## 12 STD

**Short answer :**

### Unit –1 Electrostatics

1. What is meant by quantisation of charge ?
2. Write down Coulomb's law in vector form and mention what each term represents.
3. What are the differences between Coulomb force and gravitational force
4. Write a short note on super position principle.
5. Define electric field.
6. What is meant by electric field lines?
7. The electric field lines never intersect .Justify.
8. Define electric dipole .Give the expression for the magnitude of its electric dipole moment and the direction.
9. Write the general definition of electric dipole moment for a collection of point charge.
10. Define electrostatic potential.
11. What is equipotential surface?
12. What are the properties of an equipotential surface?
13. Give the relation between electric field and electric potential.
14. Define electrostatic potential.
15. Define electric flux. Give its unit.
16. Define electrostatic energy density.
17. Write a short note on electrostatic shielding.
18. What is electric polarisation?
19. What is dielectric strength?
20. Define capacitance of a capacitor.
21. What is corona discharge or action at points .

### Unit –2 Current Electricity

22. Why current is a scalar?
23. Define current density.
24. Distinguish between drift velocity and mobility.
25. State microscopic form of Ohm's law.
26. State macroscopic form of Ohm's law.
27. What are Ohmic and non ohmic materials?
28. Define electrical resistivity.
29. Define temperature coefficient of resistance .
30. Write a short note on superconductor.
31. What is electric power and electric energy?
32. Derive the expression for power P = V I in electrical circuit.
33. Write down the various forms of expression for in electrical circuit.
34. State Kirchhoff's first rule ( current rule / Junction rule)

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35.State Kirchhoff's second rule.( Voltage rule / Loop rule )
36. .Explain the principle of potentiometer.
37.What you mean by internal resistance of a cell?
38.State Joule's law of heating.
39.What is seebeck effect?
40.What is peltier effect?
41.What is Thomson effect?
42.State the applications of Seeback effect.

## Unit –3 Magnetism & magnetic effects of electric current

43. What are the elements of the Earth 's magnetic field?
44. What is meant by electromagnetic induction?
45. Define magnetic flux.
46.Define magnetic dipole moment.
47.State Coulomb's inverse law.
48.What is magnetic susceptibility ?
49.State Biot savart's law.
50.What is magnetic permeability?
51.State Ampere's circuital law.
52.Compare dia , para and ferro magnetism.
53.What is meant by hysteresis?
54.Define magnetic declination and inclination.
55.What is resonance condition in cyclotron?
56.Define ampere.
57.State Fleming's left hand rule.
58.Is an ammeter connected in series or parallel in a circuit why ?
59.Explain the concept of velocity selector.
60.Give the properties of dia / para / ferro magnetic materials.
61.What happens to the domains in a ferromagnetic material in the presence of external magnetic field.
62.How is galvanometer converted into an ammeter and voltmeter?

## Unit –4 Electromagnetic induction

63. What is meant by electromagnetic induction?
64.State Faraday's laws of electromagnetic induction.
65.State Lenz's law.
66.State Fleming's right hand rule.
67.How is eddy current produced? How they flow in a conductor?
68.Mention the ways of producing induced emf.
69.What you mean by self induction?
70.What is meant by mutual induction?
71.Give the principle of AC generator.

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72.List out the advantages of stationary armature rotating field system of Ac generator.
73.What are step up and step down transformer?
74.Define average value of an alternating current.
75.How will you define RMS value of an alternating current?
76.What are phasors?
77.Define electric resonance.
78.What you mean by resonant frequency?
79.How will you define Q- factor?
80.Define power factor.
81.What is meant by Wattless current?
82.Give any one definition of power factor.
83.What are LC oscillations?

## Unit – 5 Electromagnetic Waves

84. What is displacement current?
85.What are electromagnetic waves?
86.Write down the integral form of modified Ampere's circuital law.
87.Write a notes on Gauss law in magnetism.
88. Give two uses of i) IR radiation ii) UV radiation iii) micro waves.
89.What are Fraunhofer lines ? Hoe are they useful in identification of elements present in sun?
90.Write notes on Ampere – Maxwell law.
91.Why are e.m waves non-mechanical?

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## Long Answer :

### Unit –1 Electrostatics

1.Dicuss the basic properties of electric charges.
2.Explain in detail Coulomb's law and its various aspects.
3.Define electric field and discuss its aspects.
4.Calculate the electric field due to a dipole on its axial line and equatorial line.
5.Derive an expression for the torque experienced by a dipole due to a uniform electric field.
6.Derive an expression for electrostatic potential due to a point charge.
7.Derive an expression for electrostatic potential due to an electric dipole.
8.Obtain an expression for potential energy due to a collection of three point charges which are separated by finite distances.
9.Derive an expression for electrostatic potential energy of the dipole in a uniform electric field.
10.Obtain Gauss law from Coulomb's law.
11.Obtain the expression for electric field due to an infinitely long charged wire.
12.Obtain the expression for electric field due to an charged infinite plane sheet.
13.Obtain the expression for electric field due to an uniformly charged spherical shell.
14.Discuss the properties of conductors in electrostatic equilibrium.
15.Explain the process of electrostatic induction.
16.Explain dielectrics in detail and how an electric field induced inside dielectric.
17.Obtain the expression for the capacitance for a parallel plate capacitor.
18.Obtaint the expression for energy staored in parallel plate capacitor.
19.Explain in detail the effect of a dielectric placed in a parallel plate capacitor.
20.Derive an expression for resultant capacitance when capacitors are connected in series and parallel.
21.Explain in detail how charges are distributed in a conductor and the principle behind the lightning conductor.
22.Explain in detail the construction and working of a Van de Graaff generator.

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## Unit –2 Current Electricity

23.Describe the microscopic model of current and obtain general form of Ohm's law.
24.Obtain the macroscopic form of Ohm's law from its microscopic form and discuss its limitation.
25.Explain the equivalent resistance of a series and parallel resistor network.
26.Explain the determination of the internal resistance of a cell using voltmeter.
27.State and explain Kirchhoff's rules.
28.Obtain the condition for bridge balance in wheatstone's bridge.
29.Explain the determination of unknown resistance using meter bridge.
30.How the emf of two cells are compared using potentiometer?
31.Explain the determination of the internal resistance of a cell using potentiometer.

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## Unit –3 Magnetism & magnetic effects of electric current

32.Discuss Earth's magnetic field in detail.
33.Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current.
34. Obtain a relation for the magnetic field at a point along the axis of a circular coil carrying current.
35.Compute the torque experienced by a magnetic needle in a uniform magnetic field.
36.Calculate the magnetic field at a point on the axial line of a bar magnet.
37.Obtain the magnetic field at a point on the equatorial line of a bar magnet.
38.Find the magnetic field due to a long straight conductor using Ampere's circuital law.
39.Discuss the working of cyclotron in detail.
40.What is tangent law ? Discuss in detail.
41.Derive the expression for the torque on a current carrying in a magnetic field.
42.Discuss the conversion of galvanometer into an ammeter and voltmeter.
43.Calculate the magnetic field inside and outside of the long solenoid using Ampere's circuital law.
44.Derive the expression for the force between two parallel current carrying conductor.
45.Give an account of magnetic Lorentz force.
46.Compare the properties of soft and hard ferromagnetic materials.
47.Derive the expression for the force on a current carrying conductor in a magnetic field.
48.Explain about working of moving coil galvanometer

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## Unit –4 Electromagnetic induction

**49.Establish the fact that relative motion between coil and magnet induces an emf in the coil of a closed circuit.**

**50.Give an illustration of determining direction of induced current - Lenz's law.**

**51.Show that Lenz's law in accordance with the law of conservation of energy.**

**52. Obtain an expression for motional emf from Lorentz force.**

**53.Give the uses of Foucault current.**

**54. Define self inductance of a coil interms of i) magnetic flux ii)induced emf.**

**55.How will you define the unit of inductance?**

**56.What you understand by self inductance of a coil ? Give its physical significance.**

**57. Assuming the length of solenoid is large when compared to its diameter , find the equation for its inductance.(Self-inductance of long solenoid)**

**58.An inductor of inductance L carries an electric current i. How much energy is stored while establishing the current in it?**

**59.Show that the mutual inductance between a pair of coils same $M_{12} = M_{21}$ .**

**60.How will you induce an emf by changing the area enclosed by the coil ?**

**61.Show mathematically that the rotation of a coil in a magnetic field over one rotation induces an alternating emf of one cycle.**

**62.Elaborate the working of a single construction details of AC generator.**

**63.Explain the working of a single phase AC generator.**

**64.How are the three different emfs generated in a three phase AC generator ?Show the graphical representation of these three emfs.**

**65.Explain the construction and working of transformer.**

**66.Mention the various energy losses in a transformer.**

**67.Give the advantages of AC in long distance power transmission with an illustration.**

**68.Find out the phase relationship between voltage and current in a pure inductive circuit. ( AC contains pure inductor )**

**69.Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.**

**70.Obtain an expression for average power of AC over a cycle. Discuss its special cases.**

**71.Explain the generation of LC oscillations in a circuit containing an inductor of inductance L and a capacitor of capacitance C.**

**72.Prove that total energy is conserved during LC oscillations.**

**73.Compare the electromagnetic oscillations of LC circuit with the mechanical oscillations of block spring system qualitatively to find the expression for angular frequency of LC oscillator.**

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## Unit – 5 Electromagnetic Waves

74.Write down the Maxwell equations in integral form.
75.Explain the Maxwell's modification of Ampere's circuital law.
76. Write a short notes on i) micro waves ii ) X – Rays iii ) Radio waves iv) visible spectrum
77.Discuss the Hertz experiment.
78.Expalin the importance of Maxwell's correction.
79.Write down the properties of electromagnetic waves.
80.Discuss the source of electromagnetic waves.
81.Explain the types of emission spectrum.
82.Explain the types absorption spectrum.

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**Short Answer :**

### Unit – 6 Ray Optics

1. What is angle of deviation due to reflection ?
2. Derive the relation between f and R for a spherical mirror.
3. What are the Cartesian sign conventions for spherical mirrors?
4. What is optical path ? Obtain the equation for optical path.
5. State Snell's law / law of refraction.
6. What is angle of deviation due to refraction ?
7. What is principle of reversibility ?
8. What is relative refractive index?
9. Obtain the equation for apparent depth.
10. Why do stars twinkle?
11. What are critical angle and total internal reflection?
12. Obtain equation for critical angle.
13. Explain the reason for glittering of diamond.
14. What are mirage and looming ?
15. Write a short note on the prisms making use total internal reflections.
16. What is Snell's window.
17. How does an endoscope work?
18. What are primary focus and secondary focus of a lens ?
19. What are the sign conventions followed for lenses.
20. Arrive at lens equation from lens maker's formula.
21. Obtain the equation for lateral magnification of the lens.
22. What is power of lens?
23. Derive the equation for effective focal length for lenses in contact.
24. What is angle of minimum deviation?
25. What is dispersion ?
26. How are rainbows are formed?
27. What is Rayleigh's scattering?
28. Why does sky appear blue?
29. What is the reason for reddish appearance of sky during sunset and sunrise?
30. Why do clouds appear white?

### Unit – 7 Wave Optics

31. What are the salient features of corpuscular theory of light?
32. What are the important points wave theory of light ?
33. What is the significance of electromagnetic wave theory of light?
34. Write a short note on quantum theory of light.

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35. Define wavefront.
36. What are the shapes of wavefront for a) source at infinite b) Point source c) Line source.
37. State Huygen's principle.
38. What is the interference of light ?
39. What is the phase of a wave ?
40. Obtain the relation between phase difference and path difference .
41. What are coherent sources ?
42. How does wavefront division provide coherent sources?
43. What is intensity or amplitude division?
44. How do source and images behave as coherent sources ?
45. What is bandwidth of interference pattern?
46. What is diffraction?
47. Differentiate between Fresnel and Fraunhofer diffraction.
48. Discuss the special cases on first minimum in Fraunhofer diffraction.
49. What is Fresnel's distance? Obtain the equation for Fresnel's distance.
50. Mention the difference between interference and diffraction.
51. What is diffraction grating?
52. What is resolution?
53. What is Rayleigh's criterion?
54. What is the difference between resolution and magnification?
55. What is polarisation?
56. Differentiate between polarised and unpolarised light.
57. Discuss polarisation by selective absorption.
58. What are polariser and analyser?
59. What are plane polarised , unpolarised and partially polarised light?
60. State and obtain Malus's law.
61. List the uses of polaroid's.
62. State Brewster's law.
63. What is angle of polarisation and obtain the equation for angle of polarisation.
64. Discuss about piles of plates.
65. What is double refraction?
66. Mention the types of optically active crystals with example.
67. Discuss about Nicol prism.
68. How is polarisation of light obtained by scattering of light?
69. What are near point and normal focusing?
70. Why is oil immersed objective preferred in a microscope?
71. What are the advantages and disadvantages of are reflecting telescope?
72. What is the use of an erecting lens in a terrestrial telescope?
73. What is the use of collimator in a spectrometer?
74. What are the uses of spectrometer?
75. What is a myopia? What is its remedy?
76. What is hypermetropia? What is its remedy?
77. What is astigmatism? What its remedy?
78. What is presbyopia?

## Unit – 8 Dual nature of radiation & matter

79. Why do metals have a large number of free electrons?
80. Define work function of a metal. Give its unit.
81. What is photoelectric effect?
82. How does photo current vary with intensity of incident light?
83. Give the definition of intensity of light according to quantum concept and its unit.
84. How will you define threshold frequency?
85. What is photo cell? Mention the different types of photocells?
86. Write the expression for the de Broglie wavelength associated with a charged particle of charge q and mass m , when it is a accelerated through a potential V.
87. State de Broglie hypothesis.
88. Why we do not see the wave properties of a base ball?
89. A proton and electron have same kinetic energy . Which one has greater de Broglie wavelength. Justify.
90. Write the relationship of de Broglie wavelength λ associated with a particle of mass m in terms of its kinetic energy K .
91. An electron and an alpha particle have same kinetic energy. How are the de Broglie wavelength associated with them related?
92. Define stopping potential.
93. What is surface barrier?
94. Mention the two features of X – ray spectra , not explained by classical electromagnetic theory.
95. What is Bremsstralung?
96. What are the applications of X – ray ?

## Unit – 9 Atomic and Nuclear physics

97. What are cathode rays?
98. Write the properties of cathode rays .
99. Give the results of Rutherford alpha scattering experiment.
100. Write down the postulates of Bhor atom model.
101. What is meant by excitation energy?
102. Define the ionization energy and ionization potential.
103. Write down the drawbacks of Bhor atom model.
104. What is distance of closest approach?
105. Define impact parameter.
106. Write the general notation of nucleus of element X . What does each term denote?
107. What is isotope? Give an example.
108. What is isotone? Give an example.
109. What is isobar? Give an example.
110. Define atomic mass unit u.

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111.Show that nuclear density is almost constant for nuclei with Z > 10.
112.What is mass defect?
113.What is binding energy of a nucleus ? Give its expression.
114.Calculate the energy equivalent of 1 atomic mass unit.
115.Give the physical meaning of binding energy per nucleon.
116.What is meant by radioactivity?
117.Give the symbolic representation of alpha decay, beta decay and gamma emission.
118. In alpha decay , why the unstable nucleus emits $^{4}$He nucleus ? Why it does not emit four separate nucleons?
119.What is mean life of a radio active nucleus ? Give an expression.
120. What is half life of a radio active nucleus ? Give an expression.
121.What is meant by activity or decay rate ? Give its unit.
122.Define curie.
123.What are the constituent particles of neutron and proton?

## Unit – 10 Electronics & Communication

124.Define forbidden energy gap.
125.Why is temperature coefficient of resistance negative for semiconductor?
126.What do you mean by doping?
127.Distinguish between intrinsic and extrinsic semiconductors.
128.A diode is called as a unidirectional device. Explain.
129.What do you mean by leakage current in a diode?
130.Draw the input and output waveforms of a full wave rectifier.
131.Distinguish between avalanche breakdown and Zener breakdown.
132.Give the Barkhausen conditions for sustained oscillations.
133.Explain the current flow in a NPN transistor.
134.What are logic gates?
135.Explain the need for feedback circuit in a transistor oscillator.
136.Write a short note on diffusion current across p-n junction .
137.What is meant by biasing ? Mention its types.
138.Why can't we interchange the emitter and collector even though they are made up of same type of semiconductor material?
139. Why are NOR and NAND gates called universal gates?
140.Define barrier potential.
141.What is rectification?
142.List the application of light emitting diode.
143.Give the principles of solar cells.
144.What is an integrated circuit?
145.What is modulation?
146.Define bandwidth of transmission system.
147.What do you mean by skip distance?
148.Give applications of RADAR.
149.What is mobile communication?
150.Explain centre frequency or resisting frequency in frequency modulation.
151.What does RADAR stand for?

## 11.Recent Developments in Physics

**152.Distinguish between Nanoscience and Nanotechnology.**
**153.What is the difference between Nano materials and Bulk materials?**
**154.Give any two examples for "Nano" in nature.**
**155.Mention any two advantages and disadvantages of Robotics.**
**156.Why steel is preferred in making Robots?**
**157.What are black holes?**
**158.What are sub atomic particles?**



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**Long Answer :**

## Unit – 6 Ray Optics

1. Derive the mirror equation and the equation for lateral magnification.
2. Describe the Fizeau's method to determine the speed of light.
3. Obtain the equation for radius of illumination (or) Snell's window.
4. Derive the equation for acceptance angle and numerical aperture of optical fibre.
5. Obtain the equation for lateral displacement of light passing through a glass slab.
6. Derive the equation for refraction at single spherical surface.
7. Obtain lens maker's formula and mention its significance.
8. Derive the equations for thin lens and for magnification.
9. Derive the equation for angle of deviation produced by a prism and the obtain the equation for refractive index of material of the prism.
10. What is dispersion? Obtain the equation for dispersive power of a medium.

## Unit – 7 Wave Optics

11. Prove law of reflection using Huygens' principle.
12. Prove law of refraction using Huygens' principle.
13. Obtain the equation for resultant intensity due to interference of light.
14. Explain the Young's double slit equation experimental setup and obtain the equation path difference.
15. Obtain the equation for bandwidth in Young's double slit experiment.
16. Discuss the interference in thin films and obtain the equations for constructive and destructive interference for transmitted and reflected light.
17. Discuss the diffraction at single slit and obtain the condition for n th minimum.
18. Discuss the diffraction at a grating and obtain the condition for the m th maximum.

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19. Discuss the experiment to determine the wavelength of monochromatic light using diffraction grating.
20. Discuss the experiment to determine the wavelength of different colours using diffraction grating.
21. Obtain the equation for resolving power of optical instruments.
22. Discuss about the simple microscope and obtain the equations for magnification for near point focusing and normal focusing.
23. Explain about compound microscope and obtain the equation for the magnification.
24. Obtain the equation for resolving power of microscope.
25. Discuss about astronomical telescope.
26. Mention different parts of spectrometer and explain the preliminary adjustments.
27. Explain the experimental determination of refractive index of the material of the prism using spectrometer.

## Unit – 8 Dual nature of radiation & matter

28. What do you mean by electron emission ? Explain briefly various methods of electron emission.
29. Briefly explain the observations of Hertz , Hallwachs and Lenard.
30. Explain the effect of potential difference on photoelectric current.
31. Explain how frequency of incident light varies with stopping potential.
32. List out the laws of photoelectric effect.
33. Explain why photoelectric effect cannot be explained on the basis of wave nature of light.
34. Explain the quantum concept of light.
35. Obtain Einstein's photoelectric equation with necessary explanation.
36. Explain experimentally observed facts of photoelectric effect with the help of Einstein's explanation.
37. Give the construction and working of photo emissive cell.
38. Derive an expression for de Broglie wave length of electrons.

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39. Briefly explain the principle and working of electron microscope.
40. Briefly explain Davisson – Germer experiment which demonstrated the wave nature of electrons.
41. List out the characteristics of photons.
42. Give the applications of photocell.
43. Hoe do we obtain characteristics X – ray spectra?

## Unit – 9 Atomic and Nuclear physics

44. Explain the J.J.Thomson experiment to determine the specific charge of electron.
45. Discuss the Millikan's oil drop experiment to determine the charge of an electron.
46. Derive the energy expression for an electron is the hydrogen atom using Bhor atom model.
47. Discuss the spectral series of hydrogen atom.
48. Explain the variation of average binding energy with the mass number using graph and discuss about its feature.
49. Explain in detail the nuclear force.
50. Discuss the alpha decay process with example.
51. Discuss the beta decay process with example.
52. Discuss the gamma emission process with example.
53. Obtain the law of radio activity.
54. Discuss the properties of neutrino and its role in beta decay.
55. Explain the idea of carbon dating.
56. Discuss the process of nuclear fission and its properties.
57. Discuss the process of nuclear fusion and how energy is generated in stars?
58. Describe the working of nuclear reactor with a block diagram.
59. Explain in detail the four fundamental forces in nature.
60. Briefly explain the elementary particles present in nature.

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## Unit – 10 Electronics & Communication

61. Elucidate the formation of n- type extrinsic semiconductors.
62. Explain the formation of depletion region and barrier potential in PN junction diode.
63. Draw the circuit diagram of a halfwave rectifier and explain its working.
64. Explain the construction and working of full wave rectifier.
65. What is a LED ? Give the principle of its operation with a diagram.
66. Write note on photodiode.
67. Explain the working principle of a solar cell. Mention its application.
68. Sketch the static characteristics of a common emitter transistor and bring out the essential features of input and output characteristics.
69. Transistor functions as a switch. Explain.
70. Describe the function of a transistor as an amplifier with the neat circuit diagram. Sketch the input and output waveforms.
71. Give the circuit symbol,logical operation, truth table Boolean expression of gates i) AND ii) OR iii) NOT iv) NAND v)NOR vi) EX- NOR
72. State and prove de Morgon's first and second theorem.
73. Explain the amplitude modulations with necessary diagrams.
74. Explain the basis elements of communication system with diagram.
75. Explain the ground wave propagation and space wave propagation of electromagnetic waves through space.
76. Fibre optic communication is gaining popularity among the various transmission media – Justify.
77. List out the advantages and limitations of frequency modulation.
78. What is meant by satellite communication ? Give its application.

## 11.Recent Developments in Physics

79. Discuss the applications of nanoparticles in various fields.
80. What are the possible harmful effects of usage of nanoparticles ? why ?
81. Discuss the functions of key components in Robots.
82. Elaborate any two types of robots with relevant examples.
83. Comment on the recent advancement in medical diagnosis and therapy.

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