

HRS Notes Series

CH#10 SIMPLE HARMONIC MOTION & WAVES

1. Define Wave (or wave motion) & vibratory (or Oscillatory) motion. Give Examples

Ans: Wave Motion: Disturbances created in a medium is called waves. e.g. Sound waves

Vibratory Motion: When a body moves to and fro about a point, its motion is vibratory motion.
e.g. Motion of a simple pendulum.

2. What kind of wave does not require any medium for their propagation?

Ans: Electromagnetic waves do not require a medium for propagation. e.g. Light waves

3. Define simple harmonic motion and give an example and write its properties.

Ans: The net force is directly proportional to the displacement from the mean position and is always directed towards the mean position e.g.

Motion of Simple Pendulum

Properties:

1. A body always vibrates about a fixed position.
2. Its acceleration is always directed towards mean position.

4. Write the necessary conditions of simple harmonic motion.

Ans: 1. The vibrating body must be frictionless.
2. A vibrating body must have inertia.

5. Define spring constant. Also write the formula. Also write the unit.

Ans: The ratio of the force acting on a body to the increase in length of the spring.

Formula: $k = -F/x$ Unit: Nm^{-1}

6. Define Hooke's Law. Also write the equation. (V.V.IMP)

Ans: The force acting on a body is directly proportional to the increase in the length of the spring.

Equation: $F \propto -x \Rightarrow F = -kx$

7. Define restoring force. Give examples. OR what is meant by restoring force in mass spring system? (V.V.IMP)

Ans: A force which always pushes a body in oscillatory motion towards its mean position. e.g.

Force acting on a spring

8. Define simple pendulum. Also write the equation. 2023 (G-1 GRW)

Ans: A simple pendulum consists of a small heavy ball of mass suspended from a rigid support by means of a long thin thread.

Formula: $T = 2\pi \sqrt{\frac{l}{g}}$

9. Write the formula to find the time-period of a simple pendulum and the time-period of a body attached to a spring.

Ans: Simple pendulum $T = 2\pi \sqrt{\frac{l}{g}}$

Mass attached with spring $T = 2\pi \sqrt{\frac{m}{k}}$

10. If the length of a simple pendulum is doubled, what will be the change in its time period?

Ans: $T = 2\pi \sqrt{\frac{l}{g}}$ if $l = 2l$

$$T' = 2\pi \sqrt{\frac{2l}{g}} \Rightarrow T' = \sqrt{2} (2\pi \sqrt{\frac{l}{g}}) \Rightarrow T' = \sqrt{2} T$$

11. Write the difference between mechanical waves and electromagnetic waves. Give examples.

Ans: Mechanical Waves: Waves which require a medium for their propagation e.g. Sound waves

Electromagnetic Waves: Waves that do not require any medium for their propagation e.g. Light waves

12. Define transverse waves & longitudinal waves. Give examples. OR

Write the difference between transverse waves and longitudinal waves.

Ans: Transverse Wave: Wave in which the vibratory motion of the particles of the medium is perpendicular to the direction of propagation of the wave.

e.g. Waves produced in a cord

Longitudinal Waves: Waves in which particles of the medium move back and forth along the direction of propagation of wave. e.g. Sound waves.

13. Write the difference between compression and rarefaction.

Ans: Compression: The parts of the wave where the slinky are close to each other.

Rarefaction: The parts of the wave where the slinky are away from each other

14. Differentiate b/w crest & trough.

Ans: Crest: Crests are the highest points of the particles of the medium.

Trough: Troughs are the lowest points of the particles of the medium.

15. Define Reflection, refraction and diffraction of a wave.

Ans: Reflection of Wave: When waves moving through one medium, fall on the surface of another medium, they bounce back to the first medium, such that the angle of incidence is equal to the angle of reflection.

Refraction of Waves: When a wave from one medium enters into the second medium at some angle, its direction of motion changes.

Diffraction of Waves: The bending of waves around the sharp edges of obstacles.

15. Electromagnetic waves do not need a medium for their propagation. Why? Explain it.

Ans: Because these waves consist of electric and magnetic

fields, they do not require a medium for propagation.

16. Define the wave equation. Also write the formula.

Ans: The relationship between velocity, frequency and wavelength is called wave equation.

Formula: $v = f \lambda$

17. Derive the equation of the wave. (V.V.IMP) OR

Prove that: $v = f \lambda$

Ans: $v = \frac{d}{t} = \frac{\lambda}{T} = \frac{1}{T} \lambda = f \lambda \Rightarrow v = f \lambda$

18. Write the relation of time-period to frequency

Ans: Time period is reciprocal of frequency. $T = \frac{1}{f}$

19. What is the reciprocity of time period? Define it. Also write its relation with time period.

Ans: Reciprocal of time period is frequency.

Frequency: The number of vibrations of a vibratory body in one second is called frequency.

Relationship: $f = \frac{1}{T}$

20. Does the wavelength increase as the frequency of the wave increases? If not, how are these quantities related?

Ans: $v = f \lambda \Rightarrow \lambda = \frac{v}{f}$ No increasing the frequency will decrease the wavelength.

21. Define time Period, vibration, frequency, amplitude and wavelength

Ans: Time Period: The time taken by a vibrating body to complete one vibration Unit: second

Vibration: One complete round trip of a vibratory body about mean position.

Frequency: The number of vibrations of a vibratory body in one second. Unit: Hertz (Hz)

Amplitude: The maximum displacement of a vibrating body about its mean position. Wavelength: The distance between two consecutive crests or troughs **Unit: Meter**

22. Define Damped oscillation. Give example from everyday life. (V.V.IMP)

Ans: The oscillations of a system in the presence of a resisting force.

e.g. motion of simple pendulum

23. Damping how does oscillation gradually reduce the amplitude of a body?

Ans: During the damping process, the resistive force reduces the mechanical energy of the body and the motion of the body gradually decreases.

24. How do shock absorbers slow vibration?

Ans: When a vehicle goes over a bumpy surface, it vibrates violently. Shock absorbers slow down these vibrations.

25. Find the speed of the wave when its frequency is 2Hz and wavelength is 0.1m.

Ans: $v = ? \lambda = 0.1\text{m}, f = 2\text{Hz} \Rightarrow v = f \lambda = 2 \times 0.1 = 0.2\text{m/s}$

26. A wave moving on a string has a frequency of 4 Hz and a wavelength of 0.4 m. Find the speed of the wave.

Ans: $v = ? \lambda = 0.4\text{m}, f = 4\text{Hz} \Rightarrow v = f \lambda = 4 \times 0.4 = 1.6\text{m/s}$

27. Find the time period & frequency of a simple pendulum, whose length is 1m while $g = 10\text{ms}^{-1}$

OR

Find the time period of a simple pendulum of length

one meter.

Ans: $T = ? l = 1\text{m}, g = 10\text{ms}^{-1}$

$\Rightarrow T = 2\pi \sqrt{\frac{l}{g}} = 2\pi \sqrt{\frac{1}{10}} = 2\pi \sqrt{0.1} = 1.99\text{ s}$

also $f = \frac{1}{T} = \frac{1}{1.99} = 0.5\text{ Hz}$

28. If $v = 340\text{ m/s}$ and $\lambda = 0.5\text{m}$ then $f = ?$

Ans: $v = 340\text{ m/s}, \lambda = 0.5\text{m}, f = ?$

$v = f \lambda \Rightarrow f = \frac{v}{\lambda} = \frac{340}{0.5} = 680\text{ Hz}$

29. If $f = 2\text{Hz}$ and $\lambda = 0.2\text{m}$, find the speed and time delay.

Ans: $f = 2\text{Hz}, \lambda = 0.2\text{m}, v = ? , T = ?$

$\Rightarrow v = f \lambda = 2 \times 0.2 = 0.4\text{m/s}$

also $T = \frac{1}{f} = \frac{1}{2} = 0.5\text{ s}$

30. If 100 waves pass a point in a medium in 20 seconds, what will be its frequency?

Ans: $n = 100, t = 20\text{s}, f = ? \Rightarrow f = \frac{n}{t} = \frac{100}{20} = 5\text{ Hz}$

31. If the time period of a simple pendulum is 1.99 s, find its frequency.

Ans: $T = 1.99\text{s}, f = ? \Rightarrow f = \frac{1}{T} = \frac{1}{1.99} = 0.5\text{ Hz}$

CH#11: SOUND

1. How is sound produced? OR

What is a sound wave? And how is it produced?

Ans: Sound is produced by vibrating bodies. e.g. Sound in a guitar.

2. A sound is a form of wave? Write its reason.

Ans: Because sound exhibits reflection, refraction and diffraction. So it is a wave.

3. Why are sound waves considered mechanical waves?

Ans: Because sound waves require a medium for propagation, so they are considered mechanical waves.

4. How does sound expand in solid or liquid?

Ans: Sound travels faster in solid bodies. Because the molecules in solids are very close together.

5. Write the formula to find the speed of sound. OR Write equations for speed, frequency and wavelength of sound.

Ans: The speed of sound can be determined by the formula $v = f \lambda$.

6. What role do compressions and rarefactions play in sound reproduction?

Ans: They transfer the air pressure to the next layers and alternately form and move forward.

7. Define pitch, quality and frequency of sound. (V.V.IMP)

Ans: **Pitch:** The property of sound by which we can distinguish between shrill & grave sound.

Quality: The property of sound by which we can distinguish between two sounds of same loudness and pitch.

Frequency: The number of waves passing a point in one second is called frequency.

8. What is the relationship between pitch and frequency? OR

Define the pitch of a sound. How does it change with

frequency?

Ans: Pitch depends on the frequency of the sound.

Higher pitch means higher frequency and lower pitch means lower frequency.

9. Why is the voice of women more shrill than the voice of men?

Ans: Because the pitch and frequency of women's voice is higher than the pitch and frequency of men's voice.

10. What is meant by loudness of sound? It depends on what factors?

Ans: The property of sound by which loud and faint sound can be distinguished.

Factors:

1. Amplitude of vibrating body
2. Area of vibrating body.
3. Distance of vibrating body.

11. How does the distance from the vibrating body affect the loudness of the sound?

Ans: As the distance of the listener from the vibrating body increases, the amplitude decreases and the sound becomes fainter.

12. How can we distinguish between two sounds with the same loudness and pitch? OR

By what feature do we distinguish the sound of individuals speaking from sounds of the same loudness?

Ans: We recognize the voice of two or more people on the basis of quality. Because the quality of each person's voice is different.

13. Write the difference between loudness and intensity of sound. OR

Write the difference b/w loudness and intensity of sound.

Ans: Loudness: The property of sound by which loud and faint sound can be distinguished.

Intensity of Sound: The energy transmitted per second through a unit area perpendicular to the direction of propagation of sound waves. Unit: Watts per square meter (W/m^2)

14. What is meant by sound intensity level? Write its SI unit. OR Define level of sound?

Ans: The difference between the loudness of an unknown sound and the loudness of a faint sound. Unit: Bell

15. What is meant by decibel scale? OR
What is the unit of loudness? Define it.

Ans: Unit: Decibel scale **Symbol:** dB

Definition: A scale used to measure intensity level of sound is called decibel scale.

16. What is meant by zero bel? Write its value. OR
Which intensity is taken as reference intensity?

Ans: 10^{-12} W/m^2 is taken as reference intensity. It is called zero bel.

17. How can some singers shatter / break a glass with their voice?

Ans: Singers produce sound of a particular frequency. This causes the glass to vibrate so much that it can break.

18. Define resonance. OR
What is meant by reflection of sound.

Ans: When sound is incident on the surface of a medium, it bounces back to the first medium.

19. Write the difference between ultrasound (ultrasonic waves) and infrasound.

Ans: Ultrasound is a sound whose frequency is more than 20,000 Hz.

Infrasound is a sound whose frequency is less than 20 Hz.

20. Write the uses of ultrasound.

Ans:

1. Detecting the depth of the ocean.
2. Diagnosis and treatment of various diseases.
3. It is used in fields of medical, agriculture etc.

21. Write the uses of ultrasound in medical field. OR Describe the use of ultrasounds for the thyroid gland.

Ans:

1. Taking pictures of thyroid glands and treating them.
2. Treatment of blood clots in the arteries.

22. Why is ultrasound beneficial in the medical field? (V.V.IMP)

Ans: Because in the medical field, ultrasounds are injected into the human body through a transmitter to diagnose diseases.

23. What is meant by sonar? Write two advantages of it. (V.V.IMP)

Ans: It is the method by which objects found in the deep ocean or the ocean floor are detected.

Advantages:

1. It is used to locate underwater depth.
2. To see shape and size of the object.

24. Define noise or noise pollution? Also write its sources. Write the methods to reduce noise?

Ans: A sound that does not have a good effect on the ears is called noise. e.g. **Crow's voice**

Sources: 1. Big machines 2. Means of transportation

Methods to reduce noise:

1. By using hearing protection devices.
2. By using sound reducing barriers.

25. What is the difference b/w Musical sound and noise?

Ans: Music: A sound that has a good effect on the ears is called music. e.g. The sound of flute.

Noise: A sound that does not have a good effect on the ears is called noise. e.g. Crow's voice

26. What is the audible frequency range? OR
What are the limits of audible sound for the human ear? Do these limits change with age?

Ans: Definition: The range of frequencies that are audible to the human ear is called the audible frequency range. A healthy human ear can hear sound with frequencies from 20 Hz to 20,000 Hz.

27. Write the frequency ranges of sound audible to bats, mice, young children and elderly people.

Ans: Bat = 120,000 Hz Rat = 100,000 Hz
Toddler = 20,000 Hz Elderly people = 15,000 Hz

28. What is meant by silent whistle? Write its use. Also write its use.

Ans: A whistle whose frequency is between 20,000 Hz and 25,000 Hz is called a silent whistle.

Frequency ranges: 20,000 Hz to 25,000 Hz.

Uses: It is used to call dogs.

29. Find the frequency of a sound wave when the speed of sound is 340m/s and the wavelength is 0.5m.

Ans: $v=340 \text{ m/s}$, $\lambda=0.5\text{m}$, $f=?$ $v = f\lambda$

$$\Rightarrow f = \frac{v}{\lambda} = \frac{340}{0.5} = 680 \text{ Hz}$$

CH#12: GEOMETRICAL OPTICS

1. What is the difference between regular and irregular reflection? (V.V.IMP)

Ans: **Regular reflection:** Reflection through smooth surfaces is called regular reflection.

Irregular reflection: Reflection through rough surfaces is called Irregular reflection.

2. What is the difference between incident ray and reflected ray?

Ans: **Incident Ray:** The ray of light which hits the mirror is called incident ray.

Reflected Ray: The ray reflected from the mirror is called reflected ray.

3. Write the difference between angle of incidence and angle of reflection.

Ans: **Angle of Incidence:** The angle between the incident ray and the normal.

Angle of reflection: It is the angle formed between the normal and the reflected ray.

4. What is meant by reflection of light?

Ans: When light travelling in a certain medium falls on the surface of another medium, a part of it turns back in the same medium.

5. Write the laws of reflection.

Ans: 1. Incident ray, the reflected ray, the normal at the point of incidence lie in same plane.

2. Angle of incidence and angle of reflection are equal. i.e. $\angle i = \angle r$

6. What is meant by refraction of light?

Ans: It is the process of bending of light as it passes from one medium to another medium.

7. Write the laws of refraction of light.

Ans: 1. Incident ray, the refracted ray, the normal at the point of incidence lie in same plane.

2. Ratio of sine of angle of incidence to sine of angle of refraction is equal to constant.

8. What is meant by Snell's law? Write its formula. (V.V.IMP)

Ans: Ratio of sine of angle of incidence to sine of angle of refraction is equal to constant. $\frac{\sin i}{\sin r} = n$

9. Define spherical mirror. Write its types.

Ans: A mirror whose reflecting surface is part of a hollow sphere of glass.

Types: 1. Convex mirror 2. Concave mirror

10. Write the difference between convex and concave mirror.

Ans: **Convex Mirror:** A spherical mirror whose outer curved surface is reflecting.

Concave Mirror: A spherical mirror whose inner curved surface is reflecting.

11. Define the mirror formula. Write the mirror formula.

Ans: It is the relationship between object distance p, image distance q and focal length f of the mirror.

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

12. Write difference b/w Centre of curvature & radius of curvature.

Ans: **Center of Curvature(C):** It is the center of sphere of which spherical mirror is a part.

Radius of Curvature(R): It is the radius of sphere of which spherical mirror is a part.

13. What is meant by radius of curvature? Write its relation with focal length?

Ans: It is the radius of sphere of which spherical mirror is a part. Relationship: $f = \frac{R}{2}$

14. Why are convex mirrors used for security purposes in shopping centers?

Ans: Because they make clear and larger image of any object.

15. What is meant by refractive index or index of refraction? Write its unit and formula.

Ans: The ratio of the speed of light in air to the speed of light in a medium.

Formula: $n = \frac{c}{v}$ Unit: It has no unit.

16. Write two uses of optical fiber.

Ans: 1. It is used in telephone.

2. It is used in advanced communication.

17. Write the difference between core and cladding of optical fiber.

Ans: **Core:** The inner part of fiber optics is called core.

Cladding: The outer part of fiber optics is called cladding

18. How does thickness of a lens affect its focal length?

Ans: By increasing lens thickness, focal length is decreased.

19. Define lens. Write any 2 uses of lens. Write the names of its types.

Ans: It is a highly transparent body whose two surfaces have at least one curved surface.

Uses: It is used in cameras, microscopes and projectors.

Types: 1. Convex lens 2. Concave lens

20. Write the difference between convex lens and concave lens. OR

Write the difference between converging lens and diverging lens.

Ans: **Convex lens:** This lens is thicker in the middle and thinner at the edges.

Concave lens: This lens is thinner in the middle and thicker at the edges.

21. What is meant by lens power? Write its formula.

Ans: The power of a lens is equal to the reciprocal of its focal length in meters. Unit: Diopter (D) Formula: $P = \frac{1}{f}$

22. If the focal length of the lens is 10m, find its power.

Ans: $P=?$, $f=10\text{m} \Rightarrow P = \frac{1}{f} = \frac{1}{10} = 0.1\text{D}$

23. Why do we use refracting telescopes with large objective lens of large focal length?

Ans: As rays of light are coming from very far objects, so large objective lens can collect more light.

24. What is meant by vision defects? Write their names.

Ans: The inability of eye to see the image of objects clearly.

Defects: 1. Nearsightedness 2. Farsightedness

25. What is near sightedness (or myopia or short sight)? How can it be corrected?

Ans: The disability of the eye to form distant images of distant object on its retina.

It is corrected by contact lens that use diverging lens.

26. What is meant by far sightedness (or hyper metropia)? How can it be corrected? (V.V.IMP)

Ans: The disability of the eye distant images of nearby object on its retina.

It is corrected by inserting a converging lens.

27. How can the defects of vision can be corrected by two ways?

Ans: 1. Near sightedness is corrected by contact lenses that use diverging lens.

2. Far sightedness is corrected by inserting a converging lens.

CH#13: ELECTROSTATICS

1. How charge is produced?

Ans: Charge is produced on different bodies due to friction

2. Define Electrostatic induction

Ans: A process of charging a conductor without any contact with the charging body.

3. What effect will distance have on the Coulomb force?

Ans: If we double the distance between the charges, the force of attraction will decrease four times.

4. Write the formula for parallel method of connecting capacitors.

Ans: $C_{eq} = C_1 + C_2 + C_3 + \dots + C_n$

5. Write the formula for series method of connecting capacitors.

Ans: $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \dots \dots \frac{1}{C_n}$

6. Define point charge and charge. Also write types of charge.

Ans: **Point charge:** Charged bodies whose size is very small as compared to their average distance.

Charge: It is the property of a body due to which it attracts or repels another body.

Types: 1. Positive charge 2. Negative charge

7. Define electroscope. Write its use (or function). (V.V.IMP)

Ans: A device with the help of which we can detect the presence of charge on a body.

Uses: 1. To check the presence of charge on a body.
2. Identifying conductors and insulators.

8. Define Coulomb's law. And also write the formula to find it. (V.V.IMP)

Ans: The force of attraction or repulsion between two charged bodies is directly proportional to the product of the magnitude of charges and inversely proportional to the square of the distance between them.

Formula: $F = k \frac{q_1 q_2}{r^2}$

9. Write the mathematical form of Coulomb's law, if the distance between two points is doubled, what will be the effect on the Coulomb force?

Ans: $F = k \frac{q_1 q_2}{r^2} = k \frac{q_1 q_2}{(2r)^2} = \frac{1}{4} k \frac{q_1 q_2}{r^2} = \frac{1}{4} F$

10. Write the difference between electric field and electric field intensity.

Ans: **Electric Field:** The area near a charge where it exerts an electrostatic force on other charges.

Electric Intensity is the strength of electric field at a point in space.

Unit: Newton per coulomb (NC⁻¹)

Formula: $E = \frac{F}{q_0}$

11. Electric field intensity is a vector quantity? Why? And what will be its direction.

Ans: Because it is a force acting on a charge, it is a vector quantity.

12. Define electric field lines. Also what will be their direction?

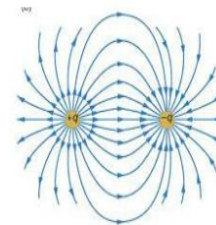
Ans: **Definition:** Lines that represent an electric field intensity.

Direction: Due to positive charges they will be directed outwards and due to negative charges they will be directed inwards.

13. Draw electric field lines b/w two opposite and equal point charges. OR

Form electric field lines from positive to negative charges.

Ans:



14. Define electric potential. Write the formula. (V.V.IMP)

Ans: The amount of work done in bringing a unit positive charge from infinity to that point.

Unit: Volt

Formula: $V = \frac{W}{q}$

15. Write the difference between watt and kilowatt hour.

Ans: **Watt:** If a body does one joule of work in one second, its power will be one watt.

Kilowatt hour: The amount of energy obtained from a power of 1 kilowatt in 1 hour.

16. Define potential difference and its unit. (V.V.IMP) or volt.

Ans: **Potential Difference:** The energy supplied by a unit charge as it moves from one point to another in the direction of the field. **Unit:** Volt

Volt: If one joule of work is done in moving one coulomb positive charge from infinity to that point.

17. What is a capacitor? Write its uses. Also write the SI unit of capacitance.

Ans: **Capacitor:** A device that stores charge is called a capacitor.

Unit: It is SI unit of capacitance Farad (F).

Uses: It is used in fan, electric motor, washing machine etc.

18. How many types of capacitor are there? Write the names and define them.

Ans: Two 1. Fixed capacitor 2. Variable capacitor
Fixed Capacitor is a capacitor whose capacitance cannot be changed. e.g. Capacitor in ceiling fan.
Variable Capacitor is a capacitor whose capacitance can be changed.

Example: Radio capacitor.

19. Define capacitance. Also write SI units.

Ans: The ability of a capacitor to store charge is called capacitance.

Unit: Farad **Formula:** $C = Q/V$

20. Define Farad. OR Define the unit of capacitance. (V.V.IMP)

Ans: **SI unit:** Farad (F).

Definition: If one coulomb of positive charge is applied to one plate of capacitor, it produces one volt potential difference, its capacitance will be one farad.

21. How can the capacitance of a capacitor be increased?

Ans: 1. In a radio capacitor, the rotating plates rotate in and out between the stationary plates.
2. By thinning the dielectric layer in an electrolytic capacitor.

22. What is the difference between a capacitor and a dielectric?

Ans: **Capacitor:** A device that stores charge is called a capacitor.

Dielectric is the air or insulator sheet between the two plates of the capacitor.

23. Write 2 uses of electrostatics. OR

Explain with the help of an example the use of static electricity.

Ans: 1. Electrostatic air cleaner.
2. Electrostatic powder spray painting.

CH#14 CURRENT ELECTRICITY

1. Write the cause of current flow in electrolytes.

Ans: It flows due to both positive and negative charges.

2. Define voltmeter and Ideal voltmeter?

Ans: **Voltmeter:** A device that measures potential difference is called a voltmeter.

Ideal Voltmeter: A voltmeter whose resistance is very high is called an ideal voltmeter.

3. What are the sources of electromotive force? Write their names.

Ans: 1. Batteries 2. Generators 3. Thermocouples

4. Find the resistance if $I=2A$ and $V=6V$

Ans: $I=2A, V=6V \Rightarrow V = IR \Rightarrow R = \frac{V}{I} = \frac{6}{2} = 3 \text{ ohm}$

5. How many watt hours are in 1000 joules?

Ans: 1000 joules equals 0.2778 watt-hours in 1000 joules.

6. Prove that: $P = \frac{V^2}{R}$

Ans: $P = \frac{W}{t} = \frac{QV}{t} = \frac{Q}{t}V = IV = \frac{V}{R} = \frac{V^2}{R}$

7. Prove that: $P = I^2R$

Ans: $P = \frac{W}{t} = \frac{QV}{t} = \frac{Q}{t}V = I(IR) = I^2R$

8. Prove: $1kWh = 3.6 \text{ MJ}$

Ans: $1kwh = 1000w \times 1h = 1000w \times (60 \times 60) \text{ sec} = 36 \times 10^5 J =$

3.6 MJ

9. Why does current flow easily in a conductor?

Ans: Because a conductor has free electrons, current flows through it easily.

10. Why current cannot pass through insulators?

Ans: Because insulators do not have free electrons, they do not allow current to pass.

11. What is the difference between a cell and a battery?

Ans: **Cell:** It is a single cell of 20 voltage.

Battery: It can be a single unit or a combination of many units.

12. Define current. Write its SI unit. OR

Write the difference between electric current and conventional current.

Ans: **Current:** It is the rate of flow of electric charges through a cross-sectional area.

Unit: Ampere

Conventional Current: The current that flows from the positive terminal to the negative terminal of the battery due to the motion of positive charges.

13. Write the SI unit of current. Define. OR

Define Ampere. (V.V.IMP)

Ans: **Unit:** Ampere

Definition: If the rate of flow of current through the cross-sectional area of a conductor is one coulomb per second, then the current will be one ampere.

14. Why the emitter always connected in series to measure current in a circuit?

Ans: So that all the current passes through the emitter and it can measure the current accurately.

15. Write the difference between galvanometer and ammeter.

Ans: **Galvanometer:** It is used to measure very small amount of current.

Ammeter: 1A to 10A current is measured by ammeter.

16. Define electric potential.

Ans: The amount of work required to move a unit positive charge from an infinite distance to a point in the electric field.

Unit: volt

17. Write the SI unit of potential difference. Also appreciate. Or define Volt.

Ans: **Unit:** Volt (V)

Definition: If the potential energy of one coulomb charge at a point is one joule, then the potential of that point will be one volt.

18. In an electric circuit does a fuse control potential difference or current?

Ans: A fuse controls the amount of current. When the current is too high, it melts and breaks the circuit.

19. Why a voltmeter is always connected in parallel to measure the voltage in a circuit?

Ans: In this case the voltages in the parallel connection of all the appliances are same. Thus the voltage can be accurately measured.

20. Write the difference between emf and potential difference.

Ans: **EMF:** The energy which the battery unit provides to the

positive charge to pass through the closed circuit.

Formula: $E=W/Q$

Potential Difference: The energy that a unit positive charge provides when moving from one point to another point.

21. State Ohm's law. Write its mathematical form.

Ans: If the temperature and physical state of a conductor does not change then the current is directly proportional to the potential difference.

Formula: $V=IR$

22. Define resistance. Write the unit. 2022 (G-1 GRW) (V.V.IMP)

Ans: The property of a material which offers resistance to the current flowing through it. **Unit:-** Ohm

23. Write the unit of resistance and define it. OR Define resistance and its unit.

Ans: **Unit:** Ohm

Definition: When the potential difference between the ends of a conductor is one volt and the current flowing through it is one ampere, its resistance will be one ohm.

24. Differentiate b/w ohmic and non ohmic materials. Give example- (V.V.IMP)

Ans: **Ohmic Materials:** Materials whose resistance remains constant with voltage or current.

Example: Resistors

Non-Ohmic Materials: - Materials whose resistance changes with voltage or current.

Example: Filament lamps

25. Write the difference between conductors and insulators. Also give examples.

Ans: Conductor is a material through which current can pass easily.e.g. Iron Insulator is a material through which current cannot pass easily. e.g. Glass, Plastic.

26. Define electric power. Also write the formula and units.

Ans: The energy obtained from electric current in unit time is called electric power.

Formula: $P=I^2R$ **Unit:** Watt (W)

27. Define unit of electric power. OR

Define A Kilowatt-Hour. OR

Define Kilowatt-Hour. Also Write The Formula To Find Energy In Kilowatt-Hour.

Ans: **Watt:** If a body does one joule of work in one second, its power will be one watt.

Formula:

$$\text{Energy in kilowatt hours} = \frac{\text{watt} \times \text{Time (in hours)}}{1000}$$

28. Write the difference between direct current and alternating current. OR

Write The Difference Between A.C Current And D.C Current. (V.V.IMP)

Ans: **Direct Current:** A current that flows in one direction only is called direct current.

Alternating Current: A current which repeatedly changes its direction.

29. Write the difference between live and neutral wire.

Ans: **Live Wire:** A wire whose potential is very high.

Neutral Wire: A wire whose potential is zero.

30. What is meant by earth wire? (V.V.IMP)

Ans: A wire that does not carry current. It is connected to a large metal plate buried deep in the ground near the house.

31. What is a fuse? How is a fuse fitted in a circuit? Also write its range.

Ans: A fuse is a thin and small metal wire that melts when high current flows.

It is placed in series with the live wire in the circuit. Range: 5A, 10A, 15A and 30A

32. Write the difference between fuse and circuit breaker.

Ans: **Fuse:** A fuse is a thin and small metal wire that melts when high current flows.

Circuit Breaker: It is a safety device. If the current rate exceeds a certain limit, the circuit breaker automatically turns off.

33. How circuit breaker works as a preventive appliance.

Ans: If the current rate exceeds a certain limit, the circuit breaker automatically turns off.

34. State Joule's law. Also write its formula.

Ans: Heat energy is generated due to current flowing through a resistance. Which is equal to the product of the square of current, resistance and time.

Formula: $W = I^2 R t$

CH#15 ELECTROMAGNETISM

1. Write two uses of electromagnets.

Ans: 1. Electric Bell 2. Re Lay

2. Define electromagnetism.

Ans: The study of magnetic effects of current is called electromagnetism.

3. Write the factors affecting the induced e.m.f.

Ans: 1. Number of turns in the coil
2. Speed of relative motion between the coil and the magnet.

4. What is meant by magnetic field strength (or intensity)?

Ans: It is the number of magnetic lines of force passing through a surface.

5. Define transformer. Write its formula. Also write its use.

Ans: A device that steps up or steps down the A.C. voltage.

$$\text{Formula: } \frac{V_s}{V_p} = \frac{N_s}{N_p}$$

Uses: It is used to increase or decrease A.C voltage.

6. On what principle does Transformer work?

Ans: It works on the principle of mutual induction.

7. Define ideal transformer. Write its formula or equation.

Ans: A transformer in which the power supplied by the secondary circuit is equal to the electric power of the primary circuit. **Formula:** $V_p I_p = V_s I_s$

8. Name the types of transformer and define them. OR What is the difference between step up and step down transformer?

Ans: **Step-up transformer:** A transformer in which the secondary voltage is higher than the primary voltage.

Step down transformer: A transformer in which the secondary voltage is smaller than the primary voltage.

9. On what factors does the secondary voltage in a transformer depend?

Ans: On what factors does the secondary voltage in a transformer depend?

10. Can a transformer work on direct current?

Ans: No! Because direct current produces constant magnetic flux.

11. How many coils are used in a transformer? Write the name.

Ans: Two coils 1. Primary coil 2. Secondary coil

12. Name the device that converts electrical energy into mechanical energy? On what principle does it work?

Ans: DC motor. It works on the principle of electromagnetic induction.

13. Define electric motor. Write the principle of electric motor or DC motor.

Ans: An electric motor converts electrical energy into mechanical energy.

Principle: When a current carrying loop is placed inside magnetic field, the loop will rotate due to the torque on the coil.

14. Write the difference between generator and motor.

Ans: A generator converts mechanical energy into electrical energy.

A motor converts electrical energy into mechanical energy.

15. What is meant by MRI? Write the uses of MRI. OR

What is meant by Magnetic Resonance Imaging?

Ans: A slight current flows in the nervous system of our body which creates a magnetic field around it. Which forms the basis of getting the image of different parts of our body.

Use: Doctors diagnose heart and brain diseases.

16. State Fleming's left hand rule. (V.V.IMP)

Ans: You should extend the thumb, first and middle finger of your left hand in such a way that these three are perpendicular to each other. If the first finger indicates the direction of the magnetic field and the middle finger in the direction of the current, then the thumb indicates the force acting on the conductor.

17. Define an electromagnet. How many poles does it have? (V.V.IMP)

Ans: The temporary magnet formed due to the flow of current in a coil is called an electromagnet. It has two poles.

1. North Pole 2. South Pole

18. Define electromagnetic induction and mutual induction. (V.V.IMP)

Ans: Electromagnetic Induction: The process in which an induced current is produced by changing the magnetic lines of force passing through the circuit.

Mutual Induction: The process in which a change in current in one coil induces a current in another coil.

19. State Faraday's law of electromagnetic induction.

Ans: The amount of induced emf is directly proportional to

the rate of change of magnetic lines of force.

20. Define Lenz's law.

Ans: "An induced current in a circuit always flows in such a way that it opposes the change which caused it."

21. Lenz's law is exactly like the law of conservation of energy. Why?

Ans: We use the mechanical energy of the hand to move the magnet towards or away from the solenoid. This mechanical energy is converted into electrical energy.

22. Define RaLay. (V.V.IMP)

Ans: An electric circuit that works and closes in accordance with another electric circuit. It is used to control large currents with the help of small currents.

23. How does an ATM machine read a bank card?

Ans: A credit card has a magnetic tape on it which contains the account information. The machine reads this information.

CH#16 BASIC ELECTRONICS

1. Define thermionic emission. Write the names of 2 elements that increase thermionic emission. OR Write the names of 2 factors that increase thermionic emission.

Ans: The process of emission of electrons from a hot metal surface.

Factors: 1. Temperature 2. Voltage 3. Nature of metal

2. Define cathode ray oscilloscope (CRO). Name its parts.

Ans: It is a device used to display the magnitude of changing electric currents.

Parts of CRO: 1. Electron gun 2. Deflecting plates 3. Fluorescent screen

3. Write the uses of cathode ray oscilloscope. OR Write 2 uses of CRO.

Ans: 1. Display heart beat 2. measuring voltages 3. range finding

4. What is the purpose of an electron gun cathode ray oscilloscope? OR

What is the function of electron gun?

Ans: It is used to generate a beam of fast moving electrons.

5. What is meant by electronics? Write its uses.

Ans: The branch of physics which deals with control of motion of electrons for different purposes.

6. Write the difference between analog and digital electronics. (V.V.IMP)

Ans: Analog Electronics is a branch of electronics that deals with analog quantities.

Digital Electronics is a branch of electronics that deals with digital quantities.

7. Write the difference between analog and digital quantities.

Ans: **Analog quantities:** Quantities whose value changes with a constant.e.g. Temperature

Digital Quantities: Quantities whose value changes without continuity. e.g. TV, Radio

8. How do digital electronic devices work?

Ans: It use only two numbers 0 and 1. So data processing is very easy.

9. Write two advantages of digital electronics over analog electronics OR

Write 2 uses of digital technology in our life.

Ans: 1. It requires Boolean algebra, which is very simple.
2. 0 and 1 numbers are used to reduce data error.

10. What is meant by ADC and DAC? OR
What is the difference between analog to digital converter and digital to analog converter?

Ans: ADC is a circuit that converts analog signals into digital signals.
DAC is a circuit which converts digital signals into analog signal.

11. Define digital signals and analog signals.

Ans: Digital signals: A signal having only 2 values is called a digital signal.

Analog Signals: Continuously changing signals are called analog signals.

12. What is meant by binary variable?

Ans: Objects that have only 2 possible states (0 and 1) are called binary variables.

13. Define digitization.

Ans: Transforming information in the form of 0 and 1 is called digitization.

14. Name the basic operations of digital electronics.

1. AND operation
2. OR operation
3. NOT operation

15. Define logical operations (or logical functions). Name any 4 logic operations.

Ans: A digital circuit performs binary operations in the form of 0 and 1 is called a logical operation.

Logic operations:

1. AND operation
2. OR operation
3. NOT operation
4. NAND operation

16. Write the names of universal logic gates. OR
BASIC LOGIC gates.

Ans: 1. AND Gate 2. OR Gate 3. NOT Gate

17. What is meant by logic gates? Write 2 uses of logic gates.

Ans: The circuits that perform various logic operations, having one or more inputs and one output.

Uses: Logic gates are used in safety alarms and alarm gates.

18. Write the names of 4 logic gates.

Ans: 1. AND Gate 2. OR Gate
3. NOT Gate 4. NOR Gate

19. What is Boolean Algebra (or Algebra of Logics)? How is it expressed?

Ans: Boolean Algebra: It is used to describe logic operations with the help of symbols. e.g. English alphabets (A, B, C etc.) are used to represent Boolean variables.

20. What is meant by logic variable? OR
Define logic states.

Ans: The states which has two possible conditions are called logic states or variables.

21. What is meant by truth table?

Ans: A table in which input and output states are written in binary form.

22. Define AND gate. Also write its symbol & Truth table.

Ans: A circuit which obeys AND operation, is called AND gate.

23. Symbol: $X=A.B$ Truth Table:

24. Define OR gate. Also write its symbol & Truth table. OR Explain OR gate.

OR Make circuit diagram & truth table of OR gate.

OR Draw the symbolic diagram of OR gate and write its truth table.

Ans: A circuit that obeys the OR operation is called OR gate.

Symbol: $X=A+B$ Truth Table:

25. Define NOT gate. How it works?

OR Make circuit diagram & truth table of NOT gate.

OR Explain NOT gate.

OR Write symbol & truth table of NOT gate.

Ans: A circuit that obeys the NOT operation is called a NOT gate. Symbol: $X=\bar{A}$ Truth Table:

26. For which purpose NOT gate is used?

Ans: Main purpose of NOT gate is to change one logic level into different logic levels.

27. Which logic gate is also called inverter? Also write its symbol.

OR How NOT gate is inverter?

OR Define inverter?

Ans: Basic logic operation of NOT gate is also called inversion. So it is called inverter gate.

Symbol: $X=\bar{A}$

28. What is NOR gate. Write its symbol.

OR Write symbol & Truth table of NOR gate.

Ans: NOR gate is formed when NOT gate is joined with OR gate. Symbol: $X=A+B$ Truth Table:

29. Define NAND gate. Also write its symbol & Truth table.

Ans: NAND gate is formed when NOT gate is joined with AND gate.

Symbol: $X=A.B$ Truth Table:

30. NOT gate is inverse of NAND gate? Explain it.

Ans: Not gate becomes when AND gate is joined with NOT gate.

NOT gate inverts the output of AND gate.

CH#17: INFORMATION & COMMUNICATION TECHNOLOGY

1. Define I.C.T. (V.V.IMP)

Ans: It is a method to store, process and transmit information in seconds.

2. Name the 3 main components of a communication system. (V.V.IMP)

Ans: 1. Transmitter 2. Transmission channel 3. Receiver

3. Write the difference between information technology and telecommunication.

Ans: Information Technology: A method used to store, organize and communicate information to others.

Telecommunication: It is the process of conveying information quickly to remote areas.

4. Write the difference between hardware and software. OR What is computer hardware?

Ans: Hardware are the parts of the computer that we can touch e.g. keyboard, mouse etc.

Software are the computer programs and the manuals that support them. e.g. computer window.

5. What is the difference between data and information? (V.V.IMP)

Ans: **Data:** The facts collected from various sources are called data in raw form.

Information: Processed data is called information.

6. What is the difference between data and processed data?

Ans: **Data:** Facts collected from various sources are called data in raw form.

Processed data: Processed data is called information.

7. Name the components of Computer Based Information System (CBIS).

Ans: 1. Hardware 2. Software 3. Data
4. Procedure 5. People

8. What is a fax machine? What is its purpose? OR What is meant by telefax machine?

Ans: It takes an image of a page, then converts it into an electronic signal and sends it through the telephone lines to another fax machine. The other machine prints these signals on paper as an image.

9. Write 2 uses of fax machine.

Ans: Sending and receiving printed documents.

10. What is the function of CPU? OR What Work Does The CPU Do?

Ans: CPU performs the computations according to the specific instructions.

11. What is the difference between a computer and a supercomputer?

Ans: Computer is machine which is used for addition, subtraction, multiplication and division.

Supercomputer is a high speed computer, can transmit information to us in 10-12th of a second.

12. Write the names of 4 input devices in computer.

Ans: 1. Mouse 2. Keyboard
3. Microphone 4. Scanner

13. Name the 4 parts of a computer.

Ans: 1. Monitor 2. Printer 3. Keyboard 4. CPU

14. What is the role of computer in our life?

Ans: 1. It is used in offices to write letters and reports etc.
2. It is used in railway stations for air ticket reservation.

15. Define CPU. Why is it called the brain of a computer?

Ans: It is the most important hardware having microprocessor inside. As it performs tasks according to instructions, so it is called the brain of computer.

16. What are information storage devices? Give an example.

Ans: A device designed to store information in a computer e.g. DVD, USB, CD, Floppy disk etc.

17. What is the difference between RAM and ROM? OR

What is the difference between RAM and ROM

memory?

Ans: **RAM:** It is temporary memory. Data can be written and changed in it.

ROM: It is permanent memory. Data cannot be changed in it.

18. What is the difference between primary memory and secondary memory in a computer?

Ans: **Primary memory:** It consists of ICs. It has two parts RAM and ROM. ROM starts the computer. ROM is temporary memory.

Secondary storage devices: It is used to store data permanently in the computer.

When we run the computer program. The data is transferred from secondary storage to primary storage.

Example: Hard disk, audio cassette.

19. Define compact disk, floppy disk, magnetic disk and hard disk.

Ans: **Compact disk:** The data on this disk is stored on very small reflective and non-reflective surfaces.

Floppy Disk: It is a small, sensitive flexible plastic covered in plastic case.

Magnetic disk: A device that stores data in the form of a changing magnetic field.

Hard Disk: It is hard and sensitive disk which stores huge data.

20. Write the data storage capacity of CD and DVD.

Ans: CD can store 80MB data. DVD can store data up to 17GB.

21. Is floppy disk or hard disk better for data storage?

Ans: Hard disk is better because hard disk can store more data than floppy disk.

22. What is meant by flash drive (or USB)? Also write its uses.

Ans: A device that consists of data storage ICs.

Uses: 1. It is portable device

2. Data can be transferred easily.

3. Every kind of useful data can be stored.

23. Write the names of four electronic devices.

Ans: 1. Television 2. Radio 3. Mobile 4. Video Cassette

24. What is the difference between Bit and Byte?

Ans: **Bit:** It is a numerical value in the form of 0 and 1.

Byte: 8 bits together make one byte.

25. What is meant by word processing and data management? V.V.IMP)

Ans: Word processing allows us to write letters, reports and books and also edit them.

Data Management: Collecting information for a main purpose, organization and storing it in the form of a file on the computer.

26. What is meant by Internet? OR

Define Internet. Write two services (or 4 uses) of it.

Ans: A network of many computers, which is a main source of information and communication in the world.

Uses: 1. E-Commerce

2. E-Learning

3. Web browsing

4. Entertainment source

27. What is meant by Global Web?

Ans: Internet is a global village of more than a billion nets.

More than several million computers work in it. It includes 200 million people from all over the world.

28. What is meant by e-mail (or electronic mail)? Write 4 advantages of it.

Ans: It is a method through which, people can send and receive messages.

Advantages:

1. Easy to use
2. More effective
3. Cost free service
4. Fast communication

29. What is the difference between web browsing and e-mail?

Ans: Web Browsing: It helps users to view web pages using web browser.

Email: It is a method through which, people can send and receive message.

30. Define browser. Write the names of four web browsers.

OR

What are browsers used for?

Ans: A browser is a process that provides a window to the web.

Examples: 1. Google Chrome 2. Safari
3. Opera 4. Firefox

31. What is meant by photo phone and cell phone (or mobile phone)?

Ans: Photo phone: It is a modern form of telephone. Users can see pictures of each other while talking.

Cell Phone: It uses radio technology and have two way communication.

32. Why are optical fibers the most effective medium in communication systems?

Ans: 1. It do not cause data loss.
2. It transfer information at very high speed.

CH#18: ATOMIC & NUCLEAR PHYSICS

1. Define atomic mass number (atomic mass), atomic number and neutron number. Write the formula.

OR
Write the difference between atomic number and atomic mass number.

Ans: Atomic Number: The number of protons present in the nucleus of an atom is called atomic number.

Symbol: Z

Atomic Mass Number: The number of protons and neutrons in the nucleus of an atom is called atomic mass number. **Symbol:** A **Formula:** $A = Z + N$

Neutron Number: The number of neutrons present in the nucleus of an atom is called neutron number.

Symbol: N

2. Define nucleons.

Ans: The protons and neutrons present in the nucleus of an atom are called nucleons.

3. Find the number of protons and neutrons in the nucleoid ${}^{13}_6\text{X}$.

Ans: Atomic mass=13 Number of protons =6 Number of neutrons =13-6 =7

4. What is meant by isotopes? Write the isotopes of hydrogen.

OR

Is it possible for an element to have different types of

atoms. Explain briefly.

Ans: Isotopes are atoms of an element having the same atomic number but different number of neutrons in the nucleus. e.g. isotopes of hydrogen are:

1. Protium
2. Deuterium
3. Tritium

5. Define radioactivity & radioactive element?

Ans: Radioactivity: It is the process in which radiations are emitted from unstable nuclei.

Radioactive element: The elements who emit radiations are called radioactive elements.

6. Write the Difference Between Natural And Artificial Radioactivity.

OR

Write the difference between natural radiation and artificial radiation.

Ans: Natural Radioactivity: It is the process in which elements having atomic number 82 or more spontaneously emit radiations.

Artificial Radioactivity: Elements whose atomic number is less than 82 do not emit radiations naturally. When they are bombarded with neutrons, they emit radiations.

7. Define nuclear transmutation (V.V.IMP)

Ans: The process in which a parent un-stable nuclide changes into a stable daughter nuclide.

8. Write the names of radiations. Write any two protective measures against radiations.

Ans: 1. Alpha rays 2. Beta rays 3. Gamma rays

Precautions:

1. These sources should not be directed towards any person.
2. These sources should be kept in the lead box.

9. Write 4 dangers of radiations.

Ans: 1. Infertility in women 2. Blood cancer
3. Blindness. 4. Genetic changes in humans

10. What is meant by background radiation and cosmic radiation?

Ans: Background Radiations: The radiations due to various radioactive substances in the atmosphere.

Cosmic Radiations: These radiations that all living things living on earth receive from outer space.

Examples: These consist of protons, electrons, alpha particles.

11. Write 2 properties of alpha, beta and gamma particles. (V.V.IMP)

Ans: Alpha particles:

1. They are emitted at very high speed.
2. Their range is not more than a few centimeters in gas.

Beta particles:

1. They consist of high energy electrons.
2. Their speed is equal to the speed of light.

Gamma particles:

1. These are electromagnetic waves with very short wavelength.
2. Their wavelength and energy keep changing.

12. Define ionization. Write its power.

Ans: The process in which radiations are converted into positive and negative ions. e.g. alpha particle has

greatest ionization power.

13. **Write the difference between stable and Un-stable nuclei.**

Ans: **Stable Nuclei:** Nuclei which do not emit radiations naturally are called stable nuclei.

Un stable Nuclei: Nuclei which naturally emit radiations are called unstable nuclei.

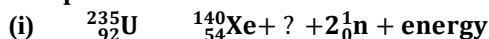
14. **Define half-life. Give example.**

Ans: It is the time during which half of unstable radioactive nuclei disintegrate. e.g. half-life of carbon-14 is 5730 years.

15. **Write 2 uses of radioisotopes. OR**
How are radioisotopes used in medical treatment?

Ans: 1. Iodine-131 is used to monitor thyroid gland.
2. Phosphorus-32 is used to detect brain tumors.

16. **Complete the nuclear reaction**

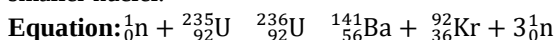


Ans: (i) ${}_{92}^{235}\text{U} + {}_0^1\text{n} \rightarrow {}_{54}^{140}\text{Xe} + {}_{38}^{93}\text{Sr} + 2{}_0^1\text{n} + \text{energy}$



17. **Define fission reaction. Write its equation. V.V.I.M.P**

Ans: It is the process in which a heavy nucleus splits into two smaller nuclei.

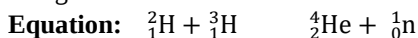


18. **Write the general equation of Gamma Decay.**

Ans: ${}_Z^AX^n \rightarrow {}_Z^AX + \gamma + \text{energy}$

19. **Define nuclear fusion. Write its equation.**

Ans: It is the process in which smaller nuclei combine to form a larger nucleus



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