SSLC Second Term examination 2024

Physics Answer Key

Answers are indicative, If you find any errors, please mail to netrimedia@gmail.com

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Answer any four questions from 1 to 5 (1 score each)

1. The absolute refractive index of diamond

The speed of light in a vacuum is 3×108m/s. The table shows that the speed of light in a diamond is 1.25×108m/s.

The absolute refractive index of a medium is the ratio of the speed of light in a vacuum to the speed of light in the medium.

The absolute refractive index of diamond is:

3 x 10^8 / 1.25 x 10^8 = 2.40

So the answer is (d).

2. The correct statement regarding the devices

- Moving coil loudspeakers convert electrical energy into sound energy.
- AC generators convert mechanical energy into electrical energy.
- Moving coil microphones convert sound energy into electrical energy.
- Electric motors convert electrical energy into mechanical energy.

So the answer is (d).

3. The correct equation related to a spherical mirror

The correct equation related to a spherical mirror is:

1/u = 1/f - 1/v

where:

- u is the object distance
- v is the image distance
- f is the focal length

So the answer is (c).

4. According to Snell's law sin i / sin r = ...

According to Snell's law, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a given pair of media. This constant is called the refractive index.

So the answer is (a).

5. The magnification of the image formed

The magnification of an image formed by a concave mirror is given by the formula:

M = -v/u

where:

- M is the magnification
- v is the image distance
- u is the object distance

In this case, the image is real, inverted, and magnified. So the answer is (c).

Answer any four questions from 6 to 10 (2 scores each)

6. What happens to the quantity of heat developed in a circuit on increasing the effective resistance while keeping the voltage constant? Justify your answer.

The amount of heat developed in a circuit is given by the formula:

H = I^2 * R * t

where:

- H is the amount of heat developed
- I is the current flowing through the circuit
- R is the resistance of the circuit
- t is the time for which the current flows

If the effective resistance is increased while keeping the voltage constant, the current flowing through the circuit will decrease. This is because the current is inversely proportional to the resistance according to Ohm's law:

I = V/R

where:

- V is the voltage across the circuit

As a result, the amount of heat developed in the circuit will also decrease.

In short, the quantity of heat developed in a circuit is directly proportional to the resistance. If the resistance increases, the heat developed will increase, and vice versa.

7. Optical fiber cables are widely used in the field of telecommunication. Write down any two advantages of using such cables in telecommunication.

Two advantages of using optical fiber cables in telecommunication are:

- **High bandwidth:** Optical fiber cables can carry a large amount of information at high speeds.

- **Low signal degradation:** The signal in an optical fiber cable does not degrade as much as it does in other types of cables. This is because the light signal is not affected by electromagnetic interference.

8. Write down the major limitation in the transmission of electricity from power stations to distant places. How can it be minimized?

The major limitation in the transmission of electricity from power stations to distant places is the loss of energy due to the resistance of the transmission lines. This loss of energy can be minimized by using high-voltage transmission lines. The higher the voltage, the lower the current for a given amount of power. This lower current results in less energy loss due to resistance.

9. The bulb flickers when the switch is on.

(a) Name the phenomenon by which current is induced in the secondary coil (Q).

The phenomenon by which current is induced in the secondary coil (Q) is called **mutual induction**.

(b) Suggest a method to make the bulb glow continuously.

replace the battery with an AC source

continuously turning the switch off and on

10. The three-pin plug ensures better safety in electrical appliances.

(a) By which name is the longest pin in it known as?

The longest pin in a three-pin plug is known as the **earth pin**.

(b) What is the advantage of this pin being longer than the other pins?

The advantage of the earth pin being longer than the other pins is that it is the first to be connected and the last to be disconnected. This ensures that the appliance is grounded before any current flows through it, which protects the user from electric shock.

Answer any four questions from 11 to 15 (3 scores each)

11. A concave mirror has a focal length of 20 cm. An object is placed 30 cm in front of the concave mirror. Find the magnification of the image.

Answer:

The magnification of the image is given by the formula:

$M = -v/u$

where:

- M is the magnification
- v is the image distance
- u is the object distance

We can use the mirror formula to find the image distance:

$1/f = 1/v + 1/u$

where:

- f is the focal length

In this case, we have:

- f = -20 cm (since the mirror is concave)
- u = -30 cm (since the object is in front of the mirror)

Substituting these values into the mirror formula, we get:

1/-20 = 1/v + 1/-30

Solving for v, we get:

v = -60 cm

Substituting the values of v and u into the magnification formula, we get:

M = -(-60)/(-30) = -2

Therefore, the magnification of the image is -2. This means that the image is inverted and twice the size of the object.

12. Classify the statements given below properly and write them down in the given table.

Step-up transformer	**Step-down transformer**
Number of turns of secondary coil is greater than that of the primary coil	Number of turns of primary coil is greater than that of the secondary coil
Output current is greater than the input current	Input current is greater than the output current
Thickness of secondary coil is greater than that of the primary coil	Thickness of primary coil is greater than that of the secondary coil

13. A part of the household circuit is shown below.

(a) Find the correct position for connecting the main fuse properly. [X/Y/Z]

Answer: Y

(b) Write down the name of 2 devices connected in series in this circuit.

Answer: Main switch and ELCB

14. In a house, 4 LED bulbs of 15 W are used for 4 hours a day, 4 fans of 60 W are used for 6 hours a day and a 50 W TV is used for 4 hours a day. If so, what is the energy consumption in one day?

Answer:

The energy consumption of the LED bulbs is given by:

4 bulbs * 15 W/bulb * 4 hours/day = 240 Wh/day

The energy consumption of the fans is given by:

4 fans * 60 W/fan * 6 hours/day = 1440 Wh/day

The energy consumption of the TV is given by:

50 W * 4 hours/day = 200 Wh/day

The total energy consumption in one day is given by:

240 Wh/day + 1440 Wh/day + 200 Wh/day = 1880 Wh/day

Converting to kilowatt-hours (kWh), we get:

1880 Wh/day / 1000 Wh/kWh = 1.88 kWh/day

Therefore, the energy consumption in one day is 1.88 kWh.

15. Observe the circuit.

(a) What change will happen to the brightness of the bulb if a 12Ω resistor is connected in parallel to the 6Ω resistor, while the bulb is glowing?

Answer: The brightness of the bulb will increase.

(b) What is the reason for the change in the brightness of the bulb?

Answer:

When a 12Ω resistor is connected in parallel to the 6Ω resistor, the total resistance of the circuit decreases. This increases the current flowing through the circuit, and therefore the current flowing through the bulb. The power of the bulb is given by:

P = I^2 * R

where:

- P is the power of the bulb
- I is the current flowing through the bulb
- R is the resistance of the bulb

Since the current flowing through the bulb increases and the resistance of the bulb remains constant, the power of the bulb increases. This increase in power causes the bulb to glow brighter.

Answer any four questions from 16 to 20 (4 scores each)

16. Different uses of different types of mirrors are given. Find which specialty of image formation by each mirror is made use of in each context.

(a) Plane mirror is used for observing the face.

Answer: A plane mirror forms a virtual, erect, and laterally inverted image of the same size as the object. This is why it is used for observing the face.

(b) Convex mirror is used as a rearview mirror.

Answer: A convex mirror forms a virtual, erect, and diminished image of the object. This allows the driver to see a wider field of view than is possible with a plane mirror.

(c) Concave reflector is used in a torchlight.

Answer: A concave reflector can focus a beam of light into a parallel beam. This is why it is used in torchlight.

(d) Dental doctors use a concave mirror for examining teeth.

Answer: A concave mirror can form a magnified image of an object when the object is placed between the pole and the principal focus of the mirror. This is why it is used by dental doctors to examine teeth.

17. The intensity of current in the secondary of a transformer is 2 A and that in the primary is 1 A. If the voltage across the secondary is 200 V,

(a) What type of transformer is this?

Answer: This is a step-up transformer.

(b) What is the power given to the primary of this transformer?

Answer: The power given to the primary of the transformer is equal to the power delivered by the secondary. The power delivered by the secondary is given by:

P = VI = 200 V * 2 A = 400 W

Therefore, the power given to the primary is also 400 W.

(c) Find out how many times is the number of primary turns when compared to secondary turns.

Answer: The ratio of the number of turns in the primary coil to the number of turns in the secondary coil is equal to the ratio of the current in the secondary coil to the current in the primary coil. In this case, the current in the secondary coil is 2 A and the current in the primary coil is 1 A. Therefore, the number of primary turns is twice the number of secondary turns.

18. On placing an object of height 9 cm at a distance 20 cm from a spherical mirror, an erect image of height 18 cm was obtained.

(a) Which type of mirror is this?

Answer: This is a concave mirror.

(b) Calculate the focal length of the mirror.

Answer: The magnification of the image is given by the formula:

M = -v/u

where:

- M is the magnification
- v is the image distance
- u is the object distance

In this case, the image is erect and twice the size of the object. Therefore, the magnification is +2. The object distance is -20 cm (since the object is in front of the mirror). Substituting these values into the magnification formula, we get:

2 = -v/(-20)

Solving for v, we get:

v = 40 cm

We can use the mirror formula to find the focal length:

1/f = 1/v + 1/u

Substituting the values of v and u into the mirror formula, we get:

1/f = 1/40 + 1/(-20)

Solving for f, we get:

f = -40 cm

Therefore, the focal length of the mirror is -40 cm.

(c) Find the distance between the object and the image.

Answer: The distance between the object and the image is equal to the sum of the object distance and the image distance. In this case, the object distance is -20 cm and the image distance is 40 cm. Therefore, the distance between the object and the image is:

-20 cm + 40 cm = 20 cm

19. A ray of light entering obliquely from one medium to another is depicted.

(a) Identify the mediums

Answer:

- Medium 1: Air
- Medium 2: Water

(b) Justify your answer.

Answer:

The ray of light bends towards the normal as it enters from medium 1 to medium 2. This means that medium 2 is denser than medium 1. Of the two options given (air and water), water is the denser medium. Therefore, medium 1 is air and medium 2 is water.

20. James Prescott Joule is a scientist who studied the specialties of heat energy.

(a) What do you mean by Joule heating?

Answer: Joule heating is the process by which the passage of an electric current through a conductor produces heat.

(b) Calculate the heat developed in a soldering iron having a resistance of 92Ω when 230 V is applied to it for 14 minutes?

Answer: The heat developed in the soldering iron is given by the formula:

H = (V^2 * t) / R

where:

- H is the heat developed
- V is the voltage applied
- t is the time for which the voltage is applied
- R is the resistance of the soldering iron

In this case, we have:

- V = 230 V
- t = 14 minutes = 840 seconds
- R = 92 Ω

Substituting these values into the formula, we get:

H = (230^2 * 840) / 92 = 483000/ or 483KJ

Therefore, the heat developed in the soldering iron is 483 KJ.

(c) What will be its power?

Answer: The power of the soldering iron is given by the formula:

P = V^2 / R

Substituting the values of V and R into the formula, we get:

P = 230^2 / 92 = 575 W

Therefore, the power of the soldering iron is 575 W.