**SOUND**

**8.1 - Define the term sound**

***SOUND:*** Sound is a form of energy produced by a vibrating body and travels in the form of waves.

A material medium is required for the propagation of sound.

***Characteristics of sound:***

Sound has 3 main characteristics. They are

1. Loudness 2.Pitch 3.Quality

1. ***Loudness*:** The loudness of sound depends on the intensity. Intensity is defined as the energy that passes through unit area per unit time. The intensity of sound depends on amplitude, distance from the source, and density of the medium.

2. ***Pitch:*** It is a special character of sound, based on which we can differentiate between two sounds having equal loudness. Pitch depends on the frequency of sound wave.

3. ***Quality:*** Quality or timber of a musical sound is a special characteristic, based on which we can differentiate between two sounds having equal loudness or pitch.

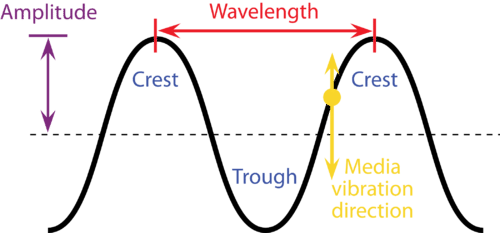
***Propagation of sound in air:***

1. When an object vibrates and makes sound, then the air layers around it also start vibrating in exactly the same way and carry sound energy from the sound producing source to our ears.
2. There is no actual movement of particles from the source to our ears.
3. The particles only vibrate back and forth, produce compression and rarefactions alternately. Then transfer the sound energy from one place to another.

**8.2 Explain longitudinal and transverse wave motion and state differences**

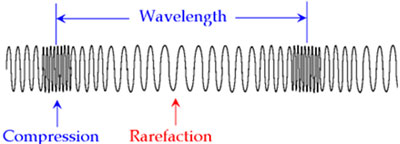
**Transverse Wave:**

If the particles in the medium are vibrates perpendicular to the direction of the wave motion,then the wave is called transverse wave.



**Longitudinal wave:**

If the particles in the medium are vibrates parallel to the direction of the wave motion, then the wave is called longitudinal wave.



**Difference between transverse and longitudinal waves:**

|  |  |
| --- | --- |
| **Transverse Wave** | **Longitudinal Wave** |
| 1. If the particles in the medium are vibrates perpendicular to the direction of the wave motion, then the wave is called transverse wave. | 1. If the particles in the medium are vibrates parallel to the direction of the wave motion, then the wave is called longitudinal wave. |
| 2. Crust and troughs are formed. | 2. Compressions and rarefactions are formed. |
| 3. They moves on the surface of a liquids and solids only. | 3. Longitudinal waves can move through solids, liquids and gases. |
| 1. **Examples:**   Light waves, all the electromagnetic  waves, magnetic waves, surface waves, ultraviolet waves, etc. | 4.**Examples:**  Sound waves, tsunami waves, ultra sounds, vibrations in gas, and oscillations in spring, internal water waves, etc. |

**8.3 Distinguish between musical sound and Noise:**

|  |  |
| --- | --- |
| **Musical sound** | **Noise** |
| 1. The sound that is pleasant to hear is called musical sound. | 1. The sound is unpleasant to hear is called noise. |
| 2.The wave nature is regular | 2. The wave nature is irregular. |
| 3. There will be no sudden change in amplitude. | 3. There will be sudden change in amplitude. |
| 4. The pitch & loudness are within the specified limits. | 4. The pitch & loudness have no specified limits. |
| 5. The sound from musical instruments like veena, guitar ---------etc. are musical sound. | 5.Sounds from horns, crackers, thunders ------- etc. are noise. |

**8.4 Explain noise pollution and state SI unit for intensity level of sound**

Any unwanted sound dumped in to the atmosphere effecting the environment badly is called noise pollution.

1. The SI unit of sound intensity is decibel (dB).

**8.5 Explain causes of noise pollution**

Man-made noise is mainly classified as:

1. Industrial noise
2. Transport noise
3. Neighbourhood noise

**Industrial noise:**

1. The sound which is comes from machinery in industries caused industrial noise.
2. Sound produced by machines in industries, factories, and mills.
3. Sound produced by civil engineering works, construction, drills, stone crushing etc.

**Transport Noise:**

1. Transport noise mainly produced by traffic noise from road, rail and aircraft.
2. The scooters, cars, motor cycles, buses, trucks and diesel engine vehicles are the causes of transport noise.

**Neighbourhood noise:**

1. Neighbourhood noise is due to the disturbance from household gadgets and community.
2. The sources of neighbourhood noise are musical instruments, TV, VCR, Radios, Transistors, Telephones, and loudspeakers etc.

**8.6 Explain effects of noise pollution** Living things:

1. It causes nervous breakdown and tension.
2. It causes head-ache.
3. It causes irritation.
4. It causes sleeplessness.
5. It causes heart, liver, and kidney problems.
6. It causes permanent deafness.

Non – living things:

1. It causes cracks in building.
2. Broken windows, doors and glasses etc. by sudden explosive sounds.
3. It causes disturbance in commutation.

**8.7 Explain methods of minimizing noise pollution**

***i) Industrial noise:***

1. Sound proof walls should be constructed for industries and factories.
2. The factories & airports should be constructed far away from the living places**.**
3. Noise creating machinery should be covered with insulating material.
4. Noise controlled machines and techniques should be adopted.

**ii)Transport noise:**

1. Unnecessary blowing of horns should be avoided.
2. Noise free zones should be maintained near schools and hospitals.
3. Plantation of trees should control the noise pollution.

**iii) Neighbourhood noise:**

1. Loud speakers should be used with in limited sound level.
2. TV, audio systems etc. should be played with low sound level.
3. The people should be educated about noise pollution.

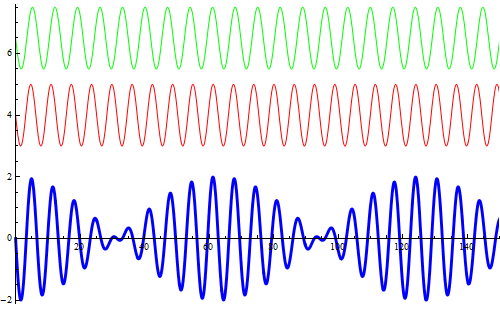
**8.8 Explain the phenomenon of beats**

When two sound waves of nearly equal frequencies travelling in the same direction interfere, the phenomenon in which waxing and waning of sound is heard at regular interval of time is called beats.

The no. of beats heard per second is called as beat frequency. n = n1 n2

Here n- beat frequency

n1, n2 - are the frequencies of sound waves.



**8.9 State the applications of beats**

1. Tuning musical instruments.
2. Find the unknown frequency of a tuning fork.
3. Produce sound waves of smaller frequency.
4. Produce tremulous effect in films.
5. The phenomenon of beats is used in detecting dangerous gases in mines.

**Explain how beats can be used to detect dangerous gases in mines?**

**Ans:** The apparatus used for this purpose consists of two small and exactly similar pipes blown together, one by pure air from a reservoir and the other by the air in the mine. If the air in the mine contains methane, its density will be less than that of pure air. The two notes produced by the pipes will then differ in the pitch and produce beats. Thus, the presence of the dangerous gas can be detected.

**8.10 Define Doppler effect**

The apparent change in the frequency of source of sound due to relative motion between the observer and source of sound is called Doppler Effect.

Here - apparent frequency n – actual frequency

V – Velocity of sound VS – Velocity of source

Vo – Velocity of observer

1. Source moves towards the stationary observer

Apparent frequency increases. nl > n

2. Source moves away from the stationary observer

Apparent frequency decreases. nl < n

3. Observer moves towards the stationary source.

Apparent frequency increases. nl > n

4. Observer moves away from the stationary source.

Apparent frequency decreases. nl < n

**8.11 List the Applications of Doppler effect**

1. It is used in RADAR system to detect speed and direction of moving aeroplane.
2. It is used in SONAR system to detect speed and direction of the moving submarine inside water.
3. It is useful to the traffic police to detect speed of the automobiles on the road.
4. It is used to identify the binary stars, Saturn’s rings.
5. It is used to measure the velocities of planets and stars.
6. It is used to find the velocity of the blood flow in different parts of the body.
7. This principle used for tracking an earth satellite.

**Limitation of Doppler effect:**

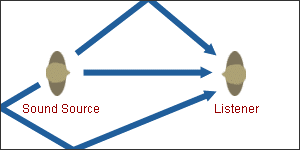
The Doppler Effect is applicable when the velocities of the source of sound and observer are much less than the velocity of sound.

**Explain how the Doppler effect is helpful to the traffic police to detect speed of the automobiles?**

1. The police use the Doppler Effect when checking for speeding vehicles.
2. A radar gun sends out radar waves at a particular frequency.
3. As the radar wave hits a vehicle, the wave reflects back toward the radar gun at a different frequency.
4. The frequency of the reflected wave depends upon the direction and speed of the vehicle.
5. The radar gun determines the speed of the vehicle by measuring the difference between the emitted frequency and the reflected frequency.

**8.12 Define reverberation and reverberation time**

1. The persistence of sound in a closed room as a result of multiple reflection of sound even after the source of sound is turned off is known as reverberation.



1. In a closed hall the observer listen the sound not only from the source but also from multiple reflections of sound at walls, ceiling, floor etc.
2. In this way observer listens the same sound repeatedly with diminishing loudness.

**Reverberation time (T):**

1. The duration of time for which the reverberation is exists a hall is called reverberation time.
2. For music the value of T is 0.5 – 1 second & the speech it is 1.2s.
3. Reverberation time depends on
4. Reflecting power of surfaces present inside the hall.
5. Volume of the hall.
6. Frequency of sounds.
7. Intensity of sound wave.

**8.13 Write Sabine’s formula and name the parameters contained**

1. According to Sabine the reverberation time (T) is directly proportional to volume of the hall (v) & inversely proportional to total absorption of the hall (A).
2. T V and T

=> T

=> T

=> T

But A= a1s1+a2s2 + ------------ +ansn

=>

The above equation is known as Sabine’s formula.

Here

T – Reverberation time

V – Volume of the hall

A – Total absorption of the hall

a – Coefficient of absorption

s – Area of the absorbing surface.

**8.14 Define and Explain echoes and also state its applications**

1. When an observer produces a sound and listens it after reflection from an obstacle the reflected sound is called echo of the direct sound.
2. Time required to hear an echo is .

Here d - distance between the observer & obstacle

V - velocity of sound.

1. The minimum distance between the observer and obstacle to hear an echo is 16.5 m.

***Examples:***

Echoes are heard due to reflection of sound

1. From a surface of water in a well.
2. From the surface of a mountain.
3. From a far off building.

***Application***:

Echoes are used

1. To find the velocity of sound.
2. To find the position and direction of motion of submarines.
3. To find the depth of the seas and oceans.
4. To find the tumours, kidney stones inside the human body.

***Minimizing methods:***

Echoes are minimized in a hall by

1. Providing good absorbing materials.
2. Providing large no.of door and windows.
3. Constructing rough walls.

**8.15 State conditions of good auditorium**

1. There should be uniform loudness inside the hall.
2. There should be no echo in the hall.
3. The noises outside the hall not enter into it.
4. There should be no resonance effect.
5. There should be no focussing effect.
6. The reverberation time should be optimum.

**ELECTRICITY AND MAGNETISM**

**10.1 - Explain the concept of Electricity**

**1.** Electricity is a form of energy, associated with electric charge.

**2.** The moving electric charges produce electric current in a medium.

**3.** When potential difference is applied across ends of a conductor the electrons move in a direction opposite to the electric field and produce current.

**4.** As long as potential difference exists across the ends of conductor current continues to flow.

**10.2 - State Ohm’s law and write the formula**

**10.3 - Explain Ohm’s law**

1. At constant temperature, the current passing through a conductor is proportional to the potential difference across it ends.

2. If a current ‘I’ passes through a conductor due to the potential difference ‘V’

then V∝ I => **𝑉=I𝑅**

Where R is proportionality constant and it is known as resistance.



3. The substances which obey the ohm’s law are called as Ohmic conductors. Their V - I graph is linear. Ex:-metals.

4. The substances which do not obey the ohm’s law are called non-ohmic conductors. Their V - I graph is non-linear.

Ex:-semiconductors and vacuum tubes.

**Limitations of Ohm's Law**

1.Ohm's law is not a fundamental law of nature.

2.Ohm's law is valid for metal conductors, provided the temperature and other physical conditions remain constant.

3.Ohm's law is not applicable to gaseous conductors.

4.Ohm's law is also not applicable to semi-conductors such as Germanium and Silicon.

**RESISTANCE:-**

1. The internal property of a conductor which opposes the flow of charge through it is called resistance (R).

2. From Ohm’s law we have V = IR => R= V/I.

3. The value of ‘R’ is calculated as the ratio of potential difference to the current flowing through the conductor.

4. SI unit –ohm (Ω),

Dimensional formula M𝐿2𝑇−3𝐼−2

**Ohm:** The resistance of a conductor through which a current of one ampere flows due to potential difference of one volt is called one ohm.

**10.4 - Define specific resistance, conductance and state their units**

**Specific Resistance (or) Resistivity (𝝆):-**

1. The resistance of unit length and unit area of cross section of a conductor is called its specific resistance (or) resistivity.

2. The resistance ‘R’ of a conductor is directly proportional to its length (l) and inversely proportional to its area of cross section (A).

∴𝑅 ∝ 𝑙 𝑎𝑛𝑑

=>

=>

3. Here 𝜌 is specific resistance. **∴**

4. SI unit: ohm-metre (Ω−𝑚)

Dimensional formula: ML3T-3I-2

**Conductance:-**

1. The reciprocal of resistance of a conductor is called its conductance.

∴𝑐𝑜𝑛𝑑𝑢(G)=1/𝑅

2. SI unit: oh𝑚−1(or) mho (or) Siemen (or) Ω−1

**Specific conductance (or) conductivity:-**

1. The reciprocal of resistivity of a specific resistance of a conductor is called its conductivity (or) specific conductance (𝜎).

∴𝜎 = 1/𝜌

2. SI unit: Ω−1𝑚−1 (𝑜𝑟) 𝑚ℎ𝑜/𝑚𝑒𝑡𝑒r (𝑜𝑟) 𝑆𝑖𝑒𝑚𝑒𝑛/𝑚𝑒𝑡𝑒r

**10.5 - State Kirchhoff’s laws**

**10.6 - Explain Kirchhoff’s laws**

**Kirchhoff’s First law:**

1. The algebraic sum of currents meeting at a junction in a circuit is zero. That is **Σ𝑖=0**

(Or)

The sum of currents flowing towards the junction is equal to the sum of currents flowing out of the junction.

2. This is known as Kirchhoff’s first law (or) Kirchhoff’s current law (KCL)

3. **Sign rule:** The current reaching the junction is taken as positive and the current leaving the junction is taken as negative.



4. From the Figure at junction on ‘O’ the reaching currents are i1, i2, i4 and the leaving currents are i3, i5

∴𝑖1+𝑖2+𝑖4= 𝑖3+𝑖5

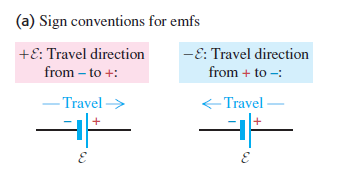
**Kirchhoff’s Second law:-**

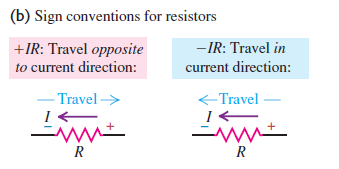
1. The algebraic sum of potential difference in a closed circuit is zero. i.e.,**Σ𝑖𝑅+Σ𝐸=0**

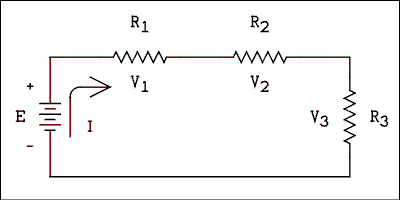
2. This is known as Kirchhoff’s second law (or) Kirchhoff’s voltage law (KVL).

3.KVL is based on the law of conservation of energy.

4. In a closed circuit, the sign convention for KVL as follows:







5.In above circuit R1,R2 and R3 are the three resistors connected in series across a voltage source E.

V1,V2 and V3 are the voltage drops across resistors R1,R2 and R3 respectively.

6. ∴ E + (-V1) + (-V2) + (-V3) = 0

=> E -V1 - V2 - V3 = 0

=> E = V1 + V2 + V3

∴ Applied voltage = Sum of the all voltage drops

7. This is called KVL equation.

**10.7 - Describe Wheatstone’s bridge with legible sketch**

**10.8 Derive an expression for balancing condition of Wheatstone’s bridge**

1. Wheat stone’s bridge is an electric circuit used to compare the resistances (or) to find the value of unknown resistance.

2. It consists of four resistances P, Q, R and S are joined to form four junctions A, B, C, D as shown in figure.

3. A cell of EMF ‘E’ is connected between the junctions A&B and a galvanometer is connected between the junctions C&D.

4. The current i flowing from battery is flows in circuit as follows:

|  |  |
| --- | --- |
| At junction A | Current i is splits as i1 and i2 |
| At junction B | Current i1 splits as i3 and ig |
| At junction D | Currents i2 and ig meet and flow as i4 |
| At junction C | Currents i3 and i4 meet and flow as i |



5. Apply KCL to junctions C&D, we get

At C, 𝑖1−𝑖𝑔−𝑖3=0

=>𝑖1=𝑖𝑔+𝑖3 ----- (1)

At D, 𝑖2+𝑖𝑔−𝑖4=0

=>𝑖2+𝑖𝑔=𝑖4 --------(2)

6. Apply KVL to loops ACDA and CBDC we get

For ACDA,

-𝑖1𝑃−𝑖𝑔𝐺+𝑖2𝑅=0------(3)

For CBDC,

-𝑖3𝑄+𝑖4𝑆+𝑖𝑔𝐺=0-----(4)

7. If we made 𝑖𝑔=0 by adjusting resistances the bridge is said to be balanced. Then the above four equations can be written as

𝑖1=𝑖3------(5)

𝑖2=𝑖4-----(6)

−𝑖1𝑃+𝑖2𝑅=0

=>𝑖1𝑃=𝑖2𝑅--------(7)

And −𝑖3𝑄+𝑖4𝑆 = 0

=> 𝑖3𝑄=𝑖4𝑆----------(8)

8. Equations (7) ÷ (8)

we get =>

9.This is the condition to balancing of wheat stone’s bridge.

**10.9 Describe Meter Bridge experiment for the determination of resistivity with a neat circuit diagram**

**10.10 Write the formula in Meter Bridge to determine specific resistance**

1. Meter bridge is based on the principle of wheat stone’s bridge.

2.A manganese wire AB of length 1m is stretched on wooden board along a meter scale, connected between two ‘L’ shaped copper strips as shown in figure.

3. A thick copper strip is placed between the two L shaped strips and then two gaps are formed.

4. Two resistors P & Q are connected in these two gaps the unknown resistance (P) is taken in left gap and known resistance (Q) is placed in right gap.

5. A cell of emf E is connected between A&B, a high resistance (HR) is connected between c and jockey (J).



6. To check the correction in connections press jockey at two edges of wire give opposite deflections in galvanometer.

7. Now the jockey ‘J’ start sliding from A on metallic wire at a particular distance from A the deflection of galvanometer is zero.

8. Note the length AJ is l1 and JB as

l2 = (100-l1).Now the wire AJ is acts as resistor R and wire BJ acts as resistor S.

9.When bridge is balanced,

**Table:-**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | Resistance Q in the right gap | Balancing lengths | | Unknown resistance |
| 𝑙1 | (100-𝑙1) |  |
| 1. |  |  |  |  |
| 2. |  |  |  |  |
| 3. |  |  |  |  |

10.This experiment is repeated for different values of known resistance ‘Q’ and ‘P’ is determined.

11. This specific resistance (or) resistivity is calculated by using the formula

12. Here

r - radius of the given wire, which is measured by screw gauge.

*l* - Length of the given wire, which is measured by a meter scale.

**Precautions:**

1. Jockey should not be dragged along the wire.

2. Current is passed in circuit only while taking observations.

3. The connections should be neat and proper.

**MAGNETISM**

**10.11 - Explain the concept of magnetism**

**Magnetism:** The substances which are attracted the other substances like iron, copper etc., are called magnetism. This property of attracting other substances is called magnetism.

**Magnetic poles:** The magnetism of a magnet is mostly concentrated at two ends of it, these are called magnetic poles.

The like poles are repel and unlike poles are attract each other. This is called law of magnetic poles.

**Magnetic pole strength**: The ability of a magnetic pole to attract or repel the pole of other magnet is called its magnetic pole strength (m).

Unit – (A-m).

Dimensional formula: 𝑀0𝐿𝑇0I

**10.12 - State the Coulomb’s inverse square law of magnetism**

**Statement:** The force of attraction or repulsion between two magnetic poles is directly proportional to the product of their pole strengths and inversely proportional to the square of the distance between them and acts along the line joining the poles.

1) Consider two poles of pole strengths **m1**and **m2** which are separated by a distance ‘**r**’ then the force ‘**F**’ between then is given by.

2)

=> => where ‘k’ is 

3) The value of ‘k’ is depends on the magnetic nature of the medium and is given by where 𝜇 𝒊𝒔 **permeability of the medium.**

∴

4) If the poles are located in force space, then

𝐻𝑒𝑟𝑒 𝜇0- Permeability of free space.

𝜇0= 4𝜋 x10−7 .

**10.13 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force**

**Unit pole:** If two poles are separated by a distance of 1m in free space and experience a force of 10−7 N on each other, then the pole strengths of the poles are unit and the poles are called units poles.

**Magnetic field**: The region around a magnet in which magnetic properties can be detected is called the magnetic field of that magnet.

**Uniform Magnetic Field:** If the intensity of the magnetic induction field is the same at every point, then the field is called “uniform magnetic field”.

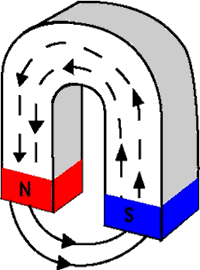
Ex: The magnetic field between two strong Electro Magnetic Poles.

**Non-Uniform Magnetic Field:** If the intensity of the magnetic induction field is different at every point, then the field is called “non-uniform magnetic field”.

Ex: The magnetic field between the two poles of bar magnets.

**Magnetic Lines of force**

The path in which a free unit north pole would move in a magnetic field is called “magnetic line of force”.



**Properties**:

1) These are the imaginary lines.

2) The magnetic lines of force are closed curves.

3) Their direction is from north to south outside the magnet and from south to north inside the magnet.

4) The concentration of the lines of force at any place indicates the strength of the magnetic field at that place.

5) They never cross one another.

6) The concentration of the lines of force is large at poles of the magnets.

**10.14 State the Magnetic induction field strength and mention its units and dimensional formula**

1. The force acting on a unit North Pole at a point in the magnetic field is called the magnetic induction field strength of the given magnet at that point

2. The force experienced by a unit North Pole is 𝐹/𝑚

∴ B = 𝐹/𝑚 ⇒ F = mB

3. According to coulomb’s inverse square law

.

For a unit North Pole m1=1 and let the pole strength of the other magnet m2= m

4. SI unit: Tesla (T)

weber /mete𝑟2

𝑁/(𝐴−𝑚)

Dimensional formula: M𝐿0𝑇−2𝐼−1

**10.15 - Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field**

1. Consider a bar magnet of a pole strength ‘m’ and length 2*l*, placed in a uniform magnetic field ‘B’.

2. The magnet experiences a force of **mB** in opposite direction on two poles.

3. Thus a couple acting on the magnet and tries the magnet to align in the direction of field.

4. Moment of the couple on the bar magnet = force × perpendicular distance between the two forces.

𝜏 = mB × NA

But from Δ SAN we get sin𝜃=N𝐴/𝑁𝑆

=>N𝐴=𝑁𝑆 𝑠𝑖𝑛𝜃 =2𝑙𝑠𝑖𝑛𝜃 ( =2𝑙)



5. 𝜏 = mB×2lsin𝜃

= (2lm) B sin𝜃

= MB sin𝜃 (∴𝑀=2𝑙𝑚)

=> =MB sin𝜃.

In vector form .

6.The torque is minimum when the magnet is placed parallel to the field direction.

𝜏 = MB sin00 = 0.

7. The torque is maximum when the magnet is placed parallel to the field direction.

𝜏 = MB sin900 = MB.

7. If B= 1T and 𝜃=900 then 𝜏=𝑀

8. Hence the magnetic moment can be defined as –“The moment of the couple acting on the magnet when placed perpendicular to the direction of uniform magnetic field of unit strength.”

**Magnetic Moment:**

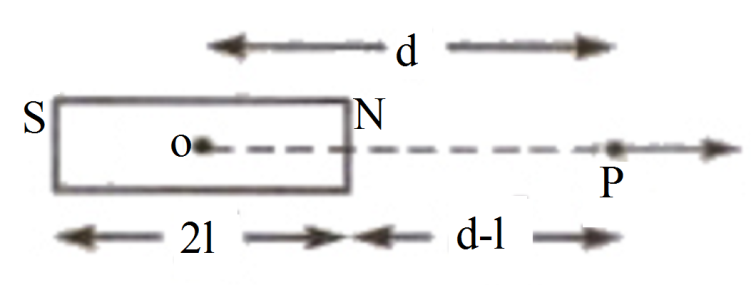
The product of pole strength its magnetic length is called magnetic moment (M). ∴𝑀=2𝑙×𝑚

SI unit: A-𝑚2 Dimensional formula:-𝑀0𝐿2𝑇0𝐼

**10.16 Derive Magnetic induction field strength at a point on the axial line**

1. The line which is passing through the centre of the magnet and parallel to its length is called axial line.

2.Let SN be a bar magnet of length 2*l* and pole strength ‘m’ and P be a point on the axial line of the magnet at a distance of ‘d’ from the centre of the magnet.



3. To find the field at ‘P’ imagine a unit north pole at P. The force on this unit north Pole due to the North Pole of the magnet is and due to the South Pole of the magnet is.

and

1. The two forces are opposite to each other along the axial line. The resultant of these two forces the magnetic induction field strength (B) at ‘P’.

-

= . - .

=

5. When *l* is very small compared with d then,>> =>-.

B = .

= .

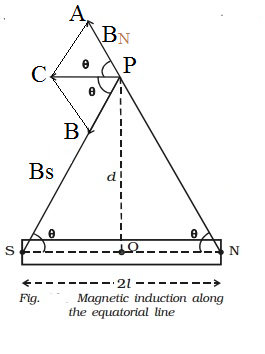
B = .

6. This is the expression for magnetic induction field strength at a point on the axial line of a bar magnet.

**Magnetic induction field strength at a point on the equatorial line of a bar magnet**

1. The line which is passing through the centre of the magnet and perpendicular to its length is called equatorial line.

2. Let SN be a bar magnet of length 2*l* and pole strength m and ‘P’ be a point on the equatorial line of the magnet at a distance of ‘d’ from the centre of the magnet .



3. To find the field at ‘P’ image an unit North Pole at P .The force on this unit north pole due to the North Pole of the magnet is and due to the South Pole is.

=.

= .

= .

1. Let PA and PB be drawn in the direction of NP and PS respectively. Now PA and PB are represented two forces and. Their resultant is obtained by constructing the parallelogram PACD.
2. PC represents the resultant force ‘F’ and it is equal to the magnetic induction field strength at ‘P’.
3. PSN and ACP are similar triangles, hence

=

= NS

= 2l ×

.

= ×

= ×

7. When *l* is very small compared with d then,

d >>*l* =>

=

B =

B =

8. This is the expression for magnetic induction field strength at a point on the equatorial of a bar magnet.

**Vectors**

1. **(a)** State parallelogram law of addition of two vectors and derive the expression for magnitude and direction of resultant vector **(7M)**

**(b)** State and explain triangle law of vectors and draw the diagram **(3M)**

2. **(a)** Write the two examples of scalar product and vector product of two vectors. **(7M)**

**(b)** State and explain polygon law of addition of vectors. **(3M)**

3. **(a)** Define scalar product and mention any six properties. **(7M)**

**(b)** Define vector & scalar and given examples. **(3M)**

4. **(a)**Define vector product and mention any six properties. **(7M)**

**(b)**Define null vector, unit vector and equal vectors.**(7M)**

**Kinematics**

1. **(a)** show that the time of ascent is equal to time of descent in the equal to time of descent in the case of vertically projected body**(7M)**

**(b)**Define acceleration due to gravity write any three properties. **(3M)**

2. **(a)** Show that the path of the projectile in oblique projection is a parabola **(7M)**

**(b)** Write the equations of motion of a freely falling body and vertically up ward projected body. **(3M)**

3. **(a)** Define projectile and give examples. **(3M)**

**(b)** Derive the expression for the maximum height and horizontal range of a projectile in oblique projection. **(7M)**

4. **(a)** Derive the expression for time of ascent , time of descent and time of flight of oblique projection.**(7M)**

**(b)** Derive the maximum height of a body projected vertically. **(3M)**

5. **(a)** Show that the path of a horizontal projectile is a parabola. **(5M)**

**(b)** Show that two angle of projections has same range in case of oblique projection. **(3M)**

**(c)** Derive the expression for maximum range. **(2M)**

6. Derive height of a tower when a body projected vertically upwards from the top of a tower. **(5M)**

**Work, Power & Energy**

1. **(a)** Define work , power and energy. Write their units and dimensional formula. **(6M)**

**(b)** Define P.E and given examples. **(2M)**

**(c)** Show that PE = mgh. **(2M)**

2. (a) Define K.E and given examples. **(3M)**

**(b)** Show that K.E= 1/2 mv2 (or) Derive the expression for K.E of body **(4M)**

**(c)** Derive the relation between K.E and momentum. **(3M)**

3. **(a)** State and prove work energy theorem**(6M)**

**(b)** State LCE and give example for energy transformation **(4M)**

**4. (a)**Verify LCE in case of freely falling body. **(10M)**

**(b)** Verify LCE in case of vertically up ward projected body. **(10M)**

**Simple Harmonic Motion**

1.**(a)** Define SHM. Give examples. **(4M)**

**(b)** Write the conditions of SHM **(3M)**

**(c)** Derive the expression for displacement of particle in SHM. **(3M)**

2.**(a)** Show that projection of a particle in uniform circular motion of SHM. **(5M)**

**(b)**. Derive the expression for velocity and acceleration of a particle in SHM. **(5M)**

**3.(a)** Define the terms amplitude and phase of a particle in SHM. **(3M)**

**(b)** Derive the expression for time period and frequency of a particle in SHM. **(4M)**

**(c)** Define the terms seconds pendulum and length of the pendulum. **(3M)**

**4.(a)** Define ideal simple pendulum.**(1M)**

**(b)** Derive the expression for time period of the simple pendulum. **(6M)**

**(c)** State the laws of motion of simple pendulum. **(3M)**

**Sound**

**1. (a)**Define sound and explain how sound can propagate in air? **(4M)**

**(b)** Write the differences longitudinal and transverse wave motion? **(3M)**

**(c)** Distinguish between musical sound and noise? **(3M)**

2. (a)Define noise pollution and state SI unit for intensity level of sound? **(3M)**

(b) Write the causes of noise pollution? **(7M)**

**3. (a)**What are the effects of noise pollution? **(4M)**

**(b)** Write the methods of minimizing noise pollution? **(6M)**

**4. (a)** Define beats and write any 3 applications of beats? **(4M)**

**(b)** What is Doppler Effect and write the limitation of Doppler Effect? **(3M)**

**(c)** Write the applications of Doppler Effect? **(3M)**

**5. (a)**Define reverberation and reverberation time? **(4M)**

**(b)** Name the factors reverberation time depends? **(3M)**

**(c)** Write Sabine’s formula and name the parameters contained? **(3M)**

**6. (a)**Define echo? Write the formula for the time of echo? **(2M)**

**(b)** Write applications of echo?How echoes can be minimised? **(4M)**

**(d)** Write the conditions of good auditorium? **(4M)**

**Electricity and Magnetism**

**1. (a)**State and explain Ohm’s law? **(3M)**

**(b)**Write the limitations of Ohm’s law? **(2M)**

**(c)** Define resistance, conductance and specific resistance. Write their units and dimensional formula? **(5M)**

**2. (a)**State and explain Kirchoff’s laws? **(4M)**

**(b)**What is the principle of Wheat stone’s bridge? Derive the balancing condition of Wheat stone’s bridge to find an unknown resistance? **(6M)**

**3. (a)** Describe Meter Bridge experiment for the determination of resistivity with a neat circuit diagram and write the formula in Meter Bridge to determine specific resistance? **(7M)**

**(b)** Define specific resistance and derive the formula for it? **(3M)**

**4. (a)** State and explain Coulomb’s inverse square law of magnetism? **(3M)**

**(b)** Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field. When it is zero and when it is maximum? **(7M)**

**5. (a)**Define magnetic lines of force and write the properties of magnetic lines of force? **(4M) (b)** Derive Magnetic induction field strength at a point on the axial line? **(6M)**

**6. (a)** State and explain Coulomb’s inverse square law of magnetism? **(3M)**

**(b)** Derive Magnetic induction field strength at a point on the equatorial line? **(7M)**

**7. (a)**Define magnetic induction field strength. State its S.I.Units? **(3M)**

**(b)**Define Magnetic pole strength and magnetic moment. Write their units and dimensional formula? **(4M)**

**(c)** Define uniform and non-uniform magnetic field? **(3M)**

**Heat and Thermodynamics**

**1.(a)**State and explain Boyle’s law and derive the relation between pressure and density of a gas. **(4M)**

**(b)**State and explain Charel’s law at constant pressure and constant temperature. **(3M)**

**(c)** Define absolute zero and absolute scale of temperature. **(3M)**

**2.(a)** Define ideal gas and derive ideal gas equation. **(7M)**

**(b)** Derive ideal gas equation in terms of density. **(3M)**

**3.(a)**Write the differences between R and r. **(4M)**

**(b)** Why universal gas constant is same for all gases. **(3M)**

**(c)** Calculate the value of R. **(3M)**

**4.(a)**Write the differences between isothermal and adiabatic processes. **(6M)**

**(b)** State first and second law of thermodynamics. **(4M)**

**5(a)** Write the differences between CP and CV. **(4M)**

**(b)** Derive the relation Cp – Cv = R. **(6M)**

**6(a)** Define specific heat of a gas at constant pressure and constant volume. **(4M)**

**(b)** Define molar specific heat of a gas at constant pressure and constant volume. **(4M)**

**(c)**Why Cp greater than Cv. **(2M)**