





Use for rough work

Q. No. 2 Part (i)

Given Data

Temperature change = $\Delta T = T_f - T_i = 45 - 40$

$= 5C^\circ$ | (Celsius change same

C = specific heat = $420\ J\,kg^{-1}\,k^{-1}$ | for kelvin change)

$m = 2kg$

To Find:-

$Q = ?$

$Q = mC\Delta T$

* Putting values

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

$Q = 4200\ J$

Q. No. 2 Part (ii)

Function of a Diode:-

A diode exhibits both, Insulator like and conductor like properties.

-) Diode can be used to **Rectify current** in electronics.
-) Diode can be used as perfect conductor where current is going in the same direction.
-) Diode can act as perfect insulator for current in opposite direction.

Q. No. 2 Part (iii)

Total Emf of circuits.

Parallel:-

When multiple cells are connected in parallel then emf (voltage across cells) remains same. so the Total emf remains **(1·5V)** for circuits in parallel.

$E_{net} = E_{mf_1} = E_{mf_2} = E_{mf_3}$

$E_{net} = 1{\cdot}5V = 1{\cdot}5V = 1{\cdot}5V.$

Emf = 1·5V in parallel

Series:-

When multiple cells are connected in series the Emf adds up to produce Total emf.

$E_{net} = \mathcal{E}_1 + \mathcal{E}_2 + \mathcal{E}_3$, **$E_{net} = 1{\cdot}5V + 1{\cdot}5V + 1{\cdot}5V = 4{\cdot}5$**

Q. No. 2 Part (iv)

Refractive Index:-

Refractive index is defined as the measure of bending of light as it enters from 1 medium to another such that one medium is vacuum.

Mathematically:-

where 'n' is refractive index and is defined as the ratio of bending of light when light enters a medium. Speed of light in vaccum = c & and in medium as 'v'

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

$$n = \frac{3 \times 10^8}{2 \times 10^8} = \boxed{1.5} = 1.5$$

[Refractive index has no unit as ratio of same quantity.]

Q. No. 2 Part (v)

Given Data:-

$V = 220V$

$I = 2A$

To find:-

$P = ?$

$$P = IV$$

$$P = 2 \times 220$$

$$P = \boxed{440\ W}$$

Q. No. 2 Part (vi)

Difference :-

AC	DC
(1) Alternating current changes current direction Meaning current direction goes forward, then backward and repeats	DC current may vary in magnitude but does not vary in direction. I.e one direction current flow.
(2) In case of contact AC current is very dangerous and produces varying muscle contractions. (For 500W and higher)	In case of contact DC current is comparatively less dangerous.
(3) Changes polarity.	Does not change polarity.

Q. No. 2 Part (vii)

Echo:

The application of wave reflection phenomena for sound is called echo.

Production of Echo:

Echo is generally produced when sound bounces off some object like a wall and returns. But it has some requirements.

1) Human brain can percieve sound for 0.1s so the difference of time in production of sound and echo should be 0.1 second.

2) Since $d = \frac{vxt}{2}$, if time is 0.1 s and speed of sound in air 340 m/s $d = \frac{0.1 \times 340}{2} = 17m.$ So distance should be 17m minimum

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Q. No. 2 Part (viii)

Ohm's Law :-

Ohm's Law states the relation between current carrying conductor and voltage applied across its ends.

$I \propto V$, $V = IR$

where R is resistance.

Since $V = IR$ and $V = 2 \times 10$ $= 20V$

$V = IR$, $V = 2 \times 10$

$V = 20\ V$

So potential difference $= 20\ V$

Q. No. 2 Part (ix)

Given Data :-

$q = 6cm$ $q = 6cm$

$p = 2cm$ $p = 2cm$

To find :-

$f = ?$

$M = ?$

As we know $M = \frac{p}{q}$ and $\frac{1}{f} = \frac{1}{q} + \frac{1}{p}$

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

$M = 3$

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

$\frac{1}{f} = \frac{2 + 6}{12}$

$\frac{1}{f} = \frac{8}{12} = \frac{4}{6} = \frac{2}{3}$

$f = 1.5cm$

Q. No. 2 Part (x)

Wavelength and diffraction:-

Diffraction on a opening of certain length depends upon wavelength. The greater the wavelength the more it diffracts.

For example :-

If a opening of 2cm allows UV and IR rays to pass through then IR rays will diffract more because of longer wavelength.

Wavelength ∝ Diffraction (if opening is same for other wavelengths)

Diffraction also depends on opening size so if opening size is constant for other wavelengths. Then length of wave is directly proportional to diffraction.

Q. No. 2 Part (xi)

Differences

Evaporation	Boiling
1) Evaporation is change of liquid to gas over varying temperatures.	Boiling is change of liquid to gas over fixed boiling point.
2) Produces cooling effect	Does not produce cooling effect.
3) Gains energy from surroundings.	Energy has to be provided.
4) Occurs only at surface.	Occurs throughout liquid.

Q. No. 3 (Page 1)

Conduction:-

Transfer of energy due to increasing vibration of an particle to the next particle.

Lattice Structure:-

A lattice structure is defined as a structure that has no free ions and has a perfect bonding of ions that results in multiple dimension structures.

Lattice Vibration:-

When electrons and other particles become excited and vibrations increase. Particles that cannot move and are not mobile vibrate about their mean position only transferring energy.

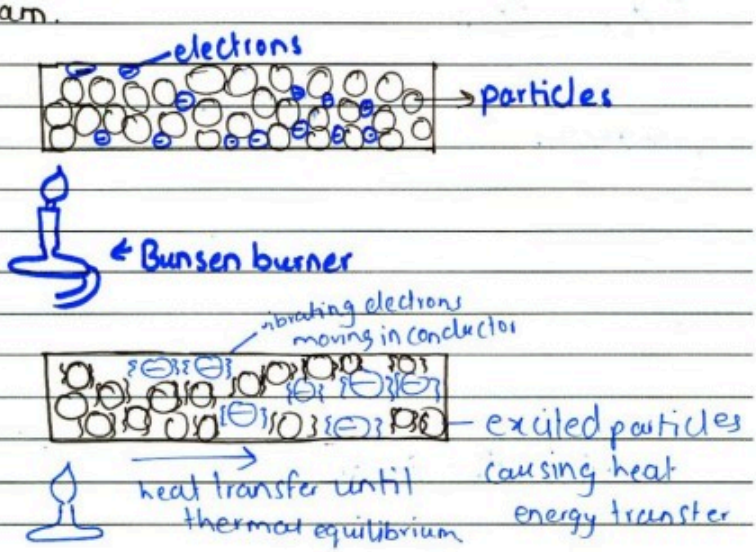
Conduction through electrons:-

In metals some electrons are so loosely binded that they break free and form a **delocalized sea**. This allows electrons to move from the hot part of conductor to the cold part so the electron loses its energy while heating the rest of the conductor.

- Insulators lack this delocalized sea which makes solid Insulators bad conductors of heat.

Q. No. 3 (Page 2)

Diagram.



Moving electrons.

This movement of electrons throughout the conductor allow heat to be distributed all over the conductor, not only the heated part.

Q. No. 4 (Page 1)

Loudness of Sound:-

Quality of sound that allows us to differentiate between a dull and loud sound.

Pitch of Sound:-

Quality of sound allowing us to differentiate between grave and shrill sound.

Physical factors affecting Loudness and Pitch:-

- Surface area of sound producing body affects loudness of sound. ∝ Loudness.
- Vibrational amplitude affects sound ∝ loudness.
- Number of vibrations being produced affects pitch. (No. of vibration ∝ pitch).
- Frequency affects pitch and amplitude affects sound with direct relation.
- Sensitivity of ear affects pitch and loudness.

Conclusion:-

- **Surface area, Vibrational amplitude, Sensitivity of ear, distance from sound source affect** loudness.
- **Number of vibrations, in unit time for sound oscilliating body** affects pitch.

Amplitude of Sound:-

Amplitude is defined as the maximum displacement to right or left from mean. it is basically the measure of energy of sound.

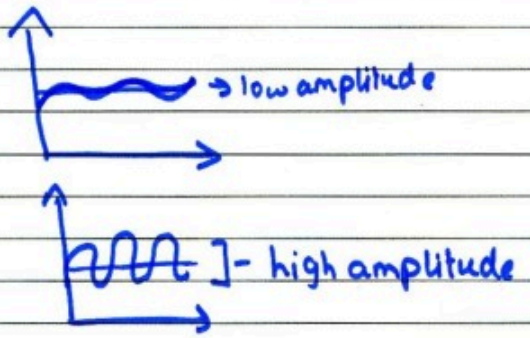
Q. No. 4 (Page 2)

Relation of Loudness and Amplitude

Loudness $\propto$ (Amplitude)^2

Example:

A screaming person's wave has a higher amplitude in comparison to normal speaking.



Q. No. 5 (Page 1)

Linear Expansion:

Increase in one dimension of a solid is called linear thermal expansion. This occurs due to increasing particle vibrations.

Factors affecting linear expansion:

- **Original** is directly proportional to linear expansion. Since it means that if original length is great, then more particles are accomodated for vibration.
- **Temperature**, greater the temperature greater the expansion.
- **Nature of material** also affects linear expansion as some metals expand more upon heating for same amount of heat.

Mathematically:

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

$$\Delta L = \alpha L_o \Delta T$$

$$\alpha = \frac{\Delta L}{L_o \Delta T}$$, where α is coefficient of thermal expansion, 'ΔL' is change in length, L_o being original length and 'ΔT' change in temperature.

$$\alpha = \frac{\Delta L / L_o}{\Delta T} = \frac{\text{Fractional change in length}}{\text{change in temperature}}$$

'α' is defined as Fractional change in length for temperature change.

Q. No. 5 (Page 2)

Gaps of Railway Tracks:

Railway tracks are generally made from metals which is good conductor of heat.

During Summer according to kinetic molecular theory, particles vibrate more vigorously increasing length of tracks. If the gaps are not kept then the tracks deform due to expansion. When gaps are left the metal simply expands into the gap without deforming.

During Winter:

Gaps are left so the track does not snap and break because particles lose energy due to cold and compress.

Principle:

These work on linear thermal expansion.

Q. No. 6 (Page 1)

Transformer:

A transformer is a device that is used to **'amplify current'** by using the principle of **induced magnetism.**

Working of Transformer.

A transformer consists of 'Primary coils on a lamanated iron core and secondary coil on the other half of iron core.'.

- A transformer gets voltage from a AC source attached to primary coil.
- This produces current as we know 'current is produced in varying magnetic field'.
- This magnetic field moves to secondary coils.
- The secondary coil may have less or more number of turns which amplifies current. Since less coils means weaker magnetic field it results in less voltage and current- creating a 'Step down' transformer.
  If there are more turns on secondary coil than primary coil it is a step up transformer.

Mathematically:

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

where N is number of turns. and (V) voltage.

Q. No. 6 (Page 2)

This tells us how to measure the ~~ratio~~ voltage that could be produced, or was introduced etc.

Diagram

Transformer.

