

$T_{1/2} = 8 \text{ day}$

$N_0 = 40g$

Δt 16 days

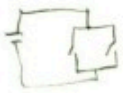
$N = ?$

$$N = \frac{1}{2^{\frac{\Delta t}{T_{1/2}}}} N_0$$

$$N = \frac{1}{2^2} 1_{10}$$

$$N = \frac{40}{4}$$

$$N = 10$$



Use for rough work

Q. No. 2 Part (i) SOLUTION:

Given Data:

$m = 2kg$

$T_i = 40°C$

$T_F = 45°C$

$c = 420 J kg^{-1} K^{-1}$

Required:

Heat = Q = ?

Formula:

$Q = mc\Delta T$

Calculation:

$Q = mc\Delta T$

$Q = (2)(420)(45-40)$

$Q = (2)(420)(5)$

$\boxed{Q = 4200 J}$

Q. No. 2 Part (ii) **FUNCTIONS OF DIODE**

1. Diode works as a rectifier in a circuit, used to convert Ac to DC.

2. Allows currents to flow only in one direction, From Positive terminal to negative.

Q. No. 2 Part (iii) **SOLUTION:**

Given Data:	Calculation:
$\mathcal{E} = 1.5V$	For $\mathcal{E}_{net}$ (series);
$n = 3$	$n = \frac{\mathcal{E}_{net}}{\mathcal{E}}$
Required:	$3 = \frac{\mathcal{E}_{net}}{1.5}$
$\mathcal{E}_{net}$ (Series) = ?	$\mathcal{E}_{net} = 1.5 \times 3$
$\mathcal{E}_{net}$ (Parallel) = ?	$\boxed{\mathcal{E}_{net} = 4.5\ V}$
Formula:	**For $\mathcal{E}_{net}$ (Parallel);**
$n = \frac{\mathcal{E}_{net}}{\mathcal{E}}$	The $\mathcal{E}_{net}$ in parallel will remain same.
	$\boxed{\mathcal{E}_{net} = 1.5\ V}$

Q. No. 2 Part (iv)

REFRACTIVE INDEX:

The measure of bending of light ray when passed from one medium to another is called Refractive index such that one medium is vacuum.

Mathematically,

$$n = \frac{c}{v}$$

Calculation:

As, $v = 2 \times 10^8 \text{ m/s}$

$c = 3 \times 10^8 \text{ m/s}$

$n = ?$

$$n = \frac{c}{v}$$

$$n = \frac{3 \times 10^8 \text{ m/s}}{2 \times 10^8 \text{ m/s}} = 1.5$$

Q. No. 2 Part (v) **SOLUTION:**

Given Data:

$V = 220V$

$I = 2A$

Required:

Power = $P = ?$

Formula:

$P = IV$

Calculation:

$P = IV$

$P = (2)(220)$

$\boxed{P = 440W}$

Q. No. 2 Part (vi)

FEATURE	ALTERNATING CURRENT	DIRECT CURRENT
DIRECTION	Current flow in changing direction.	Current flow in single direction.
SOURCE	Produced by Power cells, AC generators etc.	Produced by Solar cells, batteries, DC generators etc.

Q. No. 2 Part (vii)

ECHO:

Echo is such a behaviour in which sound wave bounce back to the listener after striking to a reflecting surface. Hence, Echo obeys the phenomenon of reflection.

PRODUCTION:

Echo is produced when a sound wave bounce back to the listener after reflection; such that the distance between source and surface is minimum 17m. Human ear can percieve sound waves within 0.1s.

Q. No. 2 Part (viii) **OHM'S LAW**

Statement: Ohm's law states the relationship between current and voltage, which is that the voltage applied and current flowing in a circuit are directly proportional.

$V \propto I$ or $V = IR$

Calculation:

As, $R = 10\,\Omega$, $I = 2A$, $V = ?$

$V = IR$

$V = (2)(10)$

$\boxed{V = 20\,V}$

Q. No. 2 Part (ix) **SOLUTION:**

Given data:

$P = 2cm$

$q = 6cm$

Required:

focal length $= f = ?$

Magnification $= M = ?$

Formula:

$\frac{1}{f} = \frac{1}{P} + \frac{1}{q}$, $M = \frac{q}{P}$

Calculation:

For focal length, $\frac{1}{f} = \frac{1}{P} + \frac{1}{q}$

$\frac{1}{f} = \frac{1}{2} + \frac{1}{6}$

$\frac{1}{f} = \frac{2}{3}$

$f = \frac{3}{2}$ ∴ Reciprocate

$\boxed{f = 1.5}$

For Magnification,

$M = \frac{q}{P}$

$M = \frac{6}{2} = 3cm$

Q. No. 2 Part (x)

REAL IMAGE	VIRTUAL IMAGE
• Can be caught on screen.	Cannot be caught on screen.
• Is always inverted.	Is always erect.
• Can be formed by convex lens only.	can be formed by convex lens or convace lens.
i.e. Image on TV.	i.e. Image in mirror.

Q. No. 2 Part (xi)

FEATURES	EVAPORATION	BOILING
Occurs	Occurs at surface of the liquid.	Occurs at throughout the liquid.
Temperature	Occurs at any temperature.	Occurs at the boiling point of Liquid.
Bubble Formation	No bubble formation.	Formation of bubbles.
Example	Drying of clothes.	Water boiling at 100°c

Q. No. 3 (Page 1) **NUCLEAR FUSION**

DEFINITION: Nuclear fusion is the process in which two smaller nuclie combine to form comparatively heavy nucleus.

MASS LOSS: In nuclear fusion, the mass of heavy ~~neve~~ nucleus is less than the mass of smaller nuclie. This change in mass is due to loss energy, according to Einstien equation.

$$E = mc^2$$

REQUIREMENT OF HIGH TEMPERATURE:

Nuclear fusion requires high temperature to fuse smaller nuclie into heavy nucleus. According to Einstien's equation $E = mc^2$, The change in energy causes the change in mass. A self-sustaining nuclear fusion reaction can also occur but only in high temperature environments like stars including sun.

b. **SOLUTION:**

Given data:

$m = 55.56\ kg$

$c\ (constant) = 3 \times 10^8\ m/s$

Required:

$E = ?$

Q. No. 3 (Page 2)

FORMULA :

$E = mc^2$

Calculation:

$E = mc^2$

$E = (55.56)(3 \times 10^8)^2$

$E = (55.56)(9 \times 10^{16})$

$\boxed{E = 5.00 \times 10^{18} J}$

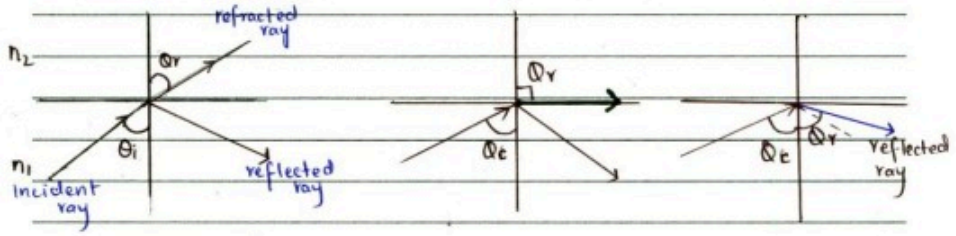
Q. No. 4 (Page 1)

TOTAL INTERNAL REFLECTIONS

DEFINITION:

Total Internal Reflection is the phenomenon of Reflection which occurs when light ray passes from denser medium to rarer medium such that the angle of incidence is greater than critical angle.

DIAGRAM



EXPLANATION:

When a light ray is passed from denser medium to rarer medium, the light ray moves toward the Normal; increasing the refracted angle. If we further increase the angle of incidence, the refracted angle makes an angle of 90° with the Normal. At this print, incidence angle is known as critical angle. As we further increase the incident angle, the refracted ray enters back to same medium and starts to reflect. This phenomenon is

Q. No. 4 (Page 2)

Total Internal Reflection.

DERIVATION:

From snell's law;

$$n_1 \sin\theta_i = n_2 \sin\theta_r$$

As, in total internal reflection, $\theta_r = 90°$

So,

$$n_1 \sin\theta_i = n_2 \sin(90)$$

$$n_1 \sin\theta_i = n_2 (1)$$

$$n_1 \sin\theta_i = n_2$$

It can be written as:

$$\frac{n_2}{n_1} = \sin\theta_i$$

If, 2nd medium is air, $n_2 = 1$

$$\frac{1}{n} = \sin\theta_c.$$

$$\boxed{\sin\theta_c = \frac{1}{n}}$$

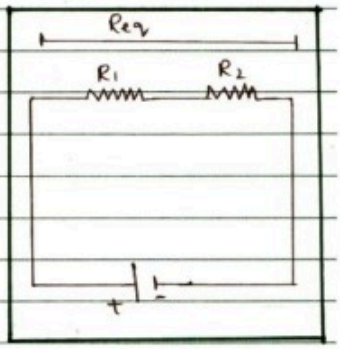
For n,

We can say;

$$n = \frac{1}{\sin\theta_c} \longrightarrow *$$

Q. No. 5 (Page 1) **RESISTORS IN PARALLEL**

DERIVATION:



As, voltage remains same in Parallel and current is shared among devices.
So, from Ohm's law;

$I_1 = \frac{V}{R_1}$, $I_2 = \frac{V}{R_2}$, $I_3 = \frac{V}{R_3}$

Combining the equations;

$$I = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$$

$$\frac{1}{V} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

As, $R = \frac{V}{I}$ So, $\frac{1}{R} = \frac{1}{V}$

Here,

$$\frac{1}{Req} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots + n.$$

"In Parallel, Equivalent resistance is less than a Resistance."

CALCULATION:

Given Data:

$R_1 = 6\Omega$

$R_2 = 3\Omega$

Required:

Req (Parallel) = ?

Formula: $\frac{1}{Req} = \frac{1}{R_1} + \frac{1}{R_2}$

Q. No. 5 (Page 2)

CALCULATION:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{eq}} = \frac{1}{6} + \frac{1}{3}$$

$$\frac{1}{R_{eq}} = \frac{1}{2}$$

∴ Taking Reciprocal

$R_{eq} = 2$

$\boxed{R_{eq} = 2}$

Q. No. 6 (Page 1)

TRANSFORMER

Transformer is the essential device used to increase or decrease the value of Alternating current.

PRINCIPLE:

Transformer works on the principle of electromagnetic Induction, which states that an electromotive force is induced in a conductor when it is placed in varying magnetic field.

WORKING:

When an alternating current is given to primary coil as Input "V_p", it creates a changing magnetic field which is carried by luminated core to the secondary coil "V_s". The voltage at secondory coil is proportional to Primary voltage. The secondary voltage also depends on the ratio of Number of turns in secondary coil to the Number of turns in Primary coil.

FORMULA:

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

This is the basic equation of Transformer.

Q. No. 6 (Page 2)

CONSTRUCTION:

A simple iron-core transformer consists of three main components which are primary coil, secondary coil and laminated iron core. The primary and secondary coil, both are wound on different sides of laminated core. An alternating current is supplied to the primary coil, which is used to create changing magnetic field.

DIAGRAM

