Answer Key & Solutions

HUMAN EYE

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1   (c) The ability of the eye lens to change its shape to focus near and distant objects clearly is called power of accommodation.

2   (c) Curvature of eye lens is adjusted with the help of ciliary muscles.

3   (a) In poorly lit room or dim light the iris expands the pupil to allow more light to enter the eye.

4   (b)

5   (d)

6   (a)

7   (d) Near the horizon at sunrise and sunset, most of the blue light and shorter wavelengths are scattered away an hence sun appears red.

8   (a) Scattering of light is not enough at such heights.

9   (d)

10 (a)

11 (d)

12 (c)

13 (a) Dispersion arises because of basic phenomenon refraction.

14 (a)

15 (a)

16 (c)

17 (b)

18 (b)

19 (d)

20 (d) $v = -15$ cm, $u = -300$ cm

$$\text{As } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{(-15)} - \frac{1}{(-300)} = \frac{-19}{300}$$

$$f = -15.8 \text{ cm} = -0.158 \text{ m}$$

$$\text{Power P} = \frac{-100 \times 19}{300} = -6.33\text{D}$$

21 (d)

22 (d)

23 (a)

24 (c)

25 (b)

26 (b) $v = -60 \text{ cm}, u = -12 \text{ cm}$

$$\therefore \frac{1}{(-60)} - \frac{1}{(-12)} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{15} \Rightarrow f = 15 \text{ cm} = \frac{15}{100}m$$

$$\text{Power} = \frac{100}{15} = \frac{20}{3}\text{D}$$

27 (c) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

Here $u = (-\infty)$

$$v = (-100)$$
$$\frac{1}{f} = \frac{1}{(-100)} - \frac{1}{(-\infty)} = -\frac{1}{100}$$
$$f = -100 \text{ cm} = -1 \text{ m}$$
$$\text{power} = -1\text{D}$$

28 (b)

29 (a)

30 (a)

31 (c)

32 (c)

33 (c)

34 (d)

35 (d)

36 (d)

37 (a)

38 (b)

39 (b)

40 (a)

41 (c)

42 (d)

43 (a)

44 (a)

45 (b)

46 (b)

47 (c)

48 (a)

49 (a) Difference in refractive indices of blue and green colour are less so they are seen together and red is seen separate because deviation depends on refractive index.

50 (c)

51 (c)

52 (c)

53 (c)

54 (a)

55 (b)

56 (c)

57 (a)

58 (b)

59 (c) Bifocal lens- Convex lens (lower part) is used to read books and concave lens (upper part) for viewing distant object.

60 (d) As refractive index of air in atmosphere fluctuates, starts twinkle in the night.

61 (c) Red object that reflects only red and absorbs any other colour incident upon it.

62 (a) Myopia is the defect of eye where person is not able to see f ar off objects and see near by objects clearly.

63 (a) In myopia defect, image formation will take place before the retina.

64 (c) $u = 2$ meter, v = 0.4 meter, f = ?

$$\frac{1}{f} = \frac{1}{-0.4} - \frac{1}{(-2)} = \frac{-5+1}{2} = \frac{-4}{2}$$

$$\frac{1}{f} = \frac{-4}{2} = -2; P = \frac{1}{f} = 2D \text{ (concave lens)}$$

65 (b) Rainbow is circular because locus of reflected rays reaching eye of observer is a circle not due to roundness of earth.

There is no rainbow on moon as there is no atmosphere.

In case of a primary rainbow, violet colour is on inside and red colour is on outside of arc.

In case of a secondary rainbow, red colour is on inside and violet colour is on outside of arc.

In late afternoon rainbow is visible in east side when light of sun in west side is reflected and refracted by a layer of water droplets.

66 (a) In primary rainbow, two refraction and one TIR

(1) Refraction of incident ray

(2) TIR

(3) Again refraction when rays come out of liquid drops
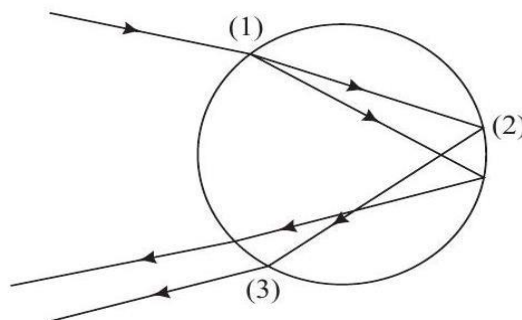

In secondary rainbow, two refraction and two TIR.

67 (c) Rainbow will be observed only when the sun is at the back side of observer.

68 (b) The primary reason why the colour red is used for traffic signals is that red light is scattered the least by air molecules. So, the red light is able to travel the longest distance.

69 (c) In case of minimum deviation, the light ray inside prism becomes parallel to base of the prism.

70 (c)

71 (b)

72 (b)

73 (d)

74 (c)

75 (b) Generally, in case of a prism (i), the formation of spectrum is shown below

MN is the Incident white light
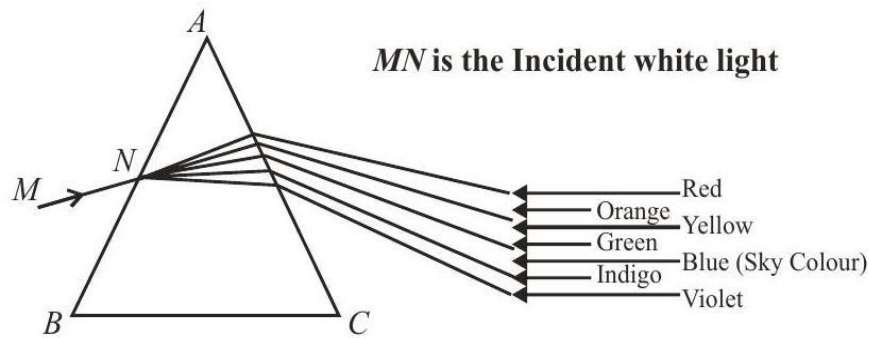
In the above figure, from top the third colour is yellow. But we can see that from bottom the third colour is blue (colour of sky). So, we can obtain the correct situation by inverting the prism. Thus, the required orientations can be found in case (ii).
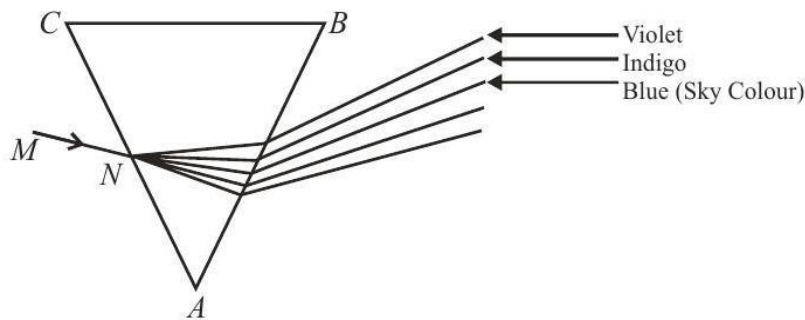
So, option (b) is correct.

76 (c) Speed of light is same for all colours of white light in air but different colours have different wavelengths and frequencies.

77 (b) Red

78 (d) Violet

79 (d) Violet

80 (d) 81. (b)

81 (b) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

Here v = 2.5 (Distance of retina as position of image is fixed)

$u = -x$

$$\frac{1}{f} = \frac{1}{2.5} + \frac{1}{x}$$

For f_{min}: x is minimum $\frac{1}{f_{min}} = \frac{1}{2.5} + \frac{1}{25}$

For f_{max}: x is maximum $\dfrac{1}{f_{max}} = \dfrac{1}{2.5} + \dfrac{1}{\infty}$

For near sighted man lens should make the image of the object within 100 cm range

For lens $u = -\infty, v = -100$

$$\dfrac{1}{f_{lens}} = \dfrac{1}{-100} - \dfrac{1}{-\infty} \Rightarrow P = -1D$$

83 (a) It is due to phenomenon called Tyndall effect.

84 (c) Sun look white at noon, as light has to travel shorter distance through the atmosphere before reaching the eye of an observer.

85 (b) When a light ray passes through denser medium from a rarer it undergoes refraction.

86 (b) In myopic eye due to the increased converging power of eye lens, the image of a far off object is formed in front of the retina.

87 (b)

88 (c) The image formed on retina is real and inverted. If magnification is less than 1, then diminished image is formed not inverted.

89 (b)