

**NOTE:** Mist reduces visibility. Sometimes, drivers have to put on their headlight even during the day. A severe mist is called fog.

## 16. GAS LAW

Manometer is the instrument for measuring gas pressure.

Barometer is the instrument used for measuring atmospheric pressure. **Aneroid barometer is used as an altimeter.**

Pressure decreases with height, but increases with depth.

### BOYLE'S LAW

It states that the pressure of a fixed mass of gas is inversely proportional to the volume, provided the temp is constant. i.e  $P \propto 1/V$

So, we have  $P_1V_1 = P_2V_2$

### CHARLE'S LAW

It states that the volume of a fixed mass of gas is directly proportional to its temperature, provided its pressure is constant. i.e  $V \propto T$

So, we have  $V_1/T_1 = V_2/T_2$

### PRESSURE LAW

It states that pressure is directly proportional to temperature. i.e  $P \propto T$

So, we have  $P_1/T_1 = P_2/T_2$

### GENERAL GAS LAW

It involves pressure, volume and temperature.

So we have  $P_1V_1/T_1 = P_2V_2/T_2$

### KINETIC MOLECULAR THEORY OF GAS

The particles possess kinetic energy due to their motion.

The molecules are in a state of constant motion.

The volume of the molecules of gas is negligible.

**NOTE:** A gas cylinder feels heavy when carried because the molecules of the gas collides with the walls of the container.

:In the diagram of a progressive wave, crest is the one above while trough is the one below.

### EQUATIONS OF WAVE

$V = f \times \lambda$ , where  $v$ = velocity,  $f$ =frequency and  $\lambda$ =wavelength.

Wavelength is the distance between two successive crest or troughs.

$Y = A \sin(2\pi x/\lambda - 2\pi ft)$ , where  $A$  represents amplitude.

RAYS AND BEAM OF LIGHT: A ray is the direction along which light energy flows while a beam is a collection of rays.

RECTILINEAR PROPAGATION OF LIGHT: This is the phenomenon that explains that light travels in a straight line.

EFFECTS OF THE RECTILINEAR PROPAGATION OF LIGHT ARE SHADOW AND ECLIPSES.

A shadow is a path where light cannot reach due to the obstruction of an opaque object. Partial shadow is called **pre-umbra** while total shadow is called **umbra**.

### ECLIPSE

Eclipse of the moon (Lunar eclipse) occurs when the earth is between the sun and the moon.

Eclipse of the sun (Solar eclipse) occurs when the moon is between the sun and earth.

### PIN HOLE CAMERA

$M = v/u$  where  $v$ = image and  $u$ = distance and  $M$ =magnification.

We can also have  $v/u = HI/HO$ , where  $HI$ = image height and  $HO$ =object height.

NOTE: If the pin hole is small, the image will be sharp but not bright. If the pin hole is light, the image will be blurry but bright.

### LAWS OF REFLECTION

1. The incident ray, the reflected ray and the normal at the point of incidence, all lie on the same point.
2. The angle of incidence is equal to the angle of reflection. i.e  $i^\circ = r^\circ$

### IMAGES FORMED BY A PLANE MIRROR

Stringed instruments E.g keyboard, violin, guitar

Percussion instruments E.g drums and bells

\*Trumpet is a brass instrument.

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### HYDRAULIC PRESS

It works on the principle of pressure

**NOTE:**  $(F_2/F_1) = (A_2/A_1)$ , where  $A_2$  is area of large piston and  $A_1$  is area of small piston

19. ELECTROMAGNETIC SPECTRUM

It consists of electromagnetic waves e.g radio wave, x-rays, gamma ray.

**The correct order is: Radio wave - Infra red - Visible light (ROYGBIV) - Ultraviolet ray - X rays - gamma rays.**

The wavelength decreases as we move from left to right while the frequency increases as we move from left to the right.

Uses of some waves

Radio wave is used in radio transmission

X-ray is used for medical tests (radiography) and checking defects in pipes

Gamma ray is used for killing cancerous cells. Gamma ray has the most penetrating power.

20. GRAVITATIONAL FIELD

Gravitational field is a region where the gravitational force can be felt.

$$F = (Gm_1m_2)/r^2$$

F = force, G = gravitational constant =  $6.67 \times 10^{-11}$ , r is distance.

**The universal gravitational law states that the force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to the square of their distance(r) apart.**

**Gravitational Potential energy = mgh**

**ESCAPE VELOCITY:** It is the minimum energy required for an object to just escape the gravitational field of an astronomical body e.g earth.

So we have  $V = \sqrt{2gR}$ . Where R is radius of the earth =  $6.4 \times 10^6$

21. ELECTRIC FIELD

**NOTE: LENZ LAW:** It states that the induced e.m.f is in such a direction as to oppose the motion producing it. Lenz law is a principle of conservation of energy.

Back e.m.f is known as inductance

**NOTE:** Heat energy is lost by eddy current and this can be reduced by the use of a soft laminated iron.

A device that converts mechanical energy into electrical energy is called a generator while a device that converts electrical energy to mechanical energy is a motor.

### GENERATORS:

There are two classes of generator

1. Alternating current generator (A.C)
2. Direct current generator (D.C)

A generator has these features: An armature, A magnetic field, Rings, carbon brushes

The difference between an A.C generator and a D.C generator is an A.C generator has two slip rings while a D.C generator has on split ring.

An alternating current is a current which changes continually in direction while passing through a conductor. A direct current is one which always flows in one direction.

A.C can be measured with

Hot-wire ammeter

Moving iron ammeter

Moving coil galvanometer.

**NOTE:** To produce a large E.M.F in an a.c or d.c,

1. The number of turns must increase
2. The strength of the magnetic field should be increased
3. The coil should be wound with soft iron core.

**NOTE:** Induction coil is commonly used in motor car ignition system.

## 25. TRANSFORMER

## RESISTANCE IN A.C CIRCUIT

**CAPACITIVE REACTANCE:**  $X_c = 1/2\pi fc$ , where  $c$  is capacitance.

Voltage of a capacitive reactance ( $V$ ) =  $I \times X_c$

**INDUCTIVE REACTANCE:**  $X_l = 2\pi fi$

Voltage of an inductive reactance ( $V$ ) =  $I \times X_l$

**NOTE:** In a capacitance reactance, the current leads the voltage by  $90^\circ$  or  $\pi/2$  or the voltage lags the current by  $90^\circ$  or  $\pi/2$ .

: In the inductive reactance, the voltage leads the current by  $90^\circ$  or  $\pi/2$  or the current lags the voltage by  $90^\circ$  or  $\pi/2$ .

**IMPEDANCE(Z):** It is the overall opposition offered by a resistor, inductor and a capacitor. The S.I unit is ohms. So we have,  $Z = \sqrt{R^2 + (X_l - X_c)^2}$

Impedance involving resistance and inductance,  $Z = \sqrt{R^2 + X_l^2}$

Impedance involving resistance and capacitance,  $Z = \sqrt{R^2 + X_c^2}$

**Power in an A.C circuit**

$$P = IV\cos\theta$$

A power of zero means that the device is a pure reactance, inductance or capacitor.

Power with no angle,  $P = I^2R$  (This is mostly used)

Resonance in a R.L.C circuit.

Resonance occurs in an a.c circuit when the maximum current is obtained.

Resonance frequency ( $f_0$ ) =  $1/2\pi\sqrt{LC}$

**NOTE:** In a R.L.C circuit, power is dissipated in the resistance only.

## 27. RADIOACTIVITY

Radioactivity is the spontaneous disintegration of the nucleus of the atom of the element emitting particles.

### RADIOACTIVITY PARTICLES

#### 1. ALPHA PARTICLE

They are positive

The nature is Helium nuclei He

They have a strong ionization energy

They have little penetrating power

They cause fluorescence in ZnS

They are heavy mass

They are deflected by both magnetic and electric field.

#### 2. BETA PARTICLE

They are negative

The nature is electron

They are deflected by both magnetic and electric field.

They have light mass

No fluorescence in ZnS

#### 3. GAMMA RAYS

They are neutral

The nature is electromagnetic wave

They are not deflected by magnetic or electric field.

They have the highest penetrating power.

They have the least ionization energy

No mass at all.

**NOTE:** Alpha particle can be stopped by lead, Beta particle can be stopped by aluminium.

### **HALF LIFE**

It is the time taken for half of the atoms of a radioactive element initially present to decay.

Example; a radioactive element has 1000 atoms and a half life of 10 years.

What number of atoms will remain after 30 years?

It means after 10 years, half of the atom will decay. Therefore, we have