SUBJECT: PHYSICS

Question Bank for 10+2 students for subject of Physics is hereby given for practice. While preparing the questionnaire emphasis is given on the concepts, short answer type questions, numerical problems in accordance with the syllabus prescribed by Punjab School Education Board so that it can help students from the examination point of view. We hope that you might appreciate this question bank.

Suggestions, constructive criticism of the question bank is always welcome.

With Regards,

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CLASS-XII
46. PHYSICS

Time: 3 Hrs

Theory: 70 Marks
Practical: 20 Marks
C.C.E.: 10 Marks
Total: 100 Marks

STRUCTURE OF QUESTION PAPER (THEORY)

1. There will be one theory paper comprising of 26 questions.
2. Question no. 1 to 8 will be of one mark each.
3. Question no. 9 to 16 will be of two marks each.
4. Question no.17 to 23 will be of four marks each. These will be internal choice in any two questions.
5. Question no. 24 to 26 will be of six marks each. There will be internal choice in them.
6. Distribution of marks over different dimensions of the paper will be as follows.

LEARNING OUTCOMES	MARKS	PERCENTAGE OF MARKS
KNOWLEDGE	26	36%
UNDERSTANDING	30	44%
APPLICATION	14	20%
Total	**70**	**100%**

7. In the category of one mark question there will be question of the objective type such as Yes/No, tick/cross, fill in the blanks, multiple choice, true/false etc.
8. Use of un-programmable calculator is allowed. The log tables can be used.
9. Total weightage of numerical will be 20% i.e 14 marks. There will be three numericals of 2 marks each & 2 numericals of 4 marks each.

UNIT WISE DISTRIBUTION OF MARKS

Unit No.	Title	Marks
UNIT-I	Electrostatics	10
UNIT-II	Current Electricity	07
UNIT-III	Magnetic effects of current and magnetism	09
UNIT-IV	Electromagnetic Induction & current	07
UNIT-V	Electromagnetic waves	03
UNIT-VI	Optics	14
UNIT-VII	Dual nature of matter	05
UNIT-VIII	Atoms and Nuclei	05
UNIT-IX	Electronics devices	07
UNIT-X	Communication Systems	03
Total Marks		**70**

SCHEMATIC DISTRIBUTION OF MARKS

UNIT	Title	1 Mark Question	2 Marks Question	4 Marks Question	6 Marks Question	Total Marks
1	Electrostatic	-	-	1	1	10
2	Current Electricity	1	1	1	-	07
3	Magnetic effects of current & magnetism	1	1	-	1	09
4	Electromagnetic Induction & Alternating current	1	1	1	-	07
5	Electromagnetic waves	1	1	-	-	03
6	Optics	-	2	1	1	14
7	Dual Nature of matter	1	-	1	-	05
8	Atoms & Nuclei	1	-	1	-	05
9	Electronic devices	1	1	1	-	07
10	Communication system	1	1	-	-	03
Total Questions		**8**	**8**	**7**	**3**	**26**
Total Marks		**8**	**16**	**28**	**18**	**70**

INSTRUCTION FOR PAPER SETTER

Note:

1. There will be one theory paper consisting of total 26 questions.
2. Question no.1 to 8 will be of 1 mark each.
3. Question no.9 to 16 will be of 2 marks each. There will be 3 numerical questions of 2 marks each.
4. Question no. 17 to 23 will be of 4 marks each. There will be two four marks questions of internal choice. Each of these questions will have one theory question & other part will be numerical from the same unit.
5. Question No.24 to 26 will be 6 marks and their will be 100% internal choice in them. These questions must have two parts: part (a) will be of one mark and part (b) will be of 5 marks. Part (a) may cover any topic from same unit as of long 5 marks question of part (b).
6. Questions paper should cover all the syllabus.
7. No question or topic should be repeated in the question paper.
8. Questions in the paper can be asked only from mentioned PSEB syllabus. Questions from any topic which is not mentioned in the syllabus will be considered as out of syllabus question.
9. All 3 sets must be of equal standard and difficulty level questions.
10. At the end of each question, paper setter must write detailed distribution of marks of each sub-question.
11. Vague, many possible answer questions, confusing answer question etc type of question will not be asked in the paper. One mark questions, answer should be of one word or one line only.
12. Language used should be clearly understood & specific.
13. Time and length limit of paper should be kept in mind.

THEORY

Unit-1:

Electrostatics, Electric Charges, charging by induction, basic properties of electric charge (addition of charges, quantisation of charges and their Conservation) Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electrical field, electric field due to a point charge, electric field due to system of charge, physical significance of electric field, electric-field lines; electric dipole, electric field due to a dipole;(on its axis, on equatorial plane)physical significance of dipoles; torque on a dipole in uniform electric field. Electric field due to continuous charge distribution, Electric flux, statement of Gauss's theorem proof of Gauss's theorem for a charge enclosed in sphere, and its applications to find electric field due to infinitely long straight wire, uniformly charged infinite thin plane sheet and uniformly charged thin spherical shell (Field inside and outside). Electric potential, potential difference, electric potential due to a point charge, potential due to an electric dipole with special cases for axis and equatorial plane and system of charges; equipotential surfaces, , relation between field and potential electrical potential energy of a system of two point charges potential energy in external field and of electric dipole in an electrostatic field. Conductors and insulators, electrostatics of conductors, free charges and bound charges inside a conductor. Electrostatic shielding its uses, Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor, Van de Graff generator.

Unit-II:

Current Electricity Electric current, flow of electric charges in a metallic conductor, drift velocity, drift of electron mobility and their relation with electric current: Ohm's law, electrical resistance. V-I characteristics (linear and non linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance and resistivity. Internal resistance of a cell, potential difference and emf of cell, combination of cells in series and in parallel. Kirchhoff's laws and simple applications of Wheatstone bridge, Meter Bridge. Potentiometer-principle and its applications to measure potential difference and for comparing emf of two cells, measurement of internal resistance of a cell.

Unit-III:

Magnetic Effects of Current and Magnetism Concept of magnetic field. Oersted's experiment; Biot-savart law and its application to find magnetic field on the axis of a current carrying circular loop, Ampere's circuital law (no proof) and its applications to infinitely long straight wire, straight and torroidial solenoids. Force on a moving charge in uniform magnetic and electric fields. Motion in a magnetic field, motion in combined electric and magnetic field (velocity selector) Cyclotron. Force on a current-carrying conductor in a uniform magnetic field Force between two parallel current-carrying conductors, definition of ampere. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometers its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (Bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; magnetism and Gauss's law; Earth's magnetic field and magnetic elements, magnetisation and magnetic intensity, magnetic properties of materials, Para-, dia-and ferromagnetic substances with examples, Electromagnets and factors affecting their strengths. Permanent magnets.

Unit-IV:

Electromagnetic Induction and Alternating Currents Electromagnetic induction, Faraday's and Henry experiments, magnetic flux, induced emf and current, Lenz's Law and conservation of energy, motional emf, Eddy currents: Self and mutual inductance. Alternating current, peak and rms value of alternating current/voltage; reactance and impedances; phasors, ac applied across resistance, ac applied across inductor, as applied across capacitor, ac applied across LCR, LC oscillations, across inductor, ac applied across capacitor ,LC oscillations, (qualitative treatment only), LCR series circuit resonance; power in AC circuit, wattles current. AC generator and transformer.

Unit-V:

Electromagnetic Waves Need for displacement current, Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (Radio waves, Radio-microwaves, infra-red, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit-VI:

Optics Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, refraction by lens, lenses, thin lens formula/equation, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact, combination of lens and mirror. Refraction and dispersion of light through a prism. Some natural phenomenon due to sunlight, Scattering of light-blue colour of the sky and reddish appearance of the sun at sunrise and sunset. Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers. Wave's optics: wave front and Huygens' Principle, reflection and refraction of plane wave at a plane surface using Huygens' Principle, wave fronts. Proof of laws of reflection and refraction using Huygens 'Principle. Interference Young's double whole experiment and expression for fringe width, coherent sources and incoherent addition of waves and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, polarization by scattering and reflection, plane polarised light -Brewster's law, uses of plane polarised light and Polaroid's.

Unit-VII:

Dual nature of Matter and Radiation Electron emission, Photoelectric effect, Hertz and Lenard's observations'; experimental study of photoelectric effect, and wave theory of light, Einstein's photoelectric equation, particle nature of light, the photon, Matter waves-wave nature of particles, de Broglie relation. Davission-Germer experiment (experimental details should be omitted; only conclusion should be explained).

Unit-VIII:

Atoms & Nuclei Alpha-particle scattering experiment; Rutherford's model of atom; Bohr modal of hydrogen atom, expression for radius, velocity and energy of electron in orbit, energy levels, line spectrum of hydrogen atom, atomic spectra, de-Broglie's explanation of Bohr' s second postulate of quantization. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity- alpha, beta and gamma particles/rays and their properties; radioactive decay law, alpha, beta and gamma decay. Mass-energy - 124 - relation, mass-defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear force, nuclear reactor, Nuclear energy.

Unit-XI:

Electronic Devices Classification of metal insulator and semiconductor, Energy bands in solids (qualitative idea only) conductor, insulators and Semiconductors; intrinsic and extrinsic semiconductors-n junction, semiconductor Diode-1-V characteristics in forward and reverse bias, diode as a rectifier, 1-V characteristics of LED, photodiode, solar cell and Zener diode, Zener diode as a voltage regulator. Junction transistor, transistor action; characteristics of a common emitter transistor: transistor as an amplifier (common emitter configuration) and oscillator, digital electronics and Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch, integrated circuits.

Unit-X:

Communication Systems Elements of a communication system (block diagram only); basic terminology Used in Electronic Communication Systems, bandwidth of signals (speech, TV and digital data); bandwidth of transmission of electromagnetic waves in the atmosphere, Sky and space wave propagation. Need for modulation. Production and detection of an amplitude modulated wave.

NOTE: - TOPICS GIVEN BELOW ARE IN PRESCRIBED SYLLABUS OF P.S.E.B BUT NOT MENTIONED IN BOOK SUBSCRIBED BY PSEB. SO THESE TOPICS ARE TO BE DONE WITH STUDENTS AND PAPER WILL INCLUDE THESE TOPICS AND QUESTIONS FROM THESE TOPICS WILL NOT CONSIDER AS OUT OF SYLLABUS.

1. Electric flux 2. Potentiometer and its applications to measure potential difference 3. Magnetic field intensity due to a magnetic dipole (Bar magnet) along its axis and perpendicular to its axis. 4. Combinations of lens and mirror 5. Poor of laws of reflection and refraction using Huygens ‘Principle’. 6. Alpha-beta and gamma particles/rays and their properties.

PHYSICS 10+2

COULOMB'S LAW

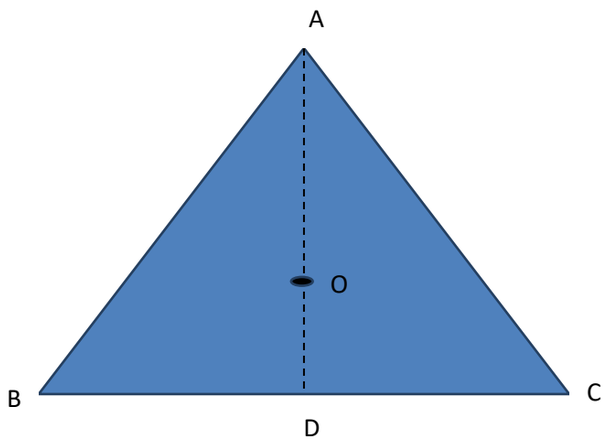
4 Marks questions

1. What are different methods of producing a charge on a body? Explain in brief.
2. What is difference between conductors and insulators? Give two examples of each.
3. What do you mean by earthing or grounding? Why it is done? How it is done?
4. Give the properties of electric charge. Explain quantisation of charge and conservation of charge.
5. What are similarities and dissimilarities between Coulomb's forces and Gravitational forces?
6. What are electric lines of forces? Give its properties. Give its one use.
7. Prove that electric field intensity on the axial line due to electric dipole is twice the intensity on the equatorial line. Give the direction of electric field on axial line and equatorial line.
8. Derive an expression for torque for a short dipole placed in a uniform electric field. Under what condition torque is maximum and minimum.
9. The electric field at a distance r from a short dipole on the axial position is E_1 and at the same distance on the equatorial position is E_2. What is the relation between E_1 and E_2?
10. An electron and proton are free to move in an electric field. Which one will have greater acceleration? Why?
11. Two point charges of unknown magnitude and sign are placed certain distance apart. The electric field is zero at a point not between the two charges but at a point on the line joining them. Write two essential conditions for this to happen.
12. Define electric potential difference and derive expression for it. Define its unit.
13. Define electric potential and derive expression for it. Define its unit.
14. Derive the expression for electric potential at a point due to an electric dipole.
15. Derive the expression for electric potential at a point on the dipole axis due to an electric dipole.
16. Prove that the electric potential due to electric dipole on the equatorial line is zero.
17. What is electrostatic shielding? Why it is safe to sit inside a car during lightning?
18. What are equipotential surfaces? Give its three properties.
19. Derive expression for potential energy of a system of two charges in the external electric field.
20. Define electrostatic potential energy of system of charges and derive expression for it for system of three charges.
21. Distinguish between electric potential and electric potential energy and state the relation between them.

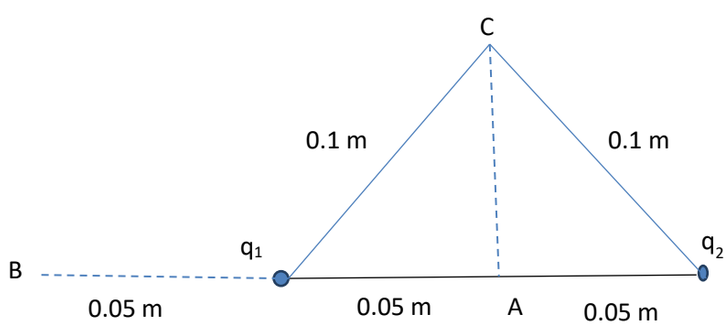
22. Derive the expression for potential energy when an electric dipole is placed inside uniform electric field. Under what condition these are maximum and minimum.
23. Show that the work done in rotating an electric dipole of dipole moment p in a uniform electric field E by an angle θ from the equilibrium position W = pE (1-cosθ). What does the negative sign in the expression for potential energy ($U=-pE\cos\theta$) signify?
24. Define capacitance. Derive the expression for capacitance of parallel plate capacitor.
25. Derive the expression for energy stored in a capacitor? In what form is the energy stored in a charged capacitor.
26. Three capacitors of capacitance C_1, C_2, C_3 are connected in (i) series (ii) parallel. Find the expression for resultant capacitance.
27. Prove that energy stored per unit volume in a capacitor is given by $\frac{1}{2}\varepsilon_0 E^2$; E is the electric field of the capacitor.
28. If a parallel plate capacitor of capacitance C is kept connected to a supply voltage V to just fill the space and then a dielectric slab is inserted between the plates. What will be the change in the capacitance, potential difference, the charge, electric field and the energy stored.
29. A parallel plate capacitor of capacitance C is charged to a potential difference V and then the battery is disconnected. Now a dielectric slab of the dimensions equal spacing between the plates is inserted between the plates. What are the changes, if any, in the capacitance, charge, potential difference, electric field and the energy stored?
30. A polythene piece rubbed with wool is found to have a negative charge of 3×10^{-7} C. (a) estimate the number of electrons transferred (from which to which). (b) Is there a transfer of mass from wool to polythene?
31. Two equally charged identical metal spheres A and B repel each other with a force of $2{\cdot}0 \times 10^{-5}$ N. Another identical uncharged sphere C is touched to A and then placed at the midpoint between A and B. What is the net force on C?
32. Four point charges +5 mC, +2 mC, +10mC and +2 mC are kept at the corners of a square of side 10 cm. A charge q=+1mC is placed at its centre. Find the net force on q.
33. Calculate the distance between two protons such that the electrostatic force between them is equal to the weight of either.
34. Two point charges are 0.1 m apart and their combined charge is 9 μC. If they repel each other with a force 18N, then calculate the magnitude of each charge.
35. Calculate the coulomb force between two alpha particlesseparated by a distance of 3.2×10^{-15} m
36. In a medium, the force of attraction between two point electric charges distance d apart is F. What distance apart should these be kept in the same medium so that the force between them becomes

a. 3F
b. F/3

37. Two point charges, q_1 and q_2 at a separation r in vacuum exert a force F on each other. What should be their separation in oil of relative permittivity 16 so that the force between them remains F only?
38. (a) Compare the strength of the electrostatic and gravitational forces by determining the ratio of their magnitudes (i) for an electron and a proton and (ii) for two protons. (b) Estimate the accelerations of electron and proton due to the electrical force of their mutual attraction when they are 1 Å apart.
39. Consider three charges q_1, q_2, q_3 each equal to q at the vertices of an equilateral triangle of side l. What is the force on a charge Q with the same sign a q placed at the centroid of the



triangle?
40. Consider three charges q, q, -q are placed at the vertices of an equilateral triangle of side l. What is the force on each charge?
41. A proton moves through a uniform electric field of 5.01 x 10 ^{3} N/C. Calculate (a) the acceleration with which the proton is moving and (b) the time taken by the proton to cover a distance of 4.8 cm.
42. A system has two charges $q_a = 2.5\times 10^{-7}$ C and $q_b = -2.5\times 10^{-7}$ C located at points A: (0, 0,-15 cm) and B: (0, 0, +15 cm) respectively. What are the total 3charge and electric dipole moment of the system?
43. Two charges +10μ C and – 10 μ C are placed 5 mm apart. Determine the electric field at (a) a point P on the axis of the dipole 15 cm away from its centre O on the side of the positive charge, (b) at a point 15 cm away from its centre O on a line passing through O and normal axis of the dipole.
44. Two point charges q_1 and q_2 of magnitude $+10^{-8}$C and -10^{-8} C, respectively, are placed 0.1 m apart. Calculate the electric field



at A, B and C.

45. Consider a uniform electric field **E =** 3×10^3 î N/C. (a) what is flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane? (b) What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis?
46. What is net flux of the uniform electric field **E =** 3×10^3 î N/C through a cube of side 20 cm oriented so that its faces are parallel to the coordinate planes?
47. A uniformly charged conducting sphere of 2.4 m diameter has surface charge density of 80 μC/m^2. (a) Find the charge on the sphere. What is the total electric flux leaving the surface of the sphere?
48. An infinite line charge produces a field of 9×10^4 N/C at a distance of 2 cm. Calculate the linear charge density.
49. A spherical conductor of radius 12 cm has a charge of 1.6 × 10-7 C distributed uniformly on its surface. What is the electric field (a) inside the sphere (b) just outside the sphere (c) at a point 18 cm from the centre of the sphere?
50. (a) Calculate the potential at a point P due to a charge of 4×10^{-7} C located 9 cm away. (b) hence obtain the work done in bringing a charge of 2×10^{-9} C from infinity to the point P. does the answer depend on the path along which the charge is brought?
51. Two charges 6×10^{-6} C and -4×10^{-6} C are located 10 cm apart. At what points on the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero.

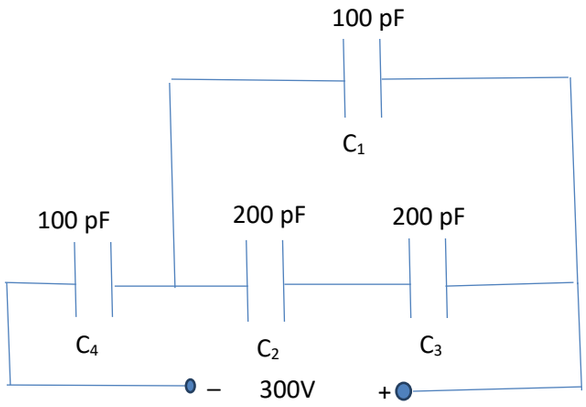
52. A regular hexagon of side 10 cm has a charge 5μC at each of its vertices. Calculate the potential at the center of the hexagon.
53. (a) Determine the electrostatic potential energy of a system consisting of two charges 7 μC and 2 μC (and with no external field placed (-9 cm, 0, 0) and (9 cm, 0, 0) respectively.

(b) How much work is required to separate the two charges infinitely away?

from each other?

54. A slab of a material of dielectric constant K has the same area as the plates of a parallel plate capacitor but has a thickness (3/4) d where d is the separation of the plates. How is the capacitance changed when the slab is inserted between the plates?
55. You are given three capacitors of value 2μF, 3μF, 6μF. How will you connect them to a resultant capacity of 4μF and 1 μF?

56. Obtain the equivalent capacitance of the network in given figure. For a 300 V supply, determine the charge across capacitor C_4.



57. A 900 pF capacitor is charged by 100V battery. (a) How much energy is stored in a capacitor? (b) The capacitor is disconnected from the battery and connected to another 900 pF capacitor. What is electrostatic energy stored by the system?
58. In a parallel plate capacitor with air between the plates, each plate has an area of 6×10^{-3} m^2 and the distance between the plates is 3 mm. calculate the capacitance of the capacitor. If this capacitor is connected to a 100 V supply, what is the charge on each plate of the capacitor? (b) what would happen if in the capacitor 3 mm thick mica sheet of dielectric constant = 6 is inserted between the plates of the capacitor (a) while the voltage supply remain connected (b) after the supply is disconnected.

6 Marks questions

59. State Coulomb's law. Define one coulomb. Give its limitations. Express coulomb's law in vector form. What is its importance?
60. What are electric lines of force? Give its properties and its importance. Why two electric lines of force do not cross each other?
61. Show that work done /line integral of electric field in moving a charge from one point to another inside the electric field is independent of path followed.
62. Derive an expression for the potential at a point along the axial line of a short electric dipole. Show mathematically that the potential at a point on the equatorial line of an electric dipole is zero.
63. Derive expression for electric field due to spherical shell at any point (i) inside (ii) outside (iii) on the surface using Gauss's theorem.
64. State and prove Gauss's theorem. Derive expression for electric field due to line charge (an infinitely long straight uniformly charged wire) using Gauss's theorem.
65. State and prove Gauss's theorem. Derive expression for electric field intensity at any point due to an infinite thin plane sheet of charge density σ C m^{-2}. What happens if sheet is thick?
66. Give the principle, construction and working of Vande Graff generator with the help of labelled diagram. What are its uses?

UNIT-2

1 Marks questions

1. By increasing the temperature, the specific resistance of a conductor and a semiconductor: (a) increases for both (b) decreases for both (c) increases, decreases respectively (d) decreases, increases respectively.
2. One kilowatt hour is equal to 36×10^6 J. true or false.
3. Fill in the blank. Kirchhoff's first law obeys law of conservation of _____ and Kirchhoff's second law obeys law of conservation of _____.
4. The filament of a bulb is made of (a) mercury (b) copper (c) tungsten (d) none of these.
5. The resistance of resistance is (a) conductance (b) specific resistance (c) voltage (d) current.
6. What is the direction of conventional current?
7. Define SI unit of current.
8. What are current carrier in conductors and semiconductors?
9. Resistivities of copper, silver and manganin are $1.7\times10^{-8}\Omega$m, $1.0\times10^{-8}\Omega$m and $44\times10^{-8}\Omega$m respectively. Which of these is the best conductor?
10. Why connecting wires are made of copper?
11. Name the material used for making standard resistors?
12. Define drift velocity of an electron.
13. What is the average velocity of the electrons in a conductor when no electric field is applied across it?
14. State ohm's law.
15. Define the SI unit of resistance.
16. On what factors resistance of conductor depends.
17. A wire of resistivity is stretched to double its length. What will be its new resistivity?
18. Define mobility.
19. Define conductance.
20. What is unit of conductance?
21. What do you mean by temperature coefficient of resistance?
22. Is the value of temperature coefficient of resistance always positive?
23. Define electric energy.
24. Which material is used for making filaments in heating elements?
25. Define electric power.
26. What are characteristics of the materials used as heating elements?
27. What are characteristics of the materials used as fuse wire?
28. Define electromotive force of a cell.
29. Choose the correct alternative:
    (a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.
    (b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.
    (c) The resistivity of the alloy manganin is nearly independent of / increases rapidly with increase of temperature.
    (d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of ($10^{22}/10^3$)

2 Marks questions

CURRENT ELECTRICITY

1. How does the drift velocity of electrons in a metallic conductor vary with increase in temperature?
2. Establish the relation between current and drift velocity.
3. What are ohmic and non ohmic devices? Give one example of each.
4. Give two limitations of ohm's law, with the help of VI graphs.
5. Define resistance. On what factors it depends?
6. Draw a graph to show the variation of resistance of a metal wire as a function of its diameter, keeping length and temperature constant.
7. Define resistivity. On what factors it depends.
8. A metal and a semiconductor material are cooled. What happens to their conductivities and why?
9. Draw a graph between resistivity and temperature in case of metals, alloys and semiconductors.
10. Why electrical power is transmitted at very voltages?
11. What is difference between e.m.f and terminal potential difference?
12. Name the material used for making standard resistors? Give two reasons.
13. Three resistances are connected in series. Find the expression for their equivalent resistance.
14. Three resistances are connected in parallel. Find the expression for their equivalent resistance
15. What happens to the drift velocity (VD) of electrons and to the resistance(r), if length of a conductor is doubled (keeping potential difference unchanged)?
16. The V-I graph is drawn for a metal wire at two temperature T_1 and T_2. If $T_1 > T_2$, draw the graph.
17. A large number of free electrons are present in metals. Why is there no current in the absence of electric field across it?
18. Will water flow more easily through a wide pipe or a narrow pipe? Will current flow more easily through a thick wire or a thin wire?
19. Distinguish between a *kilowatt* and a *kilowatt-hour*.
20. What is internal resistance of a cell? On what factors do the internal resistance of a cell depend?
21. A wire is carrying current. Is it charged?
22. It is found that 10^{20} electrons each having a charge of 1.6×10^{-19} C, pass from a point X towards another point Y in 0.1s. What are the current and its direction?
23. An electric motor operating on a 50 V dc supply draws a current of 12A. If the efficiency of the motor is 30%, estimate the resistance of the windings of the motor.
24. The wattage marked on a light bulb is not an inherent property of the bulb but depends on the voltage to which it is connected, usually 110 or 120 V. How many amperes flow through a 60-W bulb connected in a 120-V circuit?

25. An electric iron connected to a 110-V source draws 9 A of current. How much heat in joules does it generate in a minute?
26. The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5 Ω and at steam point is 5.23Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.795Ω. Calculate the temperature of the bath.
27. A silver wire has a resistance of 2.1Ω at 27.5°C and a resistance of 2.7Ω at 100°C. Determine the temperature coefficient of resistivity of silver.
28. Given n resistors each of resistance R, how will you combine them to get the (i) maximum (ii) minimum effective resistance? What is the ratio of the maximum to minimum resistance?
29. Given the resistances of 1Ω,2Ω,3Ω how will be combine them to get an equivalent resistance of (i) 11/3Ω (ii) 11/5Ω (iii) 6Ω (iv) 6/11Ω?

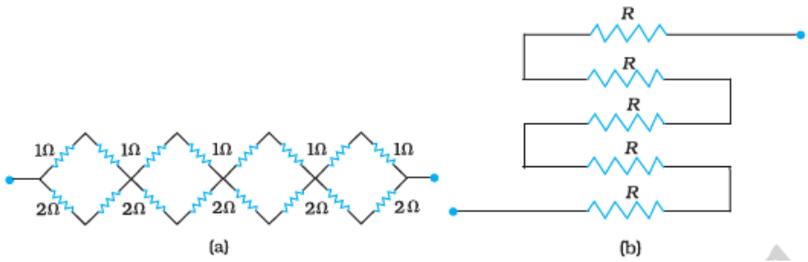
ELECTRICAL MEASUREMENT

1. Why copper thick wires are used as connecting wires?
2. Of which material potentiometer wire is made and why?
3. Why do we prefer potentiometer with a longer bridge wire?
4. Why do we prefer potentiometer rather than voltmeter to measure e.m.f of cell?
5. When is Wheatstone bridge most sensitive?
6. How can you increase the sensitivity of a potentiometer?
7. What is potentiometer? Give its principle.
8. Kirchhoff's first law obeys the law of conservation of charge. Explain.
9. Draw the diagram showing the experimental arrangement for determining the internal resistance of a given primary cell using potentiometer.

4 Marks questions

1. What is drift velocity and relaxation time? Establish relation between them.
2. State and prove Ohm's law using the concept of drift velocity.
3. How resistivity of metals, semiconductors, and insulator does vary with temperature?
4. Derive the relation for resistivity $\rho = {}^{ml}/ne^2\,\tau$ where symbols have their usual meaning.
5. What is internal resistance? Derive expression for it.
6. State and explain Kirchhoff's law.
7. Derive the principle for the balance of Wheatstone bridge using Kirchhoff's law.
8. Explain the use of slide Wire Bridge to measure unknown resistance.
9. Explain use of potentiometer to compare the emf's of two primary cells with the help of proper diagram.
10. Explain use of potentiometer to find internal resistance of primary cell with the help of proper diagram.
11. A wire of resistance 1 ohm and resistivity 'ρ' is stretched to double its length. What will be its new resistance and resistivity?
12. If a copper wire is stretched to make it 0.1% longer, what is the percentage change in its resistance?
13. A battery on e.m.f E and internal resistance r gives a current 0.5 A with an external resistance of 12 Ω and a current 0.25 A with an external resistance of 25Ω. Calculate the internal resistance and e.m.f of the cell.

14. Two wires of equal length, one of aluminium and the other of copper have the same resistance. Which of the two wires is lighter? Hence explain why aluminium wires are preferred for overhead power cables. (ρ_{Al}= 2.63 × 10^{-8}Ωm, ρ_{Cu} = 1.72 × 10^{-8} Ωm. relative density of Al =2.7, of Cu =8.9)
15. Calculate the equivalent resistance of network



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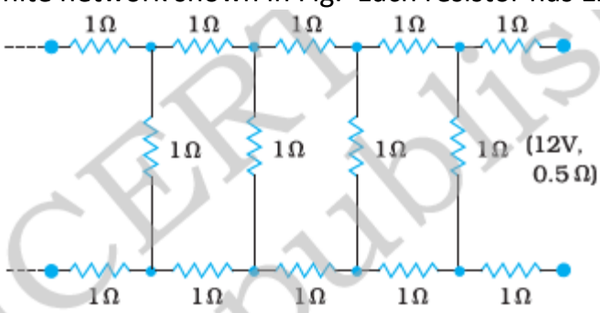
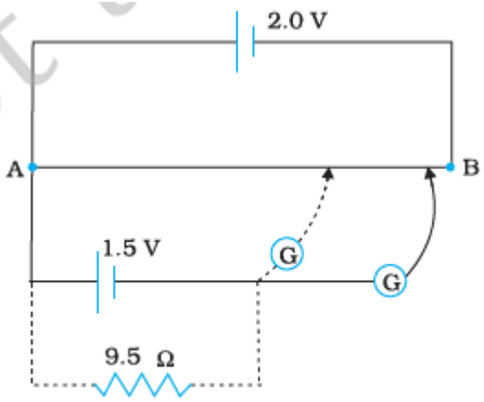
16. Determine the current drawn from a 12V supply with internal resistance 0.5Ω by the infinite network shown in Fig. Each resistor has 1Ω resistance.



17. In a potentiometer arrangement, a cell of e.m.f 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm what is the e.m.f of the second cell?
18. Figure shows a 2.0 V potentiometer used for the determination of internal resistance of a 1.5 V cell. The balance point of the cell in open circuit is 76.3 cm. When a resistor of 9.5 Ω is used in the external circuit of the cell, the balance point shifts to 64.8 cm length of the potentiometer wire. Determine the internal resistance of the



cell.

UNIT-3

MAGNETIC EFFECTS OF CURRENT AND MAGNETISM

1 Mark questions

1. The materials suitable for making electromagnets should have: (a) high retentivity and high coercivity (b) low retentivity and low coercivity (c) high retentivity and low coercivity (d) low retentivity and high coercivity.
2. To convert a galvanometer into voltmeter a _____ resistance is connected in _____.
3. Tesla is unit of magnetic flux. True or false.
4. Cyclotron is used to accelerate (a) electrons (b) neutrons (c) positive ions (d) negative ions.
5. Angle of dip is 90° at (a) poles (b) equator (c) both (a) and (b) (d) none of these.
6. State Biot Savart's law.
7. State Fleming right hand thumb rule.
8. State Ampere's circuital law.
9. State Ampere swimming rule.
10. What is magnetic Lorentz force?
11. Under what condition magnetic Lorentz force is maximum and minimum?
12. What is the force experienced by a stationary charge in magnetic field?
13. Under what conditions the force on a charge inside magnetic field is zero?
14. Define the unit of magnetic field.
15. Can neutrons be accelerated in a cyclotron?
16. What is meant cyclotron frequency?
17. State Fleming's left hand rule.
18. Give the principle of moving coil galvanometer.
19. What is nature of magnetic field in a moving coil galvanometer?
20. Define current sensitivity of a moving coil galvanometer?
21. Define voltage sensitivity of a moving coil galvanometer?
22. What is shunt?
23. What are uses of shunt?
24. How is ammeter connected in an electric circuit?
25. How is voltmeter connected in an electric circuit?
26. What is the resistance of an ideal ammeter and voltmeter?
27. Give the principle of a d.c. motor.
28. What is nature of force, when two parallel conductors carry current in (i) same direction, (ii) opposite direction?
29. What do you mean by directive property of a magnetic dipole?
30. Does an isolated magnetic pole exist like an isolate charge?
31. Define magnetic dipole moment.
32. What is SI unit of magnetic dipole moment?

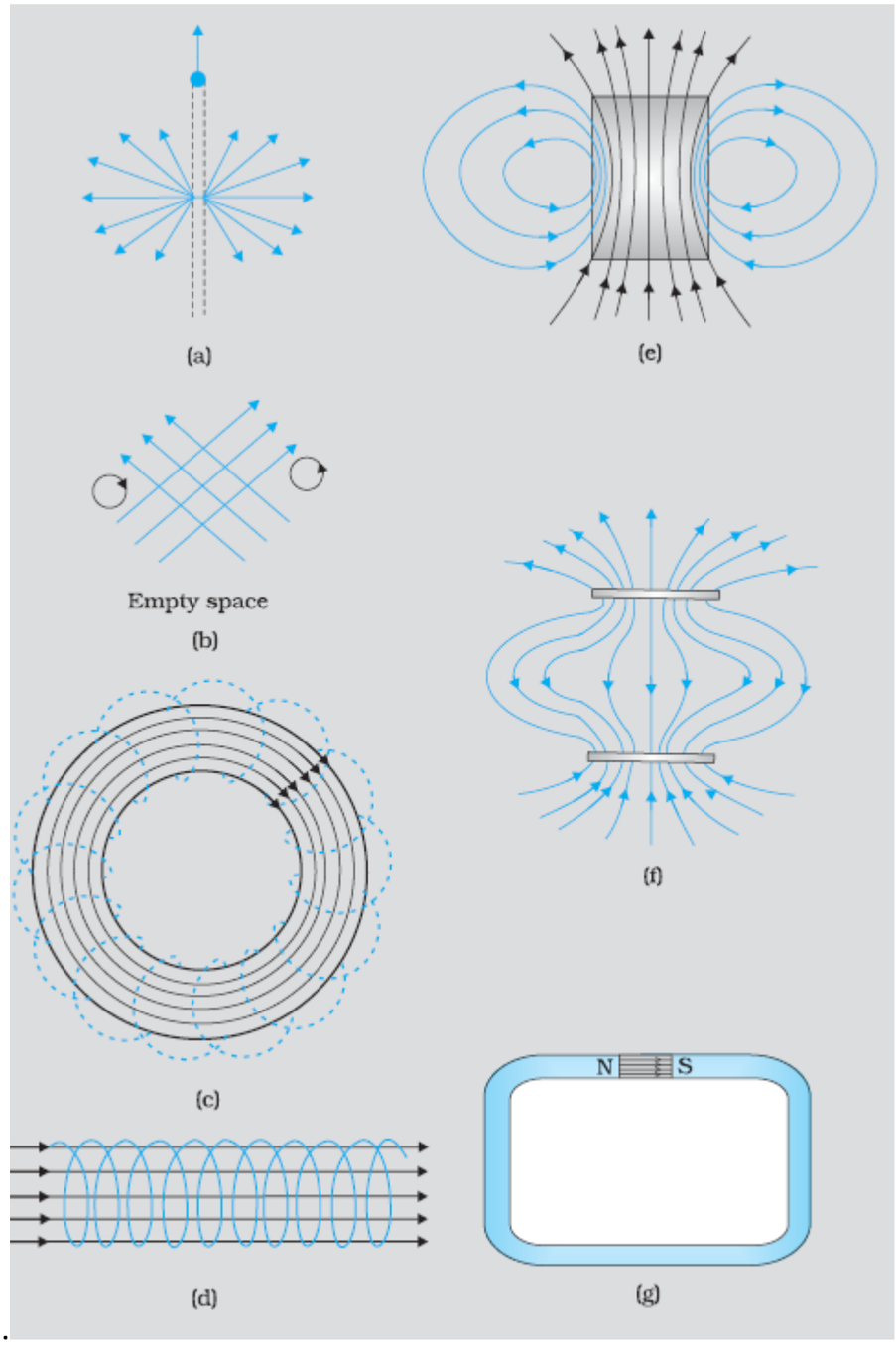
33. What is geographic meridian?
34. What is magnetic meridian?
35. Write the names of parameters of earth magnetic field.
36. Define dip.
37. Define declination.
38. Define Bohr magneton.
39. What is value of Bohr magneton?
40. What is value of dip on equator of earth?
41. What is value of dip on magnetic poles of earth?
42. The angle of dip at a location in southern India is about 18°. Would you expect a greater or smaller dip angle in Britain?
43. What do you mean by neutral points in a magnetic field?
44. Define intensity of magnetisation of magnetic materials.
45. Define magnetic flux.
46. Define magnetic susceptibility.
47. Define magnetic permeability.
48. Name a physical quantity which is measured in wb/A.
49. Define tesla.
50. Name the physical quantity, whose unit is tesla.
51. What do you mean by non-magnetic materials?
52. What happens when a diamagnetic substance is placed in a varying magnetic field?
53. What happens when a paramagnetic substance is placed in a varying magnetic field?
54. What kind of ferromagnetic material is used for coating magnetic tapes in a cassette player, or for building 'memory stores' in a modern computer?
55. State Curie law in magnetism.
56. What is Curie point?
57. What is hysteresis?
58. Define retentivity.
59. Define coercivity.
60. What type of material is used in making permanent magnets?
61. What type of material is used in making electromagnets?
62. Give the method to destroy the magnetism of a magnet.

2 Marks questions

1. What is the basic difference between magnetic and electric field?
2. Give two similarities between Biot Savart's law for magnetic fields and Coulomb's law for electrostatic fields.
3. What is electric permittivity and magnetic permeability?
4. Why force on a charge particle in a magnetic field does no work?

5. The magnetic field at a point near the centre but outside a current carrying solenoid is zero. Explain, why.
6. What is condition for selecting charged particle of particular velocity out of a beam of charges?
7. Why is a cyclotron not suitable for accelerating electrons?
8. Using Ampere's circuital law, find the expression for magnetic field due to infinitely long straight current carrying conductor.
9. Two parallel conducting wires carrying electric current in the same direction attract each other. Explain, why.
10. Two parallel conducing wires carrying electric current in the opposite direction repel each other. Explain, why.
11. Two parallel wires carrying currents in same direction attract each other, while two beams of electrons travelling in the same direction repel each other. Explain, why.
12. Why a solenoid tends to contract, when a current pass through it?
13. A loop of irregular shape carrying current is located in an external magnetic field. If the wire is flexible, why does it change to a circular shape?
14. Explain why earth's magnetic field does not affect the working of a moving coil galvanometer.
15. What is radial magnetic field? How as it been achieved in a moving coil galvanometer?
16. What is the importance of radial magnetic field in a moving coil galvanometer?
17. What is main function of soft iron core used in a moving coil galvanometer?
18. What is shunt? Give its use.
19. Compare a voltmeter and an ammeter.
20. Out of an ammeter and a voltmeter, which if the two as higher resistance and why?
21. Why is an ammeter connected in series, while a voltmeter is connected in parallel with rest of the circuit?
22. What is function of starter in a motor?
23. State four properties of bar magnet.
24. What happens if a bar magnet is cut into two pieces: (i) transverse to its length (ii) along its length?
25. A magnetised needle in a uniform magnetic field experiences a torque but no net force. An iron nail near a bar magnet, however experiences a force of attraction in addition to a torque. Why?
26. How will you distinguish between iron bar and magnetised bar?
27. Is it necessary that every magnet has north and south poles? If not, give an example of such a magnet which has no north and south pole.
28. What is the probable cause of earth's magnetism?
29. Why two magnetic lines of force do not cross each other?
30. Draw a hysteresis loop for ferromagnetic materials and represent retentivity and coercivity on the curve. What is use of hysteresis loop?
31. Which material is used for making permanent magnets and why?

32. Which material is preferred for making for core of transformer or electromagnets and why?
33. A vector needs three quantities for its specification. Name the three independent quantities conventionally used to specify the earth's magnetic field.
34. The earth's magnetic field varies from point to point in space. Does it also change with time? If so, on what time scale does it change appreciably?
35. Is the permeability of a ferromagnetic material independent of the magnetic field? If not, is it more for lower or higher fields?
36. Why does a paramagnetic sample display greater magnetisation (for the same magnetising field) when cooled?
37. Why is diamagnetism, in contrast, almost independent of temperature?
38. Point out which diagram is wrong and point out what is wrong with



them.

39. If magnetic monopoles existed, how would the Gauss's law of magnetism be modified?

40. Does a bar magnet exert a torque on itself due to its own field? Does one element of a current carrying wire exert a force on another element of the same wire?
41. Define magnetic declination and dip.
42. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. it is suspended in mid-air by a uniform horizontal magnetic field B. what is the magnitude of the magnetic field?
43. What is the radius of the path of an electron (mass 9×10^{-31} kg and charge 1.6×10^{-19} C) moving at a speed of 3×10^{7} m/s in a magnetic field of 6×10^{-4} T perpendicular to it? What is its frequency? Calculate its energy in keV. (1eV = 1.6×10^{-19} J)
44. A cyclotron's oscillator frequency is 10 MHz What should be the operating magnetic field for accelerating protons? If the radius of its Dees' is 60 cm. what is the kinetic energy (in MeV) of the proton beam produced by the accelerator.
45. Consider a tightly wound 100 turn coil of radius 1 cm, carrying a current of 1 A. what is the magnitude of the magnetic field at the centre of the coil?
46. A long straight wire carries a current of 35 A. what is the magnitude of the field at a point 20 cm from the wire?
47. A long straight wire in the horizontal plane carries a current of 50 A in north to south direction. Given the magnitude and direction of B at a point 2.5 m east of the wire.
48. What is the magnitude of magnetic force per unit length on a wire carrying a current of 8 A and making an angle of 30° with the direction of a uniform magnetic field of 0.15 T?
49. A 3 cm wire carrying a current of 10 A is placed inside a solenoid perpendicular to its axis. The magnetic field inside the solenoid is given to be 0.27 T. what is the magnetic force on the wire?
50. Two long and parallel straight wires A and B carrying currents of 8 A and 5 A in the same direction is separated by a distance of 4 cm. Estimate the force on a 10 cm section of wire A.
51. A galvanometer coil has a resistance of 12Ω and the metre shows full scale deflection for a current of 3 mA. How will you convert the metre into a voltmeter of range 1 to 18 V?
52. A galvanometer coil has a resistance of 15Ω and the metre shows full scale deflection for a current of 4 mA. How will you convert the metre into a ammeter of range 1 to 6 A?
53. A closely wound solenoid 80 cm long has 5 layers of windings of 400 turns each. The diameter of the solenoid is 1.8 cm. if the current carried is 8 A. estimate the magnitude of B inside the solenoid near its centre.
54. A square coil of side 10 cm consists of 20 turns and carries a current of 12 A. the coil is suspended vertically and the normal to the plane of the coil makes an angle of 30° with the direction of a uniform horizontal magnetic field of magnitude 0.80 T. what is the magnitude of torque experienced by the coil?

55. What is the magnitude of the equatorial and axial fields due to a bar magnet of length 5.0 cm at a distance of 50 cm from the midpoint? The magnetic moment of the bar magnet is 0.40 Am^2.
56. The earth's magnetic field at the equator is 0.4 G. estimate the earth's dipole moment.
57. In the magnetic meridian of a certain place, the horizontal component of the earth's magnetic field is 0.26 G and the dip angle is 60°. What is the magnetic field of the earth at this location?
58. A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 2 A. if the number of turns is 1000 per metre. Calculate (a) H, (b) M, (c) B and (d) the magnetising current I_m.

6 Marks questions

1. Using Biot Savart's law derives the expression for magnetic field due to current carrying straight long conductor. State right hand thumb rule.
2. Using Biot Savart's law derives the expression for magnetic field at the centre of current carrying coil.
3. Using Biot Savart's law derives the expression for magnetic field on the axis of current carrying coil.
4. Derive the expression for force on a current carrying conductor placed in a magnetic field. In which condition it is maximum and minimum.
5. Find the expression for force between two infinitely long parallel current carrying conductors. Define one ampere.
6. State and prove Ampere's circuital law. How will you find magnetic field of current carrying solenoid using this law?
7. What is torrid? How will you find magnetic field due to current carrying torroidial solenoid?
8. Derive an expression for torque on a rectangular current loop in a uniform magnetic field. Under what condition the coil is in stable and unstable equilibrium. Define magnetic moment of the current loop.
9. Give the principle, construction and working theory of moving coil galvanometer.
10. How will you convert galvanometer into (i) ammeter (ii) voltmeter?
11. Give the principle construction and working theory of a cyclotron. Why it is not suitable for accelerating electrons and neutrons? What are uses of cyclotron?
12. Define magnetic field intensity at a point and derive an expression for it at a point on the axial line of a magnetic dipole.
13. What do you mean by equatorial line of a magnetic dipole? Derive an expression for it at a point on the equatorial line of a magnetic dipole.
14. A magnetic dipole is placed in a magnetic field; derive the expression for torque and potential energy? Under what conditions these are maximum and minimum.
15. Prove that the magnetic field due to bar magnet is equivalent to the magnetic field due to current carrying solenoid by finding magnetic field due to both along axial line.
16. Show that atom acts as a magnetic dipole. Define Bohr's magneton.
17. Give ten differences between dia-, para-, and Ferro- magnetic substances.

18. Explain hysteresis loop. Define coercivity and retentivity. Why do we prefer steel or alnico for making permanent magnet?

UNIT-4

ELECTROMAGNETIC INDUCTION AND CURRENT

1 Mark questions

1. In an a.c circuit containing only capacitor, the current (a) leads voltage by 180°, (b) remain in phase with voltage (c) leads voltage by 90° (d) lags voltage by 90°.
2. Eddy currents are produced in (a) induction furnace (b) electromagnetic brakes (c) speedometer (d) all of these.
3. Split rings are used in a.c. dynamo. True or false.
4. The SI unit of magnetic flux is _____.
5. Eddy currents are produced in (a) induction furnace (b) electromagnetic brakes (c) speedometer (d) all of these.
6. What is meant by magnetic flux?
7. Weber is the unit of which physical quantity?
8. Define electromagnetic induction.
9. What is the basic cause of induced emf?
10. What are eddy currents?
11. Define one henry?
12. Define self inductance of a coil.
13. Define the SI unit of self inductance.
14. Define mutual inductance.
15. Define coefficient of mutual inductance for a pair of coils.
16. State the principle of a.c. generator.
17. Draw a labelled diagram of ac generator.
18. State Lenz's law of electromagnetic induction.
19. what is the frequency of direct current?
20. Define the mean value of an alternating current.
21. What is the mean value of an alternating current over a complete cycle?
22. Define the root mean square value of an alternating current.
23. The instantaneous current from am a.c, source is I=6sin324t. what is the r.m.s value of the current?
24. What is the resistance offered by an inductance to d.c.?
25. What is the phase relationship between current and voltage in an inductor?
26. What is acapacitive reactance?
27. What is the resistance offered by an capacitance to d.c.?
28. When doe a series LCR circuit have minimum impedance?
29. What is the principle of a transformer?

2 Marks questions

1. State Faraday's law of electromagnetic induction.
2. Self-induction is called inertia of electricity. Explain, why.
3. Define mutual induction. Define its unit.

4. Define self-induction. Define its unit.
5. Explain why the inductance coils are made of copper. What is non-inductive wiring of coils?
6. Coils in the resistance boxes are made from doubled up insulated wires. Why?
7. Why is spark produced in the switch of a fan, when it is switched off?
8. An induced current has no direction of its own. Explain why.
9. Why the coil of dead beat galvanometer wound on a metal frame?
10. What is difference between a steady current and d.c?
11. What is condition of resonance and expression for resonant frequency?
12. Which is more dangerous to use: a.c or d.c? Why?
13. Prove that capacitor blocks d.c and allows a.c. to pass through.
14. Prove that an inductor offers an easy path to d.c and resistive path to a.c.
15. The frequency of a.c. source is doubled. How do R, X_L, X_C get affected?
16. Why power factor correction is must in heavy machinery?
17. Explain the use transformer for the long distance transmission of energy.
18. What is function of choke coil in a fluorescent tube?
19. The core of a transformer is made of a material whose hysteresis loop is narrow. Why?
20. What is the use of a motor starter?
21. Why is choke preferred to rheostat in controlling a.c. supply?
22. Draw the graph showing the variation of resistance of (a) a capacitor and (b) an inductor with the frequency of an a.c. circuit.
23. For circuits used for transporting electric power, a low power factor implies large power loss in transmission. Why?
24. Give the working principle of a starter used along with a choke in a fluorescent tube.
25. The e.m.f of ac source is given by the expression E = 300 sin 314 t volts. Write the values of a peak voltage and frequency of source.
26. An electrical element X, when connected to an alternating voltage source, has the current through it leading the voltage by $\pi/2$ rad. Identify X and write an expression for its reactance.
27. Draw the graphs showing the variation of reactance of (a) a capacitor and (b) an inductor with the frequency of an a.c. circuit.
28. A long solenoid with 15 turns per cm has a small loop of area 2 cm2 placed inside the solenoid normal to its axis. If the current carries by the solenoid inside the solenoid normal to its axis. If the current carries by the solenoid changes steadily from 2.0 A to 4.0 A in 0.1 s, what is the induced emf in the loop while the current is changing?
29. Current in a current falls from 5.0A to 0.0 A in 0.1 s. If an average emf of 200 V induced, give an estimate of the self inductance of the circuit.
30. A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 20 A in 0.5 s, what is the change of flux linkage with the other coil?
31. A 100 Ω resistor is connected to a 220 V, 50 Hz ac supply. (a) what is the rms value of current in the circuit? (b) what is the net power consumed over a full cycle?
32. (a) the peak value of an ac supply is 300 V. What is the rms voltage?
    (b) the rms value of current in an ac circuit is 10 A. What is the peak current?
33. A 44 mH inductor is connected to 220 V, 50 Hz ac supply. Determine the rms value of the current in the circuit.

34. A 60 μF capacitor is connected to a 110 V, 60 Hz ac supply. Determine the rms value of the current in the circuit.

4 Marks questions

35. State Lenz's law. Show that it obeys law of conservation of energy.
36. What are eddy currents? How are they produced and how these can be minimized?
37. Derive expression for self-inductance for current carrying long solenoid.
38. Derive expression for mutual inductance for current carrying long solenoid.
39. Define average value of a.c. and derive expression for it.
40. Define r.m.s value of a.c. and derive expression for it.
41. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing resistance.
42. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing inductance.
43. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing capacitor.
44. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing LR.
45. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing CR.
46. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing LCR.
47. What is Q-factor? Give its units. On what factors it depends.
48. Derive expression for the power of an a.c. circuit containing LCR circuit.
49. What is power factor? On what factor it depends? Give its importance.
50. Distinguish between resistance, reactance and impedance.
51. Prove mathematically that the average value of a.c. over one complete cycle is zero.
52. Give the principle, construction and theory of transformer.
53. What are different types of energy losses in a transformer? How they can be minimised?
54. Explain the use of transformer for long distance transmission of energy.
55. The rate of change of current in one of the coils (a system formed by two coils) is1.6 A /s. Due to this, induced e.m.f in the other coil is 25.6×10^{3} μV. Find mutual inductance of the system formed by coils. (Ans: 16×10^{-3} H)
56. The number of turns in a coil is 10000 and area of each turn is It is placed perpendicularly to the magnetic induction B. If the coil is rotated through 90 ° from this position, then find the charge induced. [R = 10 Ω, B = 6 Wb/m^2] (Ans: 2.4 coulomb)
57. The total length of wings of an aeroplane is 15 m. Its horizontal velocity is 720 km /hr. Calculate the induced electromotive force between the two ends of its wings. The value of vertical component of earth's magnetic field is 4 $\times 10^{-5}$ Tesla. (Ans: 0.12 V)

58. There are 50 turns in the coil and the flux linked with each of its turn is 0.2 weber. If 5 ampere current passes through the coil, find self - inductance of the coil. (Ans: 2.0 H)
59. Number of turns of a coil is 50. Area of every turn is 100 cm ^{2}. The plane of the coil is perpendicular to the uniform magnetic field of 200×10^{-4} weber /m ^{2}. It is rotated so thatthe plane of the coil becomes parallel to the same magnetic field within 0.1 sec. Calculatethe induced e.m.f. (Ans: 0.10 V)
60. A coil of 500 turns and area 10 cm^2 is placed with its plane perpendicular to a magnetic field of 2×10^{-3} weber /m^2. If the field is uniformly reduced to zero in 10^{-2} s, what will be the e.m.f? Induced in the coil? If the resistance of the coil is 50 ohm, calculate the values of the current and charge induced in the coil. Ans: 0.1 volt, 0.002 A, 2×10^{-5} C)
61. A surface vector of area 60 m2 is parallel to and in a magnetic field. The intensity of this uniform magnetic field is 300 weber/m^2 (tesla). If the surface rotates through 90° in 3 minutes, then find the induced e.m.f. (Ans: 100 volt)
62. In a uniform magnetic field of 600 tesla a surface-vector of area is placed parallel to it. From this position, if this surface rotates through 90° in 5 minutes producing the induced e.m.f. of 80 volt, then find the surface-vector area. (Ans: 40 m^2)
63. The two rails of railway track, insulated from each other, and the ground are connected to a milli-voltmeter. What will be the reading of the milli-voltmeter when a train travels at a speed of 180 km /hr along the track, if the vertical component of earth's magnetic field is 2×10^{-4} weber /m^2 and rails are separated by 1 m. (Ans: 1 mV)
64. The length of the wing of an air plane is 10 m. Its horizontal velocity is 200 m /s. If the vertical component of the earth's magnetic field is 5.0×10^{-5} weber /m^2, calculate thepotential difference developed across the two ends of the wing. (Ans: 0.1 V)
65. A direct current of 2 A in a coil of 400 turns causes a flux of 10^{-4} weber to links of the coil. Compute the average counter e.m.f. induced in the coil if the current is interrupted in 0.08 s. Find the inductance of the coil. (Ans: 0.5 V, 0.02 H)
66. The length of a solenoid having 1000 turns is 10π cm. If its cross-sectional area is 10 cm^2, find its self-inductance. If a current of 10 A flows through it, what is the strength of magnetic field intensity inside it? ($\mu_0 = 4\pi \times 10^{-7}$ tesla-m /A)
(Ans: 4×10^{-3} H, 0.04 tesla)

67. Obtain the resonant frequency of a series LCR circuit with L= 2H, C=32 μF and R =10 Ω. What is the Q-value of this circuit?
68. Derive an expression for the instantaneous value of induced e.m.f in a coil when it is rotated in a uniform magnetic field at a uniform angular velocity. How does the e.m.f vary when the coil rotates through an angle of 2π?

69. The magnetic flux through a coil perpendicular to its plane is varying according to the relation $\Phi = (5\ t^3 + 4\ t^2 + 2t - 5)$ weber. Calculate the induced current through the coil at t = 2 s of the resistance of the coil is 5Ω.

UNIT 5

ELECTROMAGNETIC WAVES

1 Mark questions

1. Velocity of light is equal to (a) $\sqrt{\mu_0 \varepsilon_0}$ (b) μ_0/ε_0 (c) $\sqrt{\mu_0/\varepsilon_0}$ (d) $1/\sqrt{\mu_0/\varepsilon_0}$
2. Which of the following has minimum wavelength? (a) X-rays (b) ultraviolet rays (c) ɣ-rays (d) cosmic rays.
3. The SI unit of displacement current is _____.
4. Check whether the statement is true or false: electromagnetic waves are produced due to an accelerating charge.
5. Ozone layer in atmosphere is useful, because it (a) stops ultraviolet rays (b) absorbs pollutant gases (c) stops green house effect (d) stops increase in temperature of atmosphere.
6. What are electromagnetic waves?
7. State modified Ampere's circuital law.
8. Give the ratio of velocities of light rays of wavelength 4000 Å and 6000Å in vacuum.
9. Which of the following has shortest wavelength – radio waves, red light, ultraviolet rays?
10. Which of the following has shortest frequency – micro waves, X-rays, ultraviolet rays?
11. Arrange the following electromagnetic radiations in the ascending order of their frequencies: microwaves, radio waves, X-rays, gamma rays.
12. Arrange the following electromagnetic radiations in the descending order of their frequencies: infra-red rays, ultraviolet waves, X-rays, gamma rays.
13. Which of the following has shortest frequency? X-rays, microwaves and ultra-violet rays.Write the following radiations in an ascending order in respect of their frequencies: X-rays, microwaves UV rays and radio-waves.
14. Write the following radiations in an ascending order in respect of their frequencies: X-rays, infra-red rays, red rays, yellow light and radio-waves.
15. Write the frequency limit of visible range of electromagnetic spectrum in kHz.
16. Name the electromagnetic radiation to which waves of wavelength in the range of 10^{-2}m belong.
17. Which part of the electromagnetic spectrum is used in operating a RADAR?
18. Name the electromagnetic radiation used for viewing objects through haze and fog.

2 Marks questions

1. What is displacement current? Why did Maxwell introduce the concept of displacement current?
2. What are electromagnetic waves? Give its properties.
3. Give the brief history of em waves.

4. Explain Hertz's experiment for the production of electromagnetic waves.
5. Give two properties of infra-red rays.
6. Give two properties of ultra-violet rays.
7. Give two properties of micro waves.
8. Give two properties of X-rays.
9. Give two properties of ϒ-rays.
10. Give two uses of infra-red rays.
11. Give two uses of ultra-violet rays.
12. Give two uses of micro waves.
13. Give two uses of X-rays.
14. Give two uses of ϒ-rays
15. Explain Green house effect.
16. The small ozone layer on the top of stratosphere is crucial for human survival. Why?
17. Which part of the electromagnetic spectrum is used in operating RADAR?
18. A radio can tune in to any station in the 7.5 MHz to 12 MHz band. What is the corresponding wavelength band?

UNIT 6

OPTICS

2 Marks questions

1. State the laws of reflection.

2. Draw a ray diagram for image formed by plane mirror. Give its characteristics.
3. Does the mirror formula holds good for a plane mirror?
4. Why a convex mirror is used as a rear view mirror? Is it a perfect driver's mirror?
5. Why are mirrors used in search lights parabolic and not convex spherical?
6. Why is a concave mirrors preferred to a plane mirror for shaving?
7. A concave mirror is used in ophthalmoscope. Why?
8. What is refraction of light? State its laws.
9. What is refractive index? On what factors it depends?
10. When does Snell's law in refraction fail?
11. Why do stars twinkle at night?
12. The sun is seen a little before it rises and for a short while after it sets. Explain why?
13. Why does a tank filled with water appear shallow?
14. A stick is partially immersed obliquely under water appears to be bent. Explain why?
15. How do you explain the mirage effect produced in very hot deserts?
16. Why is the diamond brilliant? Is it a source of light also?
17. The refractive index of diamond is much greater than that of ordinary glass. Is this fact of some use to a diamond cutter?
18. Draw ray diagram to show how a right angled isosceles prism can be used to (a) deviate the ray through 180° (b) deviate the ray through 90°.
19. Can a convergent lens in one medium behave as a divergent lens in some other medium?
20. A magician during a show makes a glass lens with n=1.47 disappears in a trough of liquid. What is the refractive index of the liquid? Could the liquid be water?
21. Explain why an air bubble inside a transparent liquid behaves like a diverging lens.
22. What is spherical aberration? How it can be minimized.
23. Although the surfaces of a goggle lens are curved, it does not have any power. Explain why?
24. What is difference between primary and secondary rainbow?
25. What is dispersion of light? Explain its cause.
26. Why sky appear blue? What will it look like on moon?
27. Why the rising sun is red in colour?
28. Eye is more sensitive to yellow colour. Why is then danger signals red?
29. A thin prism of 5° angle gives a deviation of 3.2°. What is the value of refractive index of the material of the prism?
30. A diver under water looks obliquely at a fisherman standing on the bank of a lake. Would the fisherman look taller or shorter to the diver than what he actually is?
31. What is difference between reflecting and refracting type telescope?
32. A concave lens is kept in contact with a convex lens of focal length 20 cm. the combination works as a convex lens of power 2D. Find the power of the concave lens.
33. Draw a labelled diagram of eye.
34. What is difference between reflecting and refracting type telescope?
35. Draw labelled ray diagram to show the formation of image of an object by compound microscope.

36. Draw labelled ray diagram to show the formation of image of an object byastronomical telescope.
37. What is difference between hypermetropia and myopia?
38. The myopic person prefers to remove his spectacles, while reading a book. Explain why.
39. The hypermetropic person prefers to remove his spectacles, while driving. Explain why.
40. Why must both the objective and the eyepiece of a compound microscope have short focal lengths?
41. Define wave front and ray of light. How they are related to each other.
42. Why ether was called a hypothetical medium?
43. Why is the contribution of wavelets lying on the back of secondary wave front zero?
44. Draw the shape of wave front originating from (i) a point source and (ii) a line source?
45. What are two assumptions on which Huygens' Principle is based?
46. What are the conditions for two sources to be coherent?
47. When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency as the incident frequency. Explain why?
48. When light travels from a rarer to a denser medium, the speed decreases. Does the reduction in speed imply a reduction in the energy carried by the light wave?
49. State Doppler's effect in light. Give one use of doppler's effect of light?
50. What is red and blue shift in case of doppler's effectof light?
51. State the necessary conditions for the sustained interference.
52. Can white light produce interference? What is its nature?
53. State the reason, why two independent sources of light cannot be considered as two coherent sources.
54. What is the ratio of slit widths when the amplitudes of light waves from them have a ratio 3:1?
55. If the two slits in Young's experiment have width ratio 4:1, calculate the ratio of intensity at maxima and minima in the interference pattern.
56. Two coherent sources whose intensity ratio is 25:1 produce interference fringes. Calculate the ratio of intensity of maxima and minima in the fringe system.
57. Why do the oil films on the surface of water appear to be coloured?
58. Why does an excessively thin film appear black in reflected light?
59. Bubbles of colourless soap solution appear coloured in sunlight. Why?
60. Why no interference pattern is observed, when two coherent sources are (i) infinitely close to each other (ii) far apart from each other?
61. What is diffraction of light? What is condition for diffraction to takes place?
62. What is difference between interference and diffraction?
63. Why can sound waves be diffracted more easily than light waves?
64. Differentiate between polarised and unpolarised light. How are these represented?
65. What do you mean by crossed polarized and elliptically polarized light?
66. A ray of light is incident on the surface of a glass plate of refractive index 1.5 at the polarising angle. Calculate the angle of refraction.
67. For a given medium the polarising angle is 60°. What will be the critical angle of the medium?

4 Marks questions

1. Prove that for a concave mirror, the radius of curvature is twice its focal length.
2. Establish mirror formula for a concave mirror. State its sign conventions used.
3. Establish mirror formula for a convex mirror. State its sign conventions used.
4. Draw a ray diagram for the image formed by a concave mirror when the object lies at (i) infinity (ii) centre of curvature (iii) focus.
5. Draw a ray diagram for the image formed by a concave mirror when the object lies at (i) beyond centre of curvature (ii) between focus and centre of curvature (iii) between focus and pole.
6. Define magnification. Derive expression for magnification produced by a concave mirror.
7. Deduce the relation: $\mu = \frac{real\ depth}{apparant\ depth}$
8. What is normal shift? Derive relation for it.
9. What is total internal reflection? Write the conditions for total internal reflection to take place. Give one application of total internal reflection.
10. What is optical fibre? State its principle and give its applications.
11. By stating the sign-conventions and assumptions used, derive the relation between u, v and R of a convex spherical surface, when refraction takes place from optically denser to optically rarer medium.
12. By stating the sign-conventions and assumptions used, derive the relation between u, v and R of a concave spherical surface, when refraction takes place from optically denser to optically rarer medium.
13. Prove the following formula when refraction takes place at a convex spherical refracting surface and source of light lies in the rarer medium and image formed is virtual. $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ Where symbols have their usual meanings.
14. Prove the following formula when refraction takes place at aconvex spherical refracting surface and source of light lies in the rarer medium and image formed is real. $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ Where symbols have their usual meanings.
15. Derive the lens formula for a convex lens, $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$.
16. What is power of lens? Why is the power of a lens measured as the reciprocal of focal length?
17. What is equivalent lens? Obtain an expression for the effective focal length of two convex lenses placed in contact.
18. State and prove prism formula.
19. Derive the relation for refractive index of material of prism when prism is placed in minimum deviation position.
20. Prove that for small angle of prism $\delta = A(\mu - 1)$.
21. On what factors does the (i) magnifying power (ii) resolving power and (iii) light gathering power of a telescope depends?

22. What is myopia? What are its causes? Name the type of lens to correct this defect.
23. What is hypermetropia? What are its causes? Name the type of lens to correct this defect.
24. With the help of labelled diagram, find the expression for the magnifying power of a simple microscope.
25. Draw a ray diagram to show the image formed by a Newtonian reflecting type telescope. Give its two advantages.
26. Verify law of reflection using Huygens' wave theory.
27. Verify law of refraction using Huygens' wave theory.
28. What is interference of light? Show that it obeys law of conservation of energy.
29. What is sustained interference pattern? What conditions must be satisfied for producing sustain interference pattern?
30. What are coherent sources? Why two independent source of light do not produce interference pattern?
31. What happens to fringe width under the following operations; (i) slit width is reduced (ii) distance between screen and slit is reduced (iii) monochromatic light is replaced by white light (iv) apparatus is immersed in water?
32. Define resolving power of telescope. On what factors it depends?
33. Define resolving power of microscope. On what factors it depends?
34. Describe an experiment to show that light waves are transverse in nature.

35. What is polarization of light? How will you represent polarized and unpolarised light?
36. State and prove Brewster law of polarization of light.
37. Define (i) critical angle (ii) polarizing angle. What is relation between them?
38. What are polaroid and give its uses?
39. An object is placed at a distance of 40cm from a concave mirror of focal length 15cm. if the object is displaced through a distance of 20cm towards the mirror, by how much distance is the image displaced?
40. A convex lens of focal length 0.2 m and made of glass (μ=1.5) is immersed in water (μ=1.33). Find the change in the focal length of the lens.
41. An object is placed at a distance of 75 cm from a screen, where should a convex lens of focal length 12 cm be placed so as to obtain real image of the object on the screen?
42. A ray of light incident on an equilateral glass prism shows minimum deviation of 30°. Calculate the speed of light through glass prism.
43. A person's far point is 2m and his near point is 40 cm. find the nature, focal length and power of the lenses, he must use to (a) see distant objects and (b) read a book clearly. The least distance of distinct vision is 25 cm.
44. What is the focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 20 cm? is the system a converging or diverging lens? Ignore thickness of the lenses.
45. Light of wavelength 4000 $\mathring{A}$ is incident on a double slit, if the overall separation of 10 fringes on a screen 200 cm away is 1.0 cm, find the distance between two slits.

46. The fringe width in a Young's double slit interference pattern is 2.4×10^{-4} m, when red light of wavelength 6400 $\mathring{A}$ is used. By how much will it change, if blue light of wavelength 4000 $\mathring{A}$ is used?

6 Marks questions

1. With the help of a ray diagram, explain the principle, working and expression for magnifying power of compound microscope.
2. With the help of a ray diagram, explain the principle, working and expression for magnifying power of telescope.
3. What is rainbow? Differentiate between primary and secondary rainbow with a diagram. Why two observers do not see the same rainbow?
4. Giving sign conventions and assumptions derive lens maker formula for convex lens.
5. With the labelled diagram of eye explain the various parts of eye.
6. What do you mean by accommodation of eye? Write the various defects of vision and their causes. How these defects can be corrected.
7. Draw the course of rays through a compound microscope. Obtain an expression for the magnifying power of a compound microscope when image is formed at least distance of distinct vision. How can the magnifying power be increased?
8. Explain the construction and working of an astronomical telescope. Calculate its magnifying power when the image is formed at least distance of distinct vision.
9. Draw a neat labelled ray diagram to show how the image of a distinct object is formed by an astronomical refracting telescope in normal adjustment. Obtain an expression for its magnifying power.
10. State principle of superposition of light waves. Derive the conditions for constructive and destructive interference.
11. Derive the expression for fringe width for young double slit experiment.
12. Explain diffraction at a single slit and derive relation for linear width of central maxima.

UNIT 7

DUAL NATURE OF MATTER

1 Mark questions

1. Sodium and copper have work function 2.3 eV and 4.5 eV respectively. Then, the ratio of the wavelengths is nearest to : (a) 1:2 (b) 4:1 (c) 2:1 (d) 1:4
2. Check whether the statement given is true or false : The value of Planck's constant is 6.62×10^{-34} Js^{-1}.
3. The mass of a photon at rest is _____.
4. For photoelectric emission, tungsten requires light of 2300 Å. If light of 1800 Å wavelength is incident, then emission (a) takes place (b) does not takes place (c) may or may not takes place (D) depends on intensity.
5. The magnitude of saturation photoelectric current depends upon: (a) frequency (b) stopping potential (c) work function (d) intensity of light.
6. How many electron volts are there in 1 joule?
7. What is rest mass of photon?
8. Define an electron volt.
9. How many joules make one electron volt?
10. What is photon?
11. On what factor does energy of photon of light depends?
12. What is photoelectric effect?
13. Define threshold wavelength.
14. Define threshold frequency.
15. Why alkali metals are most suited for photoelectric emission?
16. If the wavelength of the incident light is decreased, how does velocity of photoelectrons change?
17. Does the threshold frequency depend on the intensity of light?
18. Define stopping potential.
19. If the intensity of incident light is doubled, how does the stopping potential change?
20. If the frequency of the incident light is equal to the threshold frequency, what will be the value of the stopping potential?
21. What is value of rest mass of photon?
22. Which photon is more energetic: a red one or a violet one?
23. Define work function.
24. Write photoelectric equation.
25. Do non-metals show photoelectric effect?
26. Name two methods of electron emission.
27. Write de-Broglie wave equation.
28. Calculate de-Broglie wavelength of an electron beam accelerated through a potential difference of 100V?
29. Two metals A and B have work function 2eV, 4eV respectively, which metal have lower threshold wavelength for photoelectric effect?
30. The work function of cesium is 2eV. What does it mean?

31. It is harder to remove free electron from copper tan from sodium. Which has higher work function?
32. Which photon is more energetic: a red one or a violet one?
33. On what factors stopping potential depends?
34. Give the four properties of photons.
35. On what factors photoelectric current depends?
36. Photoelectric emission is a spontaneous process. Comment.
37. Is photoelectric emission possible at all frequencies? Give reason.
38. If the frequency of the incident radiation on the cathode of a photocell is doubled, how will the following change: (i) kinetic energy of the electrons, (ii) photoelectric current.
39. Calculate the energy of a photon in electron volt, whose wavelength is 6600 $\mathring{A}$.
40. The maximum K.E of electrons emitted by a photocell is 3eV, what is the stopping potential?
41. What is the momentum of an electron beam of wavelength 4 $\mathring{A}$?

4 Marks questions

1. State laws of photoelectric emission.
2. With the help of experimental arrangement explain the variation of photoelectric current with (a) intensity of radiation (b) frequency of the incident radiation (c) the potential difference between the plates A (anode) and C (cathode), and (d) the nature of the material of plate C.
3. Explain, why the wave nature of light is unable to explain the photoelectric effect of light?
4. Write the Einstein's photoelectric equation. On the basis of this equation, explain the laws of photoelectric equation.
5. Give the uses of photoelectric cell.
6. Find the number of photons emitted per second by a 25W source of monochromatic light of wavelength 6000 $\mathring{A}$?
7. Radiations of wavelength 5000 $\mathring{A}$ falls on a metal whose work function is 1.9eV. Find the energy of photo-electrons emitted?
8. On using light of wavelength 5000 $\mathring{A}$, the stopping potential for a photocell is 2.4 V. if light of wavelength 4000 $\mathring{A}$ is used, and then what is value of stopping potential.
9. Derive an expression for de-Broglie wavelength of an electron moving under a potential difference of V volts.
10. What is the de-broglie wavelength associated with(a) an electron moving with a speed of 5.4×10^6 m/s and (b) a ball of mass 150 g travelling at 30 m/s.
11. What is the (a) momentum, (b) speed, and (c) de Broglie wavelength of an electron with kinetic energy of 120 V.

UNIT 8

ATOMS AND NUCLEI

1 Mark questions

1. When an electron jums from the fourth orbit to the second orbit, one gets the (a) second line of Paschen series (b) second line of Lyman series (c) second line of Balmer series (d) first line Pfund series.
2. The minimum wavelength of the X-rays produced by electrons accelerated through a potential difference of V (volt) is directly proportional to (a) $\sqrt{V}$ (b) V^2 (c) $\frac{1}{\sqrt{V}}$ (d) $\frac{1}{V}$
3. A nucleus represented by the symbol $_{Z}X^{A}$ has (a) Z neutrons and A-Z protons (b) Z protons and A-Z neutrons (c) Z protons and A neutrons (d) A protons and Z-A neutrons.
4. A radioactive element has half life period 1600 years. After 6400 years what amount will remain? (a) ½ (b) 1/16 (c) 1/8 (d) ¼
5. Solar energy is due to _____(fission reactions / fusion reactions).
6. Cadmium is used as moderator in nuclear reactor. True or false.
7. The neutron was discovered by (a) Marie Curie (b) James Chadwick (c) Rutherford (d) Pierre Curie.
8. Define impact parameter.
9. What is scattering angle for b=0?
10. What is distance of closest approach?
11. What is Bohr's quantisation condition?
12. What is Bohr's frequency condition?
13. Name the series of hydrogen spectrum which lies in ultraviolet region?
14. Name the series of hydrogen spectrum which lies in visible region?
15. Name the series of hydrogen spectrum which lies in infra-red region?
16. What is energy possessed by an electron in n=∞?
17. What is the ionisation potential of hydrogen atom?
18. What is value of Rydberg's constant?
19. How many electrons, protons and neutrons are there in a nucleus of atomic number 12 and mass number 25?
20. What are isotopes?
21. What are isobars?
22. What are isotones?
23. What are nuclear forces?
24. Give two properties of nuclear forces.
25. Define mass defect.
26. Define binding energy of a nucleus.
27. Define atomic mass unit.
28. State Einstein's mass energy relation.

29. How many joules are there in 1 MeV?
30. Define alpha decay.
31. Define beta decay.
32. Define gamma decay.
33. Select the pairs of isobars and isotones from the following nuclei: ${}_{11}Na^{22}, {}_{12}Mg^{24}, {}_{11}Na^{24}, {}_{10}Ne^{23}$

4 Marks questions

1. What is Rutherford atomic model? What are its drawbacks?
2. State the postulates of Bohr's atomic theory.
3. Derive an expression for total energy of an electron in a hydrogen atom.
4. What are drawbacks of Bohr's atomic theory?
5. What is difference between emission and absorption spectra?
6. Define isotopes, isobars and isotones. Select the pairs of isobars and isotones from the following nuclei: ${}_{11}Na^{22}, {}_{12}Mg^{24}, {}_{11}Na^{24}, {}_{10}Ne^{23}$
7. Show that nuclear density is independent of mass number.
8. Define mass defect, binding energy and binding energy per nucleon.
9. Draw the curve between mass defect and binding energy per nucleon. What conclusion is drawn from it?
10. What are nuclear forces? Give its properties.
11. What is natural and artificial radioactivity?
12. What is difference between α-rays, β-rays-rays?
13. Define radioactivity. State laws of radioactive disintegration.
14. State radioactive decay law. Show that radioactive decay is exponential decay.
15. What is half life period and mean life period? Establish relation between two.
16. What is radioactive disintegration constant? How it is related with half life period.
17. What are nuclear reactions? State the laws which are conserved during nuclear reactions.
18. What is difference between nuclear fission and nuclear fusion reactions?
19. A fusion reaction is more energetic than fission reaction. Comment.
20. Why is heavy water used as a moderator?
21. Define critical mass and critical size.
22. Natural radioactive nuclei are nuclei of high mass number. Why?
23. Define two units of radioactivity. How are they related?
24. Uranium ${}_{92}U^{238}$ is not suitable for chain reaction. Why?
25. A chain reaction dies out. State the reasons, why this could happen.
26. What are thermal neutrons? Why are the neutrons as effective as bombarding particles?
27. Why control rods are made of Cadmium in a nuclear reactor?
28. Explain the production of energy in stars.
29. In heavy nuclei, number of neutrons is more than number of protons. Why?
30. The sun is continuously losing mass. Comment on the statement.

31. The radius of the innermost electron orbit of a hydrogen atom is 5.3×10^{-11} m. what are the radii of the n=2 and n=3 orbits?
32. Obtain the binding energy (in MeV) of a nitrogen nucleus ($^{14}_{7}N$) given m($^{14}_{7}N$) =14.00307 u, m_p =1.007825 u, m_n=1.008665 u.

UNIT 9
ELECTRONIC DEVICES

1 Mark questions

1. The energy gap is maximum in : (a) metals (b) superconductors (c) insulator (d) none of those.
2. To obtain a p-type germanium semiconductor, it must be doped with (a) arsenic (b) antimony (c) indium (d) phosphorus.
3. To use a transistor as an amplifier (common base configuration) the emitter base junction is _____ biased and collector base junction is _____ biased.
4. Check whether the given statement is true or false: diode is used as an amplifier.
5. In the binary number system, 111 represents _____.
6. In Boolean algebra, y=A.B implies (a) y equals A and B (b) y equals A or B (c) y equals product of A and B (d) y equals neither A nor B.
7. Why crystalline solids have sharp melting points?
8. What is valence band?
9. What is conduction band?
10. Define forbidden energy gap in solids.
11. What is Fermi energy level?
12. Why semiconductors are doped?
13. What is hole?
14. Doping of germanium with indium leads to which type of semiconductor?
15. What is electron mobility?
16. What is an extrinsic semiconductor?
17. Draw energy band diagram for an n-type extrinsic semiconductor.
18. Draw energy band diagram for a p-type extrinsic semiconductor.
19. How does conductivity of semiconductor change with rise in temperature?
20. What do you understand by potential barrier?
21. What is depletion region in a p-n junction?
22. What is effect on width of depletion layer when p-n junction is forward biased?
23. What is effect on resistance of a p-n junction when it is reverse biased?
24. Draw a circuit diagram of a p-n junction with forward bias.
25. Draw a circuit diagram of a p-n junction with reverse bias.
26. What is zener diode?
27. What is zener break down?
28. What are photodiodes?
29. What is light emitting diodes?
30. What is solar cell?
31. What is relation between current gains α and β?
32. Define transconductance of a transistor.
33. Convert number 37 into binary number system.
34. What is logic gate?
35. What is truth table of a logic gate?
36. What is Boolean expression?

2 Marks questions

1. What is difference between crystalline and amorphous solids?
2. What is meant by doping? Why it is done?
3. Distinguish between intrinsic and extrinsic semiconductors.
4. What is difference between p-type and n-type semiconductors?
5. Why a semiconductor is damaged by strong currents?
6. What is potential barrier, depletion layer?
7. What is forward and reverse biasing on junction diode?
8. Draw labelled characteristics (forward and reverse bias) of pn junction diode.
9. What do you mean by transistor? Why it is so called? Give the symbols of n-p-n and p-n- transistor.
10. Can two p-n junction diodes back to back work as transistor.
11. Why does the width of the depletion layer in a p-n junction vary with the increase in reverse bias?
12. In a transistor base is made thin, why?
13. In a transistor, forward bias is always small as compared to the reverse bias. Explain
14. A transistor is a heat sensitive device. Explain
15. How will you test in a simple way whether transistor is spoiled or in working order?
16. Why a transistor cannot be used as rectifier?
17. In a transistor, emitter-base junction is always forward-biased, while the collector-base junction is reversing biased. Why?
18. What is digital and analog signal?
19. NAND or NOR gate are called building blocks of digital electronics. Why?
20. How NOTgate is actually releaised using transistors?
21.

4 Marks questions

22. Explain the formation of energy bands in solids.
23. On the basis of energy band theory, distinguish between metals, insulators and semiconductors.
24. What do you mean by hole in a semiconductor? Write its three characteristics.
25. What is donor energy level and acceptor energy level? Explain.
26. What is effect of increase in temperature on the conductivity of semiconductors and metals?
27. Derive an expression for electrical conductivity of semiconductors.
28. Explain the formation of pn junction.
29. What do you mean by half waves rectifier and draw its circuit diagram?
30. Draw the circuit diagram of full wave rectifier and briefly explain its working principle?
31. Explain the action of transistor.
32. What is zener diode? Give its symbol and use.
33. Explain the working of n-p-n transistor as common base amplifier.
34. Explain the working of p-n-p transistor as common base amplifier.

35. Explain the working of n-p-n transistor as common emitter amplifier.
36. Draw and explain the characteristic curves for p-n-p transistor in common emitter configuration.
37. Explain with the help of labelled diagram the working junction transistor as oscillator.
38. Explain with the help of labelled diagram the working junction transistor as switch.
39. Write the merits and demerits of semiconductor devices over vacuum tubes.
40. Define current amplification factor in common base and common emitter mode. Establish relation between two.
41. What are truth table, logic gate and Boolean expression?
42. Give the symbol, truth table and Boolean expression for AND gate.
43. Give the symbol, truth table and Boolean expression for OR.
44. Give the symbol, truth table and Boolean expression for NOT gate.
45. Give the symbol, truth table and Boolean expression for NAND gate.
46. Give the symbol, truth table and Boolean expression for NOR gate.
47. How we make AND, NOT and OR gate using NAND (NOR) gates?
48. How AND gate, OR gate are actually releaised using pn junctions?

Unit 10

COMMUNICATION SYSTEMS

1 Marks questions

1. What is the cause of Greenhouse effect? (a) infra-red rays (b) ultraviolet rays (c) X-rays (d) radio waves.
2. Ozone layer is present in (a) ionosphere (b) stratosphere (c) ionosphere (d) mesosphere.
3. Optical fibres is based on the principle of _____.
4. Frequencies in the UHF range normally propagate by means of ground waves. True or false
5. Which of the following frequencies will be suitable for beyond the horizon communication using sky waves? (a) 10 kHz (b) 10 MHz (c) 1 GHz (d) 1000 GHz.
6. Frequencies in the UHF range normally propogate by means of (a) ground waves (b) sky waves (c) surface waves (d) space waves.
7. Which of the following is not transducer? (a) loudspeaker (b) amplifier (c) microphone (d) all of these.
8. The number of geostationary satellites needed for uninterrupted global coverage is (a) 3 (b) 4 (c) 1 (d) 2.
9. Short wave bands are used for transmission of radio waves to a large distance. True or false.
10. What are the elements of communication system?
11. Draw a block diagram of communication system.
12. What is transducer?
13. What do you mean by attenuation?
14. What do you mean by bandwidth?
15. What do you mean by modulation?
16. Draw the block diagram of a transmitter.
17. Draw a block diagram of a receiver.

2 Marks questions

1. What is communication system? What are main constituents of communication system?
2. What is transducer? Give an example.
3. What is digital and analog communication system?
4. What is frequency modulation and amplitude modulation?
5. What are advantages of frequency modulation over amplitude modulation?
6. Why do we need modulation for transmission of signals?
7. What is modulation index? Give its importance.
8. What do you mean by bandwidth and frequency deviation?
9. What do you mean by quantization and sampling of an analog signal?
10. The audio signal cannot be transmitted directly into space. Why?
11. What is carrier wave? Why high frequency carrier waves are employed for transmission?

12. What is noise? What are their causes?
13. What is difference between bit-rate and sampling rate?
14. What do you mean by pulse amplitude modulation and pulse code modulation?
15. What are merits of digital communication?
16. What is modem? Explain its principle.
17. Explain the term FAX?
18. Distinguish between a FAX and an e-mail.
19. What is ground wave? Why short wave communication over long distance is not possible via ground wave?
20. What are sky waves? Why sky waves are not used in the transmission of television signals?
21. Briefly explain space wave propogation.
22. Briefly explain sky wave propogation.
23. What is an active satellite? How is it different from a passive satellite?
24. It is necessary to use satellites for long distance TV transmission. Why?
25. Deduce an expression for the distance at which TV signals can be directly received from a TV tower of height h.
26. Greater the height of a TV transmission antenna, greater is its coverage. Explain.
27. What is micro wave communication? What are its drawbacks?
28. What is communication satellite? What are its advantage and disadvantages?
29. What is remote sensing? How it is carried out? Give its applications.
30. What are active and passive satellites?
31. What is transmission medium? What are various types of transmission media used for communication systems?
32. What are drawbacks of 2-wire line?
33. What are coaxial cables? What are their main advantages over 2-wire line?
34. What is function of copper mesh in a coaxial cable?
35. What is optical fibre? What is its principle?
36. What is cladding?
37. Why do we prefer a twisted pair in comparison to parallel wire in communication systems?
38. Why does a parallel wire line radiate energy? How this problem overcome in twisted pair?

10+2

PHYSICS SAMPLE QUESTION PAPER -1

Time 3 hours max marks -70

Questions no. 1 to 8 is of one mark each.
Question no. 9 to 16 is of two marks each.
Question no.17 to 23 is of four marks each.
Question no 24 to 26 are of six marks each.

1. A fuse wire is a wire of
   (a) both high resistance and high melting point
   (b) both low resistance and low melting point
   (c) high resistance and low melting point
   (d) low resistance and high melting point.
2. A galvanometer acting as a voltmeter, will have
   (a) a high resistance in parallel with its coil
   (b) a high resistance in series with its coil.
   (c) a low resistance in parallel with its coil
   (d) a low resistance in series with its coil.
3. Which part of electromagnetic spectrum has largest penetrating power?
4. The minimum energy required to remove an electron is called
   (a) work function
   (b) kinetic energy
   (c) stopping potential
   (d) potential energy
5. What is Bohr's frequency condition?
6. What is doping?
7. Digital signals
   (a) do not provide a continuous set of values
   (b) represent values as discrete steps
   (c) utilise binary code system
   (d) all of above.
8. Define coefficient of mutual induction.
9. Name the material used for making standard resistors? Why?
10. Explain why the inductance coils are made of copper.
11. Give two uses of infra-red rays
12. What is difference between interference and diffraction?
13. The widths of two slits in an interference experiment are in the ratio 9:1. What is the ratio of amplitudes and intensities of light waves from them?
14. A current of 5.0 A flows through each of two parallel long wires. The wires are 2.5 cm apart. Calculate the force acting required. What will be the direction of force, if both currents flow in the same direction?
15. Distinguish between analog and digital type communication.
16. Derive the relation between current gains α and β.
17. Verify law of reflection using Huygens' wave theory.
18. A proton and electron have got the same de-Broglie wavelength. Which has greater kinetic energy? Explain.
19. State Coulomb's law. Define one coulomb. Give its limitations. Express coulomb's law in vector form. What is its importance?
20. Define average value of a.c. and derive expression for it.
    Or

Aman's transformer whose efficiency is 90% draws 5 A, when 200 V is applied to its primary coil. Find the current in secondary coil, if output is drawn at 300 V, the number of turns in the secondary coil.

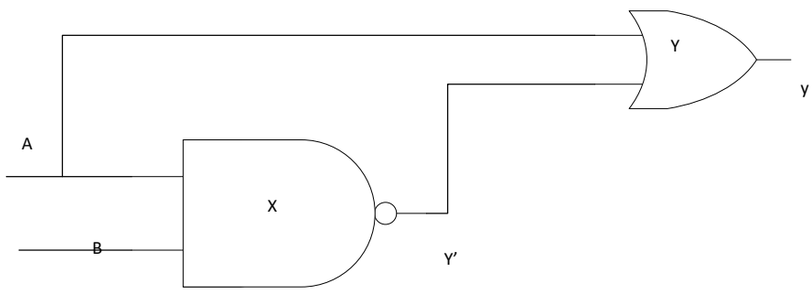
21. Explain the use of slide wire bridge to measure unknown resistance.
    Or
    A parallel combination of three resistors takes a current of 7.5 A from a 30 V supply. If the two resistors are 10 ohms and 12 ohm find the third one.
22. Write the main postulates of Rutherford's atomic model and the cause of failure of this model.
23. Explain the working of transistor as switch.
24. (a) Electric field is always at right angle to equipotential surfaces. Why?
    (b) Derive the expression for potential energy when an electric dipole is placed inside uniform electric field. Under what condition these are maximum and minimum.
    Or
    (a) Define dielectric strength of the medium.
    (b) Give the principle, construction and working of Vande Graff generator.
25. (a) State principle of superposition of light waves.
    (b) Derive the conditions for constructive and destructive interference. Derive the expression for fringe width for young double slit experiment.
    Or
    (a) What is normal adjustment in telescope?
    (b) With the help of a ray diagram, explain the principle, working and expression for magnifying power of compound microscope.
26. (a) Give the principle construction and working theory of a cyclotron.
    (b) Why it is not suitable for accelerating electrons and neutrons?
    Or
    (a) Give five differences between dia-, para-, and Ferro- magnetic substances.
    (b) Sketch the hysteresis loops for soft iron and hard steel. what do you infer about these materials from their hysteresis loops?

10+2 PHYSICS SAMPLE QUESTION PAPER - 2

Time 3 hours max marks -70

Questions no. 1 to 8 is of one mark each.
Question no. 9 to 16 is of two marks each.
Question no.17 to 23 is of four marks each.
Question no 24 to 26 are of six marks each.

1. The specific resistance of a conductor increases with
   (A) decrease with length
   (b) decrease in cross-sectional area
   (c) increase with temperature
   (d) increase in cross sectional area.
2. A diamagnetic material in a magnetic field moves
   (a) perpendicular to the field
   (b) from weaker to stronger part
   (c) from stronger to weaker part
   (d) in none of the above directions.
3. Name the electromagnetic radiation used for viewing objects through haze and fog?
4. Photoelectric effect shows:
   (a) wave nature of electrons
   (b) particle nature of light
   (c) both (a) and (b)
   (d) none of these.
5. Name the series of hydrogen spectrum, which has least wavelength.
6. What type of impurity is added to obtain n-type semiconductor?
7. An antenna is a device
   (a) that converts electromagnetic energy into radio frequency signal
   (b) that convert radio frequency signal into electromagnetic energy
   (c) that converts guided electromagnetic waves into free space electromagnetic waves and vice versa
   (d) none of the above.
8. What is frequency of direct current?
9. What is drift velocity and relaxation time? Write relation between them.
10. Why the coil of dead beat galvanometer wound on a metal frame?
11. The small ozone layer on the top of stratosphere is crucial for human survival. Why?
12. Why do stars twinkle at night?
13. Why sky appear blue? What will it look like on moon?
14. Identify the logic gates marked X,Y in fig. write its truth



table

15. Calculate the length of half wave dipole antenna at 60 MHz
16. What is shunt? Give its two uses?
17. Derive expression for impedance and phase angle when a.c. is applied to the circuit containing LR.
    Or

Find the capacitive reactance of a 10 μF capacitor at 1000 cycle s^{-1}. Calculate the inductance required to produce series resonance with the capacitor at this frequency.

18. Three capacitors of capacitance C_1, C_2, C_3 are connected in (i) series (ii) parallel. Find the expression for resultant capacitance
19. Explain one use of potentiometer with the help of proper diagram.
20. (a) If the frequency of the incident radiation on the cathode of a photocell is doubled, how will the following change: (i) kinetic energy of the electrons, (ii) photoelectric current.
    (b) What do you understand by phrase 'dual nature of radiation'?
21. Give four differences between nuclear fission and nuclear fusion reactions?
    Or
    Calculate the (i) mass defect (ii) binding energy per nucleon for a ${}_6C^{12}$ nucleus. Nuclear mass of ${}_6C^{12}$ =12.000000 a.m.u, mass of hydrogen nucleus= 1.007825 a.m.u and mass of neutron=1.008665 a.m.u.
22. Draw and explain the characteristic curves for pnp transistor in common emitter configuration.
23. Define (i) critical angle (ii) polarizing angle. What is relation between them?
24. (a) State Maxwell's cork screw rule.
    (b) Using Biot Savart's law derives the expression for magnetic field at the centre of current carrying coil.

    or

    (a) State Biot Savart's law.
    (b) Define magnetic field intensity at a point and derive an expression for it at a point on the axial line of a magnetic dipole.
25. (a) What is power of lens? Why is the power of a lens measured as the reciprocal of focal length?
    (b) Derive the lens equation for convex lens.

    or

    (a) What are coherent sources? Why two independent source of light do not produce interference pattern?
    (b) Derive the expression for fringe width in Young's double slit experiment.
26. (a) Define the unit of potential difference between two points.
    (b) Show that work done /line integral of electric field in moving a charge from one point to another inside the electric field is independent of path followed.

    or

    (a) What is principle of electrostatic shielding?
    (b) Derive expression for electric field due to spherical body at any point (i) inside (ii) outside (iii) on the surface using Gauss's theorem.