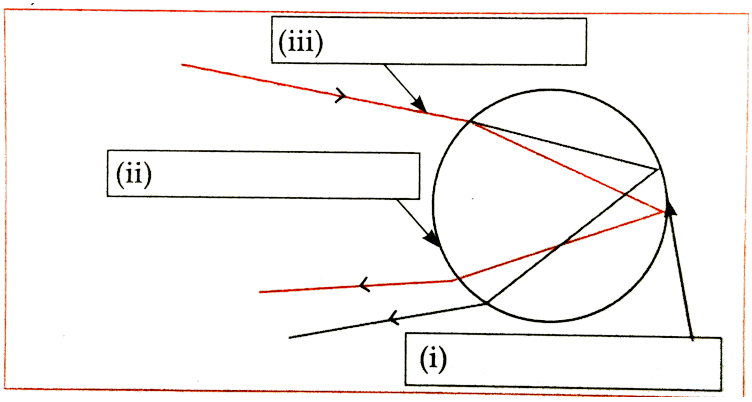
2. Fill in the blanks



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Complete The Following Statements And Explain

1. The refractive index of a medium is dependent on the _____ .

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2. The change in the _____ of light rays while going from one medium to another is called refraction.

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3. Light rays when travelling from air to water bends ..... .

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4. Light rays when travelling from Benzene to Air bends ..... .

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5. The splitting up of white light into colours is called _____.

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Draw Neat And Labelled Diagram For The Following

1. Refraction of light passing through a glass slab.

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2. What is dispersion? Explain in detail.

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3. Partial reflection and Total internal reflection.

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4. Rainbow formation.

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Paragraph Questions

1. Read the passage and Answer the following question:

In, vacuum the velocity of light radiation with different wavelength is the same. But in a material medium, the velocity of different colour radiations is not the same and they travel with different paths. Due to this, the refractive index of the medium is different for different colours. If white beam of light is incident on a glass prism, the angle of refraction for different colours is different. When Sunlight is incident on a refracting

surface, then it gets split into seven coloured spectrum and emerges out. The splitting of light into its component colours is called dispersion.

Sir Isaac Newton was the first to use a glass prism to obtain the spectrum of Sunlight. A glass prism is transparent medium bounded by two plane surfaces inclined at an angle.

When white light is dispersed into seven colours by a prism, different colours of light bend through different angles with respect to incident ray. Out of these seven colours, red light bends the least, while violet light bends

the most. So, the rays of each colour emerge along different paths and becomes distinct. Hence, we get spectrum of seven - different colours.

Q. How do emergent rays appear ?

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2. Read the passage and Answer the following question:

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Q. Write the colours of the Spectrum ?

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3. Read the passage and answer the following question:

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Q. What is dispersion ?

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Q. Which light deviates the least and which one deviates the most ?

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6. The beautiful phenomenon of the rainbow is a combination of dispersion, internal reflection and refraction of light. The rainbow appears in the sky after a rainfall. The water droplets act as small prisms. When sunlight enters the water droplets present in the atmosphere, they refract and disperse the incident Sunlight. Then, they reflect internally inside the droplet and finally again refract it. As a collective effect of all the phenomena, the seven coloured rainbow is observed.

Q. Which three major phenomena are responsible for rainbow ?

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7. The beautiful phenomenon of the rainbow is a combination of different phenomena - dispersion, internal reflection and refrection of light. The rainbow appears in the sky after a rainfall. The water droplets act as small prisms. When sunlight enters the water droplets present in teh atmosphere, they refract and

disperse the incident Sunlight. Then, they reflect internally inside the droplet and finally again refract it. As a collective effect of all the phenomena, the seven coloured rainbow is observed.

Q. How do refraction and dispersion take place ?

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8. The beautiful phenomenon of the rainbow is a combination of different phenomena -

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Q. Give a diagrammatic respresentation of Rainbow Production.

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Activity Activity Application Based Questions

1. (i) Keep a glass slab on a blank paper and draw its outline PQRS as shown in the figure.

(ii) Draw an inclined straight line on the side of PQ so that it intersect PQ at N. Pierce two pins vertically at two points A and B along the line.

(iii) Look at the pins A and B from the opposite side of the slab and pierce pins C and D

vertically so that the images of A and B are in line with C and D.

(iv) Now remove the chip and the pins and draw a straight line going through points C and D so that it intersects SR at M.

(v) Join points M and N. Observe the incident ray AN and emergent ray MD.

Questions:

(a) What is your observation about the emergent ray and incident ray ?

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2. From incident white light how will you obtain white emergent light by making use of two prisms ?

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3. You must have seen chandeliers having glass prism. The light from a tungsten bulb gets dispersed while passing through these prisms and we see coloured spectrum. If we use on LED light instead of tungsten bulb, will we be able to see the same effect ?

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4. Have you seen that objects beyond and above a holi free appear to be shaking ? Why does this happen?

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5. Objects beyond and above a holy fire appear to be shaking. Give scientific reasons.

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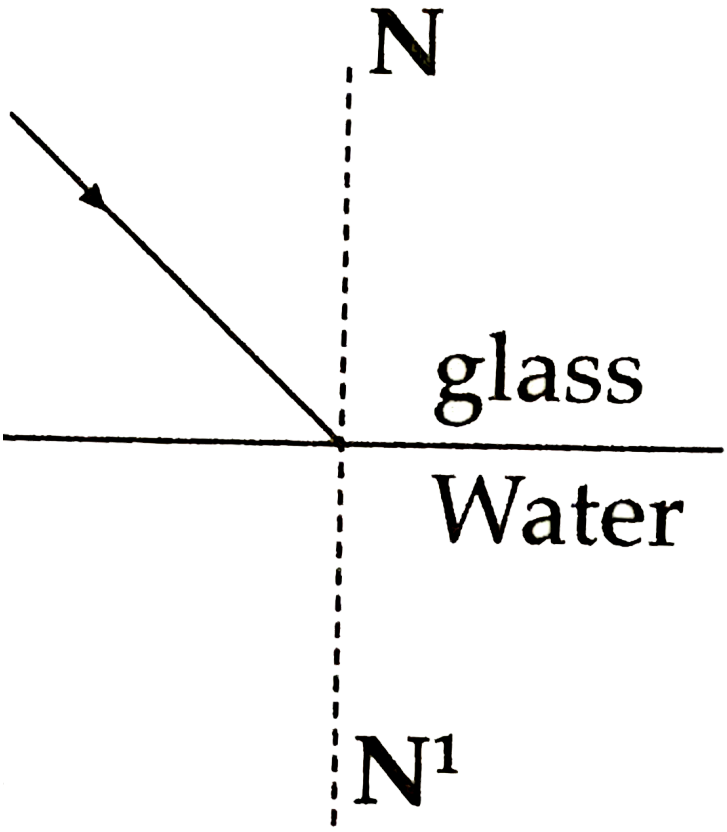

6.

(a) Complete the diagram.

(b) What is the effect on the velocity of light when it enters water ?

(c) If the light was incident on the interface at an angle greater than critical angle, which phenomen on occurs ?

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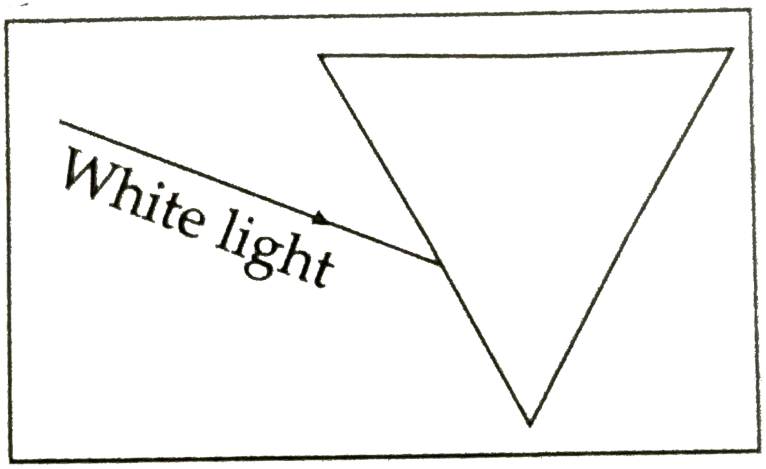
7. Complete the following diagram:



(b) Name the colour that deviates the most

and least

(c) Among orange and violet, which colour has highest velocity.

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8. What is the angle of incidence called, when angle of refraction is 90° ?

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9. State any one phenomenon in nature which is based on total internal reflection.

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10. Write the two conditions for total internal reflection.

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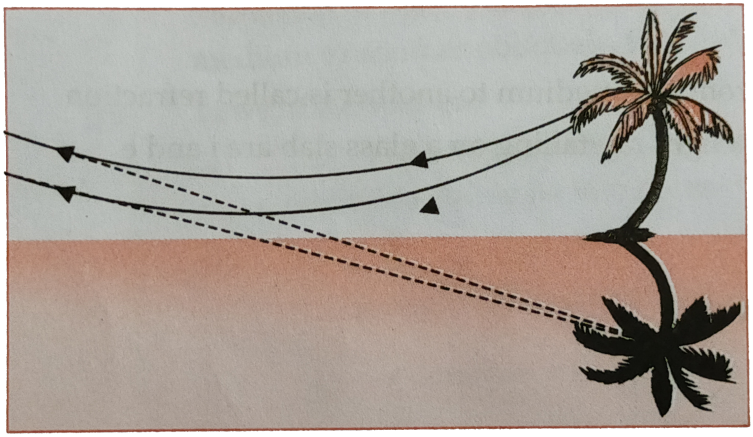
11. 

(a) Which phenomenon does the diagram show ?

(b) Which law obeyed by light makes this phenomenon occur ?

(c) Name one more phenomenon in nature where the above law is observed.

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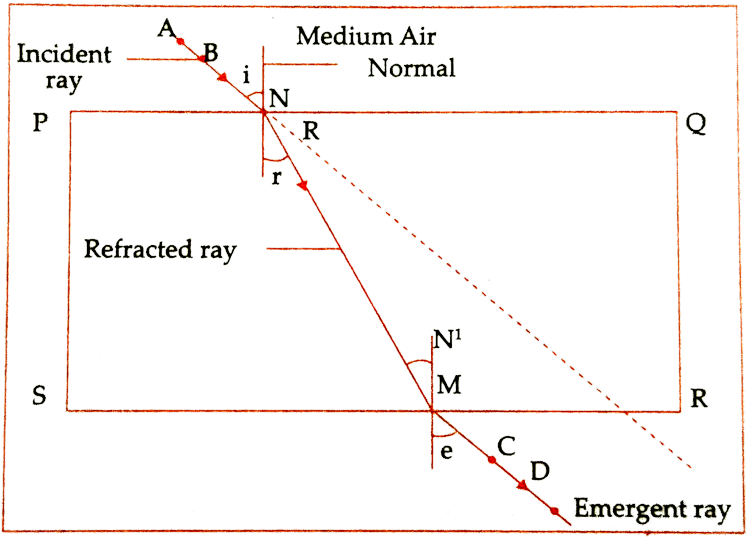
12. Answer the following questions from the diagram:



(a) How many times does the light undergo refractions ?

(b) Which two angles are equal ?

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Assignment Attempt The Following Question

1. The wavelength of visible light range for human is between _____ .

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2. Find the odd one out:

Brown, Blue, Green, Red

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3. Diamond : Denser medium : : Air : .....

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Assignment Choose And Write The Correct Option

1. The velocity of light in air is .....m/s.

A. 3×10^{10}

B. 3×10^{8}

C. 1.5×10^{8}

D. 0.3×10^8

Answer:

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2. When light ray travels from denser medium to rarer, then it ..... .

A. bends towards the normal

B. bends away from the normal

C. goes undeviated

D. deviates randomly

Answer:

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Assignment Answer The Following

1. State the laws of refraction

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2. Why Red colour is used in danger signal?

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3. If the speed of light in a medium is $1.5 \times 10^8 m/s$, what is the absolute refractive index of the medium ?

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4. Draw neat and labelled diagram for partial and total internal refraction

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5. The change in ..... of light while going from one medium to another is called refraction.

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6. If the angle incidence and angle of emergence of a light ray falling on a glass slab are i and e respectively, then prove that, i=e.

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Assignment Answer In Detail

1. With a neat labelled diagram explain Rainbow Formation.

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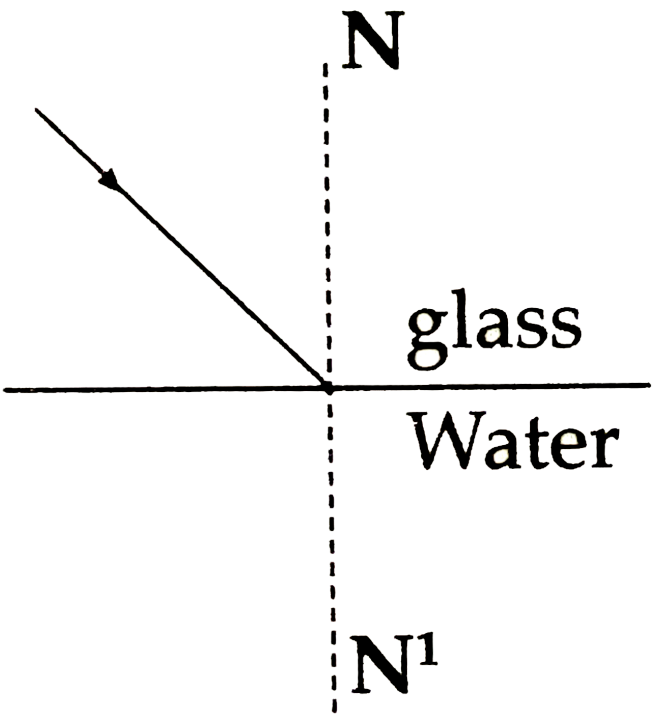

2.

(A) Define refraction

(B) (i) Complete the diagram.

(ii) What is the effect on the velocity of light when it enters water ?

(iii) If the light was incident on the interface at an angle greater than critical angle, which phenomen on occurs ?

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