10th Science Lesson 2 Questions in English

2] Optics

1. Which of the following statement is correct?
   1) Light is a form of energy which travels in the form of waves
   2) The path of light is called ray of light and group of these rays are called as beam of light.
   3) Any object which gives out light are termed as source of light and is called as luminous objects
      a) 1, 2
      b) 1, 3
      c) 2, 3
      d) All the above

Explanation

Light is a **form of energy which travels in the form of waves**. The **path of light** is called **ray of light** and **group of these rays are called as beam of light**. Any object which gives out light are termed as source of light. **Some of the sources emit their own light and they are called as luminous objects**. All the stars, including the Sun, are examples for luminous objects.

2. Which of the following statement about properties of light is correct?
   1) Light is a form of energy.
   2) Light always travels in a Zig Zag manner
   3) When light is incident on the interface between two media, it is partly reflected and partly refracted
      a) 1, 2
      b) 1, 3
      c) 2, 3
      d) All the above

Explanation

PROPERTIES OF LIGHT:

1) Light is a **form of energy**
2) **Light always travels along a straight line**.
3) When **light is incident on the interface between two media, it is partly reflected and partly refracted**.
4) The speed of light can be calculated using the following equation: $\mathbf{c = v\lambda}$ (c - velocity of light).

3. Assertion(A): Light can even travel through vacuum.
   Reason(R): Light does not need any medium for its propagation.
   a) Both (A) and (R) are correct, but (R) does not explain (A)
   b) Both (A) and (R) are wrong
   c) Both (A) and (R) are correct and (R) explains (A)
   d) (A) is Correct and (R) is wrong

Explanation

Light does not need any medium for its propagation. It **can even travel through vacuum**. The speed of light in vacuum or air is, c = 3 × 10^8 m/s. Since, light is in the form of waves, it is characterized by a wavelength (λ) and a frequency (v), which are related by the following equation: c = v λ (c - velocity of light).

4. Which of the following light has lowest wavelength?

a) Green
b) Red
c) Violet
d) Yellow

Explanation

Different coloured light has different wavelength and frequency. **Among the visible light, violet light has the lowest wavelength and red light has the highest wavelength**.

5. The deviation of ray of light is called_____

a) Reflection
b) Depression
c) Refraction
d) None

Explanation

When a ray of light travels from one transparent medium into another obliquely, the path of the light undergoes deviation. **This deviation of ray of light is called refraction**.

6. Which of the following statement is correct?

a) The velocity of light is more in a rarer medium and less in a denser medium
b) The velocity of light is less in a rarer medium and more in a denser medium
c) The velocity of light is same in both rarer medium and in denser medium
d) None

Explanation

Refraction takes place due to the difference in the velocity of light in different media. **The velocity of light is more in a rarer medium and less in a denser medium**. Refraction of light obeys two laws of refraction.

7. According to First law of refraction which of the following lie in the same plane?

1) Incident ray
2) Reflected ray
3) Refracted ray
4) Normal

a) 1, 3, 4
b) 2, 3, 4

c) 1, 2, 4
d) All the above

Explanation

First law of refraction:

According to first law of refraction, **the incident ray, the refracted ray of light and the normal to the refracting surface all lie in the same plane**.

8. Which of the following statement is incorrect?

1) Second law of refraction is also known as Snell's law
2) Refractive index gives us an idea of how fast or how slow light travels in a medium
   a) 1 alone
   b) 2 alone
   c) 1, 2
   d) None

Explanation

Second law of refraction:

The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media. This law is also known as **Snell's law**. **Refractive index gives us an idea of how fast or how slow light travels in a medium**. The ratio of speed of light in vacuum to the speed of light in a medium is defined as refractive index 'μ' of that medium.

9. The speed of light in a medium is___ if the refractive index of the medium is____

a) High, Low
b) Low, High
c) Low, low
d) Both a and b

Explanation

The speed of light in a medium is low if the refractive index of the medium is high and vice versa. The above statement is drawn out of Second law of refraction or Snell's law.

10. Which of the following statement is incorrect?

1) When light travels from a denser medium into a rarer medium, the refracted ray is bent towards from the normal drawn to the interface
2) When light travels from a rarer medium into a denser medium, the refracted ray is bent away from the normal drawn to the interface.
   a) 1 alone
   b) 2 alone
   c) 1, 2
   d) None

Explanation

- When light travels from a denser medium into a rarer medium, the **refracted ray is bent away from the normal drawn to the interface**.
- When light travels from a rarer medium into a denser medium, the **refracted ray is bent towards the normal drawn to the interface**.

11. Assertion(A): Sun is the fundamental and natural source of light
Reason(R): It is a monochromatic source of light
a) Both (A) and (R) are correct, but (R) does not explain (A)
b) Both (A) and (R) are wrong
c) Both (A) and (R) are correct and (R) explains (A)
d) (A) is Correct and (R) is wrong

Explanation

We know that **Sun is the fundamental and natural source of light**. If a source of light produces a light of single colour, it is known as a monochromatic source.

12. Which of the following is an example of composite source of light?
1) Sun
2) Sodium vapour lamp
3) Mercury vapour lamp
a) 1 alone
b) 1, 2
c) 1, 3
d) None

Explanation

A composite source of light produces a white light which contains light of different colours. Sun light is a composite light which consists of light of various colours or wavelengths. Another example for a composite source is a **mercury vapour lamp**.

13. Which of the following statement is correct?
1) When a beam of white light is refracted through any transparent media such as glass it is split into its component colours
2) This phenomenon is called as 'dispersion of light'.
a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

When a **beam of white light or composite light is refracted** through any transparent media such as **glass or water, it is split into its component colours**. This phenomenon is called as **'dispersion of light'**. The band of colours is termed as spectrum.

14. Arrange the spectrum of colours in order
    1) Indigo
    2) Yellow
    3) Red
    4) Violet
        a) 1, 3, 2, 4
        b) 4, 1, 2, 3
        c) 4, 1, 3, 2
        d) 2, 1, 3, 4

Explanation

The band of colours is termed as spectrum. This spectrum consists of following colours: **Violet, Indigo, Blue, Green, Yellow, Orange, and Red**. These colours are represented by the acronym "VIBGYOR".

15. Why do we get the spectrum when white light is refracted by a transparent medium?
    a) Bending of the light at different angles
    b) Converging of light
    c) Bending of light at same angle
    d) All the above

Explanation

We get the spectrum when white light is refracted by a transparent medium, this is **because different coloured lights are bent through different angles**. That is the angle of refraction is different for different colours.

16. Which colour has highest angle of refraction?
    a) Blue
    b) Red
    c) Violet
    d) Orange

Explanation

Angle of refraction is the smallest for red and the highest for violet. From Snell's law, we know that the angle of refraction is determined in terms of the refractive index of the medium. Hence, the refractive index of the medium is different for different coloured lights. This indicates that the refractive index of a medium is dependent on the wavelength of the light.

17. Which of the following statement is correct?
    1) When sunlight enters the Earth's atmosphere, the atoms and molecules of different gases present in the atmosphere refract the light in all possible directions
    2) This is called as 'Scattering of light'.
    3) The interacting particle of the medium is called as 'scatterer'.
        a) 1, 2

b) 1, 3
c) 2, 3
d) All the above

Explanation

When sunlight enters the Earth's atmosphere, the atoms and molecules of different gases present in the atmosphere refract the light in all possible directions. This is called as '**Scattering of light'.** In this phenomenon, the beam of light is redirected in all directions when it interacts with a particle of medium. The **interacting particle of the medium is called as 'scatterer'**.

18. Based on initial and final energy of the light beam, scattering can be classified into_____ types

a) 4
b) 2
c) 3
d) 5

Explanation

When a beam of light, interacts with a constituent particle of the medium, it undergoes many kinds of scattering. **Based on initial and final energy of the light beam, scattering can be classified as, 1) Elastic scattering 2) Inelastic scattering**

19. Which of the following statement is correct?

1) If the energy of the incident beam of light and the scattered beam of light are same, then it is called as 'elastic scattering'.
2) If the energy of the incident beam of light and the scattered beam of light are different, then it is called as 'elastic scattering'.

a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

If the energy of the **incident beam of light and the scattered beam of light are same**, then it is **called as 'elastic scattering'**.

20. Nature and size of the scatterer results in_____ types of scattering

1) Rayleigh scattering
2) Mie scattering
3) Raman scattering
4) Tyndall scattering

a) 1, 2, 4
b) 2, 3, 4
c) 1, 3, 4
d) All the above

Explanation

If the energy of the incident beam of light and the scattered beam of light are not same, then it is called as 'inelastic scattering'. The nature and size of the scatterer results in different types of scattering. They are:

- Rayleigh scattering
- Mie scattering
- Tyndall scattering
- Raman scattering

21. The scattering of sunlight by the atoms or molecules of the gases in the earth's atmosphere is____

a) Rayleigh scattering
b) Raman scattering
c) Mie scattering
d) Tyndall scattering

Explanation

The scattering of sunlight by the atoms or molecules of the gases in the earth's atmosphere is known as **Rayleigh scattering**.

22. Which of the following expresses the Amount of scattering according to Rayleigh scattering?

a) 1 /λ^4
b) 1 /λ^3
c) 1 /λ^2
d) 1 /λ^7

Explanation

Rayleigh's scattering law states that, "The amount of scattering of light is inversely proportional to the fourth power of its wavelength".

Amount of scattering 'S' ∝ 1 /λ^4

23. Assertion(A): Scattering causes the sky to appear in blue colour
Reason(R): When sunlight passes through the atmosphere, the blue colour (shorter wavelength) is scattered to a greater extent than the red colour (longer wavelength).

a) Both (A) and (R) are correct, but (R) does not explain (A)
b) Both (A) and (R) are wrong
c) Both (A) and (R) are correct and (R) explains (A)
d) (A) is Correct and (R) is wrong

Explanation

According to Rayleigh's scattering law, the shorter wavelength colours are scattered much more than the longer wavelength colours. **When sunlight passes through the atmosphere, the blue colour (shorter wavelength) is scattered to a greater extent than the red colour (longer wavelength)**. This scattering causes the sky to appear in blue colour.

24. Assertion(A): At sunrise and sunset, the light rays from the Sun appears red in colour
Reason(R): Most of the blue lights are scattered away and only the red light which gets least scattered reaches us during morning and the evening
a) Both (A) and (R) are correct, but (R) does not explain (A)
b) Both (A) and (R) are wrong
c) Both (A) and (R) are correct and (R) explains (A)
d) (A) is Correct and (R) is wrong

Explanation

At sunrise and sunset, the light rays from the Sun have to travel a larger distance in the atmosphere than at noon. Hence, **most of the blue lights are scattered away and only the red light which gets least scattered reaches us**. Therefore, the **colour of the Sun is red at sunrise and sunset**.

25. Which of the following statement is correct about Mie scattering?
1) Mie scattering takes place when the diameter of the scatterer is similar to or larger than the wavelength of the incident light.
2) The amount of scattering is dependents on the wave length.
3) Mie scattering is caused by pollen, dust, smoke, water droplets, and other particles in the lower portion of the atmosphere
a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Mie scattering takes place **when the diameter of the scatterer is similar to or larger than the wavelength of the incident light**. It is also an **elastic scattering**. The amount of scattering is independent of wave length. **Mie scattering is caused by pollen, dust, smoke, water droplets, and other particles in the lower portion of the atmosphere**.

26. _____ is responsible for the white appearance of the cloud
a) Rayleigh scattering
b) Mie scattering
c) Tyndall scattering
d) Raman scattering

Explanation

Mie scattering is responsible for the white appearance of the clouds. When white light falls on the water drop, all the colours are equally scattered which together form the white light.

27. When a beam of sunlight, enters into a dusty room through a window, then its path becomes visible to us. This an example of____ effect
a) Rayleigh scattering

b) Mie scattering
c) Tyndall scattering
d) Raman scattering

Explanation

When a beam of sunlight, enters into a dusty room through a window, then its path becomes visible to us. This is because, the tiny dust particles present in the air of the room scatter the beam of light. This is an example of **Tyndall Scattering**.

28. Tyndall Effect takes place in_____ solution

a) Colloidal
b) True
c) Suspension
d) All the above

Explanation

The **scattering of light rays by the colloidal particles in the colloidal solution is called Tyndall Scattering** or Tyndall Effect. Colloid is a microscopically small substance that is equally dispersed throughout another material. Example: Milk, Ice cream, muddy water, smoke.

29. Which scattering speaks about additional frequencies in the scattering the monochromatic light?

a) Rayleigh scattering
b) Mie scattering
c) Tyndall scattering
d) Raman scattering

Explanation

When a parallel beam of monochromatic (single coloured) light passes through a gas or liquid or transparent solid, a part of light rays is scattered. The **scattered light contains some additional frequencies (or wavelengths) other than that of incident frequency** (or wavelength). This is known as Raman scattering or Raman Effect.

30. The spectral lines having frequency equal to the incident ray frequency is_____

a) Normal line
b) Rayleigh line
c) Incident line
d) None

Explanation

Raman Scattering is defined as "The interaction of light ray with the particles of pure liquids or transparent solids, which leads to a change in wavelength or frequency." **The spectral lines having frequency equal to the incident ray frequency is called 'Rayleigh line' and the spectral lines which are having frequencies other than the incident ray frequency are called 'Raman lines'.**

31. The lines having frequencies higher than the incident frequency are called as_____

a) Stoke lines
b) Anti-stoke lines
c) Refracted lines
d) All the above

Explanation

The lines having frequencies lower than the incident frequency is called stokes lines and the lines **having frequencies higher than the incident frequency are called Anti-stokes lines**.

32. How many spherical refracting surfaces are there in lenses?

a) 1
b) 4
c) 3
d) 2

Explanation

A **lens is an optically transparent medium bounded by two spherical refracting surfaces** or one plane and one spherical surface.

33. Which of the following are the features of Convex lens?

1) It is a lens bounded by two spherical surfaces such that it is thicker at the centre than at the edges
2) A convex lens is also called as converging lens
3) A beam of light passing through it, is converged to a point

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Convex or bi-convex lens is a lens bounded by two spherical surfaces such that it is **thicker at the centre than at the edges**. A beam of light passing through it, is **converged to a point**. So, a convex lens is also called as **converging lens**.

34. Which of the following statement is correct about Concave or bi-concave Lens?

1) It is a lens bounded by two spherical surfaces such that it is thinner at the centre than at the edges
2) A parallel beam of light passing through it will spread in
3) A concave lens is also called as diverging lens.

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Concave or bi-concave Lens is a lens bounded by two spherical surfaces such that it is thinner at the centre than at the edges. **A parallel beam of light passing through it, is diverged or spread out**. So, a concave lens is also called as diverging lens.

35. If one of the faces of a bi-convex lens is plane, it is known as a_____

a) Plano-concave lens
b) Convex mirror
c) Plano-convex lens
d) None

Explanation

Plano-convex lens: If one of the faces of a bi-convex lens is plane, it is known as a **planoconvex lens**. Plano-concave lens: If one of the faces of a bi-concave lens is plane, it is known as a planoconcave lens

36. Which of the following shows the features of image formed?

1) Position
2) Size
3) Nature of the image

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

When an object is placed in front of a lens, the light rays from the object fall on the lens. The **position, size and nature of the image formed can be understood only if we know certain basic rules**.

37. Match the following with

I.	Ray of light strikes at the optical centre	1. refracted ray will be parallel to the principal axis
II.	Ray of light parallel to principal axis	2. it continues to follow its path without any deviation
III.	Ray of light strikes directed towards the principal focus	3. Either converge or diverge from principal axis based on type of lens

a) 3, 1, 2
b) 2, 3, 1
c) 1, 3, 2
d) 2, 1, 3

Explanation

Rule-1: When a ray of light strikes the convex or concave lens obliquely at its optical centre, it continues to follow its path without any deviation

Rule-2: When rays parallel to the principal axis strikes a convex or concave lens, the refracted rays are converged to (convex lens) or appear to diverge from (concave lens) the principal focus
Rule-3: When a ray passing through (convex lens) or directed towards (concave lens) the principal focus strikes a convex or concave lens, the refracted ray will be parallel to the principal axis

38. What will be the size of the image in convex lens in case of Object at infinity?

a) **Size of the image is much smaller than that of the object**
b) Size of the image is equal to that of the object
c) Size of the image is much larger than that of the object
d) None

Explanation

Let us discuss the formation of images by a convex lens when the object is placed at various positions. When an object is placed at infinity, a real image is formed at the principal focus. The **size of the image is much smaller than that of the object.**

39. Match the following with the position of image formation in the case of convex lens

i.	Object placed beyond C	1. real image is formed at infinity
ii.	Object placed at C	2. real and inverted image is formed behind the centre of curvature
iii.	Object placed between F and C	3. image is formed between the centre of curvature and the principal focus
iv.	Object placed at the principal focus F	4. a real and inverted image is formed at the other centre of curvature

a) 1, 2, 4, 3
b) 3, 4, 2, 1
c) 3, 2, 1, 4
d) 2, 1, 4, 3

Explanation

Object placed beyond C (>2F): When an object is placed behind the centre of curvature (beyond C), a real and inverted **image is formed between the centre of curvature and the principal focus**. Th e size of the image is the same as that of the object
Object placed at C: When an object is placed at the centre of curvature, a **real and inverted image is formed at the other centre of curvature**. The size of the image is the same as that of the object.
Object placed between F and C: When an object is placed in between the centre of curvature and principal focus, **a real and inverted image is formed behind the centre of curvature**. The size of the image is bigger than that of the object
Object placed at the principal focus F: When an object is placed at the focus, a real image is formed at infinity. The **size of the image is much larger than that of the object**

Object placed between the principal focus F and optical centre O: When an object is placed in between principal focus and optical centre, a **virtual image is formed**. The size of the image is larger than that of the object

40. Which of the following are the uses of Convex lenses?

1) Convex lenses are used as magnifying lenses
2) They are used as camera lenses
3) They are used to correct the defect of vision called myopia

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

APPLICATIONS OF CONVEX LENSES:

1. Convex lenses are used as **camera lenses**
2. They are used as **magnifying lenses**
3. They are used in making **microscope, telescope and slide projectors**
4. They are **used to correct the defect of vision called hypermetropia**

41. Which of the following statement about concave lens is incorrect?

1) When an object is placed at infinity, a virtual image is formed at the focus
2) When an object is placed at a finite distance from the lens, a virtual image is formed between optical centre and focus of the concave lens

a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

When an object is placed at infinity, a virtual image is formed at the focus. The size of the image is much smaller than that of the object. When an **object is placed at a finite distance from the lens, a virtual image is formed between optical centre and focus of the concave lens**. The size of the image is smaller than that of the object.

42. What happens the distance between the object and the lens is decreased in a Concave lens?

a) The distance between the image and the lens also keeps decreases
b) The distance between the image and the lens also keeps increases
c) The distance between the image and the lens will be same
d) None

Explanation

In a concave lens, **as the distance between the object and the lens is decreased, the distance between the image and the lens also keeps decreasing**. Further, the **size of the image formed increases as the distance between the object and the lens is decreased**.

43. Which of the following are the uses of concave lens?

1) Concave lenses are used as eye lens of 'Galilean Telescope'
2) They are used in wide angle spy hole in doors
3) They are used to correct the defect of vision called 'myopia'

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

APPLICATIONS OF CONCAVE LENSES:

1. Concave lenses are used as eye lens of **'Galilean Telescope'**
2. They are used in wide angle **spy hole in doors**.
3. They are used to correct the defect of vision called **'myopia'**

44. Which of the following gives the focal length (f) of the lens?

a) u + v
b) u – v
c) 1/u – 1/v
d) 1/u + 1/v

Explanation

Like spherical mirrors, we have lens formula for spherical lenses. The lens formula gives the relationship among distance of the object (u), distance of the image (v) and the focal length (f) of the lens. It is expressed as:

1/f = 1/u – 1/v

It is applicable to both convex and concave lenses. We need to give an at most care while solving numerical problems related to lenses in taking proper signs of different quantities.

45. Which of the following statement about Cartesian sign conventions are correct?

1) The object is always placed on the left side of the lens.
2) The distances measured upward and perpendicular to the principal axis is taken as positive
3) The distances measured in the same direction as that of incident light are taken as positive.

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Cartesian sign conventions are used for measuring the various distances in the ray diagrams of spherical lenses. According to cartesian sign convention,

1. The **object is always placed on the left side of the lens**.
2. All the distances are measured from the optical centre of the lens.
3. The **distances measured in the same direction as that of incident light are taken as positive.**
4. The distances measured against the direction of incident light are taken as negative.
5. The **distances measured upward and perpendicular to the principal axis is taken as positive**.
6. The distances measured downward and perpendicular to the principal axis is taken as negative.

46. Which of the following signifies the Magnification of lens?

a) height of the image/ height of the object
b) height of the image X height of the object
c) height of the image + height of the object
d) height of the image - height of the object

Explanation

Like spherical mirrors, we have magnification for spherical lenses. Spherical lenses produce magnification and **it is defined as the ratio of the height of the image to the height of an object**. Magnification is denoted by the letter 'm'. If height of the object is h and height of the image is h´, the magnification produced by lens is,

m = height of the image /height of the object = h' /h

47. If magnification is greater than 1, then we get a/an_____ image

a) Same size
b) Enlarged
c) Diminished
d) None

Explanation

If the **magnification is greater than 1, then we get an enlarged image**. On the other hand, if the magnification is less than 1, then we get a diminished image.

48. Which of the following statement about lens is correct?

1) All lenses are made up of transparent materials
2) Any optically transparent material will have a refractive index
3) The lens formula relates the focal length of a lens with the distance of object and image.

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

All lenses are made up of transparent materials. Any optically transparent material will have a refractive index. The lens formula relates the focal length of a lens with the distance of object and

image. For a maker of any lens, knowledge of radii of curvature of the lens is required. This clearly indicates the need for an equation relating the radii of curvature of the lens, the refractive index of the given material of the lens and the required focal length of the lens.

49. The ability to converge or diverge these light rays depends on_____ of the lens
    a) Principal axis
    b) Focal length
    c) Refractive index
    d) None

Explanation

It is clear that when a ray of light falls on a lens, the ability to converge or diverge these light rays depends on the **focal length of the lens**.

50. What is the formula to calculate the Power of a lens?
    a) 1 /f
    b) – f
    c) u – v
    d) f/x

Explanation

The **ability of a lens to converge (convex lens) or diverge (concave lens) is called as its power**. Hence, the power of a lens can be defined as the degree of convergence or divergence of light rays. Power of a lens is numerically defined as the reciprocal of its focal length.

P = 1 /f

51. What is the SI unit of Power of a lens?
    a) Dioptre
    b) m
    c) 1/m
    d) 1/D

Explanation

The **SI unit of power of a lens is dioptre**. It is represented by the symbol D. If focal length is expressed in 'm', then the **power of lens is expressed in 'D'**. Thus, 1D is the power of a lens, whose focal length is 1 metre. 1D = 1m^-1

52. What is the power of concave lens?
    a) Positive
    b) Negative
    c) Neutral
    d) None

Explanation

By convention, the power of a **convex lens is taken as positive** whereas the **power of a concave lens is taken, as negative**. The lens formula and lens maker's formula are applicable to only thin lenses. In the case of thick lenses, these formulae with little modifications are used.

53. What is the diameter of eye ball?

a) 2.3 cm
b) 2.3 m
c) 12.3 cm
d) 1.3 m

Explanation

The **eye ball is approximately spherical in shape with a diameter of about 2.3 cm**. It consists of a tough membrane called sclera, which protects the internal parts of the eye.

54. Which of the following refracts or bends the light on to the lens?

a) Cornea
b) Pupil
c) Retina
d) All the above

Explanation

Cornea is the thin and transparent layer on the front surface of the eyeball. It is the main refracting surface. When light enters through the cornea, **it refracts or bends the light on to the lens**.

55. _____ is the back surface of the eye

a) Pupil
b) Retina
c) Ciliary muscles
d) All the above

Explanation

Retina is the back surface of the eye. It is the most sensitive part of human eye, on which real and inverted image of objects is formed.

56. Which of the following are the possible colours of the Iris?

1) Red
2) Blue
3) Green
4) Brown

a) 1, 3, 4
b) 2, 3, 4
c) 1, 2, 4
d) All the above

Explanation

Iris is the coloured part of the eye. It may be **blue, brown or green in colour**. Every person has a unique colour, pattern and texture. Iris controls amount of light entering into the pupil like camera aperture.

57. Eye lens is fixed between_____

1) Pupil
2) Retina
3) Ciliary muscles
    a) 1, 3
    b) 2, 3
    c) 3 alone
    d) 1, 2

Explanation

Eye lens is fixed between the ciliary muscles. It helps to change the focal length of the eye lens according to the position of the object.

58. Human eye is in nature?

a) Concave
b) Convex
c) a or b
d) None

Explanation

Pupil is the centre part of the Iris. It is the pathway for the light to retina. **Eye Lens is the important part of human eye. It is convex in nature**.

59. Which of the following statement is correct?

1) The transparent layer cornea bends the light rays through pupil located at the centre part of the Iris.
2) The adjusted light passes through the eye lens
3) Retina passes the received real and inverted image to the brain through optical nerves
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

The **transparent layer cornea bends the light rays through pupil located at the centre part of the Iris**. The **adjusted light passes through the eye lens**. Eye lens is convex in nature. So, the light rays from the objects are converged and a real and inverted image is formed on retina. Then, **retina passes the received real and inverted image to the brain through optical nerves**. Finally, the brain senses it as erect image.

60. Assertion(A): The ability of the eye lens to focus nearby as well as the distant objects is called power of accommodation of the eye
Reason(R): This is achieved by changing the focal length of the eye lens with the help of ciliary muscles.

a) Both (A) and (R) are correct, but (R) does not explain (A)
b) Both (A) and (R) are wrong
c) Both (A) and (R) are correct and (R) explains (A)
d) (A) is Correct and (R) is wrong

Explanation

The ability of the eye lens to focus nearby as well as the distant objects is called power of accommodation of the eye. This is achieved by **changing the focal length of the eye lens with the help of ciliary muscles**.

61. Which of the following statement is correct?

1) Eye lens is made of a flexible, jelly-like material
2) When we see distant objects, the ciliary muscle relaxes and makes the eye lens thinner
3) when we look at a closer object, the focal length of the eye lens is decreased by the contraction of ciliary muscle

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Eye lens is made of a **flexible, jelly-like material**. By relaxing and contracting the ciliary muscle, the curvature and hence the focal length of the eye lens can be altered. **When we see distant objects, the ciliary muscle relaxes and makes the eye lens thinner**. This increases the focal length of the eye lens. Hence, the distant object can be clearly seen. On the other hand, **when we look at a closer object, the focal length of the eye lens is decreased by the contraction of ciliary muscle**. Thus, the image of the closer object is clearly formed on the retina.

62. What is the minimum time required by the eye to distinguish consecutive light pulses?

a) 1 sec
b) 0.1 sec
c) 10 sec
d) 1 msec

Explanation

If the time interval between two consecutive light pulses is less than **0.1 second,** human eye cannot distinguish them separately. It is called persistence of vision.

63. What is the minimum distance required by human eye to see the objects distinctly without strain?

a) 25 m
b) 25 cm
c) 15 cm
d) 15 m

Explanation

The **minimum distance required to see the objects distinctly without strain** is called least distance of distinct vision. It is called as near point of eye. **It is 25 cm for normal human eye**.

64. What is the far point of the eye?

a) 150 m
b) 100 m
c) 200 m
d) Infinity

Explanation

The **maximum distance up to which the eye can see objects clearly is called as far point of the eye**. It is **infinity** for normal eye.

65. Which of the following statement is correct?

1) A normal human eye can clearly see all the objects placed between 25cm and infinity
2) But, for some people, the eye loses its power of accommodation.

a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

A normal human eye can clearly see all the **objects placed between 25cm and infinity**. But, for some people, the **eye loses its power of accommodation**. Th is could happen due to **many reasons including ageing**. Hence, their vision becomes defective.

66. Which of the following statement about myopia is correct?

1) Myopia, also known as short sightedness
2) It occurs due to the shortening of eye ball
3) The focal length of eye lens is reduced or the distance between eye lens and retina increases

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

Myopia, also known as short sightedness, occurs due to the lengthening of eye ball. With this defect, nearby objects can be seen clearly but distant objects cannot be seen clearly. Th e focal length

of eye lens is reduced or the distance between eye lens and retina increases. Hence, the far point will not be infinity for such eyes and the far point has come closer.

67. Myopia can be corrected with_____

a) Concave lens
b) Convex lens
c) Bi-focal lens
d) None

Explanation

In the case of myopia, image of distant objects is/are formed before the retina. This defect can be corrected using a **concave lens.**

68. What is the formula to calculate the focal length of concave lens in the case of myopia?

a) x y /x−y
b) x /x−y
c) y /x−y
d) x−y / x y

Explanation

Let a person with myopia eye can see up to a distance x. Suppose that he wants to see all objects farther than this distance, i.e., up to infinity. Then the focal length of the required concave lens is f = −x. If the person can see up to a distance x and he wants to see up to a distance y, then, the focal length of the required concave lens is,

f = x y /x − y

69. Which of the following statement is correct about Hypermetropia?

1) Hypermetropia, also known as long sightedness
2) It occurs due to the shortening of eye ball
3) Th e focal length of eye lens is increased or the distance between eye lens and retina decreases.
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Hypermetropia, also known as long sightedness, occurs due to the shortening of eye ball. With this defect, distant objects can be seen clearly but nearby objects cannot be seen clearly. **The focal length of eye lens is increased or the distance between eye lens and retina decreases**. Hence, the near point will not be at 25cm for such eyes and the near point has moved farther. Due to this, the image of nearby objects is/are formed behind the retina. This defect can be corrected using a convex lens.

70. Which of the following statement is incorrect?

1) Due to ageing, ciliary muscles become weak and the eye-lens become rigid (inflexible) and so the eye loses its power of accommodation.
2) Presbyopia is also called as 'old age hypermetropia'
    a) 1 alone
    b) 2 alone
    c) 1, 2
    d) None

Explanation

Due to ageing, ciliary muscles become weak and the eye-lens become rigid (inflexible) and so the eye loses its power of accommodation. Because of this, an aged person cannot see the nearby objects clearly. So, it is also called as 'old age hypermetropia'.

71. Presbyopia can be corrected with_____ lens
    a) Concave
    b) Convex
    c) Bifocal
    d) It cannot be corrected

Explanation

Some persons may have both the defects of vision - myopia as well as hypermetropia. This can be corrected by **bifocal lenses**. In which, upper part consists of concave lens (to correct myopia) used for distant vision and the lower part consists of convex lens (to correct hypermetropia) used for reading purposes.

72. Astigmatism can be corrected by using_____ lenses
    a) Concave
    b) Convex
    c) Bifocal
    d) Cylindrical

Explanation

In this defect, eye cannot see parallel and horizontal lines clearly. It may be inherited or acquired. It is due to the imperfect structure of eye lens because of the development of cataract on the lens, ulceration of cornea, injury to the refracting surfaces, etc. **Astigmatism can be corrected by using cylindrical lenses (Torrid lenses)**.

73. Simple microscope has a _____lens of short focal length
    a) Concave
    b) Convex
    c) Bifocal
    d) Cylindrical

Explanation

Microscope works under the principle of angular magnification of lenses. It is classified as

1. Simple microscope
2. Compound microscope

Simple microscope has a convex lens of short focal length. It is held near the eye to get enlarged image of small objects.

74. Which of the following are the uses of Simple microscope?

1) watch repairers and jewellers
2) observe parts of flower, insects etc
3) to observe finger prints in the field of forensic science.
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Simple microscopes are used

a) by **watch repairers and jewellers**.

b) to read small letters clearly.

c) **to observe parts of flower, insects etc**.

d) to **observe finger prints in the field of forensic science**.

75. Which of the following statement is correct?

1) Compound microscope is also used to see the tiny objects.
2) It has better magnification power than simple microscope.
3) Magnification power of microscopes can be increased by decreasing the focal length of the lens used
    a) 1, 2
    b) 1, 3
    c) 2, 3
    d) All the above

Explanation

Compound microscope is also **used to see the tiny objects**. It has **better magnification power than simple microscope**. Magnification power of microscopes can be increased by decreasing the focal length of the lens used. Due to constructional limitations, the focal length of the lens cannot be decreased beyond certain limit. This problem can be solved by using two separate biconvex lenses.

76. How many lenses are there in a compound microscope?

a) 4
b) 2
c) 3
d) 1

Explanation

A **compound microscope consists of two convex lenses**. The lens with the shorter focal length is placed near the object, and is called as 'objective lens' or 'objective piece'. The lens with larger focal length and larger aperture placed near the observer's eye is called as 'eye lens' or 'eye piece'. Both the lenses are fixed in a narrow tube with adjustable provision.

77. How many times more magnification power than simple microscope than compound microscope
does have?

a) 5 to 10
b) 50 to 100
c) 50 to 200
d) 100 to 200

Explanation

Compound microscope has 50 to 200 times more magnification power than simple microscope. A travelling microscope is one of the best instruments for measuring very small length with high degree of accuracy at the order of 0.01mm. It works based on the principle of vernier. Its least count is 0.01 mm.

78. The first telescope was invented by_____

a) Newton
b) Galileo
c) Jan Lippershey
d) Einstein

Explanation

Telescope is an optical instrument to see the distant objects. **The first telescope was invented by Jan Lippershey in 1608**. Galileo made a telescope to observe distant stars. He got the idea, from a spectacle maker who one day observed that the distant weather cock appeared magnified through his lens system fitted in his shop.

79. Who invented a telescope which was fundamentally similar to the astronomical telescope?

a) Newton
b) Galileo
c) Jan Lippershey
d) Kepler

Explanation

Galileo observed the satellites of Jupiter and the rings of Saturn through his telescope. **Kepler invented Telescope in 1611 which was fundamentally similar to the astronomical telescope**.

80. According to optical property, telescopes are classified into___ types

a) 3

b) 4
c) 2
d) 5

Explanation

According to optical property, it is classified into two groups:

i) refracting telescope

ii) reflecting telescope

In **refracting telescope lenses are used**. Galilean telescope, Keplerian telescope, Achromatic refractors, Apochromatic refractors are some refracting telescopes.

In **reflecting telescope parabolic mirrors** are used Gregorian, Newtonian, Cassegrain telescope, Ritchey–Chrétien telescope are some Reflecting telescopes According to the things which are observed, Astronomical Telescope and Terrestrial Telescopes are the two major types of telescope

81. Which of the following statement is correct?

1) The image in an astronomical telescope is real
2) It is not suitable for viewing objects on the surface of the Earth
3) The major difference between astronomical and terrestrial telescope is erecting the final image with respect to the object

a) 1, 2
b) 1, 3
c) 2, 3
d) All the above

Explanation

The **image in an astronomical telescope is inverted**. So, it is not suitable for viewing objects on the surface of the Earth. Therefore, a terrestrial telescope is used. It provides an erect image. The major difference between astronomical and terrestrial telescope is erecting the final image with respect to the object.

82. A person with myopia can see objects placed at a distance of 4m. If he wants to see objects at a distance of 20m, what should be the power of the concave lens he must wear?

a) 0.2 D
b) – 0.2 D
c) 0.5 D
d) – 0.5 D

Explanation

A person with myopia can see objects placed at a distance of 4m. If he wants to see objects at a distance of 20m, what should be the focal length and power of the concave lens he must wear?

Solution:

Given that $x = 4\text{m}$ and $y = 20\text{m}$.

Focal length of the correction lens is

$$f = \frac{xy}{x-y} \quad \text{(Refer eqn.2.6)}$$

$$f = \frac{4 \times 20}{4 - 20} = \frac{80}{-16} = -5 \text{ m}$$

Power of the correction lens

$$= \frac{1}{f} = -\frac{1}{5} = -0.2 \text{ D}$$

83. A beam of light passing through a diverging lens of focal length 0.3m appear to be focused at a distance 0.2m behind the lens. Find the position of the object.
    a) −0.6 m
    b) 0.6 m
    c) 0.3 m
    d) − 0.3 m

Explanation

A beam of light passing through a diverging lens of focal length 0.3m appear to be focused at a distance 0.2m behind the lens. Find the position of the object.

Solution:

f = −0.3 m, v = −0.2 m

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

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

$$\frac{1}{u} = \frac{1}{-0.2} - \frac{1}{-0.3} = \frac{-10}{6}$$

$$u = \frac{-6}{10} = -0.6 \text{ m}$$

84. For a person with hypermetropia, the near point has moved to 1.5m. Calculate the focal length of the correction lens in order to make his eyes normal.
    a) 0.3 m

b) 0.6 m
c) - 0.5 m
d) - 0.6 m

Explanation

For a person with hypermeteropia, the near point has moved to 1.5m. Calculate the focal length of the correction lens in order to make his eyes normal.

Solution:

Given that, d = 1.5m; D = 25cm = 0.25m (For a normal eye).

From equation (2.7), the focal length of the correction lens is

$$f = \frac{d \times D}{d - D} = \frac{1.5 \times 0.25}{1.5 - 0.25} = \frac{0.375}{1.25} = 0.3 \text{ m}$$