



PHYSICS

BOOKS - SELINA PHYSICS (ENGLISH)

SPECTRUM

Examples

1. Fig. shows a light (blue + red + green) incident on a prism and on a parallel sided glass slab. Complete the diagrams by drawing

the refracted and the emergent rays.

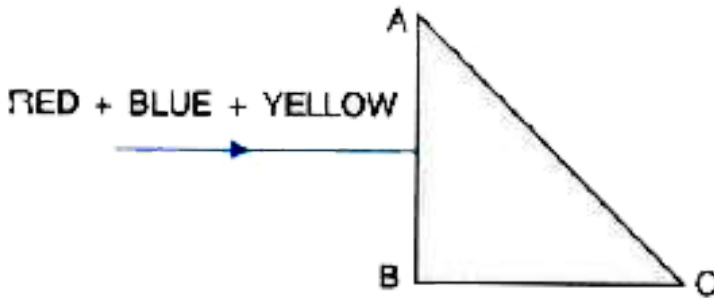
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2. A beam consisting of red, blue and yellow colours is incident normally on the face AB of an isosceles right angled prism ABC as shown in Fig. 6.5. Complete the diagram to show the refracted and the emergent rays. Given that

the critical angle of glass-air interface for yellow colour is 45°



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3. A beam of white light is incident normally on the surface AB of an equilateral prism ABC and emerges out of it suffering a deviation of 60° .

(a) Draw a diagram to show the path of beam till it emerges out of the prism. Mark the angles wherever necessary.

(b) What assumption have you made while drawing the diagram ?

(c) Name the phenomenon exhibited by the light beam.



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4. The frequency of violet light is 7.5×10^{14} Hz. Find its wavelength in (i) nm, (ii) Å. Speed

of light $c = 3 \times 10^8 \text{ m s}^{-1}$



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5. The wavelength of red light is 800 nm. Find its frequency. Speed of light = $3 \times 10^8 \text{ m s}^{-1}$.



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6. Fig. shows a light (blue + red + green) incident on a prism and on a parallel sided

glass slab. Complete the diagrams by drawing the refracted and the emergent rays.

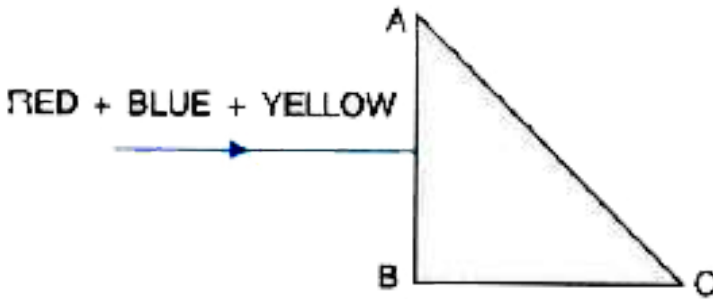
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9. The frequency of violet light is 7.5×10^{14} Hz. Find its wavelength in (i) nm, (ii) Å. Speed of light $c = 3 \times 10^8 \text{ m s}^{-1}$



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10. The wavelength of red light is 800 nm. Find its frequency. Speed of light = $3 \times 10^8 \text{ m s}^{-1}$.



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Exercise A

1. Name three factors on which the deviation produced by a prism depends and state how does it depend on the factors stated by you.



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2. How does the deviation produced by a triangular prism depend on the colour (or wavelength) of light incident on it?



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3. How does the speed of light in glass change on increasing the wavelength of light?



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4. Which colour of white light travels (a) fastest (b) slowest, in glass?



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5. Name the subjective property of light related to its wavelength.



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6. What is the range of wavelength of the spectrum of white light in (i) A, (ii) nm ?



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7. (a) Write the approximate wavelength for (i) blue, and (ii) red light

(b) The wavelength of violet and red light are 4000\AA and 8000\AA respectively. Which of the two has higher frequency?



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8. Write the seven prominent colours present in white light in the order of increasing wavelength.





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9. Name the seven prominent colours of the white light spectrum in order of their increasing frequencies.



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10. Name four colours of the spectrum of white light which have wavelength longer than blue light.



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11. Which colour of the white light is deviated by a glass prism (i) the most, and (ii) the least?



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12. The wavelengths for the light of red and blue colours are nearly $7.8 \times 10^{-7} m$ and $4.8 \times 10^{-7} m$ respectively.

(a) Which colour has greater speed in vacuum

?

(b) Which colour has greater speed in glass?



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13. Define the term dispersion of light.



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14. Explain the cause of dispersion of white light through a prism.



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15. Explain briefly, with the help of a neat labelled diagram, how does white light get dispersed by a prism.

On which surface of a prism, there is both dispersion and deviation of light, and on which surface of the prism, there is only deviation of light?



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16. What do you understand by the term spectrum ?



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17. A ray of white light is passed through a glass prism and a spectrum is obtained on a screen.

(a) Name the seven colours of the spectrum in order.

(b) Do the colours have the same width in the

spectrum ?

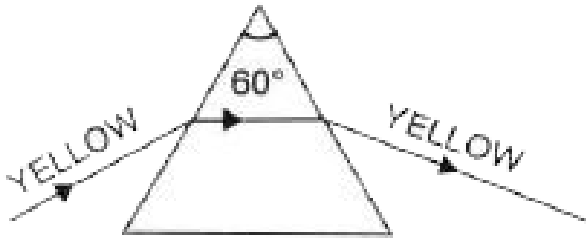
(c) Which colour of the spectrum of white light deviates (i) the most, (ii) the least?



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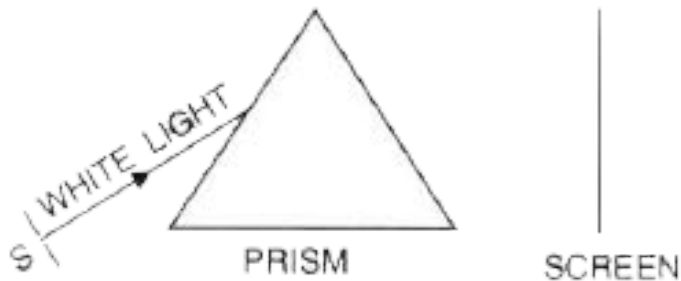
18. The diagram shown below in Fig. 6.8 shows the path taken by a narrow beam of yellow monochromatic light passing through an equiangular glass prism. If the yellow light is replaced by a narrow beam of white light incident at the same angle, draw another

diagram to show the passage of white light through the prism and label it to show the effect of the prism on the white light.



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19. Fig. shows a thin beam of white light from a source S striking on one face of a prism.



(a) Complete the diagram to show the effect of the prism on the beam and to show what is seen on the screen.

(b) If a slit is placed in between the prism and the screen to pass only the light of green colour, what will you then observe on the screen?

(c) What conclusion do you draw from the observation in part (b) above?



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20. (a) A beam of monochromatic light undergoes minimum deviation through an equiangular prism. How does the beam pass through the prism with respect to its base?

(b) If white light is used in the same way as in part (a) above, what change do you expect in the emergent beam?

(c) What conclusion do you draw about the nature of white light in part (b)?



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21. Name three factors on which the deviation produced by a prism depends and state how does it depend on the factors stated by you.



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22. How does the deviation produced by a triangular prism depend on the colour (or wavelength) of light incident on it?



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23. How does the speed of light in glass change on increasing the wavelength of light?



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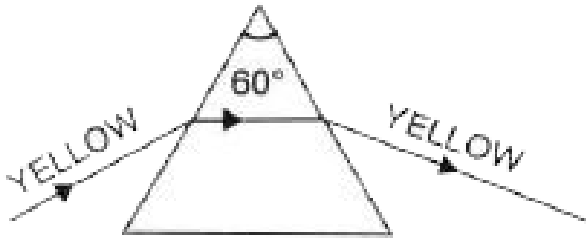
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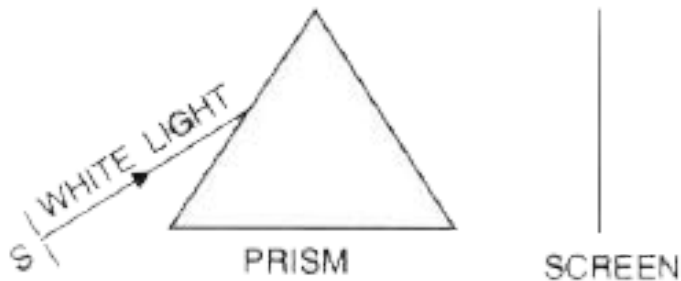
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(c) What conclusion do you draw about the nature of white light in part (b)?



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Exercise A Multiple Choice Type

1. When a white light ray falls on a prism, the ray at its first surface suffers:

A. A) no refraction

B. B) only dispersion

C. C) only deviation

D. D) both deviation and dispersion.

Answer: A::D



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2. In the spectrum of white light by a prism, the colour at the extreme end opposite to the base of prism is :

A. violet

B. yellow

C. red

D. blue.

Answer: D



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3. The wavelength of visible light is

A. 4000 nm to 8000 nm

B. 40 nm to 80 nm

C. 400 nm to 800 nm

D. 4 nm to 8 nm

Answer: D



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4. When a white light ray falls on a prism, the ray at its first surface suffers:

A. no refraction

B. only dispersion

C. only deviation

D. both deviation and dispersion.

Answer: A::B::D



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5. In the spectrum of white light by a prism, the colour at the extreme end opposite to the base of prism is :

A. violet

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C. red

D. blue.

Answer: D



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6. The wavelength range of white light is :

A. 4000 nm to 8000 nm

B. 40 nm to 80 nm

C. 400 nm to 800 nm

D. 4 nm to 8 nm

Answer: c



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1. Calculate the frequency of yellow light of wavelength 550 nm. The speed of light is $3 \times 10^8 \text{ m s}^{-1}$.



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2. The frequency range of visible light is from $3.75 \times 10^{14} \text{ Hz} \rightarrow 7.5 \times 10^{14} \text{ Hz}$. Calculate its wavelength range. Take speed of light = $3 \times 10^8 \text{ m s}^{-1}$



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Exercise B

1. (a) Give a list of at least five radiations, in the order of their increasing wavelength, which make up the complete electromagnetic spectrum.

(b) Name the radiation mentioned by you in part (a) which has the highest penetrating power.



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2. (a) Arrange the following radiations in the order of their increasing wavelength:

X-rays, infrared rays, radio waves, gamma rays, and micro waves.

(b) Name the radiation which is used for satellite communication



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3. A wave has a wavelength 10^{-3} nm. (a) Name the wave. (b) State its one property different from light.



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4. A wave has wavelength 50 Å. (a) Name the wave. (b) State its speed in vacuum. (c) State its one use.



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5. (a) Name the high energetic invisible electromagnetic wave which helps in the study of the structure of crystals.

(b) State one more use of the wave named in part (a).



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6. State the name and the range of wavelength of the invisible electromagnetic waves beyond the red end of the visible spectrum



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7. Name three radiations and their wavelength range which are invisible and beyond the violet end of the visible spectrum.



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8. Give the range of wavelength of the electromagnetic waves visible to us.



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9. Name the region just beyond (i) the red end, and (ii) the violet end, of the spectrum.



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10. What do you understand by the invisible spectrum ?



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11. Name the radiation which can be detected by (a) a thermopile (b) a solution of silver chloride.



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12. State the approximate range of wavelength associated with (a) ultraviolet rays. (b) visible light and (c) infrared rays



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13. Name the radiations of wavelength just (a) longer than 8×10^{-7} m. (b) shorter than 4×10^{-7} m



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14. Name two electromagnetic waves of wavelength smaller than that of violet light. State one use of each.



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15. Give one use each of (a) microwaves, (b) ultraviolet radiations, (c) infrared radiations, and (d) gamma rays.



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16. Name the waves (a) of lowest wavelength, (b) used for taking photographs in dark, (c) produced by changes in the nucleus of an atom, (d) of wavelength nearly 0-1 nm.



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17. Two waves A and B have wavelength 0.01 \AA and 9000 \AA respectively.

(a) Name the two waves.

(b) Compare the speeds of these waves when they travel in vacuum.



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18. Name two sources, each of infrared radiations and ultraviolet radiations.



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19. What are infrared radiations ? How are they detected ? State one use of these radiations



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20. What are ultraviolet radiations ? How are they detected ? State one use of these radiations



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21. Name three properties of ultraviolet radiations which are similar to visible light



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22. Give two properties of ultraviolet radiations which differ from visible light.



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23. Mention three properties of infrared radiations similar to visible light.



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24. Give two properties of infrared radiations which differ from visible light.



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25. Name the material of prism required for obtaining the spectrum of (a) ultraviolet light, (b) infrared radiations.



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26. Name the radiations which are absorbed by the green house gases in the earth's atmosphere.



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27. State one harmful effect each of the (a) ultraviolet and (b) infrared radiations



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28. Give reason for the following:

(i) Infrared radiations are used for photography in fog.

(ii) Infrared radiations are used for signals during war.

(iii) The photographic darkrooms are provided with infrared lamps.

(iv) A rock salt prism is used instead of a glass prism to obtain the infrared spectrum.

(v) A quartz prism is required for obtaining the spectrum of ultraviolet light.

(vi) Ultraviolet bulbs have a quartz envelope instead of glass.



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42. Name two electromagnetic waves of wavelength smaller than that of violet light.

State one use of each.



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44. Name the waves (a) of lowest wavelength, (b) used for taking photographs in dark, (c) produced by changes in the nucleus of an atom, (d) of wavelength nearly 0-1 nm.



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45. Two waves A and B have wavelength 0-01 Å and 9000 Å respectively.

(a) Name the two waves.

(b) Compare the speeds of these waves when they travel in vacuum.



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46. Name two sources, each of infrared radiations and ultraviolet radiations.



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47. What are infrared radiations ? How are they detected ? State one use of these radiations



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49. Name three properties of ultraviolet radiations which are similar to visible light



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50. Give two properties of ultraviolet radiations which differ from visible light.



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51. Mention three properties of infrared radiations similar to visible light.



Watch Video Solution

52. Give two properties of infrared radiations which differ from visible light.



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53. Name the material of prism required for obtaining the spectrum of (a) ultraviolet light, (b) infrared radiations.



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(v) A quartz prism is required for obtaining the spectrum of ultraviolet light.

(vi) Ultraviolet bulbs have a quartz envelope instead of glass.



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Exercise B Multiple Choice Type

1. The most energetic electromagnetic radiations are:

A. A) microwaves

B. B) ultraviolet Waves

C. X-rays

D. D) gamma rays.

Answer: D



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2. The source of ultraviolet light is :

A. A) electric bulb

B. B) red hot iron ball

C. C) sodium vapour lamp

D. D) carbon arc-lamp.

Answer: A::B::C



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3. A radiation P is focused by a proper device on the bulb of a thermometer. Mercury in the thermometer shows a rapid increase. The radiation P is:

A. A) infrared radiation

B. B) visible light

C. C) ultraviolet radiation

D. D) X-rays.

Answer: A::D



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B. visible light

C. ultraviolet radiation

D. X-rays.

Answer: A::D



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Exercise B Numericals

1. An electromagnetic wave has a frequency of 500 MHz and a wavelength of 60 cm.

(a) Calculate the speed of the wave.

(b) Name the medium through which it is travelling.



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2. The wavelength of X-rays is 0.01 Å. Calculate its frequency. State the assumption made, if any.





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Exercise C

1. What is meant by scattering of light?



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2. How does the intensity of scattered light depend on the wavelength of incident light ?

State the condition when this dependence hold.



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3. When sunlight enters the earth's atmosphere, state which colour of light is scattered (i) the most, and (ii) the least.



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4. A beam of blue, green and yellow light passes through the earth's atmosphere. Name the colour which is scattered (a) the least, (b) the most



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5. In the atmosphere which colour of light gets scattered the least ?



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6. Why is the colour red used as a sign of danger ?



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7. How would the sky appear when seen from the space (or moon)? Give reason for your answer.



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8. Which characteristic property of light is responsible for the blue colour of the sky ?



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9. The colour of sky, in direction other than of the Sun, is blue. Explain.



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10. (i) Why does the sun appear reddish at sunset or sun-rise ?

(ii) For which colour the refractive index of prism material is maximum and minimum ?



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11. The sky at noon appears white. Give reason.



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12. Give reasons for the following:

During the day :

Clouds appear white.



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13. Give reason why the smoke from a fire looks white.



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26. Give reason why the smoke from a fire looks white.



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Exercise C Multiple Choice Type

1. In the white light of the Sun, maximum scattering by the air molecules present in the earth's atmosphere is for :

A. A) red colour

B. B) yellow colour

C. C) green colour

D. D) blue colour.

Answer: B::C



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2. To an astronaut in a space-ship, the earth appears :

A. A) white

B. B) red

C. C) blue

D. D) black

Answer: B



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3. In the white light of the Sun, maximum scattering by the air molecules present in the earth's atmosphere is for :

- A. red colour
- B. yellow colour
- C. green colour
- D. blue colour.

Answer: B::C



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A. white

B. red

C. blue

D. black

Answer: B



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Type 1 Theory Based Mcq

1. The unit used to measure wave length of electromagnetic spectrum is called

A. hertz

B. meter

C. Angstrom

D. Unit

Answer: C



View Text Solution

2. A light which consists of one colour or one wavelength only is called

A. Monochromatic

B. Polychromatic

C. Ultraviolet

D. Infrared

Answer: A



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3. A light, which is a mixture of several colours is called light.

A. Monochromatic

B. Polychromatic

C. Singular

D. Ultraviolet

Answer: B



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4. The phenomenon due of which a polychromatic light split into its component colours, when passed through a prism is called

A. Refraction

B. Dispersion

C. Reflection

D. Interference

Answer: B



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5. A band of colour obtained on the screen when polychromatic light splits into colour is called

A. Bright band

B. Diffraction

C. Interference

D. Spectrum

Answer: D



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6. A spectrum in which various bands of colour have no sharp, well defined boundaries, but merge in each other is called

- A. Red spectrum
- B. Infrared spectrum
- C. Impure spectrum
- D. Pure spectrum

Answer: C



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7. The angle through which a light of a particular wavelength can deviate, while passing through prism is called

A. Refrangibility

B. Angle of refraction

C. Angle of reflection

D. Angle of emergence

Answer: B



View Text Solution

8. Refrangibility of light is least and light is maximum.

A. red, violet

B. violet, red

C. yellow, green

D. green, yellow

Answer: A



View Text Solution

9. Refractive index of a material for Is least and light is maximum.

A. violet, red

B. red, violet

C. yellow, green

D. green, yellow

Answer: B



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10. The colour of an opaque object is the colour of light which it.....

A. absorbs

B. reflects

C. refracts

D. deviates

Answer: B



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11. A black object while a white object
..... all colours of light.

A. absorbs, refracts

B. reflects, absorbs

C. refracts, absorbs

D. absorbs, reflects

Answer: D



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12. A transparent object its own colour to pass through and all other colours.

A. allows, absorbs

B. absorbs, allows

C. allows, reflects

D. allows, refracts

Answer: A



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13. The regions of spectrum which do not excite the retina and hence are not visible, are collectively called spectrum.

A. Impure

B. Pure

C. Invisible

D. Sensitive

Answer: C



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14. The invisible spectrum beyond red of visible spectrum is called spectrum.

A. Green

B. Infrared

C. Ultraviolet

D. Yellow

Answer: B



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15. The region of spectrum, which extends beyond violet end of visible spectrum is called spectrum.

A. Ultraviolet

B. Infrared

C. Green Yellow

D. Green

Answer: A



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16. Name the extreme colours in pure spectrum of light.

- A. violet and red
- B. violet and green
- C. green and red
- D. black and white

Answer: A



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17. When a wave passes from one medium to another of the wave varies but its remains constant.

A. frequency, velocity

B. velocity, frequency

C. frequency, wavelength

D. velocity, wavelength

Answer: B



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Type 2 Application Based Mcq

1. rays produce heating effect on being absorbed by material objects.

A. Ultraviolet

B. Infrared

C. Blue

D. Red

Answer: B



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2. rays do not scatter easily in fog.

A. Ultraviolet

B. Infrared

C. Red

D. Green

Answer: B



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3. rays produce fluorescence is Zinc-sulfide

A. Red

B. IR

C. Violet

D. UV

Answer: D



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4. rays bring about chemical reactions in silver salts.

A. IR

B. Blue

C. Red

D. UV

Answer: D



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5. rays are used to stimulate the production of vitamin D in the body.

A. UV

B. Cosmic

C. Dark

D. IR

Answer: A



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6. rays are used in detecting fake currency and diamonds.

A. UV

B. IR

C. Green

D. Blue

Answer: A



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7. rays are used in sterilizing surgical instruments.

A. Yellow

B. Red

C. UV

D. IR

Answer: C



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8. rays are used in killing bacteria in drinking water.

A. IR

B. Red

C. UV

D. Green

Answer: C



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9. UV rays have wavelength that of IR rays.

A. equal to

B. larger than

C. smaller than

D. none of these

Answer: C



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10. Gamma rays have frequency that of X-rays.

A. equal to

B. larger than

C. smaller than

D. none of these

Answer: B



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11. Waves are mainly used in radar.

A. Radio

B. UV

C. X-rays

D. IR

Answer: A



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12. Waves are used for analysis of atomic and molecular structure.

A. Radio

B. Micro

C. IR

D. UV

Answer: B



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13. Rock salt prism does not absorb
radiation.

A. IR

B. UV

C. microwave

D. radiowave

Answer: A



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14. scattered by the atmosphere because of their long wavelength.

A. UV

B. IR

C. Microwave

D. Radiowave

Answer: D



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15. radiations are not absorbed by quartz prism.

A. Micro

B. Radio

C. IR

D. UV

Answer: D



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Type 3 Diagram Based Mcq

1. Name the radiations used while taking the following photograph:



- A. Infra-red
- B. Ultra violet
- C. Radio

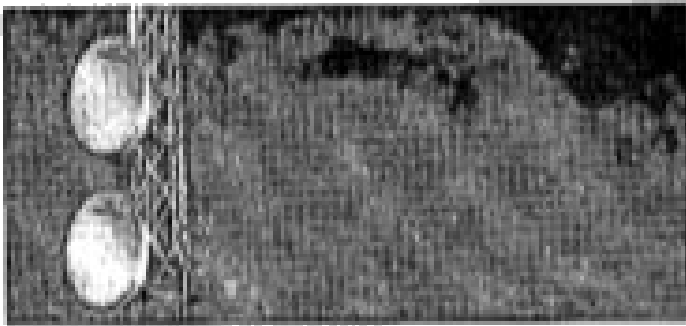
D. Yellow

Answer: A



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2. Name the waves given out by the two-dish shown in the figure:



A. Sound waves

B. Light waves

C. Microwaves

D. Radio waves

Answer: D



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3. The device used in the figure uses radiations to cook food.

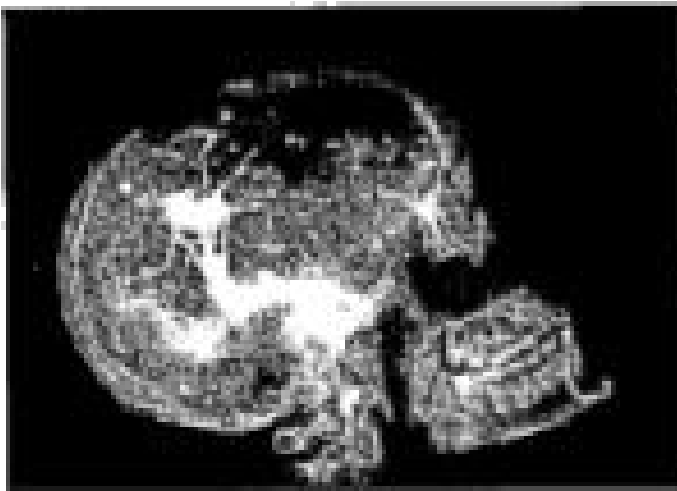


- A. safe vault
- B. mini oven
- C. microwave oven
- D. none of these

Answer: C



4. A skeletal analysis of skull is shown in the figure below. Name the rays used to obtain the same?



A. X rays

B. Microwaves

C. Sunrays

D. Infra-red

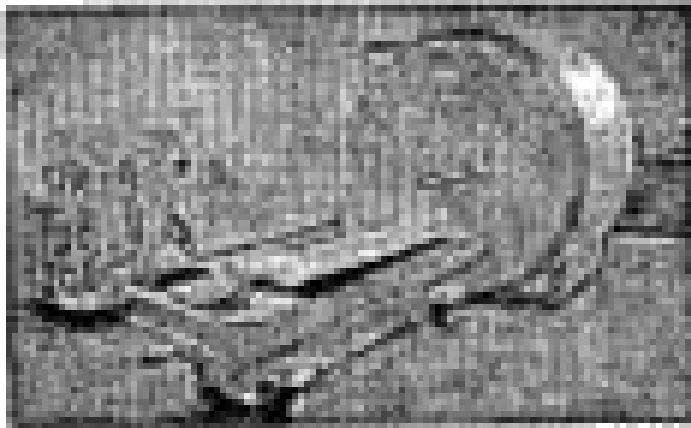
Answer: A



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5. Name the machine shown in the figure using gamma radiations in detecting fracture

or malignant cells in our body.



- A. ECG monitor
- B. MRI machine
- C. X ray machine
- D. None of these

Answer: B



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