

$N_0 = 40\ g$

$T_{1/2} = 8$

$t = 16$

$n = \frac{t}{T_{1/2}}$

$n = 2$

Use for rough work

Q. No. 2 Part (i) Given:

mass $m = 2\ kg$,

initial temp. $t_i = 40^\circ C$ $\Delta T = 45 - 40 = 5^\circ C$ or K

final temp. $t_f = 45^\circ C$

specific heat $C = 420\ J kg^{-1} K^{-1}$

Required:

heat $Q = ?$

Solution:

$Q = mC\Delta T$

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

$Q = 4200\ J$

$\boxed{Q = 4200\ J}$ → heat required

Q. No. 2 Part (ii)

Electric Field:

Space or region around a charge within which it exerts electrostatic force on other charges is known as electric field.

⇒ When a test charge is placed in an electric field it ~~travels~~ experinces electrostatic force and travels towards negative end.

Q. No. 2 Part (iii)

Given:

Total Cells = 3

1 cell e.m.f = 1.5 v

a) Series

In series e.m.f is added.

total e.m.f = 1.5 + 1.5 + 1.5

total e.m.f = 4.5 v

b) Parallel

In parallel e.m.f remains constant, it value does not change.

total e.m.f = 1.5 v

Q. No. 2 Part (iv) **Refractive Index:**

Measure of bending of light when it enters from one medium into another medium, is known as refractive index.

Given:

$v = 2 \times 10^8$ m/s

Required:

refractive index $n = ?$

Solution:

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

$$n = \frac{3 \times 10^8}{2 \times 10^8}$$

$$\boxed{n = 1.5}$$

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

$V = 220$ v

Current $I = 2$ A

Required:

Power $P = ?$

Solution:

$P = VI$

$P = (220)(2)$

$P = 440$ watt

$\boxed{\text{Power consumed} = 440 \text{ watt}}$

Q. No. 2 Part (vi)

A·C	D·C
Definition	
• A current whose direction changes after every interval of time	• A current whose direction ~~change~~ does not change
Frequency	
• Frequency of A·C in Pakistan is 50 Hz.	• Frequency of D·C is zero.
Storage	
• A·C cannot be stored.	• D·C can be stored in cells or batteries.

Q. No. 2 Part (vii)

Echo:

Sound heard after the original sound, it is known as echo.

Echo Production:

- The distance between source of sound and reflecting point must be equal to or greater than 17m.
- Any sound persist in human brain upto 0.1s. So it is heard after 0.1s.

By maintaing the above conditions, echo can be produced.

Q. No. 2 Part (viii)

Six Regions of Electromagnetic Spectrum in Increasing Order of Wavelength:

In electromagnetic spectrum there are waves of different wavelength. Their increasing order is as follows:

1. Gamma Rays (γ-rays).
2. X-Rays
3. Ultra voilet (U.V)
4. Visible light (voilet - Red).
5. ~~Microwaves~~ Infra-red
6. ~~Radiowaves~~ Microwaves
7. Radiowaves

Q. No. 2 Part (ix)

Given:

position of object $p = 2$ cm

position of image $q = 6$ cm

Required:

focal length $f = ?$

magnification $M = ?$

Solution:

For focal length

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

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

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

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

$$\boxed{f = 1.5 \text{ cm}}$$

For magnification

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

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

$$\boxed{M = 3}$$

Q. No. 2 Part (x)

Real Images	Virtual Images
• It is inverted.	• It is erect.
• It can be obtained on screen.	• It cannot be obtained on screen.
• Parallel light rays meet really.	• Parallel light rays donot meet really.
• A convex lense can form both real and virtual images.	• A concave lens can form only virtual images.

Q. No. 2 Part (xi)

Boiling	Evaporation
• It occurs in whole liquid.	• It occurs at liquid surface only.
• It uses extra heating source.	• It does not require extra heating.
• It occurs at boiling point.	• It occurs at any temperature.
• Boiling cause heating.	• Evaporation cause cooling.

Q. No. 3 (Page 1) a)

Nuclear Fusion:

- When two lighter nuclei combine to form a heavy nucleus with release of huge amount of energy, it is known as nuclear fusion.
- Combined mass of both nuclei is less than sum of individual masses of the two nuclei. The lost mass is converted into energy according to:

$$E = mc^2$$

- Nuclear fusion is the process which occure at the surface of Sun (stratosphere), causing huge amount of energy to be released.

High Temperature Requirement:

This process requires very high temperature because to combine two lighter nuclei requires high temperature. At low temperature, lighter nuclei cannot combine.

This process occurs at sun surface which has a temperature of 6000 K. and releases about 26.3 MeV energy which contributes to more high temperature.

Q. No. 3 (Page 2) b)

Given:

mass $m = 55.56$ kg

Required:

energy $E = ?$

Solution:

$E = mc^2$ $\because c = 3 \times 10^8$

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

$E = 5.0004 \times 10^{18}$ J

energy $= 5.0004 \times 10^{18}$ J

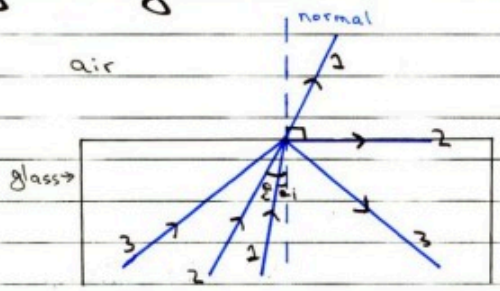
5.0004×10^{18} J of energy is released.

Q. No. 4 (Page 1) a)

Total Internal Reflection:

- Bouncing back of entire light into same medium is known as total internal reflection.
- Light does not enter other medium and after reflection travels back into same medium.

Ray Diagram:



Conditions For Total Internal Reflection:

i. Light ray must travel from denser medium towards rare medium.

ii. Angle of incidence must be greater than ~~angle of ref~~ critical angle.

$$\Theta_i > \Theta_c$$

Critical Angle: Angle of incidence is said to be critical angle when angle of refraction is 90°.

Q. No. 4 (Page 2) b)

Relationship Between Refractive Index and Critical Angle:

Using Snell's law

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

when $\theta_1 = \theta_i$ and $\theta_2 = \theta_r$

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

when $\theta_i = \theta_c$ than $\theta_r = 90^\circ$

$n_1 \sin\theta_c = n_2 \sin 90^\circ$

$n_1 \sin\theta_c = n_2 (1)$ $\because \sin 90^\circ = 1$

$n_1 \sin\theta_c = n_2$

as n_1 = glass and n_2 = air

$n_2 = 1$

$n \sin\theta_c = 1$

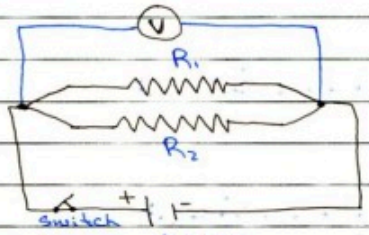
$$n = \frac{1}{\sin\theta_c}$$

Derivation.

Q. No. 5 (Page 1) Two Resistors Connected in Parallel:

- Let two resistors connected in parallel.
- Voltage across each resistor remain same.

$V_1 = V_2 = V$



- Current through each resistors divides.

$I = I_1 + I_2$

according to Ohm's Law

$V = I_1 R_1$

$$I_1 = \frac{V}{R_1}$$

$V = I_2 R_2$

$$I_2 = \frac{V}{R_2}$$

Now $$I = \frac{V}{R_1} + \frac{V}{R_2}$$

$$I = V\left[\frac{1}{R_1} + \frac{1}{R_2}\right]$$

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

as $$\frac{1}{R} = \frac{I}{V}$$

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

- R_{eq} will be smallest in circuit.

Q. No. 5 (Page 2)

Given:

resistor $R_1 = 6\ \Omega$

resistor $R_2 = 3\ \Omega$

combined in parallel

Required:

combined resistance $R_{eq} = ?$

Solution:

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

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

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

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

combined resistance $= 2\ \Omega$

Q. No. 6 (Page 1)

Transformer:

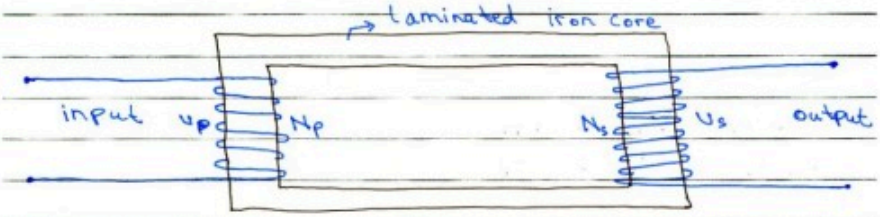
A transformer is an electrical device used to increase or decrease the given input A.C voltages.

a)

Working Principle of Transformer:

- Working principle of transformer is mutal induction between two coils.
- Transformers work on mutal induction between two coils.

c) Construction of Simple Transformer:



- There are two coils i.e primary coil (input coil), secondary coil (output coil).
- Input is given to primary coil and output is taken from secondary coil.
- Both coils are mounted on an laminated iron-core.
- Transformer increases or decreases given A.C input voltages.

Q. No. 6 (Page 2)

b) Working of a Simple Transformer:

- A simple transformer consist of two coils i.e primary coil and secondary coil.
- Mainly there are two types of simple trans former:

i. Step-up Transformer
ii. Step-down Transformer

i. Step-up Transformer:

→ Step-up transformer increases the given input voltages.
→ This is possible when the number of turns at primary is less than number of turns at secondary.

when $N_s > N_p$
then $V_s > V_p$

ii. Step-down Transformer:

→ Step-down transformer decreases the given input voltages.
→ This is possible when the number of turns at primary coil is greater than number of turns at secondary coil.

when $N_s < N_p$
then $V_s < V_p$

Formula:

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