Simple Harmonic Motion And Waves

M.C.Q's

Q: **Multiple Choice Questions:**

1. Which of the following is an example of simple harmonic motion?

(a)**The motion of simple pendulum**   (c) the motion of ceiling fan

(b) The spinning of the earth on its axis   (d) a bouncing ball on a floor

2. If the mass of the bob of a pendulum is increased by a factor of 3, the period of the pendulum's motion will:

(a) Be increased by a factor of 2   (c) **remain the same**

(b) Be increased by a factor of 2   (d) be decreased by a factor of 4

3. Which of the following devices can be used to produce both transverse and longitudinal waves?

(a) A string   (c) a ripple tank

(b) A helical spring   (d) a tuning fork

4. Waves transfer:

(a) **energy**   (c) amplitude

(b) Frequency   (d) wavelength

5. Which of the following is a method of energy transfer?

(a)conduction   (c) wave motion

(b) Radiation   (d) **all of these**

6. In a vacuum, all electromagnetic waves have the same:

(a)**speed**   (c) amplitude

(b) Frequency   (d) wavelength

7. A large ripple tank with a vibrator working at a frequency of 30 Hz produces 25 complete waves in a distance of 50 cm. The velocity of the wave is:

(a) 53 cms^{-1} **(c) 60 cms^{-1}**

(b) 750 cms^{-1} (d) 1500 cms^{-1}

8. Which of the following characteristics of a wave is independent of the others?

(a)speed   (c) **amplitude**

(b) Frequency   (d) wavelength

9. The relation between vf and λ of a wave is:

(a)Vf = λ   (c) **fλ = v**

(b) Vλ = f   (d) v = λ / f

(Exercise Short Questions)

Q1: What is Simple Harmonic Motion? What are the necessary conditions for a body to execute simple harmonic motion?

Ans: <u>Simple Harmonic Motion</u>:

Type of vibratory motion in which acceleration of a body is directly proportional to its displacement and the acceleration is always directed towards the equilibrium (mean) position is called simple harmonic motion.

$$Acceleration \quad \propto \quad - displacement$$
$$a \quad \propto \quad - x$$

<u>Basics conditions to execute SHM:</u>

o There must be elastic restoring force acting on the system.
o The system must have inertia.

Q2: Think of several examples of motion in everyday life that are simple harmonic?

Ans: <u>*Examples of SHM*</u>:

o Motion of a body attached to the end of an elastic spring.
o Motion of the bob of a simple pendulum.
o Motion of the wire of a guitar.

Q3: What are damped oscillations? How damping progressively reduces the amplitude of oscillation?

Ans: Any oscillation in which the amplitude of the oscillating quantity decreases with time is called *damped oscillation*.

In practice, the amplitude of vibrations becomes progressively smaller as energy is lost due to friction between the oscillating body and the particles in the air.

Q4: How can you define the term wave? Elaborate the difference between mechanical and electromagnetic waves? Give examples of each.

Ans: "Wave is a disturbance or variation which travels through a medium".

Mechanical Waves	Electromagnetic Waves
Mechanical waves need a material medium for their propagation.	Electromagnetic waves do not need any material medium for their propagation.
Examples: Sound and Water Waves	**Examples**: Radio and Light Waves

Q5: Distinguish between longitudinal and transverse waves with suitable examples.

Ans:

Longitudinal Waves	Transverse Waves
Movement of medium in the same direction as the wave	Movement of medium is at right angle to the direction
Waves acts as One Dimension	Waves acts as Two Dimension
It can be produced in a solid, liquid and gas	It can only produce in solid and surface of liquid

It is made up of compressions and rare fractions	It is made up of crest and troughs
Examples: Sound Waves and Vibrations in gas	**Examples**: Light and electromagnetic waves

Q6: Derive a relationship between velocity, frequency and wavelength of a wavelength of a wave.

Ans: <u>Relation of velocity, frequency and wavelength</u>:

We know that:

Velocity = ~~distance~~
time

$V = \frac{d}{t}$ and   d = vt

d = vt   = $v = \frac{d}{t}$ $(f = \frac{1}{T})$

v = f λ

Q7: Define Spring Constant. Write its formula also?

Ans: K is a constant called the spring constant. The value of K is a measure of the stiffness of the spring.   **Formula:** $K = -\frac{F}{x}$

Q8: Explain the following properties of waves with reference to ripple tank experiment.

(a)Reflection   (b) Refraction   (c) Diffraction

Ans: <u>Reflection</u>: When waves moving in one medium fail on the surface of another medium they bounce back into the first medium such that the angle of incidence is equal to the angle of reflection.

<u>Refraction</u>: When a wave from one medium enters in the second medium at some angle, its direction of travel changes is called *Refraction*.

<u>Diffraction</u>: The bending or spreading of waves around the sharp edges or corners of obstacles or slits is called *Diffraction*.

Q9: Do mechanical waves pass through vacuum that is empty space?

Ans: No, mechanical waves cannot pass through vacuum because mechanical waves are material waves and always require some medium for their propagation.

(Conceptual Questions)

Q10: If the length of a simple pendulum is doubled, what will be the change in its period?

Ans: The time period increases by a factor $\sqrt{2}$

$T = \sqrt{2}T$

Q11: A ball is dropped from a certain height onto the floor and keeps bouncing. Is the motion of the ball simple harmonic? Explain.

Ans: The bouncing ball is not in simple harmonic motion. The ball experiences only the gravitational force, except for the brief time that it's in contact with the ground.

Q12: Define Time Period. Write down formula for time period of pendulum?

Ans: Time required to complete one vibration is called time period.

$T = 2\pi\sqrt{l/g}$

Q13: What types of waves do not require any material medium for their propagation?

Ans: Electromagnetic waves do not require any material medium for their propagation.

Q14: If the time period of a simple pendulum is 1.99 second find its frequency?

Ans: As we know that: $f = \frac{1}{T}$

$f = \frac{1}{1.99}$ = 0.5025 Hz

Q15: Define Vibratory Motion?
Ans: To and fro motion of a body about its mean position is known as vibratory motion.

Q16: Define Restoring Force?
Ans: A restoring force always pushes or pulls the object performing oscillatory motion towards the mean position.

Q17: State Hooke's law and write its equation?
Ans: "The stress applied to a material is directly proportional to the strain on that material with in the elastic limit is called Hooke's Law"
$$F = - kx$$

Q18: What is Ripple Tank?
Ans: It is a device to produce water waves and to study their characteristics.

Q19: Write Characteristics of Simple Harmonic Motion?
Ans: 1. A body executing SHM always vibrates about fixed position.
2. Its acceleration is always directed towards the mean position.
3. Its velocity is maximum at the mean position and zero at the extreme position.

Q20: Define Vibration?
Ans: One complete round tip of a vibrating body about its mean position.

Q21: Difference between Time period and Frequency?
Ans:

	Time Period	Frequency
1	Time required to complete one vibration is called time period.	The number of vibrations which a body covers in one second is called frequency.
2	Its unit is Second.	Its unit is Hertz

Q22: Define Amplitude?
Ans: The maximum displacement of a vibrating body on either side from its mean position is called its amplitude.

Q23: Define Crest and Trough?
Ans: Such waves which are highest point from the mean position are called *Crest.*
Such waves which are lowest point from the mean position are called *Trough.*

Q24: How does spider detects its prey?
Ans: A spider detects its prey due to vibration produced in the web.

Q25: Define Wave Motion?
Ans: A wave motion is a disturbance in the medium which causes the particles of the medium to undergo vibratory motion about their mean position in equal intervals of time.

Q26: On what does frequency of tunning forks depends?
Ans: The frequency of tunning forks depends upon the mass of forks of tunning forks. If mass is more, then frequency is low. That means pitch is low.

Q27: What is meant by compressions and Rarefactions?
Ans: Such a wave which is close together is called Compressions.
Such a wave which is far together is called Rarefactions.

Q28: Define Simple Pendulum?
Ans: It consists of a small bob of mass (m) suspended from a light string of length (l) fixed at its upper end.

Q29: Who and when invented the pendulum clock?
Ans: Christian Huygens invented the pendulum clock in 1656.

Q30: What do the dark and bright fringes on the screen of ripple tank represent?
Ans: The dark and bright fringes on the screen of ripple tank represent the crests and troughs of transverse waves. The crest appears as bright fringes and trough appear as dark fringes on the screen.

M.C.Q's

Q1: Multiple Choice Questions:

1. Which is an example of a longitudinal wave?

(a) Sound wave   (c) light wave

(b) Radio wave   (d) water wave

2. How does sound travel from its source to your ear?

(a) By changes in air pressure   (c) by vibrations in wires or strings

(b) By electromagnetic wave   (d) by infrared waves

3. Which form of energy is sound?

(a) Electrical   (c) thermal

(b) Mechanical   (d) chemical

4. Astronauts in space need to communicate with each other by radio links because:

(a) Sound waves travel very slowly in space

(b) Sound waves travel very fast in space

(c) Sound waves cannot travel in space

(d) Sound waves have low frequency in space

5. The loudness of sound is most closely related to its:

(a) Frequency   (c) period

(b) Wavelength   **(d) amplitude**

6. For normal person, audible frequency range for sound wave lies between:

(a) 10 Hz and 10 kHz   **(c) 20 Hz and 20 kHz**

(b) 25 Hz and 25 kHz   (d) 30 Hz and 30 kHz

7. When the frequency of a sound wave is increased, which of the following will decrease?

   i. Wavelength   *ii. Period*   *iii. Amplitude*

(a) i only   (c) iii only

(b) i and ii only   (d) i and iii only

(Exercise Short Questions)

Q1:   What is necessary condition for the production of sound?
Ans: *Two* necessary conditions for the production of sound: -

| **(i)** The body must vibrate for the production of sound. |
| **(ii)** There must be a medium for the sound to travel through like air, water etc. |

Q2:   What is the effect of the Medium on the Speed of Sound? In which medium sound travels faster: air, solid or liquid?
Ans: Sound waves can be transmitted only by any medium containing particles that can vibrate. The nature of the medium will affect the speed of the sound waves. In Solids, sound move fast because in solids the molecules are very near to each other.

Q3:   What is meant by Reverberation?
Ans: Sometimes, when sound reflects from the walls, ceiling and floor of a room, the reflecting surfaces are too reflective and sound becomes garbled it is called reverberations.

Q4:   Calculate the frequency of sound wave of speed 340 ms^{-1} and wavelength 0.5
Ans: We know that: $v = f\lambda$

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

Q5:   Sound is a form of wave. List at least three reasons to support the idea that sound is a wave.
Ans:

| **(i)** Sound carries energy from one point to other through the medium that is also a property of wave. |
| **(ii)** Sound waves have the property of interference; constructive interference causes louder and destructive interference cause inaudible sound or reduced sound. |
| **(iii)** All waves are having the property to manifest phenomenon of reflection, diffraction and refraction, since sound is also wave. |

Q6:   What would happen to the loudness of sound with increase in its frequency?
Ans: Since loudness does not depend on frequency loudness will remain unchanged.

Q7:   What is the difference between the Loudness and Intensity of sound? Derive the relationship between the two.
Ans: "*Sound energy passing per second through a unit area held perpendicular to the direction of propagation of sound waves*". The basic units are (Wm^{-2}).
       "*Loudness is the characteristic of sound by which loud and faint sounds can be distinguished*".

$$L - L_o = K (\log I - \log I_o) = K \log \frac{I}{}$$

Q8:   On what factors does the loudness of sound depend?
Ans: *Loudness depends upon following*:

| **(i)** Amplitude of the vibrating body. |
| **(ii)** Area of the vibrating body. |
| **(iii)** Distance from the vibrating body. |

Q9: What do you mean by the term Intensity level of the sound? Name and define the unit of intensity level of sound.

Ans: As we know

$$L - L_o = K (\log I - \log I_o) = K \log \frac{I}{I_o}$$

The difference $(L - L_o)$ between the loudness (L) of an unknown sound and the loudness L_o is called the *intensity level of the unknown sound*.

There are *two* unit of intensity level of sound: -   **(a)** Bel (bel)   **(b)** decibel (db)

Q10: Which animal have loudest sound?

Ans: A blue whale's 180 dB rumble is the loudest animal sound ever recorded.

Q11: What is difference between Frequency and Pitch?

Ans: "*Frequency is the number of occurrences of a repeating event per unit time*" While "*Pitch of the sound is a characteristic of sound by which a shrill sound can be distinguished from a grave one*".

Q12: Describe the effect of change in amplitude on loudness and the effect of change in frequency on pitch of sound.

Ans: The loudness of the sound varies directly with the amplitude of the vibrating body. Higher amplitude has more loud sound.

Pitch of the sound varies directly with the frequency. A higher pitches means higher frequency and vice versa

Q13: Define Acoustics?

Ans: The technique or method used to absorb undesirable sounds by soft and porous surfaces is called acoustics protection.

Q14: If we clap or speak in front of a building while standing at a particular distance, we rehear our sound after sometime. Can you explain how does this happen?

Ans: This sound which we hear is called an echo and is a result of reflection of sound from the surface.

Q15: What is the Audible frequency range for Human Ear? Does this range vary with the age of people? Explain.

Ans: "The *range of the frequencies which a human ear can hear is called the Audible frequency range*".

A normal human ear can hear a sound only if its frequency lies between 20Hz and 20,000Hz.Different people have different range of audibility. It also decreases with age. Young children can hear sounds of 20,000 Hz but old people cannot hear sounds even above 15,000 Hz.

Q16: Explain that Noise is a Nuisance?

Ans: "*A noise nuisance is an annoyance or a noise that is audible*".

Impacts of Noise:

The impact of noise on human health is a matter of great concern. Noise pollution can affect us in several ways: *Hearing problems*, *Poor cognitive function*, *cardiovascular issues, Sleep disturbance, Trouble communication* and *Mental health problem.*

Q17: Describe the importance of Acoustic Protection?

Ans: Acoustic has a great importance in our daily life.

(i) Office equipment's has increased significantly, the noise level remained almost the same.
(ii) Productivity increases when the noise level decreases at the work place.
(iii) Indoor environment of all places of work must ensure that people feel healthy both in mentally and physically terms.

Q18: What are the uses of Ultrasound in Medicine?
Ans: Some few uses of Ultrasound in Medicine are: -

(i) Ultrasound is used to diagnose and treat different ailment.

(ii) Ultrasounds are used to help a doctor to evaluate the flow of blood in the vessels.

(iii) The heart can also be studied by using an ultrasound.

(iv) Ultrasound is a helpful way to observe many of body's internal organs.

Q19: Why two tin cans with a string stretched between them could be better way to communicate than merely shouting through the air?
Ans: Two tin cans with a string stretched between them could be better way to communicate than merely shouting through the air because sound is a vibration of kinetic energy passed from molecule to molecule.

Q20: Why the sound of women is shrill as compared to men?
Ans: The sound of women is shriller than that of men because the frequency and pitch of sound of women is higher than that of men.

Q21: What is meant by Soundless Whistle?
Ans: Some people use soundless whistle to call dogs whose frequency lies between 20,000 Hz to 25,000 Hz. It is silent for human but not for dogs.

Q22: Define SONAR?
Ans: Ultrasound is used for locating objects lying deep on the ocean floor, etc. the technique is called SONAR.

Q23: How can noise pollution are reduced?
Ans: Noise pollution can be reduced to acceptable level by replacing the noisy machinery with environment friendly machinery and equipment or using hearing protection devices.

Q24: Define Echo Or Reflection of Sound?
Ans: When sound is incident on the surface of a medium it bounces back into the first medium. This phenomenon is called echo or reflection of sound.

Q25: Is there any difference between echo and reflection of sound?
Ans: No, there is no difference between echo and reflection.

Q26: Define Ultrasound?
Ans: Sounds of frequency higher than 20,000 Hz which are inaudible to normal human ear are called ultrasound or ultrasonic.

Q27: Why ultrasound is useful in medical field?
Ans: Because in medical field, ultrasonic waves are used to diagnose and treat different ailments.

(Important Extra Short Questions)

Q28: How sound waves are produced?
Ans: All sounds are produced by the vibrations of objects.

Q29: What is the Intensity of sound of Rusting of leaves and Faintest Audible sound?
Ans: The intensity of sound of Rusting of leaves is 10 dB and the faintest audible sound is 0 dB

Q30: Define Stethoscope?
Ans: A medical instrument for listening to the action of someone's heart or breathing and two tubes connected to earpieces.

Q31: Name two characteristics of sound?
Ans: 1. Loudness.   2. Pitch.

Q32: Define Quality of sound?
Ans: The characteristic of sound by which we can distinguish between two sounds of same loudness and pitch is called Quality of sound.

Q33: What is the difference between Musical sound and Noise?
Ans:

Musical Sound	Noise
Such sounds which are pleasant to our ears are called Musical sound.	Such sounds which are not pleasant to our ears are called Noise.
Example : Guitar and Piano	**Example :** Transportation equipment

Q34: Why are sound waves called mechanical waves?

Ans: Mechanical waves need medium for the propagation and Sound waves also need medium for their propagation of sound. That's why sound waves called mechanical waves.

(M.C.Q's)

Q: **Multiple Choice Questions:**

1. Which of the following quantity is not changed during refraction of light?
(a) Its direction   **(c) its frequency**
(b) Its speed   (d) its wavelength

2. A converging mirror with radius of 20 cm creates a real image 30 cm from the mirror. What is the object distance?
(a) 5.0 cm   **(c) -15 cm**
(b) 7.5 cm   (d) 20 cm

3. An object is placed at the center of curvature of a concave mirror. The image produced by the mirror is located:
(a) Out beyond the center of curvature   (c) at the focal point
(b) Between the center of curvature and the focal point **(d) at the center of curvature**

4. An object is 14 cm in front of a convex mirror. The image is 5.8 cm behind the mirror. What is the focal length of the mirror.
(a) -4.1 cm   **(c) -9.9 cm**
(b)-8.2 cm   (d) -20 cm

5. The index of refraction depends on:
(a) The focal length   **(c) the speed of light**
(b) The image distance   (d) the object distance

6. Which type of image is formed by a concave lens on a screen?
(a) Inverted and real   (c) inverted and virtual
(b) Upright and real   **(d) upright and virtual**

7. Which type of image is produced by the converging lens of human eye if it views, a distant object?
(a) Real, erect, same size   **(c) real, inverted, diminished**
(b) Virtual, erect, diminished   (d) virtual, inverted, magnified

8. Image formed by a camera is:
(a) Real. Inverted and diminished   (c) virtual, inverted, diminished
(b)Virtual, upright and magnified   (d) virtual, inverted, magnified

9. If a ray of light in glass is incident on an air surface at an angle greater than the critical angle, the ray will:
(a) Refract only   **(c) reflect only**
(b) Partially refract and partially reflect   (d) diffract only

10. The critical angle for a beam of light passing from water into air is 48.8 degrees. This means that all light rays with an angle of incidence greater than this angle will be:
(a) absorbed   **(c) totally reflected**
(b) partially reflected and partially transmitted   (d) totally transmitted

(Exercise Short Questions)

Q1:   What do you understand 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, this is called* Reflection of light".

Q2:   Describe the following terms used in Reflection:
     (i) *Normal*   (ii) *Angle of Incidence*   (iii) *Angle of Reflection*
Ans:

(i) *Normal*: Normal is the perpendicular at the point of incidence.
(ii) *Angle of incidence*: The angle with which a light ray strikes a reflecting surface.
(iii) *Angle of reflection*: The angle between a reflected ray and the normal drawn at the point of incidence to a reflecting surface.

Q3:   State Laws of Reflection?
Ans: *Laws of Reflection*:
     ➢ ***First law of Reflection*:** The incident ray, the normal, and the reflected ray at the point of incidence all lie in the same plane.
     ➢ ***Second law of Reflection*:** The angle of incidence is equal to the angle of reflection**.**

Q4:   Define Refraction of Light?
Ans: "*Bending effect of light as it passes from one transparent material into another is called* Refraction of light".

Q5:   Define the following terms used in refraction:
          (i) *Angle of incidence*   (ii) *Angle of refraction*
Ans: *Angle of incidence*: The angle that the incident ray makes with the normal is referred as the angle of incidence.
     Angle of refraction: The angle that the refracted ray makes with the normal line is referred to as the angle of refraction.

Q6:   What is meant by Refractive index of a material?
Ans: When a ray of light passes from one particular medium to another, the ratio of the sin of the angle of incidence to the sin of the angle of refraction is constant. This constant ratio is called the *refractive index*.
$$n = \frac{Sin\ i}{Sin\ r}$$

Q7:   State the Laws of Refraction of Light?
Ans: *First law of Reflection*: The incident ray, the normal, and the reflected ray at the point of incidence all lie in the same plane.
     ***Second law of Reflection*:** For two particular media, the ratio of the sin of the angle of incidence to sin of the angle of refraction is a constant.

Q8:   What is meant by the term Total Internal reflection?
Ans: The angle of incidence for which the angle of refraction becomes 90 is called critical angle. When the angle of incidence becomes larger than the critical angle, no refraction occurs. The entire light is reflected back into the denser medium. This is known as Total Internal reflection.

Q9: State the conditions for Total Internal reflection?
Ans: *Conditions for total internal reflection*:
   (1) The ray of light passes from denser to a less dense medium.
   (2) The angle of incidence in the denser medium is greater than the critical angle.

Q10: What is Critical Angle?
Ans: "*The critical angle is defined as the angle of incidence in the optically denser medium for which the angle of refraction in the less dense medium is 90 °*"

Q11: What are Optical Fibers?
Ans: An optical fibre cable is a bundle of glass fibres with thickness of a human hair.

Q12: Define the following terms applied to a lens:
            (i) Principal axis   (ii) Optical centre   (iii) Focal length Ans:
(i) *Principal axis*: Each of the two surfaces of a spherical lens is a section of a sphere. The line passing through the two centres of curvatures of the lens is called *Principal axis*.
(ii) *Optical centre*: A point on the principal axis at the centre of lens is called *Optical centre*.
(iii) *Focal length*: The focal length is the distance between the optical centre and the principal focus.

Q13: What is meant by the Principal focus of a: (a) Convex lens (b) Concave lens
Ans: *Principal focus of Convex lens*: The light rays travelling parallel to the principal axis of a concave lens after refraction meet at a point on the principal axis called principal focus or focal point. Hence convex lens is called *converging lens*.
     Principal focus of Concave lens: The parallel rays appear to come from a point behind the lens called principal focus. Hence concave lens is also called *diverging lens*.

Q14: Describe how light is Refracted through Convex lens?
Ans: Refraction of light through convex lens can be described with the help of three principal rays as:
   (1) The ray parallel to the principal axis passes through the focal point after refraction by the lens.
   (2) The ray passing through the optical center passes straight through the lens and passes deviated.
   (3) The ray passing through the focal point becomes parallel to the principal axis after refraction by the lens.

Q15: A coin is placed at a focal point of a converging lens. Is an image formed? What is its nature?
Ans: A coin is placed at a focal point of a converging lens. No image is formed because the refracted rays are parallel and never meet.

Q16: What are the Differences between Real and Virtual Images?
Ans:

Real Images	*Virtual Images*
Real image usually appear inverted.	Virtual image usually appears erect.
Real images can be obtained on a screen.	Virtual image cannot be obtained on screen.
On mirror, Real images lie in front of the reflecting surface.	On mirror, Virtual image lies behind the mirror.
On lens, Real images lie on the other side of the object.	On lens, Virtual images lies on the same side of the object.
Light rays meet at a focal point in front of the mirror.	Light rays meet at a focal point behind the mirror.

Q17: How does a converging lens form a virtual image of a Real object? How does a diverging lens can form a real image of a Real object?
Ans: A converging lens can form a virtual image of a real object. If the object is placed between lens and principal focus, a virtual image can be obtained.

Image formed by diverging lens: No, it is not possible for a diverging or a concave lens to form a real image of real object because when you extend its light ray, they diverge and never end up intersecting.

Q18: Define Power of a lens and its Units?

Ans: "Power of a lens is defined as *the reciprocal of its focal length in metres*"

   Unit: SI unit of power of a lens is *dioptre* denoted by a symbol *D*.

Q19: Define the terms Resolving Power and Magnifying Power?

Ans:

Resolving Power	*Magnifying Power*
Resolving power of an instrument is its ability to reveal the minor details of the object under examination.	The ratio of the angles subtended by the image as seen through the optical device to that subtended by the object at the unaided eye.

Q20: What is meant by the terms Nearsightedness and Farsightedness? How can these defects be corrected?

Ans: ***Nearsightedness (myopia)***: "*Some people cannot see distant objects clearly without the aid of spectacles. This defect of vision is known as Short sight or Nearsightedness*".

Correction of Nearsightedness: The nearsighted eye can be corrected with glass or contact lenses that use diverging lenses.

   Farsightedness (hypermetropia): "*The disability of the eye to form distinct images of nearby objects on its retina is known as Farsightedness*".

Correction of Farsightedness: Farsightedness can be corrected with the aid of a suitable converging lens.

Q21: Define Lens?

Ans: A lens is any transparent material having two surfaces, of which at least one is curved.

Q22: Why the position of fish inside the water seems to be at less depth than that of its actual position?

Ans: The position of a fish inside the water seems to be at less depth than that of its actual positions due to refraction of light.

Q23: Define Endoscopy?

Ans: A medical procedure suing any type of endoscope is called endoscopy.

Q24: Why or why not concave mirrors are suitable for make up?

Ans: Concave mirror are used for makeup because concave mirrors are curved inwards and make the person's image larger as he\she approaches the mirror.

Q25: Difference between telescope and microscope?

Ans:

	Telescope	**Microscope**
1	Telescope is an optical instrument which is used to observe distant objects using lenses or mirrors.	Microscope has two converging lenses, which is used to investigate structure of small objects.
2	In refracting telescope, an objective forms a real image of the distant object while an eyepiece forms a virtual image that is viewed by the eye.	A compound microscope is used to study bacteria and other micro objects.

Q26: Define Light Pipe?

Ans: Light pipe is a bundle of thousands of optical fibres bounded together.

Q27: What is meant by principal focus or focal point?

Ans: After reflection, ray of light parallel to the principal axis converge to a point F, this point is called "The Principal Focus"

Q28: Under what conditions will a converging lens form a virtual image?
Ans: The image is behind the object, virtual, erect, and larger than the object.
Q29: Under what conditions will a converging lens form a real image that is the same size as the object?
Ans: The image is at 2F, real, inverted, the same size as the object.
Q30: Define Prism?
Ans: Prism is a transparent object which has five faces. Three faces are rectangular and two faces are triangular.

(Important Extra Short Questions)

Q31: Define Accommodation?
Ans: The variation of focal length of eye lens to form a sharp image on retina is called Accommodation.

Q32: Define Mirror Formula or Lens Formula? Ans:

Mirror Formula or Lens Formula is:
$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

Q33: Define Spherical Mirror?
Ans: A mirror whose polished, reflecting surface is a part of a hollow sphere of glass or plastic is called a spherical mirror.

Q34: Difference between Regular and Irregular Reflection?
Ans:

Regular Reflection	Irregular Reflection
The reflection by smooth surfaces is called regular reflection.	The reflection by rough surfaces is called irregular reflection.

Q35: Difference between Convex and Concave Mirror?
Ans:

Concave Mirror	Convex Mirror
A spherical mirror whose inner curved surface is reflecting is called Concave mirror.	A spherical mirror whose outer curved surface is reflecting is called Convex mirror.
The focus is in front of the mirror.	The focus lies behind the mirror.

Q36: Define Snell's Law and write its formula?
Ans: The ratio of the sin of the angle of incidence i to the sin of the angle of refraction r is always equal to a constant. This is also called Snell's law.

Formula: $n = \dfrac{Sin\ i}{Sin\ r}$

Q37: Find the focal length of convex lens if its power is 5D?
Ans: We know that: $f = \dfrac{1}{P} = \dfrac{1}{5} = 0.2$ m

M.C.Q's

Q: Multiple Choice Questions:

1. A positive electric charge:

(a) Attracts other positive charge

(c) repels other positive charge

(b) Attracts a neutral charge

(d) repels a neutral charge

2. An object gains excess negative charge after being rubbed against another object which is:

(a) Neutral

(c) positively charged

(b) Negatively charged

(d) either a, b or c

3. Two unchanged objects A and B are rubbed against each other.

(a) Remains unchanged

(c) becomes positively charged

(b) Becomes negatively charged

(d) unpredictable

4. When you rub a plastic rod against your hair several times and put it near some bits of paper, the pieces of papers are attracted towards it. What does this observation indicate?

(a) The rod acquires a negative charge

(c) the rod acquires a positive charge

(b) The rod and the paper are oppositely charged

(d) the rod and the paper has the same charges

5. According to coulomb's law, what happens to the attraction of two oppositely charged objects as their distance of separation increases?

(a) Increases

(c) decreases

(b) Remains unchanged

(d) cannot be determined

6. The coulomb's law is valid for the charges which are:

(a) Moving and point charges

(c) moving and non-point charges

(b) Stationary and point charges

(d) stationary and large size charges

7. A positive and a negative charge are initially 4 cm apart. When they are moved closer together so that they are now only 1 cm apart, the force between them is:

(a) 4 times smaller than before

(c) 4 times larger than before

(b) 8 times larger than before

(d) 16 times larger than before

8. Five joules of work is needed to shift 10 C of charge from one place to another, The potential difference between the places is:

(a) 0.5 V

(c) 5 V

(b) 2 V

(d) 10 V

9. Two small charged spheres are separated by 2 mm. Which of the following would produce the greatest attractive force?

(a) +1 q and +4 q

(c) +2 q and +2 q

(b) -1 q and -4 q

(d) +2 q and -2 q

10. Electric field lines:

(a) Always cross each other

(c) cross each other in the region of strong field

(b) Never cross each other

(d) cross each other in the region of weak field

11. Capacitance is defined as:

(a) VC

(c) V/Q

(b) **Q/V**

(d) QV

(Exercise Short Questions)

Q1: How electric charge is produced?
Ans: The electric charge is produced by rubbing a neutral body with another neutral body.

Q2: Define electrostatic induction?
Ans: If in the presence of charged body, an insulated conductor has like charges at one end and unlike charges at the other end then this is called the *electrostatic induction*.

Q3: What is Gold leaf electroscope?
Ans: "*The gold leaf electroscope is sensitive instrument for detecting charges*".

Q4: How can a charge are detected on a body?
Ans: In order to detect the presence of charge on anybody, bring the body near the disk of an unchanged electroscope. If the body is neutral there will be no deflection of the leaves. But if the body is positively or negatively charged, the leaves of the electroscope diverge.

Q5: Define Charge?
Ans: Charge is the property of a body which attracts or repels the other bodies.

Q6: Explain Coulomb's law of electrostatics and write its mathematical form?
Ans: "*The force of attraction or repulsion between two point charges is directly proportional to the product of the magnitude of charges and inversely proportional to the square of the distance between them*".
Mathematical form: If there are two point charges q_1 and q_2, separated by a distance (r), then the electrostatic force F between the charges.

$$F \propto q_1 q_2$$
$$\text{Force} \propto 1/\text{Distance}^2$$
$$F \propto 1/r^2$$

Combining above both two equations:

$$F \propto q_1 q_2/r^2$$
$$F = q_1 q_2/r^2$$

Above equation is called Coulomb's law.

Q7: What is meant by Electric field and Electric intensity?
Ans: *Electric Field*: The electric field is a region around a charge in which it exerts electrostatic force on another charges.

Electric field Intensity: The strength of electric field at any point in space is known as electric field intensity.

Q8: For what purpose electroscope is used?
Ans: Electroscope is used to detect the presence of charge an a body.

Q9: How would you define Potential difference between two points? Define its unit.
Ans: Potential difference between two points becomes equal to the energy supplied by the charge. Thus, we define potential difference between two points as the energy

supplied by a unit charge as it moves from one point to the other in the direction of the field.

Unit: Unit of potential difference is *Volt*.

Q10: What is meant by electroscope?

Ans: The instrument which is used to detect the presence of electric charge and a body is called electroscope.

Q11: What do you mean by the Capacitance of a capacitor? Define units of capacitance.

Ans: Capacitance of capacitor is defined as "*the ability of the capacitor to store charge*". It is given ratio of charge and the electric potential as:

$$C = \frac{Q}{V}$$

Unit: SI unit of capacitance is farad.

Q12: Derive the formula for the equivalent capacitance for a series combination of a number of capacitors?

Ans: In this combination, the capacitors are connected side by side.

$$V = V_1 + V_2 + V_3$$
$$V = \frac{Q}{C1} + \frac{Q}{C2} + \frac{Q}{C3}$$
$$V = Q \left(\frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3} \right)$$
$$\frac{V}{Q} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}$$
$$\frac{1}{Ceq} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}$$

Q13: Discuss different Types of Capacitors?

Ans: Capacitors are either *Variable* or *Fixed*.

(1) *Fixed Capacitor*: - **(a)** Paper Capacitor. **(b)** Mica Capacitor.

(2) *Variable Capacitor*.

Q14: What is difference between variable and fixed type capacitor?

Ans: A **fixed capacitor** is constructed in such manner that it possesses a fixed value of capacitance which cannot be adjusted. While in **variable type of capacitors** some arrangement is made to change the area of the plates facing each other.

Q15: Enlist some Uses of capacitors?

Ans: _Uses of Capacitors_:

(i) Capacitors are used for tuning transmitters, receivers and transistor radios.

(ii) Capacitors are used in electronic circuits of computers.

(iii) Capacitors are used to differentiate high and low frequency.

Q16: Discuss one Application of static electricity?

Ans: Powder Painting use static electricity to paint new cars.

Q17: What are Hazards of static electricity?

Ans: Hazards of static electricity are as follows given: -

 (a) Lightning. **(b)** Fires or Explosions.

Q18: Write the use of capacitor?

Ans: 1. Tuning transmitters. **2.** Table fans, exhaust fans
 3. Receiver and transistor radios

Q19: What is the difference between capacitor and dielectric?

Ans:

Capacitor	Dielectric
A device used for storing electric charge is called a capacitor.	The medium between the two plates is air or a sheet of some insulator. This medium is known as dielectric.

Q20: In what direction will a positively charged particle move in an electric field?

Ans: It depends upon the source of electric current.

Q21: Define Volt?

Ans: If one joule of work is done against the electric field in bringing one coulomb positive charge from infinity to a point in the electric field then the potential at that point will be one volt.

Q22: Define electric potential?

Ans: Electric potential at a point in an electric field is equal to the amount of work done in bringing a unit positive charge from infinity to that point.

Q23: Describe two properties of electric lines of force?

Ans: 1. Field lines always move away from positive charge towards negative charge.

2. The spacing between the field lines shows the strength of electric field.

Q24: Define electric field lines?

Ans: In electric field, the direction of electric intensity is represented by lines which are called electric field lines.

Q25: What is unit of capacitance? Define it.

Ans: The SI unit of capacitance is farad.

(Important Extra Short Questions)

Q26: Define electrolyte?

Ans: Electrolyte is a solution in which current flow because of ions.

Q27: Write two uses of electrostatics?

Ans: 1. Electrostatics is used in photocopying.

2. Electrostatics is used in Car Painting.

Q28: How a capacitor store charge?

Ans: The charge on each plate attract each other and thus remained bound with in the plates, in this way charge is stored in a capacitor for long time.

Q29: Distinguish between watt and kilowatt hour?

Ans:

Watt	Kilowatt hour
The electric power is said to be one watt if one joule of energy is supplied by current in one second.	The amount of energy delivered by a power of one kilowatt in one hour is called kilowatt hour.

Q30: Define electrostatics?

Ans: The study of charges at rest is called electrostatics.

Current Electricity

M.C.Q's

Answers

1	D	2	C	3	B	4	C	5	A
6	A	7	C	8	C	9	A		

CHAPTER 14

Current Electricity

(Exercise Short Questions)

Q1: Define the term Electric Current?
Ans: "*The rate of flow of electric charge through any cross-sectional area is called Electric current*"

Formula: Current = $\dfrac{\text{Charge}}{\text{Time}}$ or $I = \dfrac{Q}{t}$

Unit: SI unit of Current is *Ampere (A).*

Q2: What is the difference between Electronic current and Conventional current?
Ans:

Electronic Current	*Conventional Current*
The current due to motion of negative charges that flows from the negative terminal of the battery to the positive terminal in the electrical circuit is called *Electronic current*.	The current due to motion of positive charges that flows from positive terminal of battery to its negative terminal is called *Conventional current*.

Q3: How can we differentiate between e.m.f and Potential difference?
Ans:

E.M.F	*Potential Difference*
(i) Electromotive force is the total voltage in the battery.	Potential difference is the work done in moving a charge against the electric field.
(ii) Electromotive force is always greater.	Potential difference is always small.
(iii) EMF is only applicable to an electric field.	Potential difference is only applicable to magnetic, gravitational and electric field.

Q4: Define Ohm's Law?
Ans: If V is the potential difference across the two ends of any conductor, then current I will flow through it. The value of the current changes with the changes in potential difference and explained by ohm's law.

Q5: Define Resistance and its Units?
Ans: "*The property of a substance which offers opposition to the flow of current through it is called its Resistance.*"
Unit: SI unit of resistance R is ohm.

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Q6:   What is the difference between Conductors and Insulators?
Ans:

Conductors	Insulators
(i) A material or an object that conducts heat, electricity, light or sound is called Conductors.	A material that does not easily transmit energy, such as electric current or heat is called Insulators.
(ii) Conductors have very small value of resistance.	Insulators have very large value of resistance.
Example: Gold and Silver	*Example:* Wood and Plastic

Q7:   What is Joule's law?
Ans: *Joule's Law*: The amount of heat generated in a resistance due to flow of charges is equal to the product of square of current (I), resistance (R) and the time duration (t).

Q8:   What is difference between D.C and A.C?
Ans:

Direct Current	Alternating Current
(i) If the current flows in only one direction it is called direct current.	If the current constantly changes direction, it is called alternating current.
(ii) The positive and negative terminals of d.c sources have fixed polarity.	Alternating current is a current which changes its polarity again and again.
(iii) The current derived from a cell or a battery.	The current is produced by A.C generation.

Q9:   Discuss the main features of Parallel combination of resistors?
Ans: In parallel combination one end of each resistor is connected with positive terminal of battery while the other end of each resistor is connected with the negative terminal of battery.

> *Equivalent resistance*: From Ohm's Law:

$$\frac{V}{R_e} = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$$

$$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots\ldots + \frac{1}{R_n}$$

Q10: Determine the equivalent resistance of Series combination of resistors?
Ans: In series combination, resistors are connected end to end and electric current has a single path through the circuit. This means that the current passing through each resistor is the same.

> *Equivalent resistance*: From Ohm's Law:

$$V = IR$$
$$IR_e = I(R_1 + R_2 + R_3 + \ldots\ldots)$$
$$R_e = R_1 + R_2 + R_3 + \ldots\ldots$$

Q11: Describe briefly the Hazards of household electricity?
Ans: Major dangers of electricity are electric shock and fire by short circuit.

Q12: Describe two safety measures that should be taken in connection with the household circuit?
Ans: Take much care to use *fuses* and *circuit breakers* in an electric circuit as safety devices.

Q13: Define circuit breaker?
Ans: The circuit breaker acts as a safety device in the same way as a fuse.

Q14: What is a difference between a cell and a battery?
Ans: A cell is a single unit at the base voltage. A battery can be a single cell or multiple cells connected together in series or parallel to make the voltage/current rating desired.

Q15: Can current flow in a circuit without potential difference?
Ans: No, current does not flow in a circuit without potential difference. Current flows from higher potential to a lower potential.

Q16: What are damp conditions?
Ans: Never operate any electrical appliance with wet hands. Also keep switches, plugs sockets and wires dry.

Q17: In order to measure current in a circuit why ammeter is always connected in series?
Ans: In order to measure current in a circuit the ammeter is connected in series, so the current flowing in the circuit also passes through the ammeter.

Q18: In order to measure voltage in a circuit voltmeter is always connected in parallel. Discuss?
Ans: Voltmeter is always connected in parallel with the resistance across which the potential difference is to be measured. Higher the resistance of the voltmeter, more reliable would be its readings.

Q19: What is meant by earth wire?
Ans: There is no current in earth wire. The earth wire is connected to a large metal plated buried deep in the ground near the house.

Q20: Why diamond does not conduct electricity?
Ans: Diamond does not conduct electricity because it has no free electrons.

Q21: Define electric potential and write its unit?
Ans: Electric potential at a point in an electric field is equal to the amount of work done in bringing a unit positive charge from infinity to that point.
    Unit: The unit of electric potential is Volt (V)

Q22: Define unit of power?
Ans: The unit of electric power is Watt.
    Watt: The electric power is said to be one watt if one joule of energy is supplied by current in one second.

Q23: Does a fuse in a circuit control the potential difference or the current?
Ans: Fuse in a circuit controls the excess amount of current.

Q24: Differentiate between Galvanometer and Ammeter?
Ans:

Galvanometer	Ammeter
Galvanometer is very sensitive instrument and can detect small current in a circuit.	Ammeter is also used to measure current. A current as 1A to 10A can be measured by ammeter.

Q25: Define unit of current?
Ans: SI unit of current is ampere (A)
    Ampere: If a charge of one coulomb passes through a cross sectional area in one second, then current is one ampere.

Q26: Define Ohmic and Non-Ohmic Materials?
Ans:

Ohmic Materials	Non-Ohmic Materials
Materials that have a constant resistance over change of voltages and currents.	Materials having resistance that changes with voltage or current.

Q27: Define Resistivity and write its unit?
Ans: The resistance of one metre cube of a substance is called resistivity.
    Unit: The unit of resistivity is ohm metre.

Q28: Define Kilowatt hour?
Ans: The amount of energy delivered by a power of one kilowatt in one hour is called kilowatt hour.

Q29: Define electric power?
Ans: The amount of energy supplied by current in unit time is known as electric power.

M.C.Q's

Answers

1	D	2	B	3	D	4	A	5	C
6	C	7	D	8	B	9	D		

CHAPTER 15

Electromagnestism

(Exercise Short Questions)

Q1: What is meant by intensity of magnetic field?
Ans: The number of magnetic lines of force passing through any surface.

Q2: State and explain the Right Hand Grip Rule?
Ans: A simple method of finding the direction is of magnetic field around the conductor is the Right Hand Grip Rule. "*Grasp a wire with your right hand such that your thumb pointed in the direction of the current. Then curling fingers of hand will point in the direction of the magnetic field*".

Q3: Define the principle of A.C generator?
Ans: When a coil rotates in a magnetic field, the induced current in it continuously changes from maximum to minimum value and from minimum to maximum value and so on. This is the basic principle on which an A.C generator works.

Q4: Under what condition the magnetic flux will be minimum and maximum?
Ans: Magnetic flux is maximum when magnetic field lines are perpendicular to the area. Similarly magnetic flux is minimum when magnetic field lines are parallel to the area.

Q5: Write the use of relay?
Ans: The relay is used to control a large current with the help of small current.

Q6: What is an Electric Motor?
Ans: "*That device which converts electric energy into rotational kinetic energy*".

Q7: Define electromagnet?
Ans: The type of temporary magnet, which is created when current flows through a coil is called an electromagnet.

Q8: Write two factors affecting induced e.m.f?
Ans: The magnitude of induced e.m.f in a circuit depends on the following factors:

1. Speed of relative motion of the coil and the magnet.
2. Number of turns of the coil.

Q9: State Lenz's law?
Ans: The direction of an induced current in a circuit is always such that it opposes the cause that produces it.

Q10: What do you understand by the term Mutual Induction?
Ans: "*The phenomenon of production of induced current in one coil due to change of current in a neighboring coil is called Mutual Induction*".

Q11: What is Transformer?
Ans: "*The transformer is a practical application of mutual induction*".

(Important Extra Short Questions)

Q12: Define electromagnetism?
Ans: Electromagnetism is the study of magnetic effects of current.
Q13: What is meant by solenoid?
Ans: A coil of wire consisting of many loops is called a solenoid.
Q14: Which device is used for converting electrical energy into mechanical energy?
Ans: An electric motor is used to convert electrical energy into mechanical energy.
Q15: Describe Fleming's left hand rule?
Ans: Stretch the thumb, forefinger and the middle finger of the left hand mutually perpendicular to each other. If the forefinger points in the direction of the magnetic field, the middle finger in the direction of the current, then the thumb would indicate the direction of the force acting on the conductor.
Q16: What is the difference between a generator and a motor?
Ans: The primary difference between a motor and a generator is that a motor converts electrical energy into mechanical energy and a generator converts mechanical energy into electrical energy.
Q17: Define electromagnetic induction?
Ans: The process of generating an induced current in a circuit by changing the number of magnetic lines of force passing through it is called electromagnetic induction.
Q18: Can a transformer operate on direct current?
Ans: No, a transformer cannot operate on direct current because direct current gives constant magnetic flux.
Q19: How many coils are used in a transformer?
Ans: There are two coils in transformer. One is primary coil and other is secondary coil.
Q20: Define step up transformer?
Ans: If the secondary voltage V_s is larger than the primary voltage V_p, the transformer is called a step-up transformer.
Q21: Define step down transformer?
Ans: If the secondary voltage V_s is smaller than the primary voltage V_p, the transformer is called a step-down transformer.
Q22: Define armature?
Ans: In a practical electric motor the coil, called the armature. It is made of many loops mounted on a shaft or axle.
Q23: Define ideal transformer?
Ans: In an ideal transformer, the electric power delivered to the secondary circuit is equal to the power supplied to the primary circuit.
Q24: Write two ways to increase the magnetic force?
Ans: 1. the current in the wire is increased.
　　　2. Strength of magnetic field is increased.
Q25: How the direction of magnetic field lines is determined in current carrying straight wire?
Ans: The direction of the magnetic field is governed by the direction of the current flowing through the conductor.
Q26: What is the function of split rings in the D.C motor?
Ans: To reverse the direction of current, the connection to coil is made through an arrangement of brushes and a ring that is split into two halves called a split ring commutator.

M.C.Q's

Answers

1	D	2	D	3	C	4	D	5	C
6	A	7	B						

CHAPTER 16

Electronics

(Exercise Short Questions)

Q1: Define Electronics?

Ans: Electronics is the branch of physics that deals with the control of motion of electrons using different devices.

Q2: Explain the working of different Parts of Oscilloscope?

Ans: Parts of Oscilloscope are:

i) The electron gun with control grid.
ii) The deflecting plates.
iii) A fluorescent screen.

Q3: Name Some Uses of Oscilloscope?

Ans: Uses of Oscilloscope:

i) It is used in many fields of science; displaying waveforms, measuring voltage, range finding and echo sounding.
ii) It is used to display heart beats.

Q4: What is cathode ray oscilloscope?

Ans: The cathode ray oscilloscope is an instrument which is used to display the magnitudes of changing electric currents or potentials.

Q5: What is Electron gun? Describe the process of thermionic emission?

Ans: *Electron Gun*: **"**Electron gun is used to investigate the properties of electron beam". The electrons are produced by thermionic emission from a tungsten filament heated by 6 V supply.

    Thermionic emission: The process of emission of electrons from the hot metal surfaces is called *Thermionic emission*.

Q6: What do you understand by Digital and Analogue Quantities?

Ans:

Analogue Quantities	*Digital Quantities*
i) The quantities whose values vary continuously are known as Analogue Quantities.	The quantities whose values vary in non-continuous manner are called Digital Quantities.
ii) Time, Pressure, Distance etc.	0 and 1 Numbers.

Q7: **Differentiate between Analogue and Digital Electronics. Write down name of five Analogue and five Digital device that are commonly used in everyday life?**
Ans:

Analogue Electronics	*Digital Electronics*
The branch of electronics consisting of circuits which process analogue quantities is called *Analogue electronics.*	The branch of electronics which deals with digital quantities is called *Digital electronics.*

Analogue Devices	*Digital Devices*
➢ Loud speaker	Modern telephone system
➢ Radio	Naval and other systems of military importance
➢ Temperature sensor	Computer

Q8: **Define Boolean Algebra?**
Ans: The algebra used to describe logic operations by symbols is called Boolean algebra
Q9: **Write down some benefits of using Digital electronics over Analogue electronics?**
Ans:

1. Digital electronics require Boolean algebra which is very simple.
2. In digital electronics only 1 and 0 are used so data error is reduced.
3. Circuit of digital electronics is small.

Q10: What are the Three Universal Logic Gates? Give their Symbols and Truth tables.
Ans: *Universal Logic Gates*: A universal logic gate is one that can be put together in different configurations to perform all the Boolean operations.
   (1)*AND Gate*.   **(2)** *OR Gate*.   **(3)** *NOT Gate*.
   (1) **AND Gate**: The circuit which implements the AND operation is known as *AND Gate*.
      Symbol, Truth Table:

A	B	X=A.B
0	0	0
0	1	0
1	0	0
1	1	1

   (2) **OR Gate**: The electronic circuit which implements the OR operation is known as *OR Gate*.
      Symbol, Truth Table:

A	B	X=A+B
0	0	0
0	1	1
1	0	1
1	1	1

   (3) **NOT Gate**: The electronic circuit which implements NOT operation is known as *NOT Gate*.
      Symbol, Truth Table:

A	A
0	1
1	0

Q11: Name two factors which can enhance thermionic emission?
Ans:

(a) Magnitude of the charge flow increases dramatically with increasing temperature.
(b) The substance used as a filament because different materials have different number of free available electrons.

Q12: Give three reasons to support the evidence that cathode rays are negatively charged electrons?

Ans:

(a) Negatively charged particles are primarily that they are deflected by a magnet in just the same way as moving negatively electrified particles.
(b) The cathode rays are deflected and accelerated towards positively charged plate.
(c) They are negative in nature.

Q13: Write the use of logic gates?

Ans: Logic gates are used in safety alarm and alarm gate.

Q14: When a moving electron enters the magnetic field, it is deflected from its straight path. Name two factors which can enhance electron deflection?

Ans: Following are the two factors which can enhance electron deflection:

(a) Angle between magnetic lines and the moving electron is matter.
(b) The intensity of magnetic field, more the intensity of magnetic field more will be the deflection force.

Q15: How can you compare the logic operation X = A.B with usual operation of multiplication?

Ans: It is called AND gate. The truth table of this gate is given below:

A	B	X
0	0	0
1	0	0
0	1	0
1	1	1

Q16: NAND gate is the reciprocal of AND gate. Discuss

Ans: In Truth Table of NAND gate, it is clear that it is the reciprocal of AND gate.

A	B	$X = \overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0

A	B	$X = A.B$
0	0	0
0	1	0
1	0	0
1	1	1

(Important Extra Short Questions)

Q17: What is meant by ADC and DAC?

Ans: The circuit which converts the analogue signals to digital signals.
The circuit which converts the digital signals to analogue signals.

Q18: Define bit and byte?

Ans: "A bits represents data using 1's and 0's" While "Eight bit is a byte"

Q19: Name two factors which enhance thermonic emission?

Ans: Thermonic emission depends upon the temperature voltage and nature of material.

Q20: What do you mean by fluorescent screen?

Ans: The screen of a cathode-ray tube consists of a thin layer of phosphor.

Q21: Define Logic function OR Logical Operations?

Ans: The binary arithmetic operations with binary digits "1" and "0".

Q22: Write the components of CRO?

Ans: 1. The electron gun.   **2.** The deflecting plates.   **3.** A fluorescent screen.

Q23: Define truth table?

Ans: Set of inputs and outputs in binary form is called truth table.

M.C.Q's

Answers

1	C	2	B	3	D	4	C	5	C
6	D	7	B						

CHAPTER 17

Information & Communication Technology

(Exercise Short Questions)

Q1: **What is difference between data and information?**
Ans: *Data***:** Data is raw material for data processing. Data relates to fact, event and transactions.

    Information: Information is data that has been processed in such a way as to be meaningful to person who receives it.

Q2: **What do you understand by information and communication technology (ICT)?**
Ans: *Information and Communication Technology (ICT)* is defined as the scientific methods and means to store, process and transmit vast amounts of information in seconds with the help of electronic equipment's.

Q3: **What are the components of information technology?**
Ans: There are *five* components of information technology:
   *(a)*Hardware   *(b)* Software   *(c)* Data   *(d)* Procedures   *(e)* People

Q4: **Differentiate between the Primary memory and the Secondary memory?**
Ans:

	Primary memory	*Secondary memory*
1	The processor or the CPU directly stores and retrieves information from it.	It stores the data permanently unless it is erased.
2	The primary memory has two types RAM and ROM.	The secondary memory is usually available in the form of floppy disk storage media, hard disk, CD Disk, CD and DVD.

Q5: **Name different information storage devices and describe their uses?**
Ans: Audio-video tapes, compact disks, laser disks, floppy disks and other disks are used for storing information. These devices can store a huge amount of information in a very small space.

Q6: **Explain briefly the transmission of radiowaves through space?**
Ans: Electrical signals representing information from a microphone, TV camera, or a computer can be sent from one place to another place using either cables or radio waves.

Q7: **How light signals are sent through optical fibre?**
Ans: Interesting application of principle of total internal reflection is used in optical fibres.
Q8: **What is Computer? What is the role of computer in everyday life?**
Ans: "*Computer is an electronic computing machine used for adding, subtracting or multiplying*".

    Importance of Computer: It is used in offices, hotels, railways, medical field, engineering and weather forecasting.
Q9: **What is the difference between Hardware and Software? Name different software**
Ans: *Hardware*: Hardware refers to the parts of a computer that you can see and touch. These include CPU, Monitor, Keyboard, Mouse, Printer etc.

    Software: Software refers to the instructions, or programs, that tell the hardware what to do.
Q10: **What do you understand by the term Word Processing and Data Managing?**
Ans: *Word Processing*: Word processing is such a use of computer through which we can write a letter, article, book or prepare a report.

    Data Processing: To collect all information regarding a subject for any purpose and to store them in the computer in more than one inter linked files which may help when needed, is called Data Processing.
Q11: **What is Internet?**
Ans: "*Internet is a network of networks, which spreads all across the globe*".
Q12: **Discuss the role of Information technology in School education?**
Ans: Importance of information technology in educational sector is well known. It helps the students as well as the teachers in studying the course material easily because of fast access.
Q13: **Why optical fibre is more useful tool for the communication process?**
Ans: Optical fibres are now widely used in telecommunication. They can carry much more information than copper wires. They are also lighter and are becoming cheaper to manufacture than copper wires.
Q14: **Which is more reliable floppy disk or a hard disk?**
Ans: Hard disk is more reliable. Because a typical floppy has a storage capacity of between 1 and 3MB, while a hard disk might hold hundreds or thousands of megabytes of information.
Q15: **What is the difference between RAM and ROM memories?**
Ans:

RAM	*ROM*
a) It is used to store the temporary information.	It is used to store the permanent information.
b) Speed of RAM is faster and boost up the speed.	Speed of ROM is slower and cannot boost up the speed.
c) Electricity is needed in RAM to flow to preserve information.	Electricity is not needed in ROM to flow for preserving information.
d) RAM is a chip.	ROM are generally optically drivers
e) The price of RAM is comparatively high.	The price of ROM is comparatively low.

(Important Extra Short Questions)

Q16: **Define telecommunication?**
Ans: The method that is used to communicate information to far off places instantly is called telecommunication.

Q17: What is meant by photophone?
Ans: Photo phone is a modern version of a cell phone in which user can also see the pictures of each other.
Q18: What is meant by fax machine?
Ans: Fax machines are must for many businesses around the world.
Q19: Write the two uses of internet?
Ans: 1.Web browsing this function allows user to view web pages.
    2. E-mail allows people to send and receive text messages.
Q20: What is the hard disk?
Ans: A hard disk is a rigid, magnetically sensitive disk that spins rapidly and continuously inside the computer chassis or in a separate box connected to the computer housing.
Q21: Write two advantages of e-mail?
Ans: 1.Fast communication.   2. Cost free service.
Q22: What is Flash drive?
Ans: A flash drive is a small storage device that can be used to transport files from one computer to another.
Q23: What is Cell phone?
Ans: Radio technology is applied in mobile phone. Cell phone sends and receives the message in the form of radio waves.
Q24: What are browsers? Give their two examples?
Ans: A browser is an application which provides a window to the web.
    Example : Google and Opera
Q25: BSC and MSC stand for which words?
Ans: BSC means Base Stations While MSC means Mobile Switching Centre.

M.C.Q's

Answers

1	A	2	B	3	B	4	D	5	B
6	D	7	B	8	A	9	B		

CHAPTER 18

Atomic & Nuclear Physics

(Exercise Short Questions)

Q1: What is difference between Atomic Number and Atomic Mass number? Ans:
Atomic Number: Atomic number is the number protons in the nucleus of an atom of the element.

    Atomic Mass Number: Atomic number is the total number of protons and neutrons in the atom.

Q2: What do you mean by the term radioactivity?
Ans: "*Radioactivity is such a process in which the elements with the charge number greater than 82, naturally keep on radiating*".

Q3: How can we make radioactive elements artificially?
Ans: For this purpose very high energy particles are bombarded on the stable element. This bombardment excites the nuclei and the nuclei after becoming unstable become radioactive element.

Q4: What are the three basic radioactive decay processes and how do they differ from each other?
Ans: There are following basic radioactive decay processes:
    (1) Alpha decay.   **(2)** Beta decay. **(3)** Gamma decay.

Q5: Write two properties of beta rays?
Ans: 1. Beta particles are of high energy electrons.
    2. Beta particles have speed as high as close to the speed of light.

Q6: Explain whether the atomic number can increase during nuclear decay?
Ans: Yes, atomic number can increase during nuclear decay. During the B-decay atomic number of atom can be increased.

Q7: What do you understand by half-life of a radioactive element?
Ans: "The time during which half of the unstable radioactive nuclei disintegrate is called the *half-life of a radioactive element*".

Q8: Is radioactivity a spontaneous process?
Ans: Radioactive decay involves the spontaneous transformation of one element into another. So, radioactivity is a spontaneous process.

Q9: What is meant by Background radiations?

Ans: Radiations present in atmosphere due to different radioactive substance are called background radiations. Everywhere in rocks, soil, water and air of our planet are traces of radioactive elements. This natural radioactivity is called the *background radiation*.

Q10: Describe two uses of radioisotopes in medicine, Industry or research?

Ans: *Use of radioactive isotope in medicine*:
  (1) Radioactive cobalt-60 is used for curing cancerous tumors and cells.
  (2) Isotopes of Iodine-131 are used for diagnosis of goiter in thyroid gland.
  ➢ *Use of Radioisotope in Industry or research*:
    1) The radioisotopes are used in a chemical reaction to follow a radioactive element during the reaction and ultimately to determine the structure.
    2) Radioactive isotopes are used to generate electricity by carrying out controlled nuclear fission reaction in nuclear reactors.

Q11: What are two common radiation hazards? Briefly describe the precautions that are taken against them.

Ans: *Common Radiations Hazards*:
  (1) Radiation burns, mainly due to beta and gamma radiations, which may cause redness and sores on the skin.
  (2) Blindness or formation of cataract in the eye.
  ➢ *Precautions*:
  (1) The sources should only be handled with tongs and forceps.
  (2) All radioactive sources should be stored in thick lead containers.
  (3) Never point a radioactive source towards a person.

Q12: What is meant by cosmic radiations?

Ans: The earth, and all living things on it also receive radiation from outer space, this radiation is called cosmic radiation.

Q13: Nuclear fusion reaction is more reliable and sustainable source of energy than nuclear fission chain reaction?

Ans: Fusion reaction produces very less or, if the right atoms are chosen, no radioactive waste. In case of nuclear fission large radioactive waste is produced and disposal of radioactive waste is a complicated problem. For nuclear power, fusion is the better choice.

(Important Extra Short Questions)

Q14: Define Isotopes?

Ans: Isotopes are atoms of an element which have same number of protons but different number of neutrons in their nuclei.

Q15: Define nuclear transmutation?

Ans: A process in which nucleus of an unstable heavy element breaks into two nuclei of lighter elements with the emission of radiation is called nuclear transmutation.

Q16: Define Ionization?

Ans: The phenomenon by which radiations split matter into positive and negative ions is called Ionization.

Q17: Write two properties of gamma rays?

Ans: 1. their wave lengths and energies can vary.
     2. Gamma rays is electromagnetic radiation of very short wave length.

Q18: Which has more penetrating power, an Alpha particle or a Gamma ray photon?

Ans: The alpha particle has the shortest range because of its strong interacting or ionizing power. The gamma rays can penetrate a considerable thickness of concrete. It is due to their large speed and neutral nature.

Q19: What is the difference between Natural and Artificial radioactivity?
Ans: _**Natural Radioactivity**_**:** Natural radioactivity arises from radioactive components contained in nature.

**Artificial Radioactivity****:** Artificial radioactivity will come through, elements produced, with in nuclear reactors as well as accelerators.

Q20: Define Fission reaction?
Ans: When a heavy nucleus such as U-235, splits or fissions, into two smaller nuclei by absorbing a slow moving neutron. This reaction is called nuclear fission reaction.

Q21: Define nuclear fusion. Write its equation?
Ans: When two light nuclei combine to form a heavier nucleus, this process is called nuclear fusion.

$$^{2}H + {}^{3}H \longrightarrow {}^{4}He + {}^{1}n$$
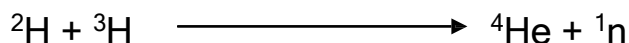
Q22: Define Carbon dating?
Ans: The age of a dead human, animal or tree can be estimated by comparing the activity of carbon-14 in the live and dead tree. The technique is called carbon dating.

Q23: Define Penetrating Power?
Ans: The strength of radiations to penetrate a certain material is called penetrating power.

Q24: What is meant by tracer?
Ans: Radioactive tracers are chemical compounds containing some quantity of radioisotopes.

Q25: Write two properties of α-Particle? Ans:
1.Alpha particles ejected at high speed.
2. Alpha particles have a range of only a few centimeters in air.

Q26: Define radioactive isotopes?
Ans: The stable and non-radioactive elements can also be changed into radioactive elements by bombarding them with protons, neutrons or alpha particles.

Q27: Difference between stable and unstable nuclei?
Ans: Nuclei which do not emit radiations naturally are called stable nuclei.
Nuclei which emit radiations naturally are called unstable nuclei.

Q28: Write Half-life of Hydrogen, Lead, Uranium and Carbon?
Ans: Half-life of Hydrogen = 12.3 years
Half-life of Lead = 10.6 years
Half-life of Uranium = 7.1×10^{8} years
Half-life of Carbon = 5730 years

Q29: Define atom and write its basic particles?
Ans: Atom is an indivisible particle of matter. Protons, Neutrons and Electrons are the basic particles of atom.

Q30: Define Electron Volt?
Ans: Electron volt is also a unit of energy used in atomic & nuclear physics.

$$\textbf{1ev} = \textbf{1.6} \times \textbf{10}^{-19} \textbf{ J}$$