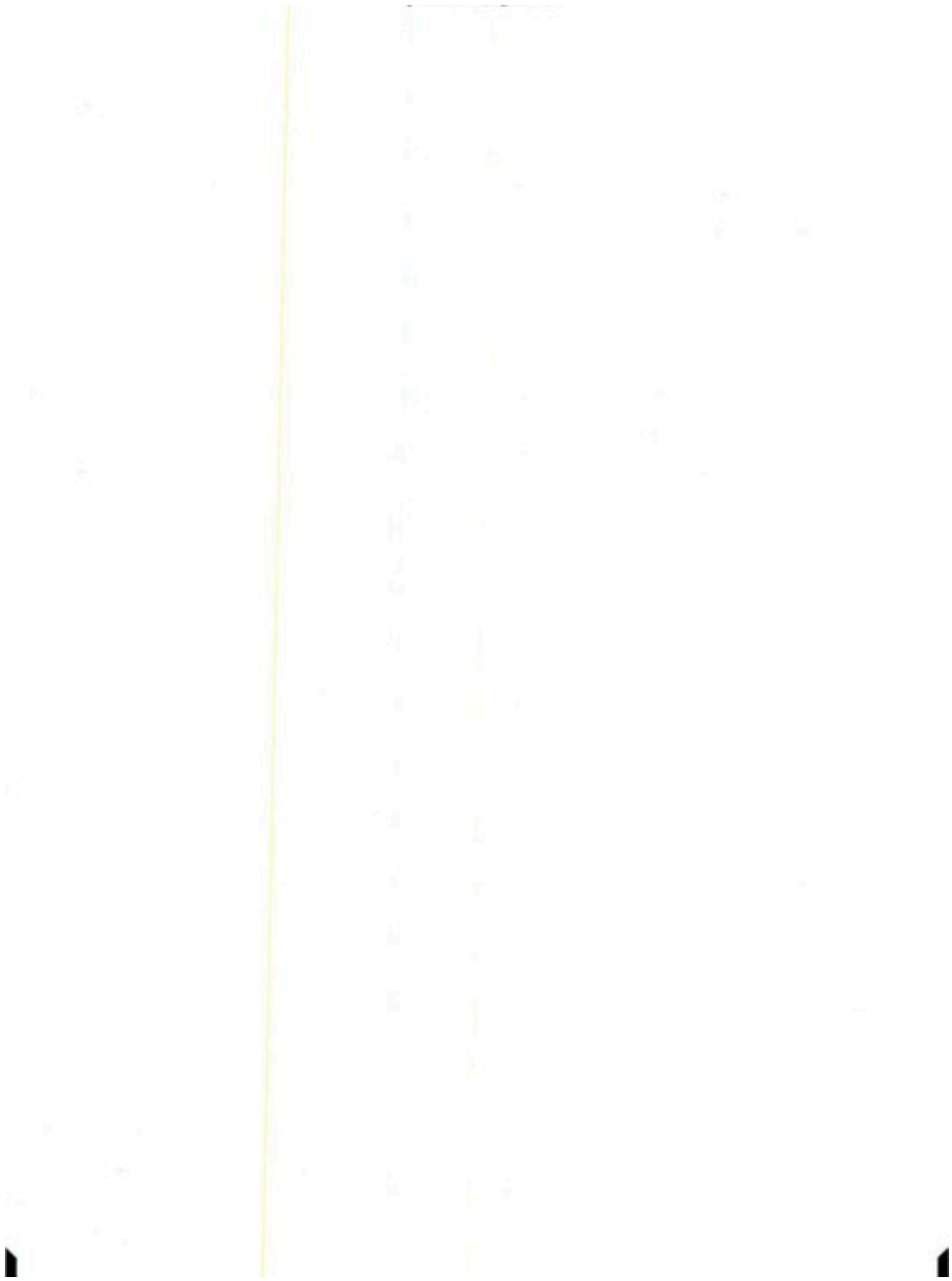




Use for rough work

Q. No. 2 Part (i)

Ans:-

Given:

mass = m = 2Kg

c = specific heat = $420 JKg^{-1}K^{-1}$

Temperature = $\Delta T^\circ = 45^\circ C - 40^\circ C = 5^\circ C$

Q = heat = ?

Solution:

Formula:- $c = \frac{Q}{m\Delta T}$

$\therefore Q = mc\Delta T$

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

$\boxed{Q = 4200 J}$ Ans

Q. No. 2 Part (ii)

Ans:-

1) **Electric field:**

Electric field is defined as "the force exerted on a charge when it is brought into the area of electric field."

Mathematically: $E = \frac{F}{q}$, SI unit is **N/C**.

2) **Affect of test charge:**

When an charged object is brought in the electric it exerts force on other according to their charge.

- Positive charge are move outwards, as they lose electrons.
- Negative charge are mov inwards, as they gain or attracts electrons.

In summary, test charge exerts force on other charges according to their own charge in electric field.

Q. No. 2 Part (iii)

Ans:-

Given:

$\mathcal{E}_{series} = ?$, $\mathcal{E}_{net} = 1.5\ V$

$\mathcal{E}_{parallel} = ?$, $n = 3$

Solution:

1) **In series:**

We use formula: $\mathcal{E}_{series} = n(\mathcal{E}_{net}) : \mathcal{E}_1 + \mathcal{E}_2 + \mathcal{E}_3 + \cdots \mathcal{E}_n$

$\mathcal{E}_{series} = 3 \times 1.5$

$\mathcal{E}_{series} = 4.5\ V$ Ans

2) **In parallel:**

the em-f remains same in all cells so: $\mathcal{E}_1 = \mathcal{E}_2 = \cdots \mathcal{E}_n$

$\mathcal{E}_{parallel} = 1.5\ V$ Ans

Q. No. 2 Part (iv)

Ans:-

1) **Refractive Index:**

"The bending of light rays when it passes through one to another, such that one is vacuum, is called refractive Index."

2) **Calculate=?**

Given:

v = speed of light in medium = 2×10^8

c = speed of light in vacuum = 3×10^8

n = ?

Solution:

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

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

$n = 1.5 \ m/s^{-1}$ Ans

Q. No. 2 Part (v)

Ans:-

Given:

P = ? , current = I = 2A

voltage = 220V

Solution:

As power = $\frac{V^2}{R}$ — (1) eq

so first we will find resistance:

$\because V = IR$

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

$R = 110 \Omega$

put R in eq (1)

$P = \frac{V^2}{R}$

$P = \frac{(220)^2}{110}$

$P = \frac{48400}{110}$

$P = 440 W$ Ans

Q. No. 2 Part (vi)

Ans:- AC (alternating current) is very different from DC (direct current). Both of them has their own use in appliances. Following is the difference between AC and DC:

Alternating current (AC)	Direct Current (DC)
• In AC, the current flows in different directions, going forward half the time and backward half the time.	• In DC, the current flows in one direction.
• It is represented by a sin wave.	• It is represented by a straight line.
• It is produced by an alternator.	• It is produced by cells, battery etc.
• It changes periodically.	• The frequency of DC is 0Hz.
• Circuit symbol of AC: ~	• It does not change periodically.
• The frequency of AC in Pakistan is 50Hz.	• Circuit symbol of DC: ⊣⊢

Q. No. 2 Part (vii)

Ans:-

Echo:

"Echo is the reflection back of sound when it hits a reflecting or smooth surface."

When we speak ~~speak of~~ or some wave is produced we can hear of feel the same ware reflecting back. It is distinct from original wave.

Production of echo:

When some wave is produced, it is reflected back after hitting the walls. This reflected wave is distant from original wave, and is much fainter, that wave is what we called echo.

For example:

When we speak in a classroom, we can hear our own voice, after speaking is because of echo, that other sound wave feels distant from original.

Q. No. 2 Part (viii)

Ans: **Ohm's law:**

Ohm's law states the difference between potential difference across two points and current across these points.

It states: "Potential difference across two points is directly proportional to the current between these points, when the temperature and physical state is kept constant."

Given:	Solution:
R = 10Ω	∴ V = IR
I = 2A	V = (2)(10)
V = ?	V = 20 Volts Ans

Q. No. 2 Part (ix)

Ans:-

Given:

distance of object = p = 2cm

distance of image = q = 6cm

focal length = f = ?

Magnification = M = ?

Solution:

For focal length:

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

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

$= \frac{1}{f} = \frac{3}{6}$

f = 1.5 cm / $\frac{3}{2}$ Ans

For magnification:

$\therefore M = \frac{q}{p}$ ⟩ $m = \frac{6}{2}$

M = 3 cm Ans

M = 0.33 cm Ans

Q. No. 2 Part (x)

Ans:- Following are the difference between real and virtual images.

Real images:

1). Real images are formed by actual interaction of light ray at focal point.
2). It can be formed in a screen and is always ~~erect~~ inverted.
3). Can be formed by concave lens.
* **Forexp:** the image of TV in screen.

Virtual Images:

1). Formed by imaginary interaction of lightrays.
2). It cannot be formed in a screen and is always erect.
3). Can be formed by concave, convex and plane mirrors also
* **For exp:** The image of yourself in mirror.

Q. No. 2 Part (xi)

Ans:- Following are the three differences between boiling and evaporation.

Boiling:

1) It occurs throughout the liquid and bubbles are also formed.
2) It occurs at the specific point called boiling point.
3) ~~It uses continuous external heat source~~ and doesnot depends on surface area.

***Forexp:** Boiling of water at 100°C.

Evaporation:

1) It occurs only at the surface and bubbles are not formed.
2) It occurs at any temperature, below the boiling point.
3) It is dependent on surface area and cools the surrounding.

***For exp:** ~~Sweating is~~ evaporation of sweat providing cooling effect.

Q. No. 3 (Page 1)

Ans:1) **Conduction:**

Conduction is defined as ~~the~~ method of heat transfer due to collisions of atoms and molecules and due to motion of electrons from it's ~~cot~~ hot part to cold part.

Conduction only occurs in solids and can't occur in liquids or gases, as they require the shear power of solids to transfer heat.

2) **Conduction in solids with reference to lattice vibrations:**

Have you ever noticed? that the ~~the~~ handle of a metal ~~the~~ pan gets heated, even if they are not getting heat directly, this is ~~be~~cause of conduction, that travels heat from pan, to handle. That is why handles of metal pans are made up of wood, as they have low conductivity.

When we heat solids, the heat increases the temperature of solids, due to which atoms starts vibrating with greater amplitude and vigrously. They hit their neighbouring atoms, and then they starts to vibrate ~~vibr~~ vigrously, thus transfers heat, due to increase K.E of particles. That is how solids transfers heat by lattice vibrations.

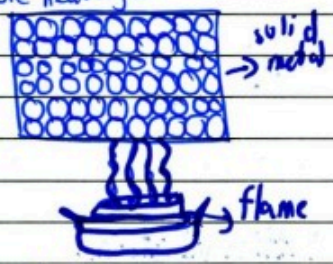
3) **Heat transfer in metallic solids through free electrons:**

When we heat the metals, the free electrons in the metals ~~due to~~ transfer heat due to conduction. Metals have free electrons in their valence shells and are losely bounded by their nucleus. When we apply heat, these free electrons in metals ~~tra~~ vibrates and transfers heat from one atom to another atom, thus this is why metals have high conductivity due to presense of free electrons, these free electrons transfer heat effectively, that is why metal pans are made up of wood, due to their low conductivity.

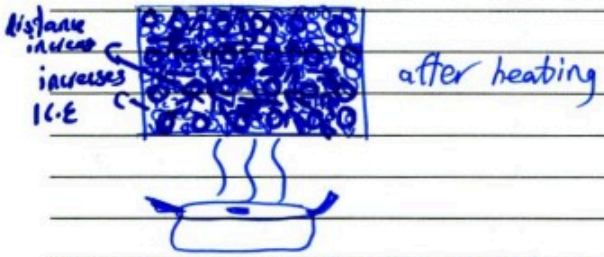
Q. No. 3 (Page 2)

Diagram:

before heating:



After heating:



We can see from diagram that heating the solid, increase the K.E, which increases vibrations, thus also increase the size by ~~conducting~~ heating through conduction.

Q. No. 4 (Page 1)

Ans:

1) **Total Internal Reflection:**

((It is the phenomena of refracting of light back to the same medium while travelling from denser to less denser medium, such that angle of incidence is greater than critical angle.))

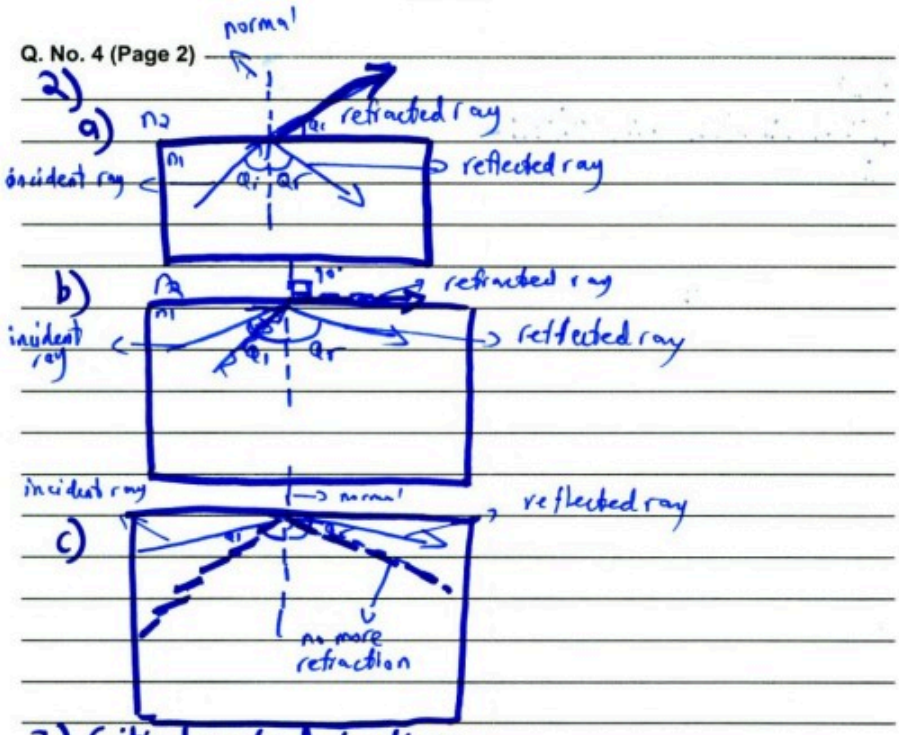
When we strike some light, some is reflected back while some is absorbed or transmitted into another medium. This ray is called transmitted ray. According to laws of reflection the angle of incidence is equal to angle of refraction. When the light travels from less dense medium like air to denser medium like water, it bends towards normal. Thus increasing the angle of incidence decreasing the angle of refraction.

But, when light travels from denser medium like water to less ~~de~~ denser medium, like air, it bends away from the normal. Increasing the angle of incidence increasing the angle of refraction. When we increase the incidence angle, that much, that the refracted light does not refract anymore and reflects back to same medium. This only possible when angle of incidence is greater than critical angle.

((The ~~angle~~ angle of incidence for which the angle of refraction is greater than 90°, is called critical angle.))

When the incident angle becomes greater than critical angle the refracted ray does not refract anymore and is reflected back into same medium. This phenomenon is called total internal reflection.

Q. No. 4 (Page 2)



3) Critical angle derivation:

By using Snell's law:

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

As refracted angle is become 90° so

$$n_1 \sin\theta_i = n_2 \quad \because \sin 90° = 1$$

For critical angle:

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

$$\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right) \quad — (1.1)$$

As we know trigonometric ratio of sin can't be greater than 1, so

3) $\sin\theta_c = \frac{1}{n}$ or simply $n = \frac{1}{\sin\theta_c}$ — (1.2)

Q. No. 5 (Page 1)

Ans a) **Linear expansion of solids:**

Linear expansion of solids are the expansion of solids in length only. In linear expansion of solids, only length is increased. As solids have closely packed atoms. When the temperature of solid is increased it causes to increase the vibrations among atoms. This increased vibrations, increases the gap between solid. This is how solid expands.

Linear expansion of solids depends upon, nature of material, original length and temperature of solids.

1) Temperature of solid increased:

When we increase the temperature of solids, the particles starts vibrating with greater amplitude. This increased vibrations increasing the gap between solid. Thus temperature increase increasing the length of solid.

$$\Delta L \propto \Delta T$$

2) Original length of rod:

Linear expansion of solids also depends upon original length of rod. When their is a bigger rod, then their are more atoms to contribute to expansion, as greater atom vibrates more, thus original length of rod is also directly proportional to the expansion of solid.

$$\Delta L \propto L_o$$

3) Nature of materials:

Different materials expands differently on heating. Thus nature of different materials expands different. For example, aluminium will expand more than iron, with the same temperature given.

Q. No. 5 (Page 2)

let original rod 'Lo' and temperature (T). Then the increase in length (ΔL) and increase in temperature (ΔT). let original rod $\Delta L = L - L_o$. As we know change in length of solid is directly proportional to original length and change of temperature

$$\Delta L \propto L_o \Delta T \quad \text{—(1)}$$

by removing proportional with equal:

$$\Delta L = \alpha L_o \Delta T \quad \text{—(2)}$$

Here (α) is constant of proportionality and has SI unit of $(\ )(^{\circ}C^{-1})$.

$$\alpha = \frac{\Delta L}{L_o \Delta T}$$ formula for measuring change in length of solids.

b) Their are gaps left between the railway station because of very important reason. As we know solids or metals expands, with increasing temperature.

Explanation:

- In summer, the temperature of atmosphere increases, this increased temperature increases the temperature of railway tracks, this causes them to slightly expand.
- If their are no expansion joints given, the railway tracks can buckle or break, and can cause significant damage.
- Expansion gaps helps to prevent these hazards.

In summary:

Expansion gaps are given, so in summer the expansion of metals don't create any damage or buckle of tracks.

Q. No. 6 (Page 1)

Ans:-

a) Principle of transformer:

Transformer works on a principle of electrostatic induction. It works on that, changing magnetic field induces induced em.f, according to Faraday's law. This is how transformer is used to increase of decrease the value of alternating voltage.

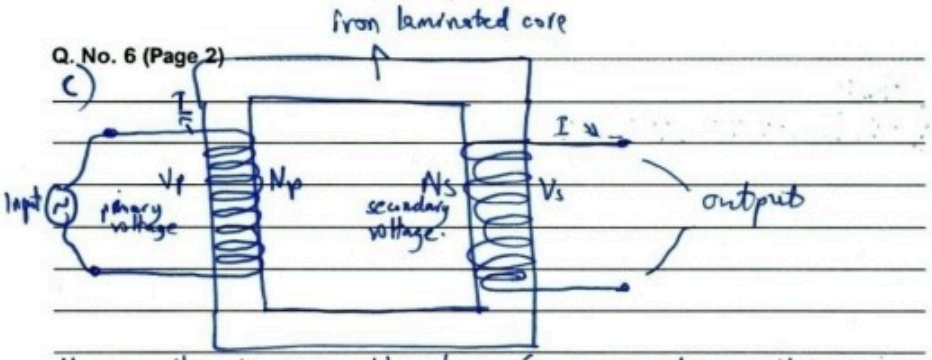
b) Working and formula of transformer:

Many devices in our homes, like game system, printers uses transformer. Thus, the function of transformer is to increase or decrease the value of alternating voltage. The transformer consists of three main parts, the primary coil, the secondary coil and iron laminated core. Both the primary and secondary coil are wounded on iron core on opposite sides. In primary coil, the current has passed. The current should be AC to work properly. Thus the current passed through primary coil generates magnetic and electric field. The primary coil is connected to secondary voltage. Thus when the electric and magnetic field is gone into secondary, it generates current of voltage. Thus, secondary coil is dependent (Vs) is dependent on primary voltage (Vp). It is also dependent on number of turns in primary voltage (Np) to the no. of turns in secondary voltage (Ns). Thus the formula for transforme can be given as:

$$\frac{Ns}{Np} = \frac{Vs}{Vp}$$

Q. No. 6 (Page 2)

c)



Here in the diagram, the transformer is drawn. It is made according to need. If we want to increase output voltage, we use step-up transformer or if we want to decrease output voltage we use step-down transformer.

Step-up transformer:



In step-up transformer, no. of turns in secondary voltage is greater than primary. So voltage across secondary is greater. Thus step-up transformer is used to increase output voltage.

Step-down transformer:



In step-down transformer no. of turns in primary is greater than in secondary. So voltage across primary is greater. Thus step-down transformer is used to decrease the value of output voltage.