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PHYSICS 12th CLASS

MOST IMPORTANT THEORY QUESTIONS FOR CBSE

BY

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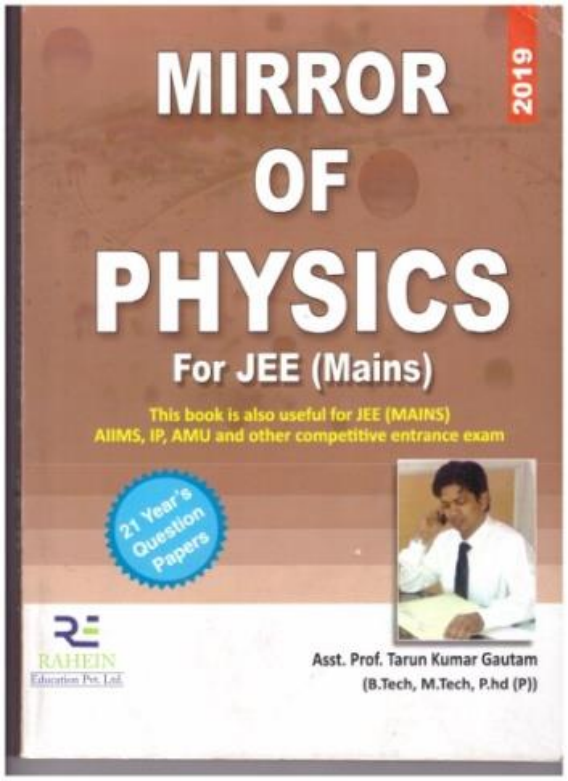
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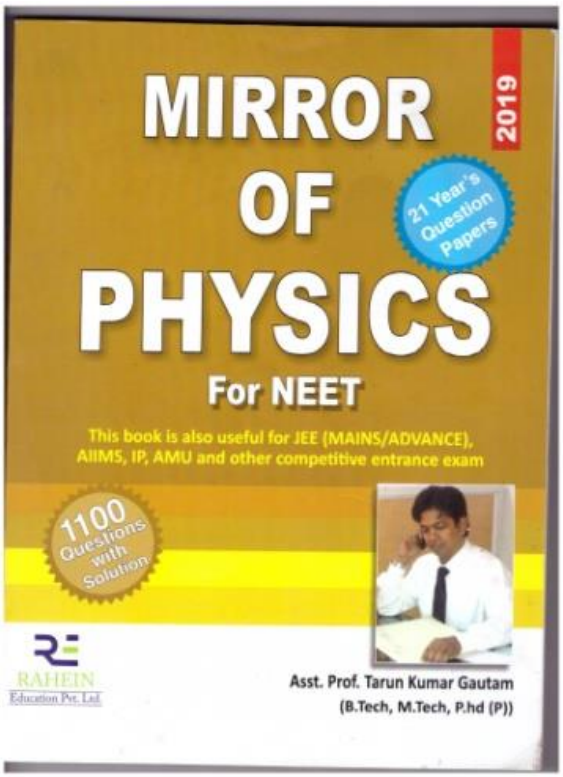
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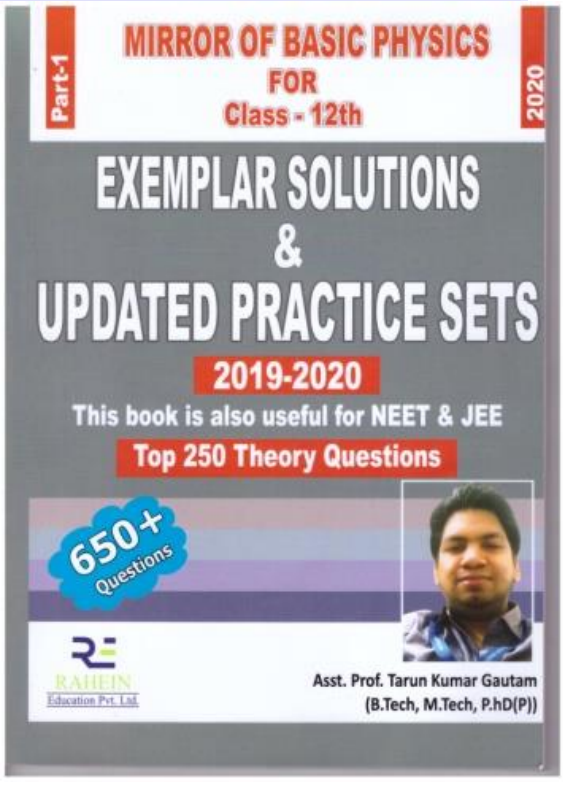
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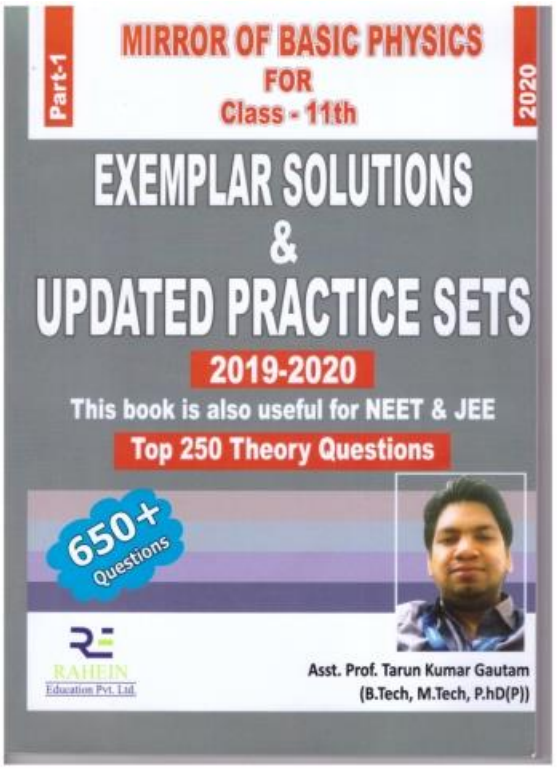
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Chapter 1: Electric Charge and Field

1) Write the vector form of coulomb's law and electric field?

2) Find the electric field at a point on the axial line of a dipole?

3) Find the electric field at any point along the equatorial line of an electric dipole?

4) Derive an expression for the torque acting on an electric dipole, which is held in uniform electric field, when the axis of the dipole makes an angle θ with the electric field. Hence define electric dipole moment?

5) Sketch the line of force of

(i) a point charge $q > 0$

(ii) a point charge $q < 0$

(iii) an electric dipole or two equal and opposite charges separated by a small distance.

(iv) two equal positive charges placed small distance apart in air, and

(v) a positively charged plane conductor

6) State and prove Gauss's theorem in electrostatics?

7) Using this theorem, derive an expression for the electric field intensity due to an infinitely long, straight wire of linear charge density λ cm^{-1}?

8) Using this theorem, derive an expression for the electric field intensity at a point near a thin infinite plane sheet of charge density σ cm^{-2}?

9) Using this theorem to calculate the electric field due to a uniformly charged spherical shell at a point?

(a) Outside the shell

(b) On the shell, and

(c) Inside the shell

10) Draw a graph showing the variation of electric field E with distance r from the centre of a uniformly charged thin spherical shell?

Chapter 2: Electric Potential and Capacitance

1) Define electric potential. Derive an expression for the electric potential at a distance r from a point charge q?

2) Draw graphs showing the variations of (i) electrostatic potential V and (ii) electrostatic field E with distance r from a charge q?

3) Derive an expression for the electric potential at a point along the axial line of the dipole?

4) Derive an expression for the electric potential due to an electric dipole?

5) Sketch equipotential surfaces for

(i) a positive point charge

(ii) two equal and opposite charges separated by a small distance

(iii) two equal and positive charges separated by a small distance

(iv) a uniform electric field

6) Define electric potential energy of a charge system. Derive expressions for the potential energy of a system of two point charges and three point charges and hence generalize the result for a system of N point charges.

7) Define the term electric dipole moment. Derive an expression for the total work done in rotating the dipole through an angle θ in uniform electric field $\vec{E}$?

8) Using Gauss's law, show that electric field inside a conductor is zero?

9) Show that the electrostatic potential is constant throughout the volume of a conductor and has the same value (as inside) on its surface?

10) What is electrostatic shielding? Mention its few applications?

11) Show that the capacitance of a spherical conductor is proportional to its radius. Hence justify that farad is a large unit of capacitance?

12) (a) Derive an expression for the capacitance of a parallel plate capacitor?

(b) What are the factors on which the capacitance of a parallel plate capacitor depends?

13) Derive an expression for the energy stored per unit volume in a charged parallel plate capacitor?

14) Two capacitors with capacity C_1 and C_2 are charged to potentials V_1 and V_2 respectively and then connected in parallel. Calculate the common potential across the combination, the charge on each capacitor, the electrostatic energy stored in the system and the change in the electrostatic energy from its initial value?

15) What are dielectrics? Distinguish between polar and non – polar dielectrics. Give examples.

16) How does a dielectric develop a net dipole moment in an external electric field when it has?

(i) Non – polar molecules and (ii) polar molecules?

17) Explain the effect of introducing a dielectric slab between the plates of a parallel plate capacitor on its capacitance. Derive an expression for its capacitance with dielectric as the medium between the plates.

18) Derive an expression for the capacitance of parallel plate capacitor with conducting slab inserted between its plates. Assume the slab thickness to be less than the plateseparation?

Chapter 3: Electric Current

1) Derive the terms drift velocity and relaxation time. Establish the relation between drift velocity of electrons and electric field applied to the conductor.

2) Derive Ohm's law on the basis of the theory of electron drift?

3) Define the term current density of a metallic conductor. Deduce the relation connecting current density (i) and the conductivity (σ) of the conductor, when an electric field E, is applied to it.

4) Alloys of metal have greater resistivity than their constituent metals. Why?

5) Define mobility of a charge carrier. Express it in terms of relaxation time. Give its SI and practical units.

6) What do you understand by the resistivity of a conductor? Discuss its temperature dependence for a

(i) Metallic conductor

(ii) Semiconductor

(iii) Ionic conductor

(iv) Electrolyte

7) Sketch graphs showing the variation of resistivity of following materials with temperature:

(i) Copper (ii) nichrome (iii) carbon of semiconductor.

8) Why alloys like constantan or manganin are used for making standard resistors?

9) What are ohmic and non- ohmic conductors/resistors? State the conditions under which Ohm's law is not obeyed. Give one example of each type?

10) Define internal resistance of a cell. Prove that $r = \left(\frac{\varepsilon}{V} - 1\right)R$, where R is the external resistance used?

11) Two cells of different emfs and internal resistances are connected in series. Find expressions for the equivalent emf and equivalent internal resistance of the combination?

12) Two cells of emfs $\mathcal{E}_1$ and $\mathcal{E}_2$ and internal resistance r_1 and r_2 are connected in parallel between the points A and B. Deduce the expression for

(a) the equivalent emf of the combination

(b) the equivalent resistance of the combination and

(c) the potential difference between the points A and B.

13) State Kirchhoff's laws for electrical circuits and explain them giving illustrations.

14) What is a potentiometer ? Describe the construction and principle of a potentiometer?

15) State the principle of a potentiometer. With the help of a circuit diagram, describe a method to find the internal resistance of a primary cell?

16) Why is the use of a potentiometer preferred over of a voltmeter for measurement of emf of a cell?

17) What is a Wheatstone bridge? State the Wheatstone bridge principle. Deduce the condition for which the Wheatstone bridge is balanced?

18) Draw a circuit diagram which can be used to determine the resistance of a given wire. Explain the principle of the experiment and give the formula used.

Chapter 4: Magnetic Effect of Current

1) State the Biot – Savart law for the magnetic field due to a current carrying element. Use this law to obtain a formula for magnetic field at the centre of a circular loop of radius R carrying a steady current I. Indicate the direction of the magnetic field?

2) Using Biot – Savart law deduce an experiment for the magnetic field on the axis of a circular current loop. Draw the magnetic field lines due to a circular current carrying loop?

3) (a) State Ampere's circuital law, expressing it in integral form?

(b) Use Ampere's law to derive the formula for the magnetic field due to an infinitely long straight current carrying wire?

4) A long solenoid with closely wound turns has n turns, per unit of its length. A steady current I flows through this solenoid. Use Ampere's circuit law to obtain an expression, for the magnetic field, at a point on its axis and close to its midpoint?

5) Apply Ampere's circuital law to find the magnetic field both inside and outside of a toroidal solenoid?

6) Discuss the motion of a charged particle in a uniform magnetic field with initial velocity (i) parallel to the field, (ii) perpendicular to the magnetic field and (iii) at an arbitrary angle with the field direction.

7) Draw a schematic sketch of a cyclotron. Explain briefly how it works and how it is used to accelerate the charged particles.

(i) Show that time period of ions in a cyclotron is independent of both the speed and radius of circular path.

(ii) What is resonance condition? How is it used to accelerate the charged particles?

8) Why does a current carrying conductor experience a force in a magnetic field?

9) Two long straight parallel conductors carrying steady currents I_1 and I_2 are separated by a distance r. Explain briefly, with the help of a suitable diagram, how the magnetic field due to one conductor acts on the other. Hence deduce the expression for the force acting between the two conductors. Mention the nature of the force?

10) Derive a formula for the force between two parallel straight conductors carrying current in opposite directions and write the nature of the force. Hence, define an ampere.

11) Derive an expression for the torque on a rectangular coil of area A, carrying a current I and placed in a magnetic field B. The angle between the direction of B and vector perpendicular to the plane of the coil is θ.

12) With the help of a neat and labelled diagram, explain the underlying principle, construction and working of a moving coil galvanometer. What is the function of : (i) uniform radial field (ii) soft iron core; in such a device?

13) What do you mean by figure of merit of galvanometer?

14) When is a galvanometer said to be sensitive? Define current sensitivity and voltage sensitivity of a galvanometer. State the factors on which the sensitivity of a moving coil galvanometer depends. How can we increase the sensitivity of a galvanometer?

15) How will you convert a galvanometer into an ammeter of range 0-1 amperes? What is the effective resistance of an ammeter?

16) What is a shunt? Mention its important uses.

17) How can a galvanometer of resistance G be converted into a voltmeter to read a maximum potential difference of V volts? Support your answer with related mathematical expression.

Chapter 5: Magnetism

1) Derive an expression for the magnetic field intensity at a point on the axis of a bar magnet. What is the direction of the field?

2) Derive an expression for the magnetic field intensity at a point on the equatorial line of a bar magnet. What is the direction of the field?

3) Derive an expression for the torque on a magnetic dipole placed in a magnetic field and hence define magnetic dipole moment?

4) Derive an expression for the potential energy of a bar magnet when placed in a uniform magnetic field?

5) Explain how an atom behaves as a magnetic dipole. Derive an expression for the magnetic dipole moment of the atom. Also define Bohr magneton.

6) State Gauss's law of magnetism. What are its important consequences?

7) Name and define the various parameters required to completely specify earth's magnetic field at a place. Show them in a labelled diagram. Deduce various relations between them.

8) Define the terms: (i) magnetizing field, (ii) magnetic intensity, (iii) magnetization, (iv) magnetic induction, (v) magnetic permeability, (vi) relative permeability and (vii) magnetic susceptibility. Give their SI units, if any. Derive a relation between relative permeability and susceptibility.

9) What are dia, para and ferromagnetic substances? Give one example of each.

10) What are diamagnetic substances? Explain the origin of diamagnetism on the basis of electron theory.

11) What are paramagnetic substances? Explain the origin of Para magnetism?

12) What are ferromagnetic substances? Explain briefly domain theory to explain ferromagnetism.

13) What is hysteresis loop? Explain with its help the terms related to it.

14) How will you select materials for making permanent magnets, electromagnets and cores of transformers?

15) Distinguish between soft and hard ferromagnetic materials. Give examples of each type.

Chapter 6: Electromagnetic Induction

1) Describe the various experiments performed by Faraday and Henry which ultimately led to the discovery of the phenomenon of electromagnetic induction.

2) State Faraday's laws of electromagnetic induction. Explain them mathematically.

3) State Lenz's law. Show that Lenz's law follows from the principle of conservation of energy.

4) Prove that the magnitude of the emf induced in a conductor of length l when it moves at v m/s perpendicular to a uniform magnetic field B is Blv.

5) Deduce an expression for the motional emf by considering the Lorentz force acting on the free charge carries of a conductor moving in a perpendicular magnetic field. Also deduce expressions for the induced current, force necessary to pull the conductor, power delivered by the external source, and power dissipated as Joule loss. Hence discuss the energy conservation.

6) What are eddy currents? How are they produced? Give some experiments to demonstrate their existence.

7) Why are eddy currents considered undesirable in devices in which iron is used? How are eddy currents minimized?

8) Describe some important applications in which eddy currents are used to their advantage.

9) Deduce an expression for the self-inductance of a long solenoid of N turns, having a core of relative permeability μ_r.

10) Define mutual inductance between two long coaxial solenoids. Find out the expression for the mutual inductance of inner solenoid of length l having the radius r_1 and the number of turns n_1 per unit length due to the second outer solenoid of same length and n_2 number of turns per unit length.

11) A rectangular coil of N turns, area A is held in a uniform magnetic field B. If the coil is rotated at a steady angular speed ω, deduce an expression for the induced emf in the coil at any instant of time.

12) With the help of a labelled diagram, explain the principle, construction and working of an a.c. generator. Describes the expression for induced emf.

Chapter 7: Alternating Current and Electrical Machines

1) Define average value of a.c. over half a cycle. Establish the relationship between the 'average value' and the 'peak value' of an alternating current.

2) What is meant by root mean square or effective value of an alternating current? Derive a relation between it and its peak value.

3) Prove that the voltage and current always vary in the same phase in an a.c. circuit containing resistance only. Show this phase relationship graphically.

4) A sinusoidal emf is applied to a circuit containing an inductor only. Show that the current lags behind the voltage by $\pi/2$. Show this phase relationship graphically.

5) Discuss the phase relationship between current and emf in an a.c. circuit containing a capacitor only. Derive the expression for the reactance of a capacitor C, when connected across an a.c. source. Give its units.

6) An inductor L, a capacitor C and a resistor R are connected in series in an a.c. circuit. Deduce with the help of suitable phasor diagrams, a mathematical expression for impedance of this circuit. What is meant by resonance of this circuit? Prove that this circuit exhibits resonance at a frequency given by $\frac{1}{2\pi\sqrt{LC}}$.

7) What do you mean by sharpness of resonance in a series resonant circuit? Find an expression for Q-factor of the circuit.

8) (a) Define power factor of an a.c. circuit.

(b) What are the maximum and minimum values of power factors of an a.c.circuit?

9) What is wattles current?

10) Show that the magnetic energy required to build up the current I_0 in a coil of self – inductance L is $\frac{1}{2}LI_0^2$.

11) Prove that an ideal inductor does not dissipate power in an a.c. circuit.

12) Prove that an ideal capacitor connected to an a.c. source does not dissipate any power.

13) What are LC – oscillations? Explain qualitatively, how these oscillations are produced. Why do these oscillations get damped?

14) Explain with the help of a labelled diagram, the principle, construction and working of a transformer. Why is its core laminated?

15) What are the various energy losses in a transformer? How can they be reduced? Explain uses?

Chapter 8: Electromagnetic Waves

1) What is displacement current? Why was this concept introduced?

2) State and explain Maxwell's modification of Ampere's circuital law.

3) State Maxwell's equation.

4) What is an electromagnetic wave? How can we express mathematically a plane electromagnetic wave propagating along X-axis? Also represents it graphically.

5) Prove mathematically that electromagnetic waves are transverse in nature.

6) Obtain expression for the energy density of an electromagnetic wave. In an electromagnetic wave, show that the average energy density of the E field equals the average density of the B field.

7) What is Greenhouse effect for the atmosphere of the earth and what is its impotance?

8) What is the importance of ozone layer in the atmosphere?

Chapter 9: Ray Optics and Optical Instruments

1) State the principle of reversibility of light. Hence prove that ${}^1\mu_2 = \frac{1}{{}^1\mu_2}$.

2) Discuss the refraction through a glass slab and show that emergent ray is parallel to the incident ray but laterally displaced.

3) A ray of light is incident at angle i on a rectangular slab of thickness t and refractive index μ. Obtain an expression for the lateral displacement of the emergent ray. Can lateral displacement exceed t?

4) For a ray undergoing refraction through a combination of three media, show that

$${}^1\mu_2 \times {}^2\mu_3 \times {}^3\mu_1 = 1$$

5) Deduce the relation, $\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$

6) Explain with the help of diagram, how does the refraction of light affect the length of the day? How would the length of the day be affected if there were no atmosphere around the earth?

7) The sun near the horizon appears flattered at sunset and sunrise. Why?

8) Explain the phenomenon of total internal reflection. State two conditions that must be satisfied for total internal reflection to take place. Derive the relation between the critical angle and the refractive index of the medium.

9) Why does a diamond sparkle? Is it a source of light also?

10) Draw ray diagram to show how a right angled isosceles prism can be used to

(i) deviate a ray through 90°

(ii) deviate a ray through 180°, and

(iii) invert an image without the deviation of the rays.

11) What are optical fibres? How are light waves propagated in them? Write their some important uses.

12) Derive the relation between distance of object, distance of image and radius of curvature of a convex spherical surface, when refraction takes place from a rarer medium of refractive index μ_1 to a denser medium of refractive index μ_2 and the image produced is real. State assumptions and combination of signs used.

13) By stating the sign conventions and assumptions used, derive the relation between distance of object, distance of image and radius of curvature of spherical surface, when refraction takes place from optically rarer to optically denser medium and the image formed is virtual.

14) By stating the sign conventions and assumptions used, derive the relation between distance of object, distance of image and radius of curvature of a convex spherical surface, when refraction takes place from optically denser to optically rarer medium, when image in real.

15) Stating the new Cartesian convention, derive the relation between u, v and R, when refraction takes place from a concave spherical refracting surface.

16) By stating the sign conventions and assumptions used, derive the relation between object distance, image distance and radius of curvature of a concave spherical surface, when refraction takes place from optically denser to optically rarer medium.

17) Derive the lens maker's formula for a double convex lens. State the assumptions used and the convention signs used.

18) Derive the lens maker's formula for a thin biconcave lens.

19) Draw a ray diagram to show the formation of image of an object placed between the optical centre and focus of the convex lens. Write the characteristics of image formed. Using this diagram, derive the relation between object distance, image distance and focal length of the convex lens. Write the assumptions and convention of signs used. Draw the graph showing the variations of v and u.

20) Derive lens formula relating object distance, image distance and focal length of a thin concave lens.

21) What is meant by power of a lens? What is one dioptre?

22) Write expressions for the equivalent focal length and power of a combination of two thin lenses separated by a distance d.

23) Show that in case of a prism : $A + \delta = i + e$, where the symbols have their usual meanings.

24) Derive the expression for the refractive index of the material of the prism in terms of the angle of the prism and angle of minimum deviation.

25) What is dispersion of light? Explain it with a ray diagram. Also explain the cause of dispersion of light.

26) Explain the terms angular dispersion and dispersive power. How are the two related? Write expression for these quantities in terms of refractive index.

27) What is rainbow? Differentiate between primary and secondary rainbow with a diagram. Why two observers do not see the same rainbow?

28) What do you mean by scattering of light?

29) Why does the sky appear blue? What will it look like on the moon?

30) How do you account for the red colour of the sun during sunrise and sunset?

31) Explain the working of a simple microscope and show that its magnification m is given by m = 1 + D/f.

32) With the help of a ray diagram, explain the working of a simple microscope when the image is formed at infinity. Write an expression for its magnifying power.

33) (a) Define the magnifying power of a microscope. With the help of a ray diagram, explain the formation of the image in a compound microscope. Derive an expression for its magnifying power when the final image is formed at the near point. How can its magnifying power be increased?

(b) Draw a schematic diagram of a compound microscope when the final image is formed at infinity.

34) What is a telescope ? What are the different types of telescopes commonly used?

35) What is an astronomical telescope? Describe its construction and working? Calculate its magnifying power when the final image is formed at the least distance of distinct vision.

36) Explain the construction and working of an astronomical telescope. Derive an expression for its magnifying power in normal adjustment.

37) With the help of a labelled diagram, explain the construction and working of a cassegrain reflecting telescope. Write an expression for its magnifying power.

38) Draw a labelled diagram of a reflecting type telescope. Write four advantages of a reflecting type telescope over a refracting type telescope.

Chapter 10: Wave Optics

1) Sketch the geometrical of the wavefront :

(i) emerging from a point source of light.

(ii) emerging from a linear source of light like a rectangular slit.

(iii) corresponding to a beam of light coming from a far away source.

2) Sketch the wavefronts corresponding to:

(i) parallel rays

(ii) converging rays

(iii) diverging rays

3) State Huygen's principle. What are the assumptions on which this principle is based?

4) Describe Huygen's geometrical construction for propagation of wavefronts in a medium.

5) Deduce the laws of reflection on the basis of Huygen's wave theory.

6) Use Huygen's principle to verify the laws of refraction.

7) Sketch the incident and refracted wavefronts for refraction of a plane wavefront from denser to a rarer medium. Is Snell's law of refraction also valid in this case?

8) Derive an expression for the intensity at any point on the observation screen in Young's double slit experiment. Hence write the conditions for constructive and destructive interference.

9) State the conditions, which must be satisfied for two light sources to be coherernt.

10) Define fringe width. Derive an expression for fringe width in Young's double slit experiment.

11) Draw a graph showing the variation of intensity against the position of x on the screen in Young's double slit experiment.

12) Prove that the law of conservation of energy is obeyed during the interference of light.

13) Explain diffraction at a single slit. Derive relation for the linear with of central maximum.

14) Draw a graph showing the variation of intensity with diffraction angle θ in a single slit diffraction experiment.

15) Show that the central maximum in the single slit diffraction is twice as wide as the secondary maximum and the pattern becomes narrower as the width of the slit is increased.

16) Define limit of resolution of an optical instrument.

17) Define resolving power of an optical instrument. How does it depend on wavelength?

18) Define resolving power of a compound microscope. On what factors does it depend?

19) Define resolving power of a telescope. On what factors does it depend?

20) What are unpolarised and polarised waves? Explain polarisation, taking an example of mechanical waves.

21) Distinguish between unpolarised and plane polarised lights. How are these represented ?

22) Describe an experiment to show that light waves are transverse in nature.

23) State Malus law. Draw a graph showing the dependence of intensity of transmitted light on the angle between polariser and analyser.

24) Explain with the help of a suitable ray diagram how an unpolarised light can be polarised by reflection from a transparent medium. Write the expression for the Brewster angle in terms of the refractive index of denser medium.

Chapter 11: Dual Nature of Radiation and Matter

1) Describe an experiment arrangement to study photoelectric effect. Explain the effect of (i) intensity of light on photoelectric current, (ii) potential current, and (iii) frequency of incident radiation on stopping potential.

2) State the laws of photoelectric emission.

3) Establish Einstein's photoelectric equation. Use this equation to explain the laws of photoelectric emission.

4) Draw a graph showing the variation of stopping potential with the frequency of incident radiation in relation to photoelectric effect.

(a) What does the slope of this graph represent?

(b) How can the value of the Planck's constant be determined from this graph?

(c) How can the value of work function of the material be determined from this graph?

5) What is a photo-cell? Mention the different types of photo-cells.

6) Derive de – Broglie wave equation for a material particle.

7) Show that the de – Broglie wavelength λ of electrons of energy K is given by the relation:

$$\lambda = \frac{h}{\sqrt{2mK}}$$

8) Show that the de – Broglie wavelength λ of electrons accelerated through a potential difference of V volts can be expressed as

$$\lambda = \frac{h}{\sqrt{2meV}} = \lambda = \frac{123}{\sqrt{V}} \text{ Å}$$

9) Describe Davission and Germer experiment to establish the wave nature of electrons. Describe a labelled diagram of the apparatus used.

Chapter 12: Atoms

1) State Bohr's postulates for explaining the spectrum of hydrogen atoms.

2) Using Bohr's postulates, derive an expression for the radii of the permitted orbits in the hydrogen atom. Also obtain an expression for the total energy of an electron in the nth orbit of an atom. What does negative value of this energy signify? What is Bohr's radius?

3) Show that the speed of an electron in the innermost orbit of H-atom is 1/137 times the speed of light in vacuum.

4) What is the energy level diagram for an atom? Calculate the energies of the various energy levels of a hydrogen atom and draw an energy level diagram for it.

5) Explain the origin of the spectral lines of hydrogen using Bohr's theory.

6) State the drawbacks of Bohr's atomic theory?

Chapter 13: Nuclei

1) How is the size of a nucleus estimated? Write the relation between the radius of a nucleus and its mass number.

2) Show the nuclear density in a given nucleus is independent of mass number A.

3) Draw a graph showing the variation of potential energy as a function of their separation. What is the significance of negative potential energy in this graph? Indicate the regions in which the nuclear force is (i) attractive, and (ii) repulsive.

4) What is mass defect of a nucleus? Express it mathematically. What light does it throw on the building energy of nucleus?

5) What do you mean by binding energy of a nucleus? Obtain an expression for binding energy. How binding energy per nucleus explains the stability of nucleus?

6) Draw a plot showing the variation of binding energy per nucleon with mass number A. Write two important conclusions which you can draw from this plot. Explain with the help of this plot, the release in energy in the processes of nuclear fusion and fission.

7) State the radioactive decay law. Deduce the relation $N = N_0e^{-\lambda t}$ where the symbols have their usual meanings. Sketch a graph to represent radioactive decay law. Define disintegration constant.

8) Define the terms decay constant and half-life of a radioactive sample. Write their SI units. Derive the relation connecting the two.

9) Write a relation between the number of radioactive nuclei in a sample and the number of half-lives.

10) What is nuclear energy? With the help of the binding energy curve, explain how nuclear energy can be realized.

Chapter 14: Semiconductor Electronics

1) Explain the formation of energy bands in solids. On the basis of energy band diagrams, distinguish between (i) a metal, (ii) an insulator and (iii) a semiconductor?

2) Define Fermi level and Fermi energy?

3) What are intrinsic semiconductors? On the basis of valence band model, explain the mechanism of conduction in intrinsic semiconductors. How do holes act as positive charge carries?

4) Sketch and explain the energy band diagram of intrinsic semiconductors?

5) What is doping? State the necessary conditions for doping. What are the various methods of doping?

6) What are the two dopants used in doping tetravalent crystals of Ge or Si?

7) What are extrinsic semiconductors? Mention their two types.

8) Explain how an intrinsic semiconductors can be converted into (i) n-type and (ii) p- type semiconductor. Give one example of each and their energy band diagrams.

9) Deduce the relation between different charge carrier concentrations for an extrinsic semiconductor. What does this equation imply in regard to n-type and p-type semiconductors?

10) Explain the variation of conductivity of a semiconductor with temperature.

11) What is a p-n junction? Explain with the help of a diagram, how (i) depletion layer, and (ii) potential barrier is formed in a p-n junction diode depend? Give the circuit symbol for a p-n junction diode.

12) Explain the action of a p-n junction diode in (i) forward bias arrangement and (ii) reverse bias arrangement.

13) Explain briefly with help of a circuit diagram, how V-I characteristics of a p-n junction diode are obtained in (i) forward bias, and (ii) reverse bias. Draw the shape of the curves obtained.

14) What is a rectifier? Explain, why junction diode acts as a rectifier?

15) Draw a circuit diagram of a full – wave rectifier. Explain its working principle. Draw the input/output, wavefronts indicating clearly the functions of the two diodes used?

16) With a circuit diagram, explain how a zener diode can be used as a voltage regulator ?

17) What is a photodiode? Draw the circuit diagram of an illuminated photodiode in reverse bias. How is photodiode used to measure light intensity?

18) Give some important uses of photodiodes.

19) What is a light diode? Draw a circuit diagram and explain its action. Draw its I-V characteristics.

20) Give some advantages of LED's over conventional incandescent lamps.

21) Give some important uses of LED's.

22) What is a solar cell? Briefly describe the construction and working of a typical p-n junction solar cell. Give its V-I characteristic.

23) Name the materials commonly used in the fabrication of solar cells. What criteria are followed in the selection of such materials? Give important advantages of solar cells.

24) Give some important uses of solar cells.

25) What is a junction transistor? Mention its two types. How are they represented symbolically?

26) Define the two current gains of a transistor and deduce a relation between them.

27) Draw a circuit diagram to study the input and output characteristics of an n-p-n transistor in common emitter configuration. Show these characteristics graphically. Explain how (i) input resistance (ii) output resistance and (iii) current amplification factor of the transistor are calculated by using these characteristics.

28) Explain the use of a transistor as a switch?

29) With the help of a labeled circuit diagram, explain the use of n-p-n transistor as a common emitter amplifier. Discuss phase relationship between input and output voltages. Write expressions for the various gains of a common emitter amplifier.

30) With the help of a labeled circuit diagram, explain the use of p-n-p transistor as a common emitter amplifier. Discuss the phase relationship between input and output voltages.

31) What is an oscillator? Give its working principle. With the help of labelled circuit diagram, explain how a transistor can be used to produce self-sustained oscillations?

32) What is an OR gate? Give Boolean, logic symbol and truth table for an OR gate. Explain with the help of a circuit diagram, how is this gate realized in practice.

33) What is an AND gate? Give Boolean expression, logic symbol and truth table for an AND gate. Explain, with the help of a circuit diagram, how is this gate realized in practice?

34) Which is a NOT gate? Give Boolean expression, logic symbol and truth table for a NOT gate. Explain with the help of a circuit diagram, how is this gate realized in practice?

Chapter 15: Communication Systems

1) What is a communication system? With the help of block diagram, describe the functions of its various components.

2) Define the various terms commonly used in describing various electronic communication systems.

a) Transducerb) Signalc) Noised) Transmittere) Receiverf) Attenuationg) Amplificationh) Range

i) Bandwidthj) Basebandk) Modulationl) Demodulationm)Repeater

3) With the help of block diagram, briefly describe an arrangement for transmission and reception of a message signal over a distance of several thousand kilometers.

4) What are analog and digital signals? Give examples.

5) What is modulation? What is the need of modulation in communication systems?

6) Mention the different types of modulation techniques when the carrier waves are sinusoidal continuous waves.

7) What is amplitude modulation? Draw an A.M. wave. Give its important features.

8) Define modulation factor. Express it in terms of maximum and minimum voltages of A.M. wave. Give the importance of modulation factor.

9) What is meant by sideband frequencies in a carrier wave? Justify that bandwidth of an A.M. wave is $2f_m$, where f_m is the modulating frequency.

10) With the help of block diagram, explain the principle of generating an amplitude modulated wave from a baseband signal.

11) With the help of a simple circuit diagram, briefly explain the production of amplitude modulated carrier wave.

12) What is meant by detection of a modulated carrier wave? Discuss, in brief with the help of a block diagram, the essential steps of a simple method used for ‘detecting the modulating signal from this modulated carrier wave’.

13) Discuss the advantages and disadvantages of amplitude modulation.

14) Give the advantages and disadvantages of frequency modulation and amplitude modulation.

15) What is a communication channel? Define its bandwidth.

16) What are guided and unguided transmission media? Give examples.

17) How can we classify transmission media on the basis of their nature? Give the approximate bandwidths.

18) What is the space communication? Mention the different types in which electromagnetic waves can propagate from one point to another.

19) Give some advantages and disadvantages of ground wave propagation.

20) What is Space wave propagation? State the factors which limit its range of propagation.

21) Deduce an expression for the distance upto which the T.V. signals can directly be received from a T.V. tower of height h.

22) Write an expression for the maximum line of sight (LOS) distance between two antennas for space wave propagation.

23) What is ionosphere? Explain its importance in communication.

24) What is sky propagation? Define critical frequency.

25) What do you mean by the terms Internet, Email, World Wide Web, E-commerce, Chat, Mobile Telephony and GPS?

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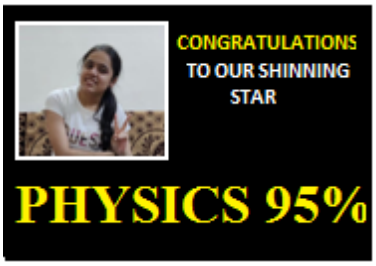

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