Physics Question Bank(Class-12th)
(Year-2016 - 2024)

UNIT-1 Electrostatics

Each question Carries 1 mark-

Year-2016

1. When a body becomes negatively charged, its mass:-

a) decreases **b) increases** **c) remains the same** **d) None of these.**

2. The value of velocity of light in vacuum is:-

a) $\sqrt{\frac{\mu_o}{\varepsilon_0}}$ **b)** $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ **c)** $\sqrt{\mu_0 \varepsilon_0}$ **d) None of these.**

3. No of electrons forming 1 Coulomb of charge is equal to:-

a) 6.25 **b)** 6.25×10^{-18} **c)** 6.25×10^{18} **d)** 6.25×10^{-19}.

4. The average power dissipated in pure capacitor in ac circuit is:-

a) $\frac{1}{2}CV^2$ **b)** CV^2 **c)** $2CV^2$ **d) Zero.**

5. What are the units of absolute permittivity of free space?

Year-2017

1. What is the dimensional formula of Electric potential?

a) $[M^2L^2T^{-3}A^{-1}]$ **b)** $[ML^2T^{-3}A^{-1}]$ **c)** $[ML^2T^{-2}A^1]$ **d)** $[ML^{-2}T^{-3}A^{-1}]$

2. State Coulomb's law from Gauss law.

3. What is the dimensional formula of electric capacitance?

a) $[M^{-1}L^{-2}T^4A^2]$ **b)** $[M^{-1}L^{-2}T^4A^2]$ **c)** $[M^{-1}L^{-2}T^{-4}A^2]$ **d)** $[M^1L^{-2}T^{-4}A^{-2}]$

Year-2018

1. The dimensional formula of absolute permittivity of free space is:-

a) $[M^{-1}L^{-3}T^4A^2]$ **b)** $[M^{-1}L^{-2}T^2A]$

c) $[M^{-1}L^{-2}T^{-2}A]$ **d)** $[M^{-1}L^{-2}T^{-2}A^{-2}]$

2. 1Kwh is equal to:

a) $36X10^3J$ **b)** 36×10^5 J **c)** $36 X10^{-5}J$ **d)** $36X10^{-3}J$

3. What is the value of absolute permittivity of free space in SI system?

Year-2019

1. In SI, unit of electric field is:-

a) Am^{-1} **b)** NC^{-1} **c)** Cm^{-1} **d)** $C\,m^{-2}$

2. The number of electrons present in one coulomb of charge is:-

3. A circle of radius 'r' is drawn with charge +q at the centre. A charge q_o is brought from the point B to C. Then the work done is:-

a) positive **b) negative** **c) infinite** **d) zero**

Year -2020

1. Electric field intensity due to an electric dipole at a point distance 'r' from its centre varies as:-

a) r b) r^2 c) r^3 d)r^{-3}

2. Kilowatt- hour is the unit of :-

a) current b) Voltage c) electric power d) electric energy

3. The unit of intensity of electric field is:-

a) NC^{-1} b) JC^{-1} c) Vm d) Nm^{-1}

Year-2021

1. Dimensional formula of absolute permittivity of free space is:-

a) $[M^{-1}L^{-3}T^4A^2]$ b) $[ML^3TA^2]$ c) $[M^2L^{-3}T^4A]$ d) $[M^{-1}L^{-3}TA^2]$

2. Name CGS unit of the charge:-

a) Stat Coulomb b) Henry c) Ohm d)C/m^3

3. A body gets positively charged it means that:-

a) it has gain the electrons b) It has lost the electrons

c) Neither gain nor loss. d) None of above.

4. Electric flux due to an electric dipole:-

a) q/ε_0 b)q/ε c)Zero d) $2q/\varepsilon_0$

5. A spherical conductor of radius 12 cm has a charge of 1.6 X 10^{-7} C distributed uniformly on its surface. What is the electric field inside the sphere?

a) 10^6 NC b) 10^{-6} NC c) 10^5 NC^{-1} d) Zero.

6. If the distance between two plates of a parallel plate capacitor is doubled, then its capacitance:-

a) decreases two times b) increases two times

c) increases 4 times d) decreases 4 times

7. The dielectric constant of matter is:-

a) zero b) 1 c) 0.5 d) Infinite

8. In which orientation a dipole placed in a uniform electric field is in unstable equilibrium?

a) when p is parallel to E i.e $\Phi=0^0$ b) when p is antiparallel to E i.e $\Phi=180^0$

c) when p is perpendicular to E d) Both a and b

9. One Coulomb is equal to _____ Stat Coulomb.

10. When a thick plate of dielectric slab is placed in the air space of a parallel plate capacitor then:-

a) capacitance decreases b) capacitance increases

c) remains same d) None of the above.

11. Dimensional formula of potential gradient is:-

a) $[MLA^{-2}T^{-3}]$ b) $[MLA^{-1}T^{-3}]$

c) $[ML^2AT^{-3}]$ d) $[ML^{-1}T^{-2}]$

12 Define and write their SI units:

a) Conductance b) Conductivity c) Kirchoff's second law

13. Energy density of electric field E is:-

a) $\varepsilon_0 E$ b) $\varepsilon_0 E^2$ c)$2\varepsilon_0 E^2$ d)$\frac{1}{2}\varepsilon_0 E^2$

14. Dipole moment is a :-

a) Scalar quantity b) Vector quantity c) Both a and b d) None of above.

15. Unit of Electric potential is:-

a) J/C^2 b) J/C c) J/C^{-2} d) None of above

16. SI unit of potential gradient is:-

a) Vm b) Cm c) Vm^{-2} d) Cm^2

17. For a point charge located in space, equipotential surface are:-

a) concentric circles b) concentric spheres

c) parallel planes d) parallel liner lines

18. The unit of electric power is:-

a) Watt **b) Volt** **c) Joule** **d) kWh**

19. If a stationary charge is put inside a magnetic field, then the charge will:-

a) move in helix **b) move in circle**

c) move in stationary line **d) remains stationary**

20. Electron volt (eV) is the measure of:-

a) charge **b) potential** **c) energy** **d) current.**

Year-2022

1. Electric field at a point is:-

a) always continuous

b) continuous if there is no change at that point and discontinuous if there is a charge at that point.

c) discontinuous only if there is a negative charge at that point.

d) none of these.

2. A positively charged particle is released from rest in an uniform electric field. The electric potential energy of the charge:-

a) remains constant because the electric field is uniform

b) increases because the charge moves along the electric field

c) decreases because the charge moves along the electric field

c) decreases because the charge moves opposite to the electric field

3. A hemisphere is uniformly charged positively. The electric field at point on a diameter away from the centre is directed:-

a) perpendicular to the diameter **b) parallel to diameter**

c) at an angle tilted towards the diameter **d) at an angle tilted away from the diameter**

4. What is the angle between the electric dipole moment and the electric field strength due to the equatorial line?

a) 0^0 **b) 60^0** **c) 90^0** **d) 180^0**

5. Equipotential surfaces associated with an electric field which is increasing in magnitude along X-direction are:-

a) planes parallel to xy-plane **b) planes parallel to xz plane**

c) planes parallel to yz plane **d) co axial cylinders of increasing radii around X-axis**

6. An arbitrary surface encloses a dipole. Then the electric flux through the surface is:-

a) Q/ε_0 **b) $\varepsilon_0 Q$** **c) ε_0/Q** **d) zero**

7. Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately:-

a) planes **b) paraboloids** **c) ellipsoids** **d) spheres**

Year-2023

1. Which one of the following is the unit of Electric field?

a) Coulomb **b) Newton** **c) Volt** **d) NC^{-1}**

2. Calculate the number of kWh in one joule:-

a) 6.3×10^6kWh **b) 2.8×10^{-7}kWh**

c) 3.6×10^6 kWh **d) 3.6×10^3 kWh**

3. The SI unit of electric dipole moment is:-

a) Cm **b) C** **c) Cm^{-1}** **d) Nm^{-1}**

Each question Carries 2 marks

Year-2016

1. Can a body have a charge of 4.0×10^{-19} C? Justify your answer.

2. Show that Electric field is negative gradient of electric potential.

3. Name two basic properties of electric charge.

4. State and explain Coulomb's law. Define coulomb.
5. Can a body have a charge of 0.8 X 10^{-19}? Justify your answer.
6. What are equipotential surfaces? Show that no work is done in moving a test charge on equipotential surface.

Year-2017

1. What is electric dipole moment? Give its SI units and direction.
2. Can a body have a charge of 4.0 X 10^{-19} C? Justify your answer.
3. What are polar and non-polar molecules? Give examples.
4. Find the Coulomb's force between two photons placed at 8 X 10^{-14} m distance.
5. Explain why Coulomb's law of electrostatics is not a universal law.
6. Assuming the Earth to be a spherical conductor, find its capacitance. Given radius of Earth is 6400 km.
7. Deduce Coulomb's law from Gauss Law.

Year-2018

1. Explain what is meant by quantization of electric charge?
2. How many electrons are present in one coulomb of charge?
3. Calculate Coulomb's force between two alpha particles separated by a distance of 3.2 X10^{-15}m.
4. Explain the law of conservation of charge by giving one example.
5. What is the importance of Coulomb's law in vector form?
6. Calculate the force between two protons separated by a distance of 20cm.

Year-2020

1. Why two electric lines of force never intersect each other?
2. Show that no work is done in moving a charge over an equipotential surface.

Year-2021

1. What do you understand by Conservation of Charge? Give one example to illustrate it.
2. What do you mean by Quantization of Electric charge?
3. Derive an expression for the electric potential energy of an electric dipole placed in uniform electric field.
4. Calculate the potential at a point P due to a charge of 4 X 10^{-7} C located 9 cm away.
5. What is electrostatic shielding? What is its importance?
6. Compare the properties of electric charge and mass which are not similar.
7. Show that work done in moving a unit charge along a closed path is zero.
8. A 12 pF capacitor is connected to a 50 V battery. How much electrostatic energy is stored in the capacitor?
9. Derive an expression for capacitance of a parallel plate capacitor with a dielectric slab of some thickness between the plates of the capacitor.
10. Vehicles carrying inflammable materials usually have metallic ropes touching the ground during motion. Why?
11. Define Electric susceptibility. Establish a relationship between Electric susceptibility and Dielectric constant.
12. Two charges 5 X $10^{-8}$and -3 X 10^{-8}C are located 16 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.

13. A long straight wire in the horizontal plane carries a current of 50A in north to south direction. Give the magnitude and direction of B at a point 2.5 m east of wire.

Year-2022

1. Obtain an expression for torque acting on an electric dipole placed in uniform magnetic field.
2. A 12 PF capacitor is connected to a 50 V battery. How much electrostatic energy is stored in the capacitor?
3. Obtain an expression for energy stored in a charged capacitor. In what form the energy is stored in a capacitor?
4. A regular hexagon of side 10cm has a charge 5μC at each of its vertices. Calculate the potential at the centre of the hexagon.
5. Show that electric field can be expressed as negative gradient of potential.
6. A spherical conductor of radius 12 cm has a charge of 1.6 X 10^{-7}C distributed uniformly on its surface. What is the electric field just outside the sphere?

Year-2023

1. Distinguish between polar and non-polar dielectrics.
2. Define the equipotential surfaces. Give its two properties.
3. Explain why two electric field lines never cross each other at a point?

Each question Carries 3 mark

Year 2019

1. Derive an expression for the capacitance of a parallel plate capacitor filled with dielectric slab.
2. The permeability of a material is measured to be 0.12 $TA^{-1}m$. Find the relative permeability and susceptibility?
3. Derive an expression for the torque experienced by an electric dipole placed in uniform electric field. What is the net force acting on the electric dipole?
4. Define electric field intensity and find an expression for it at a point on axial line of an electric dipole.
5. Define electric dipole. Show that the electric field is the negative gradient of its potential.

Year-2021

1. Define the Coulomb's law. Derive an expression for electric field intensity at a point on the axial line of an electric dipole.
2. State Gauss theorem for Electrostatics. Deduce Coulomb's law from Gauss's law.
3. Define Electric potential energy. Show that Electric field intensity is given by the negative gradient of electric potential.
4. Define the electric dipole moment. Derive an expression for electric field intensity at a point on the equitorial line of an electric dipole.
5. What do you mean by Equipotential surface? Write and explain various properties of equipotential surfaces.
6. Define the Gauss's law. Using Gauss theorem find out the Electric field intensity due to an infinitely long thin wire of uniform linear charge density.
7. Derive an expression for energy density in case of parallel plate capacitor. Give their SI unit and dimensional formula.

Year-2022

1. Derive an expression for electric field intensity of a thin infinitely long straight line of charge with uniform linear charge density (Cm^{-1}).

2. Show that the force on each plate of parallel plate capacitor has a magnitude equal to $\frac{1}{2}$QE, where Q is the charge on the capacitor and E is the magnitude of electric field between the plates.
3. Derive an expression for electric field intensity at a point on the axis of uniformly charged ring at a distance from the centre of the ring.
4. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell. What is the surface charge density on the inner and outer surfaces of the shell?
5. Derive an expression for potential energy of an electric dipole in a uniform electric field. In which situation, the potential energy of dipole is maximum?
6. Derive an expression for electric field intensity at any point on the axial line of an electric dipole. Its distance of point of observation from the centre of dipole is very- very large as compared to dipole length, then find the electric field.
7. A long charged cylinder of linear charged density λ is surrounded by a hollow co-axial conducting cylinder. What is the electric field in space between the two cylinders?
8. Derive an expression for potential at a point due to a point charge. Depict the equipotential surfaces for a single point charge.
9. What is dielectric? A dielectric slab of thickness 't' is kept between the plates of a parallel plate capacitor separated by a distance 'd'. Derive an expression for its capacitance.

Each question carries 4 marks

Year-2016

1. What is electric dipole? Derive an expression for electric field due to an electric dipole on axial line.
2. What is the principle of parallel plate capacitor? Find the capacitance of the plate capacitor with conducting slab between its plates.
2. State and prove Gauss theorem. Deduce Coulomb's law using Gauss theorem.

Year-2017

1. a)Define electric dipole and axial line.
b) Derive an expression for electric field intensity at a point on the axial line of an electric dipole.
2. Write any two uses of Vande Graff generator. Discuss construction and working of Vande Graff generator.

Year-2018

1. Define Gauss Theorem. Using it derive an expression for electric field intensity at a point due to an infinitely long straight uniformly charged wire.

Year-2020

1. State Gauss's Theorem in electrostatics. Deduce Coulomb's law from it.
2. Define electric dipole moment. Derive an expression for electric field intensity at a point on the equatorial line of the electric dipole.
3. Derive an expression for electric field intensity at a point on the axial line of the electric dipole.

Year-2023

1. What is Electric flux? Write its SI units using Gauss Theorem, derive an expression for Electric field at a point due to uniformly charged infinite plane sheet.
2. Define the Electric dipole moment. Derive an expression for Electric field intensity at a point on the equatorial line of the electric dipole.
3. What is parallel plate capacitor? Derive a relation for capacitance of parallel plate capacitor with dielectric slab introduced in between its plates.

4. What is an Electric dipole? Derive an expression for torque on Electric dipole when electric dipole is placed in uniform electric field. What is the net force acting on the electric dipole?
5. Define the Electric potential. Obtain an expression for it, due to a point charge 'q' at a point 'P' at a distance 'r' from 'q'.
6. State Coulomb's law in Electrostatics. Give its vector form. Calculate Coulomb's force between two alpha particles separated by a distance of 3.2 X 10^{-5} m.

Unit-2 Current Electricity

Each question carries 1 mark-

Year-2017

1. Resistivity of a conducting wire:-
a) varies with its length.
b) varies with its mass.
c) varies with its cross section.
d) is independent of its dimensions.
2. If a wire of resistance is stretched to double of its length, then new resistance will be:-
a) R/2 b) R c) 2R d) 4R

Year-2018

1. Dimensional formula of electrical resistance is:-
a) $[ML^2T^{-3}A^{-2}]$ b) $[ML^2T^{-3}A^{-1}]$ c) $[ML^3T^{-3}A^{-2}]$ d) $[ML^2T^{-3}A^{-1}]$
2. Kirchoff's I and II laws are based on conservation of:-
a) Energy and charge. B) Mass and Energy
c) Mass and Charge D) Charge and Energy

Year-2019

1. To convert a galvanometer into an ammeter, we connect:
a) low resistance in parallel b) high resistance in parallel
c) high resistance in series d) low resistance in series
2. Resistance of a conductor increases with the rise of temperature, because:
a) relaxation time decreases b) relaxation time increases
c) electron density decreases. d) electron density increases.

Year-2020

1. If a wire of resistivity "ρ" is stretched to double its length, then its new resistivity will be:-
a) half b) double c) four times d) not change

Year-2021

1. The current through a conductor is 1 ampere. The no. of electrons that pass through the conductor in one second is:-
a) 3.125 X 10^{18} b) 6 X 10^{18} c) 6.25 X 10^{18} d) 12.5 X 10^{18}
2. Resistivity of a conductor depends upon:-
a) its material b) its cross section c) its length d) both b and c
3. A carbon resistor has yellow, violet, brown and golden (in order) colour strips its resistance is:-
a) 470 Ω ±5 % b) 47 X 10Ω ±10 % c) 470 Ω ±20 % d) 47Ω ±5 %
4. What is the effect to temperature on relaxation time in a metal?
a) Relaxation time decreases with rise in temperature
b) Relaxation time increases with rise in temperature

c) No effect of temperature
d) None of these

5. Two long parallel conductors carrying current in the opposite direction:-

a) Attract each other **b) repel each other**
c) neither attract nor repel **d) None of these.**

6. The length of conductor is halved its conductivity will be:-

a) Changed **b) remain unchanged** **c) Become ½** **d) None of above.**

7. If a charge flowing through a cross section of a wire can be written as $q=5t^2+8t$, then calculate the electric current at t=2 sec.

a) I=25 A **b) 26 A** **c) 27A** **d) 28A**

8. Ohm's law is not obeyed by:-

a) Electrolytes **b) Discharge tubes** **c) Vacuum tubes** **d) All of above.**

9. Kirchoff's 1^{st} law is based upon:-

a) Law of conservation of charge. **B) Law of conservation of energy**
c) Both a and b **d) None of the above.**

11. A charged particle enters a magnetic field at angle of 90^0 with the magnetic field. The path of the particle will be a :-

a) Helix **b) Ellipse** **c) Circle** **d) Straight line**

12. When a magnetic dipole is placed in uniform magnetic field, it will experience:-

a) a force but no torque **b) a torque but no force**
c) force as well as torque **d) neither force nor torque**

13. Two parallel and neighboring conducting wires carry current in the same direction then one:-

a) attract the other **b) repel the other**
c) does not exert any force on the other **d) rotated around the other.**

14. If current is passed through a spring, then spring will:-

a) expand **b) compress** **c) remain same** **d) none of these.**

15. If a charge flowing through a cross section of a wire can be written as $q=6t^2+5t$, then calculate the electric current at t=0 sec.

a) I=0 A **b) 3 A** **c) 5A** **d) 20A**

16. Which one of the following is best material for making connecting wires?

a) Magnum **b) Constantan** **c) Copper** **d) Nichrome**

17. A wire of resistivity is stretched to double its length. Then its new resistivity will be:-

a) Half **b) double** **c) four times** **d) not change.**

18. Tesla is the unit of:-

a) Electric flux **b) Magnetic Induction** **c) Magnetic flux** **d) Electric field.**

Year-2022

1. EMF of cell depends upon:-

a) internal resistance **b) external resistane**
c) electrolyte and electrodes of the cell **d) none of these.**

2. In superconductivity the conductivity of a material becomes:-

a) infinite **b) finite** **c) zero** **d) none of these.**

3. A potentiometer is an accurate and versatile device to make electric measurements of emf because the method involves:-

a) cells **b) potential gradients**
c) a condition of no current flowing through galvanometer
d) a combination of cells, galvanometer and resistances.

3. The resistance of a conductor increases with:-

a) increase in length **b) increase in temperature**

c) decrease in cross sectional area **d) all of the above.**

4. Which of the following characteristics of electrons determines the current in a conductor?

a) drift velocity alone **b) thermal velocity alone**

c) both drift and thermal velocity **d) neither drift nor thermal velocity**

5. Two resistanes A and B have colour codes orange, blue, white and brown, red, green respectively. Then the ratio of their resistances A:B is:-

a) 3:1 **b) 1:3** **c) 1:3 X 10^4** **d) 3 X 10^4: 1**

6.On increasing the temperature of a conductor, its resistance increases because the:-

a) relaxation time increases **b) electron density increases**

c) relaxation time decreases **d) relaxation time remains constant**

Year-2023

1. If a charge flowing through a cross section of a wire can be given as $q=5t^2+8t$ (where 'q' is charge and 't' is time), then calculate the electric current at t=2s.

a) 20A **b) 36 A** **c) 13 A** **d) 28 A**

Each question carries 2 mark-

Year-2016

1. A resistor has coloured bands of yellow, red and blue colours respectively. Find the value of resistance.

2. Discuss grouping of resistors in series and parallel.

3. A wire has resistance 90 Ohm and it is cut into three piece having equal lengths. If these are now connected in parallel, find the resistance of the combination.

4. A galvanometer of resistance 15 Ohm gives full scale deflection for a current of 2 mA. Calculate the shunt resistance needed to convert it into an ammeter of range 0-5 A?

5. Calculate the value of resistance needed to convert a galvanometer of resistance 200 Ohm, which gives full scale deflection for a current of 5 mA, into a voltmeter of range 25 volt.

6. A galvanometer of resistance of 10 Ohm gives full scale deflection for a current of 4 mA. How can it be converted into an ammeter of range 0-5 A?

Year-2017

1. What is the principle of potentiometer? How it is used to compare the emf's of two primary cells?

Year-2021

1. A negligibly small current is passed through a wire of length 15m and uniform cross section 6.0×10^{-7} m^2 and its resistance is measured to be 5 ohm. What is the resistivity of the material at the temperature of the experiment?

2. Find the expression of drift velocity in terms of average relaxation time.

3. A battery of emf 10V and internal resistance 3 Ohm is connected to a resistor. If the current in the circuit is 0.5 A, what is the resistance of the resistor?

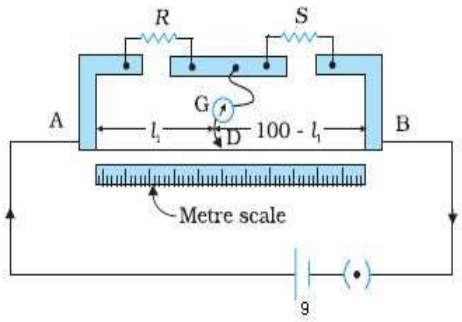
4. A long straight wire carries a current of 35A. What is the magnitude of the field B at a point 20 cm from the wire?

5. Distinguish between EMF and Potential difference.

6. Three resistors of 2, 4 and 5 Ohm are combined in parallel. What is the total resistance of the combination?

Year-2022

1. Nichrome and copper wires of same length and same radius are connected in series. Current (I) is passed through them. Which wire gets heated up more? Justify your answer.
2. Discuss the factors on which resistivity of a conductor depends.
3. Distinguish between ohmic and non-ohmic conductors.
4. Why is the metre bridge given this name?
5. In a metre bridge (figure) the balance point is found to be at 39.5 cm from the end A, when the resistor S is of 12.5 Ohm. Determine the resistance of R. What happens if galvanometer and cell are interchanged at the balance point of the bridge? Would the galvanometer show any current?

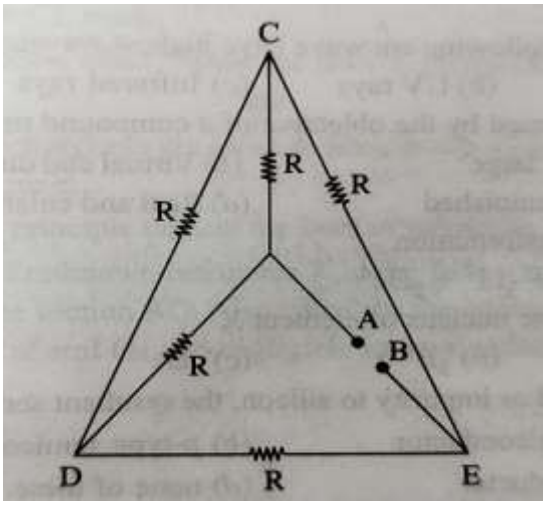


6. A 4 Ohm insulated resistance wire is bent in the middle by 180^0 and both the halves are twisted with each other. What will be its new resistance?
7. State the factors on which the resistance of a conductor depends at constant temperature.
8. Show that $\vec{J} = \sigma \vec{E}$.
9. Define internal resistance of a cell. On what factors does it depends?
10. A battery of emf 10 V and internal resistance 3 Ohm is connected to a resistor. If the current in the circuit is 0.5 A, what is the resistance of the resistor? What is the terminal voltage of the battery when the circuit is closed?
11. A uniform wire is cut into four segments. Each segment is twice as long as the earlier segment. If the shortest segment has a resistance of 2 ohm, find the resistance of original wire.
12. Is ohm's law universally applicable for all conducting elements. If not, give examples of elements which do not obey Ohm's law.
13. Prove that $r=\left(\frac{E}{V}-1\right)R$, where R is external resistance used.

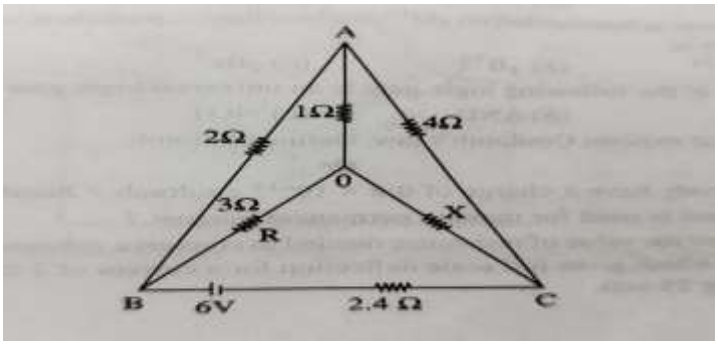
Each question carries 3 marks:

Year-2016

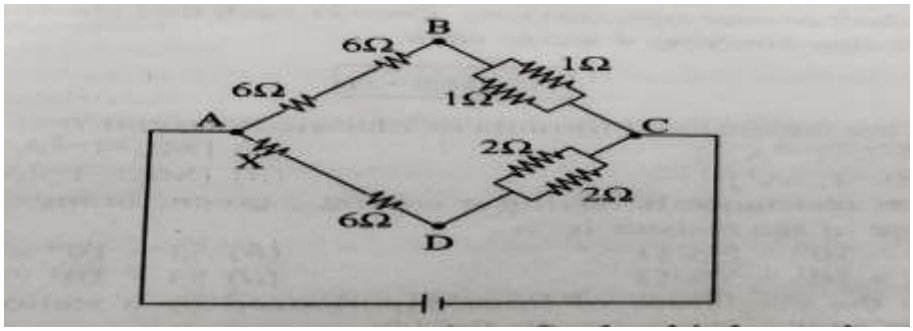
1. a) Calculate the equivalent resistance of the given electrical network between points A and B.
b) Also calculate the current through ACB, if a 10 V dc source is connected between A and B and the value of R is 2 Ohm.



2. What is internal resistance of a cell? Establish a relationship between emf and terminal potential difference and 'r'.
3. What are the points of differences between emf and potential difference?
4. Find the value of unknown resistance X in the following circuit, if no current flows through the section AO. Also calculate the current drawn by the circuit from the battery of emf 6V and negligible internal resistance.



5. What is the principle of potentiometer? How it is used to compare the emf of two cells.
6. Find an effective emf of the cells when connected in series.
7. In the given circuit, calculate the value of 'X', so that the potential difference between B and D is zero.



Year-2017

1. Define electrical energy and electrical power. Derive a relation between them.
2. What is the principle of meter bridge? How is it used to find the unknown resistance?
3. Define resistance. Discuss the effect of temperature on it.
4. Define internal resistance of a coil. Using potentiometer, determine the internal resistance of the a cell.
5. What is the difference between kW and KWh? Calculate the number of joules in 1 KWh.

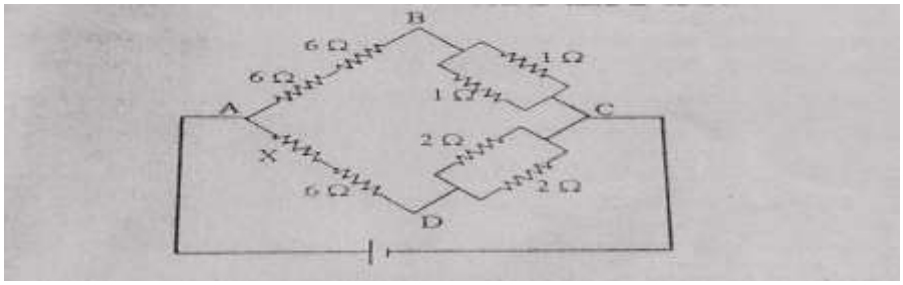
Year-2018

1. What is the principle of potentiometer? How it is used to compare the emf of two cells.
2. Derive the expression for balance condition of wheat stone bridge using Kirchoff's second law.

3. What is the principle of potentiometer? How it is used to measure the internal resistance of a cell?

4. Define resistivity of a material and discuss the factors on which it depends. What is the unit of resistivity?

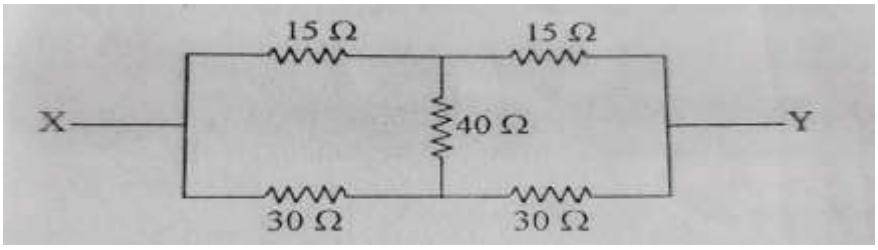
5. In the given circuit, calculate the value of X so that potential difference between B and D is zero.



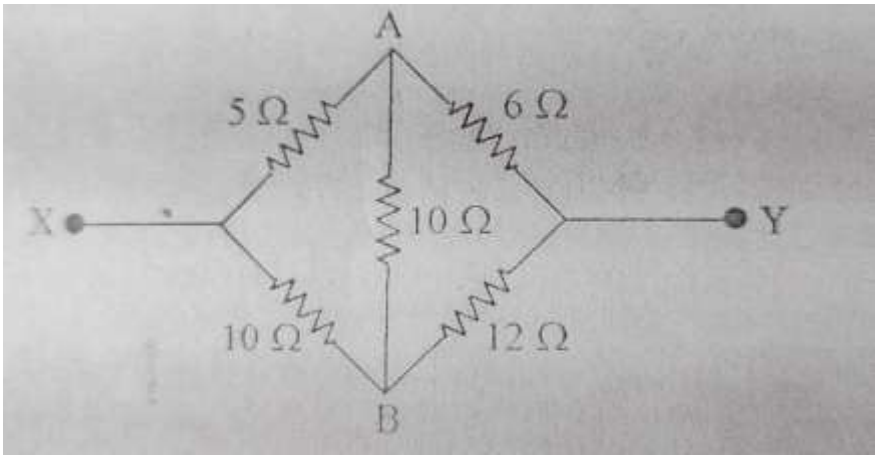
6. Define internal resistance of a cell. Prove that $r=(\frac{E}{V}-1)R$, where symbols have their usual meanings.

7. Find the effective resistance of three resistors R_1, R_2 and R_3 connected in parallel.

8. Calculate equivalent resistance of the network between points X and Y.



9. Five resistances are connected as shown in figure, what is the difference between points X and Y?



Year-2019

1. Define the term resistivity of conductor. Give its SI units. Show that the resistance of a conductor is given by –

$R=ml/ne^2\tau A.$

2. A wire of resistance 5 ohm is drawn out so that length is increased to twice of its original length. Calculate its new resistance.

3.With the help of a circuit diagram, explain how a meter bridge can be used to find unknown resistance of a given wire?

4. Define drift velocity and derive the expression for it in a conductor in terms of relaxation time.

5. What is the principle of potentiometer? How it is used to compare the emf of two cells.

6. Define relaxation time of electrons in a conductor and derive the expression for current through the conductor in terms of drift velocity.

7. How many electrons pass through a lamp in 2 minutes, if the current is 300 mA. Given that charge on an electron is $1.6X10^{-19}C$.

Year-2020

1. A wire having resistance R ohm is stretched to double its length. What is the new resistance?

2. Using Kirchoff's laws prove the principle of Wheatstone's bridge.

3. Derive the relation between current and drift velocity.

4. State Ohm's law. On what factors the resistance of a conductor depends?

5. Define drift velocity and derive an expression for it.

6. A heater rated as 220V, 880W. What is the current drawn by the heater, when connected to a 220V mains? Calculate the resistance of the heater.

7. Derive an expression for internal resistance of a cell.

8. When two resistances are joined in series, they have value of 25 ohm and in parallel 4 ohm. Find each resistance.

Year-2021

1. Define Ohm's law. Illustrate failures of Ohm's law with example.

2. Derive an expression for magnetic force acting on a current carrying conductor placed in uniform magnetic field.

3. What is the magnitude of magnetic force per unit length on the wire carrying a current of 8A and making an angle of 30^0 with the direction of a uniform magnetic field of 0.15T?

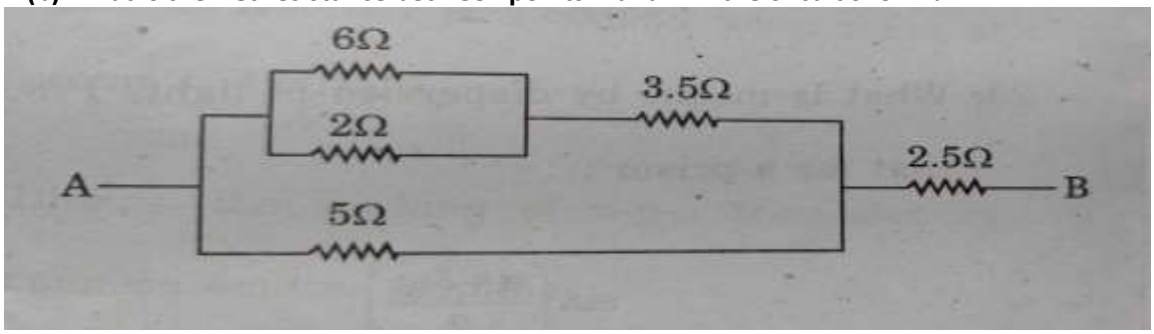
4. What is the principle of potentiometer? How it is used to find out the internal resistance of the cell?

Year-2023

1. With the help of a circuit diagram, explain how a metre bridge can be used to find the unknown resistance of a given wire.

2. (a) State Kirchoff's laws in Electricity.

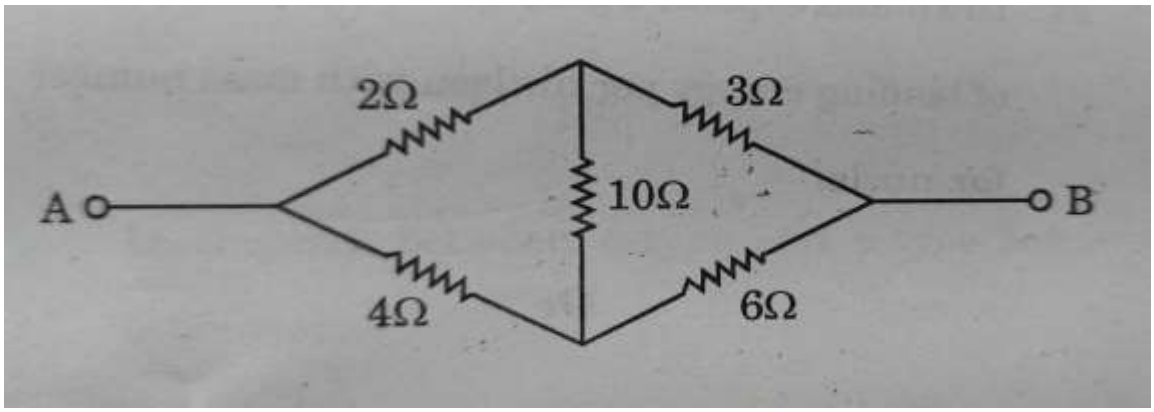
(b) What is the Net resistance between points A and B in the circuit shown?



3. Define the drift velocity and derive an expression for it.

4. (a) Define internal resistance of a cell.

(b) What is resistance between parts A and B in the circuit shown?



5. Obtain an expression for internal resistance of a cell using potentiometer.
6. Define SI unit of electric energy. A heating element of resistance 20 Ohm is connected to 220 V supply. How much heat will be produced in one minute?

Unit-3 Magnetism

Each question carries 1 marks:-

Year-2016

1. What is the magnitude of force experienced by a stationary charge when placed in a uniform magnetic field:-
a) F=qvB Sinθ **b) F=qvB** **c) F=zero** **d) none of these.**
2. Two long parallel conductors carrying current in the same direction:-
a) attract each other **b) repel each other**
c) neither attract nor repel **d) none of these.**
3. Tesla is the unit of:-
a) Electric field **b) Electric flux** **c) Magnetic induction** **d) Magnetic moment.**
4. Resistance of an ideal ammeter is:-
a) infinite **b) zero** **c) 1 Ohm** **d) 10 Ohm**

Year-2017

1. What is the magnitude of force experienced by a stationary charge when placed in an uniform magnetic field?
a) F=qvB Sin θ **b) F=qvB** **c) F=0** **d) None of these.**
2. Two long parallel conductors carrying current in opposite direction:-
a) attract each other **b) repel each other**
c) neither attract nor repel **d) None of these.**
3. An accelerated electron will produce:-
a) EM- waves **b) Alpha rays** **c) Beta rays** **d) Gamma rays**
4. A charged particle enters in a magnetic field with some velocity parallel to the magnetic field. The nature of path followed by the charged particle will be:-
a) Helical **b) circular** **c) resistor** **d) semiconductor**

Year-2019

1. Angle of dip is 90^0 at

a) pole **b) equator** **c) both a and b** **d) none of these.**

Year-2020

1. At magnetic poles, the angle of dip is:-

a) 45^0 **b) 30^0** **c) 90^0** **d) Zero**

2. A bar magnet is kept in uniform magnetic field. It experiences:

a) a torque but not a force

b) a force but not a torque

c) both a force and a torque

d) neither a force nor a torque

3. A cyclotron is used to accelerate:-

a) Electron **b) Neutron** **c) Positive ions** **d) None of these.**

Year-2021

1. The value of magnetic field inside a current carrying solenoid is:-

a) $B= \mu_0 ni$ **b) $B=\mu_0 n/2i$** **c) $B=\mu_0 ni/2r$** **d) 0**

2. Right hand thumb rule is used to find:

a) Direction of electric current.

b) Magnetic field due to a current carrying conductor

c) Force due to current carrying conductor

d) Both b and c

3. The direction of force experienced by a current carrying conductor placed in a magnetic field is given by:-

a) Lenz's Rule **b) Fleming's left hand rule**

c) Fleming's right hand rule **d) Screw rule**

4. Angle between the magnetic meridian and geographical meridian is:-

a) 12.3^0 **b) 10.3^0** **c) 13.3^0** **d) 11.3^0**

5. What is the angle of dip at a place where vertical and horizontal components of Earth's Field are equal?

a)$\delta=45^0$ **b) $\delta=0^0$** **c) $\delta=90^0$** **d) $\delta=30^0$**

6. The magnetic susceptibility of a Ferromagnetic substance is:-

a) Small and positive **b) Small and negative**

c) High and positive **d) None of these.**

7. What is the dimensional formula of magnetic flux?

8. Magnetic dipole moment is a quantity directed from:-

a) north to south **b) south to north**

c) east to west **d) west to east**

9. Which of the following substances is diamagnetic?

a) Bi **b) Al** **c) Ca** **d) Ni**

10. A magnetic field can be produced by:-

a) a moving charge **b) a changing electric field**

c) both a and b **d) None of these.**

11. At the magnetic poles the angle of dip is:-

a) 45^0 **b) 30^0** **c) 90^0** **d) 0^0**

12. The SI unit of permeability is:-

a) Wb m^{-1} A^{-1} **b) Wb m^{-2} A^{-1}** **c) Wb m^{-1} A^{-2}** **d) Wb m^{-3} A^{-1}**

13. If Magnetic moment is zero, the substance is:-

a) diamagnetic **b) paramagnetic** **c) ferromagnetic** **d) none of these**

14. Nickel is:-

a) diamagnetic **b) paramagnetic** **c) ferromagnetic** **d) none of these**

15. What is the magnitude of the force experienced by a stationary charge, when placed in a uniform magnetic field?

a) F=qvB Sin θ **b) F=qvB** **c) q(vXB) Sin θ** **d) Zero**

Year-2022

1. The primary origin of magnetism lies in:-

a) atomic currents and intrinsic spin of electron

b) Pauli exclusion principle

c) Polar nature of molecules

d) None of these.

2. In a cyclotron, a charged particle :-

a) undergoes acceleration all the time

b) speeds up between the dees because of the magnetic field.

c) speeds up in a dee

d) slows down within a dee and speeds up between dees.

3. A positive charge is moving towards an observer. The direction of magnetic lines is:-

a) Clockwise **b) anticlockwise**

c) right **d) left**

4. In a permanent magnet at room temperature:-

a) magnetic moment of each molecule is zero

b) the individual molecules have non-zero magnetic moment which are all perfectly aligned.

c) domains are partially aligned

d) domains are all perfectly aligned.

5. Biot Savart Law indicated that the moving electrons (velocity $\vec{v}$) produce a magnetic field $\vec{B}$ such that :-

a)$\vec{B}$ is perpendicular to $\vec{v}$

b) $\vec{B}$ is parallel to $\vec{v}$

c) it obeys inverse cube law

d) it is along the line joining the electron and point of observation.

6. Galvanometer is converted to ammeter by connecting:-

a) small resistance in parallel. **b) small resistance in series.**

c) large resistance in series. **d) large resistance in parallel.**

7. Let the magnetic field on earth be modelled by that of a point magnetic dipole at the centre of earth. The angle of dip at a point on the geographical equator:-

a) can be zero at specific points **b) can be positive or negative value**

c) is bounded in a range **d) all of the above.**

8. An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?

a) The electron will be accelerated along the axis

b) The electron path will be circular about the axis

c) the electron will experience a force at 45^0 to the axis and hence execute a helical path.

d) The electron will continue to move with uniform velocity along the axis of the solenoid.

9. Electromagnets are made of soft iron core because soft iron has :-

a) low susceptibility and high retentivity.

b) high permeability and low retentivity.

c) high permeability and high coercivity.

d) low permeability and low retentivity.

10. Match List –I with List –II

List-I	List-II
1) Ampere's swimming rule	a) Direction of induced current in a conductor
2) Fleming's Left hand rule	b) Direction of magnetic field lines due to current through the circular coil
3) Fleming's Right hand rule	c) Direction of deflection of magnetic needle due to Current in a straight conductor
4. Right Hand Thumb Rule	d) Direction of force on current carrying conductor due to magnetic field

Year-2023

1. A charged particle enters at 30^0 to the magnetic field. Its path becomes:-

a) circular b) helical c) elliptical d) straight line

2. Magnetic dipole moment is a quantity directed from:-

a) South to North b) North to South

c) East to west d) West to East.

3. A charged particle enters in a magnetic field with some velocity parallel to the magnetic field. The nature of path followed by the charged particle will be:-

a) helical b) circular c) straight line d)parabolic

Each question carries 2 marks:-

Year-2017

1. What is voltmeter? Why it is always connected in parallel to the circuit?
2. How will you convert a moving coil galvanometer into an ammeter and voltmeter?
3. What is an ammeter? Why is it always connected in series in the circuit?
4. Define paramagnetic and ferromagnetic materials. Give examples.
5. Explain domain theory to explain ferromagnetism.

Year-2018

1. Why steel is used for making permanent magnet?
2. What is the cause of earth's magnetism?
3. A galvanometer of resistance 15 Ohm gives full scale deflection for a current of 2 mA. Calculate shunt required to convert it into an ammeter of range(0-5) A.
4. A galvanometer coil has a resistance of 30 ohm and the meter shows full scale deflection for a current of 2 mA. Calculate the value of the resistance required to convert it into an ammeter of range 0 to 1A.
5. Calculate the value of resistance needed to convert a galvanometer of resistance 200 ohm which gives full scale deflection for a current of 5mA, into a voltmeter of range 25 volt.

Year-2021

1. State and derive an expression for Biot- Savart's law.
2. What is toroid? Derive an expression for magnetic field due to a current carrying toroid.
3. A circular coil of wire consisting of 100 turns, each of radius 8.0 cm carries a current of 0.40 A. What is the magnitude of magnetic field B at the centre of the coil?
4. Derive an expression for magnetic field strength at a point on the equatorial line of a bar magnet.
5. Define Magnetic intensity and magnetic susceptibility.
6. Explain three magnetic elements of Earth.
7. Derive the relation between magnetic permeability and magnetic susceptibility.
8. Find the magnetic field due to a solenoid.

9. Find the force between two infinitely long straight conductors carrying current I in the same direction.
10. Distinguish between diamagnetic , paramagnetic and ferromagnetic substances.
11. State and prove Ampere's circuital law.
12. Derive an expression for the force acting on a current carrying conductor placed in a magnetic field.

Year-2022

1. Find expression for work done in rotating a bar magnet in a uniform magnetic field. Under what situation a magnet suspended in a uniform magnetic field will be in stable equilibrium.
2. Derive an expression for torque acting on a bar magnet held at an angle with the direction of a uniform magnetic field. What does the torque do?
3. What is magnetic dipole moment of a current loop? In what direction does it act? Is it a scalar or a vector?

Year-2023

1. Show that the average energy density of the electric field is equal to the average energy density of the magnetic field.
2. What is the importance of Radial magnetic field in a moving coil galvanometer?
3. Find the force acting on an alpha particle moving with velocity $\vec{v}$ in the direction of magnetic field $\vec{B}$?

Each question carries 3 marks:-

Year-2016

1. Derive an expression for magnetic field due to straight current carrying conductor at any point.
2. State and Prove Ampere's Circuital law in magnetic field.
3. Derive an expression for force experienced by current carrying conductor placed in magnetic field. What is the direction of force?
4. Derive an expression for magnetic field on the axis of current carrying coil of radius 'a' at a distance 'x' from the centre of the coil.

Year-2018

1. State Ampere's Circuital law. By using it derive an expression for magnetic field intensity at a point due to a straight current carrying conductor.
2. Calculate the force between two parallel conductors carrying currents in the same direction.
3. Calculate the force between two parallel conductors carrying currents in the opposite direction

Year-2019

1. Derive an expression for the torque acting on the current carrying loop placed in a uniform magnetic field.
2. What are ferromagnetic substances? Explain ferromagnetism on the basis of electron theory.
3. State and prove Ampere's circuital law.
4. Explain how does an atom behave as magnetic dipole. Derive an expression for its magnetic dipole moment.

Year-2020

1. Using Biot Savart's law, find expression for the magnetic field at the centre of the circular orbit carrying current I.

2. Define magnetic elements of earth.
3. Explain domain theory of ferromagnetic substances.
4. What are paramagnetic substances? Write its two properties.
5. How can we convert a galvanometer into voltmeter?
6. What are the limitations of cyclotron?
7. State and prove Ampere's circuital law.
8. How can we convert a galvanometer into ammeter?
9. Derive an expression for torque on a magnetic dipole placed in uniform magnetic field.

Year-2021

1. A 3cm wire carrying a current of 10A is placed inside a solenoid perpendicular to its axis. The magnetic field inside the solenoid is given to be 0.27T. What is the magnetic force on the wire?
2. Show that an atom behaves as a magnetic dipole. Find an expression for the magnetic dipole moment of orbiting electron.
3. Two long and parallel straight wires A and B carrying currents of 8A and 5A in the same direction are separted by a distance of 4 cm. Estimate the force on a 10cm section of wire A.

Year-2022

1. What is the force that a conductor $\vec{dl}$ carrying a current I, experiences when placed in a magnetic field $\vec{B}$? Name the rule which gives direction of force.
2. Show that the path followed by a charged particle moving at right angle to the uniform electric field is parabolic in nature.
3. What are the parameters of earth's magnetic field? Explain them. What does dip angle vary as one moves from magnetic equator to the pole?
4. State the principle of cyclotron. Show that the time period of revolution of particles in a cyclotron is independent of their speeds.
5. Using Biot- Savart's law, derive an expression for magnetic field at the centre of circular coil of n-turns carrying current I. Give expression for Biot-Savart's law in vector form.
6. What is solenoid? Derive an expression for magnetic field due to a current carrying solenoid.
7. Depict the magnetic lines due to two straight , long parallel conductors carrying currents I_1 and I_2 in the same direction. Hence deduce an expression for force per unit length on one conductor to other.
8. What is hysteresis loop? Explain with its help the terms related to it. In a submarine, a compass becomes ineffective. Why?

Year-2023

1. Calculate the torque on a bar magnet, when placed in the uniform magnetic field.
2. Derive an expression for magnetic field on the axis of current carrying coil of radius 'a' at a distance 'x' from the centre of the coil.
3. What are the magnetic elements of Earth's magnetism? Explain them.
4. What is a Voltmeter? How can a galvanometer be converted into a voltmeter?
5. What is Solenoid? Obtain an expression for magnetic field on the axis of long straight solenoid using Ampere's circuital law?
6. State and Prove Ampere's Circuital law.
7. Derive an expression for potential energy of a bar magnet when placed in uniform magnetic field? When it is maximum and minimum?
8. Derive an expression for the maximum force experienced by a straight conductor of length 'l' carrying current 'I' and kept in a uniform magnetic field 'B'.

Each question caries 4 marks:-

Year-2017

1. Define-a) Magnetic declination (θ).
b) Magnetic inclination (dip).
c) Derive an expression for torque experienced by a magnetic dipole (Bar magnet) when placed in uniform magnetic field.
2. State Fleming's Left Hand Rule. Derive an expression for magnetic force experienced by a current carrying conductor placed in a uniform magnetic field.

Year-2022

1. A horizontal straight wire 10m long extending from east to west is falling with a speed of 5.0 ms^{-1}, at right angles to the horizontal component of the earth's magnetic field, 0.30 X 10^{-4} Wb m^{-2}. What is the instantaneous value of the emf induced and direction of the emf in the wire? Which end of the wire is at higher potential?
2. Show that atom behaves as a magnetic dipole. Find an expression for the magnetic dipole moment of an orbiting electron.
3. A rectangular wire of sides 8cm and 2cm with a small cut is moving out of a region of uniform magnetic field of 0.3T directed normal to the loop. What is the emf developed across the cut if the velocity of the loop is 1 cms^{-1} in a direction normal to (a) longer side (b) shorter side of the loop? For how long does the induced voltage last in each case?
4. A jet plane is travelling towards west at a speed of 1800 Kmh^{-1}. What is the voltage difference developed between the ends of the wing having a span of 25m, if the earth's magnetic field at the location has a magnitude of 5 X 10^{-4} T and the dip angle is 30^0.

Unit-4 Electromagnetic Induction

Each question carries 1 marks:-

Year-2016

1. Energy dissipiated in LCR circuit is :-
a) L only b) C only c) R only d) All of above.

Year-2017

1. The rms value of ac is 220 V. Nearly the peak value of ac is :-
a) 220 V b) 311 V c) 211 V d) 50 V.
2. What is the frequency of house hold supply of ac in India?
a) Zero b) 60 Hz c) 50 Hz d) None of these.
3. Direct current cannot flow through:-
a) inductor b) capacitor c) resistor d) semiconductor

Year-2018

1. Resonance occurs in a series LCR circuit when:-
a) X_L=Xc b) X_L>X_c c) X_L<X_c d) None of these.
2. When LCR series circuit is at resonance then the phase angle between current and voltage is:
a) 0^0 b) 360^0 c) 90^0 d) 180^0
3. Define power factor in an ac circuit.
4. A transformer is a device which gives only:-
a) dc voltage b) ac voltage c) ac and dc voltage d) none of these.
5. Transformer is based upon the principle of:-

a) Self induction b) mutual induction c) eddy currents. D) none of these.

Year-2019

1. Eddy currents are produced in:-
a) Induction furnace b) electromagnetic brakes
c) speedometer d) all of these

Year-2020

1. Phase difference between voltage and current in ac circuit having resistor only is:-
a) 45^0 b) 90^0 c) 180^0 d) Zero
2. When ac flows through inductor, then current :-
a) is in phase with voltage b) lags behind the voltage by 90^0
C) leads the voltage by 90^0 d) none of these
3. A transformer works on:-
a) ac only b) dc only c) both ac and dc d) none of these

Year-2021

1. Define Steady current
2. Define Alternating current.
3. The self inductance L of a solenoid of length l and area of cross section A, with a fixed number of turns N increases as:-
a) l and A increases b) l decrease and A increases
c) l increases and A decreases d) Both l and A decrease.
4. Lenz's law is a consequence of the law of conservation of :-
a) charge b) mass c) momentum d) Energy
5. A light bulb is rated at 100W for a 220V supply. Find:-
a) the resistance of the bulb.
b) the peak voltage of the source.
c) the r.m.s. current through the bulb.
6. When an AC voltage of 220V is applied to the capacitor C:-
a) the maximum voltage between plates is 220 V
b) the current is in phase with the applied voltage
c) the charge on the plates is not in phase with the applied voltage
d) power delivered to the capacitor is zero.
7. What is the dimensional formula of self inductance?
8. The output of a step down transformer is measured to be 24 V, when connected to a 12 watt light bulb. The value of the peak current is:-
a) $\frac{1}{\sqrt{2}}$ b) $\frac{3}{\sqrt{2}}$ c) $\frac{5}{\sqrt{2}}$ d) $\frac{11}{\sqrt{2}}$
9. The line that draws power supply to your house from street has:
a) 220V average voltage b) voltage and current out of phase by 90^0
c) voltage and current are in phase. D) Zero average current.
10. What is the dimensional formula for inductive reactance?
11. In step up transformer, relation between number of turns in primary (N_p) and number of turns in secondary (N_S) is-
a) $N_s > N_p$ b)$N_p > N_s$ c) $N_s = N_p$ d) none of these
12. Transformer is based upon the principle of:-
a) Self induction b) mutual induction c) eddy current. d) angular momentum

Year-2022

1. The phase difference between voltage drop across L and C in series LCR circuit is:-

a) 0^0 **b) 180^0** **c) 90^0** **d) 60^0**

2. The mutual inductance M_{12} of a coil 1 with respect to coil 2-

a) increases when they are brought nearer.

b) depends on current passing through the coils

c) increases when one of them is rotated about an axis.

d) both a and b are correct.

3. If the r.m.s. current in a 50 Hz ac circuit is 5A, the value of the current $\frac{1}{300}$seconds after its value becomes zero is:-

a) $\frac{5}{\sqrt{2}}$A **b) $\frac{5}{6}A$** **c) $\sqrt[5]{\frac{3}{2}}$A** **d) $5\sqrt{2}$A**

4. Match the following:-

List –I	List-II
1) AC generator	a) Best way of reducing ac
2) DC generator	b) Works on mutual induction
3) Choke coil	c) Slip ring arrangement
4) Transformer	d) Split ring arrangement

5. The heat produced by a 100 Watt heater in 2 minutes is equal to-

a) 4×10^3J **b) 6×10^3J** **c) 10×10^3 J** **d) 12×10^3 J**

6. R/L has the dimensions of

a) time **b) mass** **c) length** **d) frequency**

7. A metal plate is not getting heated. It is because:-

a) A direct current is passing through the plate.

b) It is placed in a time varying magnetic field.

c) It is placed in a space varying magnetic field, but does not vary with time.

d) A current (either direct or alternating) is passing through the plate.

8. The output of a step down transformer is measured to be 24 V when connected to 12 watt light bulb. What will be the value of its peak current?

9. What is the dimensional formula for induced emf?

10. Inductive reactance varies with frequency as :-

a) $X_L \propto v$ **b) $X_L \propto \frac{1}{v}$** **c) $X_L \propto v^2$** **d) None of these.**

11. Why is 220V ac more dangerous than 220V dc?

Year-2023

1. If the r.m.s current in a 50 Hz ac circuit is 5A, the value of current, $\frac{1}{300}$s after its value becomes zero is:-

a) $5\sqrt{2}$A **b)$5\sqrt{3/2}$A** **c)$\frac{5}{6}$A** **d)$\frac{5}{\sqrt{2}}$A**

2. Calculate current through a lamp of 60 W operating at 220V:-

a) 2.73A **b) 27.3 A** **c) 0.0273 A** **d) 0.273A**

3. The output of a step down transformer is measured to be 24V when connected to a 12 watt light bulb. The value of the peak current is:-

a)$\frac{1}{\sqrt{2}}A$ **b) $\sqrt{2}$A** **c) 2 A** **d) $2\sqrt{2}$A**

4. Transformer does not work on:-

a) Both ac and dc **b) AC** **c) DC** **d) None of these.**

Each question carries 2 marks:-

Year-2016

1. What is self inductance? Define coefficient of self induction. Give its SI unit.
2. What is Lenz law? Show that it is in accordance with conservation of energy.
3. Why ac is more dangerous than dc? Explain.

Year-2018

1. Why ac is more dangerous than dc? Explain.
2. Why transformer cannot be used to step up dc voltage?
3. Capacitor blocks dc. Why?
4. State Faraday's law of electromagnetic induction.

Year-2019

1. What is self induction? What are its SI units?
2. What are eddy currents? Write any two of its applications.

Year-2020

1. Define mutual inductance. Write its SI units.

Year-2021

1. A pure inductor of 25 mH is connected to a source of 220V. Find the inductive reactance and r.m.s current in the circuit, if the frequency of the source is 50 Hz.
2. A 15 μF capacitor is connected to a 220 V, 50 Hz source. Find the capacitive reactance and the current (r.m.s and peak) in the circuit. If the frequency is doubled, what happens to the capacitive reactance and the current?

Year-2022

1. State Faraday's laws of electromagnetic induction and write three methods for producing induced emf.
2. An applied voltage signal consist of a superposition of a dc voltage and an ac voltage of high frequency. The circuit consists of an inductor and a capacitor in series. Show that the dc signal will appear across C and the ac signal across L.
3. A charged 30 μF Capacitor is connected to a 27 mH inductor. What is the angular frequency of free oscillations of the circuit?
4. Show that Lenz's law is in accordance with the principle of conservation of energy.
5. Why is choke coil needed in the use of fluorescent tubes with ac mains? Why not use an ordinary resistor, instead of the choke coil?
6. A 44 mH inductor is connected to 220V, 50Hz ac supply. Determine the r.m.s value of the current in the circuit.
7. Derive an expression for self inductance of a solenoid. What happens to the self inductance of the coil if it is wound on a rod of magnetic material?
8. An electric lamp is connected in series with a variable capacitor? What happens if source is dc or ac and if the capacitane is decreased?
9. A 60 μF capacitor is connected to a 110 V, 60 Hz ac supply. Determine the r.m.s. value of the current in the circuit.
10. What is a phasor? Using phasor diagram, obtain an expression for the impedence of the series LCR circuit.
11. Show that resonance frequency is $\frac{1}{2\prod\sqrt{LC}}$

Year-2023

1. Draw the graph to show variation of capacitive reactance (X_c) with frequency of the ac source used.
3. Define self inductance of a coil. Write its SI unit.
4. Write four Maxwell's equations.
5. Why capacitor blocks dc? Explain.

Each question carries 3 marks:-

Year-2017

1. Define eddy currents, explain the dampening of oscillating metallic plates due to eddy currents.
2. Show that the phase difference between voltage and current in an ac circuit having pure capacitor is 90^0.
3. Derive an expression for energy stored in an inductor.
4. Show that there is no phase difference between voltage and current in an ac circuit having pure resistor.
5. What is Lenz's law? Show that it is in accordance with the law of conservation of energy.
6. Show that the phase difference between voltage and current in an ac circuit having pure inductor is 90^0.
5. Define step –down transformer. A transformer has 300 secondary turns and 400 primary turns. If the secondary voltage is 300 V, calculate the primary voltage.
6. Define step-up transformer. A step up transformer is used on a 120 V line to provide a potential of 2400 V. If the primary coil has 75 turns, how many turns must the secondary coil have?
7. Define transformer. A step down transformer is used on a 3300 V line to provide a potential difference between of 330 V. If the primary windings have 4000 turns, how many turns must be secondary?

Year-2021

1. What do you understand by Self-inductance? Give dimensions of self induction. Using the concept, estimate self-inductance of the circuit in which the current falls from 5A to 0A in 0.1 s. If an average emf of 200 V is induced in the circuit
2. AC source is applied across a resistor. Derive an expression for current. Draw a phasor diagram for the circuit and graph of V and I versus ωt.
3. Derive an expression for motional electromotive force for a straight conductor moving in a uniform and time independent magnetic field. Using this expression calculate the instantaneous value of the emf induced in a horizontal straight wire 10 m long extending from east to west is falling with a speed of 5 ms^{-1} at right angles to the horizontal component of the earth's magnetic field 0.30 X 10^{-4} $Wbm^{-2.}$
4. AC source is applied across an inductor. Derive an expression for current and draw a phasor diagram to show the phase difference between I and V.
5. AC source is applied across a capacitor. Derive an expression for current and draw a phasor diagram to show the phase difference between I and V.

Year-2022

1. Define root mean square value of alternating current? Derive an expression for it

Each question carries 4 marks:-

Year-2016

1. What do you mean by average value of ac? Derive an expression why average value is calculated for half cycle of ac?

2. What do you mean by RMS value of ac? Derive an expression for rms value of ac.
3. Derive an expression for average power in LCR series circuit connected to ac supply hence define power factor.

Year-2018

1. What do you mean by impedence of LCR series circuit? Derive an expression for it. What is the condition for resonance?
2. Describe the principle and theory of a transformer. Why the efficiency of a transformer is always less than unity?

Year-2019

1. Derive an expression for average power of an ac circuit containing L,C,R in series.
2. Define mean value and root mean square value of alternating current. Derive an expression for root mean square value of alternating current.
3. What is a transformer? Explain with the help of diagram, the principle, construction and working of transformer. Why is the core of the transformer laminated?

Year-2020

1. What do you mean by root mean square value of ac? Derive an expression for r.m.s value of ac.
2. Derive an expression for impedance of an ac circuit containing LCR in series. What is meant by resonance?
3. What do you mean by Average value of ac? Derive an expression for it.

Year-2022

1. State the principle of transformer. Discuss three energy losses in transformer. How is it useful for transmission of electrical energy?

Year-2023

1. Describe the principle, construction and theory of transformer.

Unit-5 Electromagnetic Waves

Each question carries 1 mark:-

Year-2016

1. The radio waves which are received after reflection in ionosphere are called :-
a) ground waves b) sky waves c) space waves d) surface waves
2. Which of the following em waves have highest wavelength :-
a) X-rays b) UV rays c) Infra red rays d) Microwaves.
3. A transformer is a device which gives only:-
a) DC voltage b) AC voltage c) AC and DC voltage d) None of these.
4. What is the cause of Green House Effect?
a) Infra red rays b) UV rays c) X-rays d) radio waves.

Year-2017

1. When a wave enters in a medium, what does not change?
a) Wavelength b) Amplitude c) Frequency d) Speed.
2. Which of the following em waves has the highest wavelength?

a) X-rays **b) Microwaves** **c) Infra red waves** **d) UV rays.**

Year-2018

1. What is the cause of Green House effect?

a) Infra red rays **b) UV rays** **c) X-rays** **d) Radio waves.**

2. The radio waves which are received after reflection from ionosphere are called:-

a) ground waves. **B) sky waves.** **C) space waves** **d) charge and energy.**

Year-2019

1. Electromagnetic waves are transverse in nature is evident by:-

a) polarization **b) interference** **c) reflection** **d) diffraction**

2. What is sky wave propagation? Why is it limited up to 30 MHz?

3. The audio signal cannot be transmitted directly into the space. Why?

Year-2020

1. The wavelength of matter waves is independent of:-

a) Mass **b) velocity** **c) momentum** **d) Charge**

2. The ratio of speed of X-rays to gamma rays in vacuum is:-

a) greater than 1 **b) less than 1** **c) 1** **d) none of these.**

3. The em waves used in telecommunication system are:-

a) ultraviolet rays **b) microwaves** **c) visible light** **d) infra red rays**

4. In earth's atmosphere, Ozone layer lies in:-

a) Troposphere **b) Stratosphere** **c) Mesosphere** **d) Ionosphere**

5. Which of the following has highest wavelength?

a) X-rays **b) UV rays** **c) microwaves** **d) Gamma rays**

Year-2021

1. Out of the following options which can be used to produce a propagating electromagnetic wave?

a) A charge moving at constant velocity **c) A charge less particle**

b) A stationary charge **d) An accelerating charge.**

2. Which of the following frequencies will be suitable for beyond the horizon communication using sky waves?

a) 10KHz **b) 10 MHz** **c) 1 GHZ** **d) 1000 GHz**

5. Out of the following options, which can be referred as heat waves?

a) radio waves **b) microwaves** **c) infra red rays** **d) visible rays**

6. What is the value of band width of following?

a) TV signal **b) Speech Signal**

c) Video Signal **d) Music Signal**

7. The maximum distance upto which TV transmission from a TV tower of height h can be received is proportional to:-

a) $h^{1/2}$ **b) h** **c) h^3** **d) h^2**

Year-2022

1. Match List-I with List II

List-I	List-II
1) Transformer	a) Greater than one
2) AC generator	b) Mutual induction
3) Choke coil	c) Electromagnetic induction
4) Transformation ratio for step-up transformer	d) When ac flows through an inductor, The current lags behind the emf by 90^0

2. A power transmission line feeds input power at 2300 V to a step down transformer with its primary windings having 4000 turns. The number of turns in the secondary to get output power at 230 V should be:-

a) 40 turns **b) 400 turns** **c) 4000 turns** **d) none of these.**

3. Match List –I with List –II

List-I	List-II
1) Capacitor	a) High frequency ac can hardly pass through
2) Inductor	b) dc is blocked
3) Transformer	c) the voltage and current are in phase
4) Resistor	d) The core is laminated to reduce Eddy current loss

4. Electromagnetic waves are produced by:-

a) Charge in uniform motion only.

b) Charges at rest only.

c) Accelerated or decelerated charge only

d) All of the above

5. A radio can tune into any station in the 7.5 MHz to 12 MHz band. The corresponding wavelength band is:-

a) 4m-2.5 m **b) 40m-25m** **c) 2.5m-40m** **d) 0.25m-40m**

6. The Electromagnetic waves do not transport:-

a) Energy **b) charge**

c) Communication signal/information **d) Momentum**

7. Amplitude of the magnetic field part of a harmonic electromagnetic wave in vacuum is B_0=510 nT. What is the amplitude of the electric field part of the wave?

a) 150 NC^{-1} **b) 160 NC^{-1}** **c) 153 NC^{-1}** **d) 163 NC^{-1}**

8. Frequencies in the UHF range normally propagate by means of:-

a) Space waves **b) Ground waves** **c) Sky waves** **d) Surface waves**

9. To radiate signals with high efficiency the antennas should have a size comparable to the wavelength λ of the signal:-

a) at least $\frac{\lambda}{3}$ **b) at least λ/4** **c) at least λ/6** **d) at least λ**

10. Which radiations are used in treatment of Muscle ache?

a) Infra red **b) UV** **c) Microwaves** **d) X-ray.**

11. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is:-

a) C:1 **b) C^2:1** **c) 1:1** **d)$C^{1/2}$:1**

12. In space wave propagation, the relation between height of antenna (h) and range of transmission d (radius of earth =R) is:-

a) d=$\sqrt{2Rh}$ **b)d=2Rh** **c)d=$(2h)^{1/3}$** **d) d=h**

Year-2023

1. For a wave propagating in a medium, identify the property that is independent of the other:-

a) velocity **b) wavelength** **c) frequency**

d) all these depends on each other.

2. The electromagnetic waves do not transport:-

a) energy **b) charge** **c) momentum** **d) information**

3. A TV transmission tower has a height of 240m, signals broadcast from this tower will be received by LOS communication at a distance of (Assume the radius of Earth to be 6.4 X 10^6m).

a) 100 km **b) 24 km** **c) 55km** **d) 50 km**

4. Electromagnetic waves are produced by:-

a) Static charge **b) chargeless particles**

c) accelerating charges **d) none of these**

Each question carries 2 marks

Year-2016

1. Give four properties of em waves.

2. Give four uses of X-rays?

Year-2017

1. How radio waves are produced? Give any three uses of radio waves.

2. Write a short note on ground wave propagation.

3. Write a short note on sky wave propagation.

4. How microwaves are produced? Give any three uses of Microwaves.

5. Write a short note on space wave propagation.

Year-2018

1. What are electromagnetic waves? Give their two properties.

2. What are X-rays? Give their one use.

3. Define electromagnetic waves. What is the source of electromagnetic waves?

4. What is electromagnetic spectrum? Give two uses of infra red rays.

5. What are microwaves? Write one application of microwaves and UV rays.

6. What are the various energy losses in transformer?

Year-2019

1. The wavelength of X-rays is 1 Å. Calculate its frequency.

2. What is ground wave propagation? Why it is not suitable for high frequency?

Year-2020

1. Write one use of each:- IR rays and X- rays.

2. What are electromagnetic waves? How are these produced?

3. Why laminated iron core is used in transformers?

4. Arrange the following radiations in the descending order of wavelength: Gamma rays, Infra red rays, red light, yellow light, radio waves, UV rays.

5. Give two uses of UV rays.

6. What is transformer? On what principle it works?

7. Prove that electromagnetic waves are transverse in nature.

8. What are microwaves? Give one application.

Year-2021

1. Give two uses of each of the following:-a) Radio waves **b) Microwaves**

2. Give two uses of each of the following:-a) Infra red rays **b) visible rays** **c) UVrays**

Year-2022

1. The small ozone layer on top of the atmosphere is crucial for human survival. Why?

2. Write four uses of X-rays.

3. Is it necessary for a transmitting antenna to be at the same height as that of the receiving antenna for Line of Sight (LOS) Communication?

4. A TV transmitting antenna is 81m tall. How much service area can it cover if the receiving antenna is at the ground level?
5. If the earth did not have atmosphere would its average surface temperature be higher or lower than what it is now? Explain.
6. What does an Electromagnetic wave consist of? On what factors does its velocity in vacuum depend?
7. Write four characteristics of Electromagnetic waves.

Year-2023

1. Name the main parts of electromagnetic spectrum in ascending order of their wavelength.
2. Give four properties of em waves.
3. Give one use of each:-
a) IR rays b) Gamma rays c) Microwaves d) UV rays
4. A radio wave can tune into any station in the 7.5 MHz to 12 MHz band. What is the corresponding wavelength band?

Each question carries 3 marks:-

Year-2016

1. What do you meany by ground wave, sky wave and space wave propagation?
2. What is electromagnetic spectrum? Give two uses of infra red rays.
3. What are microwaves? Give their one use.
4. Find the maximum distance covered by TV transmitting antenna of height 'h'. What is skip zone?

Year-2018

1. Deduce an expression for the distance at which TV signals can directly be received from a TV tower of height h.

Year-2019

1. What is space wave propagation? Give two examples of communication system, which use space wave mode.

Year-2020

1. Discuss the ground wave and space wave propagation.
2. A TV tower has height 'h'. Derive an expression for the maximum distance up to which the signal can be received from the antenna.

Year-2022

1. Show that the average energy density of the electric field equals to the magnetic field in electromagnetic waves.
2. Discuss the inconsistency in Ampere's circuital law. What modification was given by Maxwell in this law?
3. What does the term LOS communication mean? "Greater is the height of a TV transmitting antenna, greater is its range." Prove.

Year-2023

1. Discuss the Ground wave and space wave propagation.
2. Prove that d=$\sqrt{2hR}$, for TV signals received on the surface of Earth

Unit-6 Optics

Each question carries 1 mark:-

Year-2016

1. The image formed by the objective of a compound microscope is:-

a) virtual and large **b) virtual and diminished**

c) real and diminished **d) real and enlarged**

2. To get three images of a single object one should have two plane mirror at an angle of :-

a) 30^0 **b) 60^0** **c) 90^0** **d) 120^0**

Year-2017

1. Pencil in a beaker filled with water seems to be broken or bent due to:-

a) reflection **b) diffraction** **c) total internal reflection** **d) refraction.**

2. When exposed to sunlight, thin films of oil on water often exhibit brilliant colours due to the phenomenon of:-

a) dispersion **b) interference** **c) diffraction** **d) polarization.**

3. If the angle between two plane mirrors is 60^0, then number of images formed are :

a) 5 **b) 6** **c) infinite** **d) None of these.**

Year-2018

1. To get five images of a single object one should have two plane mirror at an angle of :-

a) 30^0 **b) 60^0** **c) 90^0** **d) 120^0**

2. To get nine images of a single object one should have two plane mirror at an angle of:-

a) 40^0 **b) 36^0** **c) 90^0** **d) 120^0**

3. What is the focal length of plane mirror?

a) Zero **b) infinity** **c) zero to infinity** **d) none of these.**

4. Brilliance of diamond is due to:

a) Shape **b) cutting** **c) reflection** **d) total internal reflection**

Year-2019

1. Mirage is a phenomenon due to:-

a) reflection of light **b) refraction of light**

c) total internal reflection of light **d) diffraction of light.**

Year-2020

1. The critical angle of light passing from glass to air is minimum for:-

a) red **b) green** **c) yellow** **d) violet**

2. The sky appears blue, because:-

a) it is a natural colour **b) red light is absorbed**

c) blue light is scattered the most **d) blue light is absorbed**

Year-2021

1. The reddish appearance of the sun at sunrise and sunset is due to-

a) the dispersion of light **b) the scattering of light**

c) the diffraction of light **d) polarization of light.**

2. When a ray of light enters a glass slab, then:-
a) its frequency and velocity change
b) its frequency does not change
c) its frequency and wavelength change
d) only frequency changes.
3. In Photoelectric effect, the electrons are ejected from metals, if the incident light has a certain minimum:-
a) Wavelength **b) Frequency** **c) Amplitude** **d) Angle of incidence**
4. For light diverging from a point source:-
a) the wave front is spherical
b) the intensity increases in proportion to the distance squared.
c) the wave front is parabolic
d) the intensity at the wave front does not depend on the distance
5. The phase difference between any two points situated on the same wave front is:-
a) 36^0 **b) 180^0** **c) 0^0** **d) 90^0**
6. Mirage is the phenomena due to:-
a) total internal reflection of light **b) reflection of light**
c) the diffraction of light **d) the polarization of light.**
7. For total internal reflection, which of the following is correct?
a) light travels from rarer to denser medium.
b) light travels from denser to rarer medium.
c) light travels in air only.
d) light travels in water only.
8. A short pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab, the first colour to emerge is:-
a) Blue **b) Green** **c) Violet** **d) Red**
9. An endoscope is employed by a Physician to view the internal parts of a body organ. It is based on the principle of:-
a) Refraction of light **b) The scattering of light**
c) Total internal reflection **d) The polarization of light.**

Year-2022

1. For a Glass Prism (n=$\sqrt{3}$), the angle of minimum deviation is equal to the angle of the prism. The angle of the prism is:-
a) 30^0 **b) 45^0** **c) 60^0** **d) 90^0**
2. A glass lens with refractive index n=1.47 disappear in trough of liquid. What is the refractive index of liquid?
a) 1.5 **b) 1.47** **c) 1.2** **d) 1.6**
3. When a ray of light goes from denser to rarer medium and angle of refraction is right angle, then angle of incidence is called:-
a) Reflection angle **b) Emergent angle**
c) Polarising angle **d) Critical angle**
4. A small telescope has an objective lens of focal length 144 cm and an eye-piece of focal length 6.0cm, the magnifying power of the telescope is:-
a) 24 **b) 2.4** **c) 4.2** **d) 42**
7. In Young's double slit experiment, the source is white light, one of the holes is covered by red filter and another by a blue filter. In this case:-
a) There shall be alternate interference patterns of red and blue.
b) There shall be an interference pattern for red distinct from that for blue.

c) There shall be no interference fringes.
d) There shall be an interference pattern for red mixing with one for blue.
8. Match the List I with List-II

List-I	List-II
1) Interference of light	**a) $I=I_0Cos^2\Theta$**
2) Brewester's law	**b) Obtsacle /aperture of size**
3) Diffraction of light	**c) $\mu=\tan ip$**
4) Law of Malus	**d) Coherent sources**

9. The phenomena involved in the reflection of radiowaves by ionosphere is similar to:-
a) Reflection of light by a plane mirror.
b) Total internal reflection of light in air during mirage.
c) Dispersion of light by water molecules during formation of a rainbow.
d) Scattering of light by molecules of air.
10. When a glass lens with n=1.47 is immersed in a trough of liquid, it looks to be disappeared. The liquid in trough could be:-
a) Water b) Kerosene c) Alcohol d) Glycerine
11. An astronomical refractive telescope has an objective of focal length 20 m and an eye piece of focal length 2cm:-
a) The length of the telescope tube is 20.02m
b) The magnification is 1000
c) The image formed is inverted
d) All of these.
12. For light diverging from a point source:-
a) The wavefront is spherical and intensity decreases in proportion to the distance squared.
b) The wavefront is parabolic
c) The intensity at the wavefront does not depend on the distance
d) None of the above.
13. Match List –I with List –II

List-I	List-II
1) Myopia	**a) Bifocal lens**
2) Hypermetropia	**b) Cylindrical lens**
3) Presbyopia	**c) Concave lens**
4) Astigmatism	**d) Convex lens**

14. A short pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab the first colour to emerge is:-
a) Blue b) Green c) Violet d) Red
15. The radius of curvature of a plano-convex lens is 20cm. If the refractive index of the material of the lens be 1.5, it will:-
a) act as a convex lens only for the objects that lie on its curved side.
b) act as a concave lens for the objects that lie on its curved side.
c) act as a convex lens irrespective of the side on which the object lies.
d) act as a concave lens irrespective of the side on which the object lies.
16. Mirage is observed in deserts due to phenomenon of:-
a) Interference of light b) Total internal reflection
c) Scattering of light d) Refraction of light.
17. A giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eye piece of focal length 1.0 cm is used, then the angular magnification of telescope is:-
a) 150 b) 1500 c) 15 d) None of these

18. A person looking at a mesh of crossed wires is able to see vertical wires more distinctly than the horizontal wires. This defect is due to:-

a) myopia **b) hypermetropia** **c) astigmatism** **d) presbyopia.**

19. Match the List I with List-Ii

List-I	List-II
1) Total internal reflection	a) Used for reducing glare
2) Refraction	b) Optical fibre
3) Interference	c) $\mu=\frac{\text{Sin i}}{\text{Sin r}}$
4) Polarisation	d) Light added to light can produce darkness

Year-2023

1. A short pulse of white light is incident from air to glass slab at normal incidence. After travelling through the glass slab, the first colour to emerge is:-

a) blue **b) green** **c) violet** **d) red**

2. If the refractive index of a material of equilateral prism is $\sqrt{3}$, then angle of minimum deviation of the prism is:-

a) 30^0 **b)45^0** **c)60^0** **d)75^0**

3. One cannot see through fog because:-

a) Light is scattered by droplets

b) Fog absorbs the light

c) Light suffer total internal reflection at droplets

d) Refractive index of the fog is infinity.

4. The equivalent focal length 'F' of two thin lenses of focal lengths f_1 and f_2 in contact is:-

a) f_1+f_2 **b)$\sqrt{f1+f2}$** **c) $\frac{f1f2}{f1+f2}$** **d) f_1-f_2**

5. Which of the following is not due to total internal reflection of light?

a) brilliance of diamond **b) working of optical fibre**

c) difference between apparent and real depth **d) mirage on hot summer day.**

6. A passenger in an Aeroplane shall:-

a) never see a rainbow.

b) may see a primary and a secondary rainbow as concentric circles.

c) may see a primary and a secondary rainbow as concentric arcs.

d) shall never see a secondary rainbow.

7. Peacock and other birds shows multi-colour due to:-

a) Reflection of light **b) Refraction of light.**

c) Interference of light **d) Polarisation of light.**

8. Radius of curvature of plane mirror is:-

a) Zero **b) Infinite** **c) One** **d) None of these**

Each question carries 2 marks:-

Year-2016

1. Define Power of a Lens. What are its units?

2. If two lenses of power -15 D and +5 D are in contact with each other, what is the focal length of this combination?

3. What are coherent sources? Give their conditions.

4. Why are danger signals red? Explain.

5. Why sun appears reddish at the time of sun set?

6. What are polaroids? Give their applications.

7. Why the colour of sky is blue?

Year-2017

1. What is mirage? Discuss mirage in brief.
2. In Young's double slit experiment, the distance between the slits is halved, what change in the fringe width will take place?
3. Define power of a lens. Two lenses of power -15 D and +5 D are in contact with each other. What is the focal length of this combination?
4. State and explain Huygen's principle.
5. Using Huygen's Principle , prove Snell's law of refraction.
6. Discuss sparkling of a diamond.
7. In Young's double slit experiment, the distance between the slits and screen is halved, what change in the fringe width will take place?
8. Define one dioptre. Two lenses of focal length 20 cm and -25 cm are placed in contact. Find the total power of combination?
9. Explain twinkling of stars.
10. In Young's double slit experiment, three colours green, yellow and red are successfully used. For which colour, the fringe width will be maximum.
11. An object is placed in front of a concave mirror of radius of curvature 40 cm at a distance of 10 cm. Find the position and nature of the image.

Year-2018

1. Distinguish between interference and diffraction of light.
2. Why sky appears blue in colour?
3. Light waves can be polarized but sound waves cannot be polarized. Why?
4. Why danger signals are red?
5. Can two independent sources of light be coherent? Why?

Year-2019

1. What are polaroids? Give any two uses of the polaroids.
2. Define total internal reflection. State the conditions for the phenomenon of total internal reflection
3. Why danger signals are red in colour?
4. What is the difference between interference and diffraction of light?
5. What is wave front? Give the types of wavefront.

Year-2020

1. What is the critical angle for the material of refractive index $\sqrt{2}$?
2. Coloured spectrum is seen through a muslin cloth. Why?
3. An object is placed in front of a concave mirror of radius of curvature 40cm at a distance of 10cm. Find the position and nature of image formed.
4. What is total internal reflection? Under what conditions does it takes place.
5. What are coherent sources?
6. Differentiate between interference and diffraction of light.
7. Refractive index of glass is 1.5. Find the speed of light in glass and the critical angle for glass.
8. Derive lens formula in case of convex lens when image formed is real.

Year-2021

1. Light from a point source in air falls on a spherical glass surface (n=1.5 and radius of curvature =20 cm). The distance of the light source from the glass surface is 100cm. At what position the image is formed?
2. A convex lens has 20cm focal length in air. What is focal length in water? (Refractive index of air-water=1.33, refractive index for air-glass=1.5).
3. Two slits are made one millimeter apart and the screen is placed one metre away. What is the fringe separation when blue-green light of wavelength 500 nm is used?
4. An object of size 3 cm is placed 14cm in front of a concave lens of focal length 21cm. Describe the image produced by the lens.

Year-2022

1. The refractive index of diamond is much greater than that of ordinary glass. Is this fact of some use to a diamond cutter?
2. In what way is diffraction from each slit related to interference pattern in a double –slit experiment?
3. Double convex lenses are to be manufactured from a glass of refractive index 1.55, with both faces of same radius of curvature. What is the radius of curvature required if focal length of lens is to be 20 cm.
4. 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 he actually is? Explain.
5. In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band?
6. An object of size 3 cm is placed 14 cm in front of a concave lens of focal length 21 cm. Describe the image produced by the lens.
7. Why must both the objectives and eyepiece of compound microscope have short focal lengths?
8. When a low flying aircraft passes overhead, we some times notice a slight shaking of the picture on our TV Screen. Suggest a possible explanation.
9. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of the image and magnification.

Year-2023

1. Derive mirror formula for concave mirror when real image is formed.
2. Light waves can be polarized but sound waves cannot be polarized. Why?
3. What do you mean by dispersion of light? What is the cause of dispersion?
4. Explain the difference between Diffraction and Interference of light.
5. What is total internal reflection? Under what conditions does it takes place?
6. Why the colour of sky is blue? Explain.

Each question carries 3 marks:-

Year-2016

1. What is total internal reflection? What are its conditions? Establish relationship between critical angle and refractive index.
2. What is fringe width? Derive an expression for fringe width in Young's double slit experiment.
3. Using Huygen's principle deduce the laws of refraction.
4. Using Huygen's principle prove the laws of reflection.

Year-2017

1. What is Polaroid? Give its uses.
2. What are the conditions for sustained interference with good contrast?

3. What is the difference between interference and diffraction?
4. Derive Lens maker's formula. Also state sign conventions used to derive lens maker's formula.

Year-2018

1. Using Huygen's Principle, prove the laws of refraction.
2. What are the two assumptions on which Huygen's principle is based? Explain Huygen's geometrical construction for wave fronts.
3. Using Huygen's Principle, prove the laws of refraction.

Year-2019

1. Prove the relation:-
$-n_1/u + n_2/v = n_2 - n_1/R$ when refraction occurs from rarer to denser medium at a convex spherical refracting surface and image formed is real.
2. What is optical fibre? On what principle it works? Give two application of optical fibres.
3. Prove the relation:-
$-n_1/u + n_2/v = n_2 - n_1/R$ when refraction occurs from rarer to denser medium at a concave spherical refracting surface.

Year-2020

1. Prove the relation:-
$-n_1/u + n_2/v = n_2 - n_1/R$ when refraction occurs from rarer to denser medium at a convex spherical refracting surface.
2. Derive the mirror formula for concave mirror when image formed is real.
3. Derive an expression for magnifying power of a simple microscope, when image formed is at least distance of distinct vision.

Year-2021

1. State Huygen's principle. Prove Snell's law of reflection on the basis of Huygen's principle. Is Huygen's principle valid for longitudinal sound waves?
2. Show that the fringe width of dark fringe is equal to the fringe width of bright fringe in Young's double slit experiment.
3. Define Polarising angle. Derive the relation connecting polarizing angle and refractive index of a medium.

Year-2022

1. Explain refraction of light on the basis of Huygen's principle and deduce Snell's law.
2. What is electromagnetic spectrum? Name the important parts of the electromagnetic spectrum in order of increasing frequency.
3. Define total internal reflection. Find the relation between critical angle and refractive index.
4. Define polarizing angle. Derive the relation connecting Polarising angle and refractive index of the medium.

Year-2023

1. What is meant by dispersion of light? Prove that for a prism:

$$n=\frac{Sin\left(\frac{a+\delta_m}{2}\right)}{Sin\left(\frac{A}{2}\right)}$$

where A is angle of prism, δ_m is the angle of minimum deviation and 'n' is refractive index of material of prism.

2. State Huygen's Principle. Using this principle, prove the laws of reflection.
3. Prove that for diffraction at a single slit, width of central maximum is twice as that of secondary maximum.

Each question carries 4 marks:-

Year-2016

1. Using new Cartesian sign conventions derive:-
$-n_2/u + n_1/v = n_1-n_2/R$ when refraction occurs at convex spherical refracting surface and object lies in denser medium?
2. In Young's double slit experiment, prove that dark and bright fringes are equal in width.
3. What is compound microscope? With the help of a ray diagram explain the working of compound microscope. Find an expression for its magnifying power.
4. Using new Cartesian sign conventions derive:-
$-n_1/u + n_2/v = n_2-n_1/R$ when refraction occurs from rarer to denser medium at convex spherical refracting surface.
5. What is meant by dispersion of light? Prove that for a prism:

$$n=\frac{Sin\left(\frac{a+\delta_m}{2}\right)}{Sin\left(\frac{A}{2}\right)}$$ **where symbols have their usual meanings.**

Year-2017

1. Define compound microscope. Using ray diagram, find an expression for its magnifying power.
2. Stating new Cartesian sign conventions, derive the relation:-

$$-\frac{n_1}{u}+\frac{n_2}{v}=\frac{n_2}{R}-\frac{n_1}{R}$$

When refraction takes from rarer medium to denser medium at a convex spherical surface, where letters have their usual meanings.
3. What is simple microscope? Define its magnifying power. Using ray diagram, find an expression for magnifying power of simple microscope for distinct vision.
4. What are coherent sources of light? Show that the fringe width of dark fringe is equal to the width of bright fringe in Young's double slit experiment.

Year-2018

1. Show that in Young's double slit experiment for interference of light, the widths of bright and dark fringes are equal.
2. What is meant by polarization of light? Derive Brewester's law of polarization of light.
3. Define magnifying power of a compound microscope. Derive an expression for magnifying power of a compound microscope when the image is formed at least distance of distinct vision.
4. What is meant by dispersion of light? Prove that for a prism $A+\delta=i+e$ where symbols have their usual meanings.
5. Define magnifying power of an astronomical telescope. Derive an expression for magnifying power of astronomical telescope.
6. What is meant by dispersion of light? Derive an expression for prism formula.

Year-2019

1. Explain Fraunhoffer's diffraction at a single slit and derive relation for the width of central maxima.
2. What do you mean by interference of light? Deduce the conditions for constructive and destructive interference in Young's double slit experiment.

3. What is fringe width? Derive an expression for fringe width using Young's double slit method for interference of light.

Year-2020

1. State Huygen's Principle and prove the laws of refraction on its basis.
2. What is interference of light? Find an expression for fringe width in Young's double slit experiment.
3. Derive expression for conditions of constructive and destructive interference in Young's double slit experiment.
4. Explain diffraction of light at a single slit and derive an expression for the width of central maxima.
5. State Huygen's Principle and prove the laws of reflection on its basis.

Year-2021

1. Derive Lens maker's formula for a convex lens. The radii of curvature of the faces of a double convex lens are 10cm and 15 cm. Its focal length is 12cm. What is the refractive index of glass?
2. What is diffraction of light? Explain the diffraction of light at a single slit and derive an expression for width of central maxima.
3. What is compound microscope? With the help of a ray diagram, explain the working of compound microscope. Find the expression for its magnifying power when the final image is formed at the near point.
4. Prove the relation:-
$-n_1/u + n_2/v = n_2 - n_1/R$ when refraction occurs from rarer to denser medium at a convex spherical refracting surface.
5. What is meant by plane polarized light? Which type of waves show the property of Polarisation?
6.Briefly discuss:-a) Polarisation by scattering b) Polarisarion by reflection

Year-2022

1. By stating sign conventions and assumptions, derive the expression for lens Maker's formula for convex lens i.e.

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R1} - \frac{1}{R2}\right)$$ **where the letters have their usual meanings.**

2. What is diffraction of light? Find conditions for maxima and minima, when diffraction of light takes place at single slit.
3. Prove the relation $\angle A + \angle\delta = \angle i + \angle e$ for a prism. What does this relation becomes, when prism is placed in minimum deviation?
4. What is Fringe width? Derive an expression for fringe width using Young's double slit experiment for interference of light.
5. Prove the relation:-
$-n_1/u + (-n_2)/v = n_2 - n_1/R$, when refraction occurs from rarer to denser medium at a convex spherical refracting surface .
6. Define Magnifying power. Derive an expression for magnifying power of a compound microscope, when image is formed at least distance of distinct vision.

Year-2023

1. By stating sign conventions and assumptions, derive the expression for lens maker's formula for convex lens.
2. What is compound microscope? Using ray diagram, find an expression for its magnifying power when final image is at least distance of distinct vision?
3. Define the magnifying power of an astronomical telescope. Derive an expression for its magnifying power, when final image is at least distance of distinct vision.

4. Prove that:-

$$\frac{-n_1}{u} + \frac{n_2}{v} = \frac{n_2}{R} - \frac{n_1}{R}$$

When refraction occurs from rarer to denser medium at a concave spherical refracting surface.

5. Derive an expression for the conditions of constructive and destructive interference in Young's double slit experiment.

6. State and prove Brewester's law. Show that at polarizing angle, the reflected and refracted beams of light are at 90^0 to each other.

Unit-7 Dual Nature of Matter and Radiation

Each question carries 1 mark:-

Year-2018

1. The minimum energy required to remove an electron is called:-

a) work function **b) kinetic energy** **c) stopping potential** **d) potential energy**

Year-2019

1. Electron volt (ev) is a unit of :-

a) energy **b) potential** **c) current** **d) charge**

2, The unit of Planck's constant is:-

a) Nm **b) eV** **c) Js** **d) Js^{-1}**

Year-2020

1. The velocity of light in vacuum can be changed by changing:

a) frequency **b) Amplitude** **c) Wavelength** **d) None of these**

2. The mass of photon at rest is:-

a) Zero **b) 1.6 $X10^{-35}$ kg** **c) 1 amu** **d) 9 $X10^{-31}$ Kg**

Year-2021

1. For which of the following the stopping potential is minium?

a) red light **b) blue light** **c) yellow light** **d) green light.**

2. The ratio of wavelength of last line of Balmer series to the last line of Lyman series is:-

a) 1 **b) 4** **c) 0.5** **d) 2**

3. What is the shortest wavelength present in the Paschen series of spectral lines?

4. Which of the following has the longest de Broglie wavelength, if they are moving with the same velocity?

a) Neutron **b) Proton** **c) Alpha particle** **d) Beta particle**

5. Taking the Bohr's radius as a_o= 53 pm, the radious of Li^{++} ion in its ground state on the basis of Bohr's model. Will be about:

a) 53 pm **b) 27 pm** **c) 18 pm** **d) 13 pm**

6. Which of the following is dependent on the intensity of radiation in a Photoelectric experiment?

a) Stopping potential

b) Amount of Photoelectric current

c) Work function of the surface

d) Maximum kinetic energy of photoelectrons.

7. Momentum of Photon of frequency 'v' is :-

a) Zero **b) hv/c** **c) hc/v** **d) 2hc/v**

8. In Bohr model of hydrogen atom, which of the following is quantized?
a) linear momentum of electron.
b) linear velocity of electron.
c) angular momentum of electron.
d) angular velocity of electron.

Year-2022

1. A particle is dropped from a height H. The de-Broglie wavelength of the particle as a function of height is proportional to:-
a) H **b) $H^{1/2}$** **c) H^{0}** **d) $H^{-1/2}$**
2. The minimum energy required to remove an electron from the metal surface is called:-
a) Work function **b) Kinetic energy** **c) Stopping potential** **d) Potential energy**
3. The de-Broglie wavelength λ associated with electrons, for V=54V will be:-
a) 0.167 nm **b) 0.167 m** **c) 0.167 mm** **d) 0.167 cm**
4. If the kinetic energy of a free electron doubles, its de-Broglie wavelength becomes?
a) half **b) twice** **c) $\frac{1}{\sqrt{2}}$times** **d) $\sqrt{2}$times**
5. The energy of a photon of wavelength λ is:-
a) hcλ **b) hc/λ** **c)hλ/c** **d) λ/hc**

Year-2023

1. The rest mass of photon is:-
a) 1 kg **b) infinite** **c) 1 g** **d) zero**
2. The de-Broglie equation states:-
a) dual nature **b) particle nature** **c) wave natue** **d) None of these**
3. Which of the following does not support the wave nature of light?
a) Interference **b) Diffraction** **c) Polarisation** **d) Photoelectric effect**
4. Momentum of a photon of frequency ν *is*:
a) hv/c **b)hvc** **c) h/vc** **d)hc/v**

Each question carries 2 marks:-

Year-2017

1. How X –rays are produced? Give three uses of X-rays.

Year-2019

1. Derive an expression for the de-broglie wavelength associated with an electron accelerated from rest through a potential difference V.
2. State the laws of photoelectric emission.

Year-2020

1. State the laws of photoelectric emission.
2. What is photon? Write its two properties.
3. Derive Einstein's photoelectric equation.

Year-2021

1. What is the shortest wavelength present in the Balmer series of spectral lines?
2. A hydrogen atom initially in the ground level absorbs a photon, which excites it to the n=4 level. Determine the frequency of Photon.
3. The ground state energy of Hydrogen atom is -13.6 eV. What are the kinetic and potential energies of the electron in this state?

4. Using the Bohr's model calculate the speed and orbital period of the electron in a Hydrogen atom in the n=2 level. Use orbital speed of an electron in n_{th} orbit, $v_n=c/137n$, where c is the speed of light and n is number of the orbit.

Year-2022

1. What is the (a) momentum,(b) speed of an electron with kinetic energy of 120 eV. Given h=6.63 X 10^{-34}Js, m_e=9.1 X 10^{-31} kg, 1eV= 1.6 X 10^{-19}J
2. What is Photon? Show that it has zero rest mass or photons cannot exists at rest. Explain.
3. State the postulates of Bohr's atomic model.
4. On the basis of Bohr's atomic model, find an expression for radius of nth orbit of a hydrogen atom.
5. What is the momentum and de-Broglie wavelength of the electrons accelerated through a potential difference of 56V.
6. If the wavelength of an electromagnetic radiation is doubled, what will happen to (a) the energy of photons and (b) the momentum of photon?
7. Obtain Bohr's quantization condition of angular momentum on the basis of the Bohr's atomic model.
8. What is the de-Broglie wavelength of a ball of mass 0.060 kg moving at a speed of 1.0 ms^{-1}? (Given h=6.63 X 10^{-34} JS)
9. Show that the wavelength of electromagnetic radiation is equal to the de-Broglie wavelength of its Quantum (Photon).

Year-2023

1. What is Photon? Write its two properties.
2. Find the de-Broglie wavelength of an electron accelerated between two points having potential difference of 'V' volts.
3. Derive the Einstein's photoelectric equation.

Each question carries 3 marks:-

Year-2016

1. Derive de- Broglie wavelength of an electron moving under potential difference of V Volt.
2. Give the value of speed and rest mass of photon. Determine the wavelength of photon of energy 10^{10} eV. Given h= 6.625 X 10^{-34} Js.
2. What is photoelectric effect? State the laws of photoelectric emission.
3. A photon and electron have got same de Broglie wavelength. Which has greater total energy? Explain.
4. Verify the laws of photoelectric effect, after deriving Einstein's photoelectric equation.
5. Derive an expression for de-Broglie wavelength of an electron moving under potential difference of 'V' volt.

Year-2017

1. Give the value of speed and rest mass of a photon. Determine the wavelength of a photon of energy 10^{10} eV. Given h=6.625 X10^{-34}Js.
2. State the postulates of Rutherford's atomic model.
3. Define and give the value of 1 eV (electron volt). Calculate the energy of photon in eV for radiation of wavelength 1m.

4. de-Broglie wavelength of a proton is 2Ă. What is (i) Velocity and (ii) Kinetic energy? Given mass of proton =1.67 X 10^{-27} kg.

Year-2018

1. Define threshold frequency. Explain the laws of Photoelectric emission.
2. Derive an expression for de-Broglie wavelength of an electron moving under potential difference of V Volts.
3. Define Photoelectric effect. Derive Einstein's photoelectric equation.
4. Derive de-broglie's wave equation for material particles.
5. Define work function of a metal and give its units and discuss various types of electron emission.

Year-2019

1. Explain the term stopping potential and threshold frequency in photoelectric effect.

Year-2021

1. Plot the variation of photoelectric current with collector plate potential for different frequencies of incident radiation, $v_1>v_2>v_3$ of incident radiation having the same intensity. In which case will the stopping potential be higher? Justify your answer.
2. Plot the variation of photoelectric current with collector plate potential for different intensity of incident radiation, $I_3>I_2>I_1$ of incident radiation having the same frequency. In which case will the photocurrent be higher? Justify your answer.
3. Plot the variation of stopping potential v_o with frequency v of incident radiation for a given photosensitive material. Write the conclusion drawn from this graph.

Unit-8 Atoms and Nuclei

Each question carries 1 mark:

Year-2016

1. When $_3Li^7$ is bombarded by protons and the resultant in ionosphere are called:-
a) alpha particle. B) Beta particle c) Gamma photon d) neutron.
2. A deuteron is bombarded 8O16 nucleus then alpha particle is emitted, the product nucleus is:-
a) $_7N^{14}$ b) $_5B^{10}$ c) $_2Be^9$ d) $_7N^{13}$

Year-2017

1. An atom bomb works on the principle of :-
a) Aplha decay b) Beta decay c) nuclear fission d) nuclear fusion.
2. The penetrating power is maximum for :-
a) Alpha rays b) Beta rays c) Gamma rays d) None of these.
3. A nucleus of $_{11}Na^{23}$ contains :-
a) 12 electrons b) 12 protons C) 12 neutrons d) 11 neutrons

Year-2018

1. $_7N^{14}$ is bombarded with $_2He^4$. The resulting nucleus is $_8O^{17}$ with the emission of :-
a) Neutrino b) Antineutrino c) Proton d) Neutron
2. In reaction $_4Be^9 + _2He^4 \longrightarrow {}_6C^X + {}_0n^1$ .Calculate the value of X.
a) 1 b) 12 c) 10 d) 14.

Year-2019

1. The binding energy per nucleon is maximum in case of :-

a) $_2He^4$ b) $_{26}Fe^{56}$ c) $_{56}Ba^{141}$ d) $_{92}U^{235}$

Year-2020

1. The energy equivalent to 1 amu is:-

a) 1.6×10^{-19} J **b) 6.02×10^{23} J**

c) 9.31 MeV **d) 931 MeV**

Year-2023

1. When $_3Li^7$ is bombarded by protons and the resultant nuclei are $_4Be^8$, the emitted particles are:-

a) alpha particle **b) Beta particle** **c) gamma photon** **d) neutron**

2. The binding energy per nucleon is maximum in :-

a) $_2He^4$ **b) $_{26}Fe^{56}$** **c) $_{56}Ba^{141}$** **d) $_{92}U^{235}$**

Each question carries 2 marks:-

Year-2021

1. Define nuclear binding energy. Write its expression also.

2. Plot a graph between binding energy per nucleon and mass number. Write down two main inferences from the graph.

3. Define half life in Radioactivity. Obtain an expression for it.

Year-2022

1. Show that nuclear density is the same for all nuclei.

2. Define :-

a) Mass defect

b) Packing fraction

c) Binding energy per nucleon

Each question carries 3 marks:-

Year-2016

1. Show that radioactive decay is an exponential process. State the laws of radioactive decay.

2. What are nuclear forces? Give their four properties.

2. What is mass defect, binding energy and binding energy per nucleon?

Year-2017

1. Define binding energy per nucleon. Discuss the main features of the graph between mass number and binding energy per nucleon.

2. State the laws of radioactive decay and deduce the relation $N=N_0e^{-\lambda t}$ where symbols have their usual meaning.

Year-2018

1. What is mass defect, binding energy and binding energy per nucleon?

2. Define nuclear size and Nuclear density. Show that nuclear density is the same for all nuclei.

3. Define nuclear forces. Give their properties.

Year-2019

1. State the laws of radioactive decay and deduce the relation $N=N_0e^{-\lambda t}$ where symbols have their usual meaning.

Year-2020

1. Define binding energy per nucleon. Draw a curve between mass number and binding energy per nucleon. Also explain the curve.
2. State the laws of radioactive decay.
3. Derive an expression for half life of a radioactive substance.

Year-2022

1. Draw the graph showing the variation of binding energy per nucleon with mass number for different nuclei. Explain, using this graph, why heavy nuclei can undergo fission.
2. State Radioactive decay law. Define half life ($T_{1/2}$) of a radioactive substance and show that $T_{1/2}=\frac{0.693}{\lambda}$ where λ is decay constant.

Year-2023

2. Calculate the binding energy per nucleon of $_{26}Fe^{56}$, given mass of $_{25}Fe^{56}$ is 55.934949 amu, mass of neutron is 1.008665 amu, mass of proton is 1.007825 amu.
3. Draw and explain a graph showing the variation of binding energy per nucleon with mass number for nuclei.
4. A neutron is absorbed by $_3Li^6$ nucleus with subsequent emission of alpha particles. Write the corresponding nuclear reaction. Calculate the energy released in this reaction in MeV. Given mass of $_3Li^6$=6.01516 amu, mass of $_2He^4$ =4.0056044 amu, mass of neutron($_0n^1$)=1.0086654 amu, mass of tritium ($_1H^3$)= 3.016049 amu.
5. Explain the laws of radioactive decay.
6. Obtain an expression (in MeV) and binding energy per nucleon of a nitrogen nucleus ($_7N^{14}$), given mass of $_7N^{14}$= 14.00307 amu and mass of proton=1.007825 amu and mass of neutron =1.008665 amu.

Unit-9 Solid and Semiconductor Devices

Each question carries 1 mark:-

Year-2016

1. n-type semiconductor is obtained by doping intrinsic germanium with:-
a) Phosphorous b) Aluminium c) Boron d) Gold
2. In nuclear transformation:-
$_aX^b + {}_0n^1 \longrightarrow {}_2He^4 + {}_3Li^7$
which one is the nucleus of element X:-
a) $_5B^{10}$ b) $_5B^9$ c) $_4Be^{11}$ d) $_6C^{12}$
3. Boron is added as impurity to silicon, the resultant semiconductor is:-
a) n-type semiconductor b) p-type semiconductor
c) n-type conductor d) none of these.

Year-2017

1. A n-type semiconductor is:-
a) neutral b) negatively charged c) positively charged d) none of these.
2. A p-type semiconductor is:-

a) neutral b) negatively charged c) positively charges d) none of these.

Year-2018

1. At absolute zero, Ge behaves as:-

a) Conductor b) Insulator c) Semiconductor d) Superconductor

Year-2019

1. When arsenic is added as an impurity to silicon, resulting material is:-

a) n- type b) p-type c) intrinsic semiconductor d) none of these

2. Which of the following is used as moderator in nuclear reactor?

a) Uranium b) Heavy water c) Cadmium d) Plutonium

3. At zero Kelvin, a piece of germanium behaves as:-

a) semiconductor b) insulator c) good conductor d) superconductor

Year-2020

1. Boron is added as an impurity to silicon, the resulting material is:-

a) p-type semiconductor b) n-type semiconductor

c) intrinsic semiconductor d) none of these

2. Depletion layer in P-N junction diode consists of:

a) electrons b) immobile ions c) holes d) both a and c

3. Hydrogen bomb is based on the principle of:-

a) Nuclear fission b) Beta decay c) Nuclear fusion d) none of these

4. Atom bomb works on the principle of:-

a) Nuclear fission b) Nuclear fusion

c) Beta decay c) Gamma decay

5. When a p-n junction diode is reverse biased, then:-

a) high current flows. b) depletion region is increased.

c) the height of potential barrier is reduced. d) the depletion region is reduced.

Year-2021

1. In the depletion region of a diode:-

a) there are mobile charges b) unequal number of holes and electrons exist.

c) recombination of holes and electrons has taken place

d) None of these.

2. Hole is:-

a) an anti-particle of electron in the conduction band.

b) a vacancy created when an electron leaves a covalent bond.

c) Absence of free electrons.

d) an artificially created particles.

Year-2022

1. When a forward bias is applied to a p-n junction, it?

a) Raises the potential barrier b) Reduces the majority carrier current to zero.

c) Lowers the potential barrier d) None of the above.

2. Match the List I with List-II

List-I	List-II
1) Elemental semiconductor	a) GaAs and I_nP
2) Inorganic semiconductor	b) Anthracene and doped

3) Organic semiconductors **c) Liquid crystal display**

4) LCD **d) Si and Ge**

3. Choose the correct product of nuclear reaction:-

$_{90}Th^{234} \longrightarrow {}_{91}Pa^{234}$ + ……..

a) Aplha **b) Beta** **c) Gamma** **d) None of these.**

4. In alpha decay, A is mass number and Z is atomic number:-

a) A decreased by 4 and Z increases by 2.

b) A decreased by 4 and Z decreases by 2.

c) A increased by 4 and Z decreases by 2.

d) A increased by 4 and Z increases by 2.

5. In an n-type silicon, which of the following statement is true:-

a) Electrons are majority carriers and trivalent atoms are the dopants.

b) Electrons are minority carriers and pentavalent atoms are the dopants.

c) Holes are minority carriers and pentavalent atoms are the dopants.

d) Holes are majority carriers and trivalent atoms are the dopants.

6. What happens during the regulation action of Zener diode?

a) The zener resistance is constant.

b) The current through the series resistance changes and resistance offered by the Zener changes

c) The current and voltage across the Zener remain fixed.

d) None of the above.

7. Match the List I with List-II:-

List-I	List-II
1) CRT	a) Low resistivity and high conductivity
2) Metal	b) Resistivity and conductivity intermediate
3) Semiconductor	c) Cathode ray tubes
4) Insulator	d) High resistivity and low conductivity

Year-2023

1. p-n junction diode is:-

a) ohmic resistance **b) non-ohmic resistance**

c) negative resistances **d) positive resistance**

2. Hydrogen bomb is based on the principle of :-

a) Nuclear fission **b) Beta decay** **c) Nuclear fusion** **d) None of these**

3. Depletion layer consists of :-

a) Electrons **b) Immobile ions** **c) mobile ions** **d) Both a and b**

4. The relation between base current (I_b), emitter current (I_e) and collector current (I_c) for common-emitter transistor is:-

a) $I_b=I_e+I_c$ **b) $I_c=I_b+I_e$** **c) $I_e=I_b+I_c$** **d) None of these**

Each question carries 2 marks:-

Year-2016

1. What is doping? What happens to the conductivity with increase of temperature?

Year-2017

1. In transistor the base is thin and lightly doped, explain why?

2. In a transistor, reverse bias is quite high as compared to forward bias. Explain why?

3. What is Rectifier? On what principle it works.

Year-2018

1. Distinguish between intrinsic and extrinsic semiconductors.
2. What is the difference between P-type and N-type semiconductor.
3. In a transistor, base is made very thin. Why?

Year-2020

1. Distinguish between forward and reverse biasing of junction diode.

Year-2022

1. What is Doping? Distinguish between p-type and n-type semiconductor on the basis of energy band diagram.
2. In a transistor, base is made thin and doped with little impurity atoms. Why?
3. What is Zener diode? How it can act as a voltage regulator?
4. Draw V-I characteristics of Zener diode with circuit diagram and explain its working.
5. Explain the formation of p-n junction.

Year-2023

1. With the help of necessary circuit diagram, give working of a diode as a half wave rectifier.
2. Explain the Forward and Reverse biasing.
3. What is p-n junction diode? Draw the complete characteristics of a junction diode.

Each question carries 3 marks:-

Year-2016

1. What is amplifier? With the help of circuit diagram explain the working of transistor as an Amplifier in common- base mode.
2. What is oscillator? With the help of a diagram explain the working of a transistor as an oscillator in CE mode.
3. What is the difference between p-type and n-type semiconductor?
4. What is rectification? How can diode be used as half wave rectifier?

Year-2018

1. On the basis of energy band diagram , distinguish between metal, insulator and semiconductors.
2. Define forward and reverse biasing of p-n junction diode. Why is a semiconductor damaged by a strong current?
3. What is rectification? How a diode can be used as a half wave rectifier?

Year-2020

1. Explain through a diagram, working of transistor as an oscillator.
2. Discuss the working of p-n junction diode as a full wave rectifier.
3. Discuss the working of n-p-n transistor as common-emitter amplifier.

Year-2022

1. Derive the relation $N=N_oe^{-\lambda t}$, where symbols have their usual meanings.
2. What is nuclear fusion? In what sense, is it differ from nuclear fission? Why nuclear fusion is not possible in a laboratory?
3. Draw a labelled diagram of nuclear reactor and explain the functions of moderator, control rods and coolant in a nuclear reactor.

Year-2023

1. Discuss the working of n-p-n transistor as common emitter amplifier.
2. Explain the Energy bands of solids in detail.
3. Explain through a diagram working of a transistor as an oscillator.
4. Distinguish between n-type and p-type semiconductor.
5. Explain n-p-n transistor as an amplifier using circuit diagram.
6. What is a Zener diode? Explain, how it is used as a voltage regulator?

Each question carries 4 marks:-

Year-2018

1. What is rectification? How a diode can be used as a half wave rectifier.

Year-2019

1. What is oscillator? With the help of a circuit diagram, explain the working of a transistor as an oscillator in common-emitter configuration.
2. Explain (i) forward biasing (ii) reverse biasing of a p-n junction diode. With the help of circuit diagram, explain the use of this device as a half-wave rectifier.

Year-2021

1. What is a solar cell? Explain its construction and working. Draw V-I characteristics of solar cell. Why are Si and GaAs are preferred materials for solar cells?
2. How is Junction barrier formed across a p-n junction? Using a labeled diagram, explain the working of a p-n junction diode as a half wave rectifier. Draw output waveform across the load R_L connected in the half wave rectifier.
3. Distinguish between Forward and Reverse biasing in p-n junction diode with the help of circuit diagram. Explain construction and working of photo-diode. The current in the forward bias is known to be more (mA) than the current in the reverse bias (μA). What is the reason then to operate the photodiodes in reverse bias?

Year-2022

1. What is an Oscillator? With the help of circuit diagram, explain the working of transistor as an oscillator in the common-emitter configuration.
2. What is a rectifier? With the help of necessary circuit diagram, give working of a diode as a half wave rectifier?
3. What is a Transistor? Give a brief description of the three segments of a transistor. Discuss the action of n-p-n transistor.
4. What is an "Amplifier"? With the help of a circuit diagram, explain the function of a n-p-n transistor as an amplifier.

Unit -10 Communication System

Each question carries 1 marks:-

Year-2016

1. Modulation :-

a) reduces the bandwidth use

b) allows practicable antennas

c) helps in long distance transfer of messages
d) amplifies the band width
2. Major limitation of amplitude modulation is:-
a) noisy output **b) high cost** **c) average audio response**
d) medium of efficiency.
3. Which of the following logic gate is an universal logic gate:-
a) OR **b) AND** **c) NOT** **d) NAND**

Year-2017

1. Which of the following logic gate is an universal logic gate?
a) OR **b) AND** **c) NOT** **d) NAND**

Year-2018

1. Modem is a device which performs:-
A) Modulation **b) Demodulation**
c) Rectification **d) Modulation and Demodulation**
2. Which of the following logic gate is an universal logic gate?
a) OR **b) AND** **c) NOT** **d) NOR**
3. The function of MODEM is to convert :
a) analog signal into digital signal
b) digital signal into analog .
c) analog signal into digital and vice versa.
d) none of these.

Year-2019

1. Zener diode is used for:-
a) Amplification **b) rectification** **c) stabilization** **d) All of above**

Year-2021

1. A basic communication system consists of (A) transmitter, (B) information source, (C) user of information, (D) Channel, (E) receiver. Choose the correct system in which these are arranged in a basic communication system:-
a) BADEC **b) ABCDE** **C) BDACE** **d)BEADC**

Year-2022

1. The process of regaining of information from carrier wave at the receiver is termed as:-
a) Demodulation **b) Modulation** **c) Attenuation** **d) Amplification**
2. The waves used by Artificial satellites for Communication purposes is:-
a) Microwaves **b) AM radio waves**
c) FM radio waves **d) X-rays.**

Year-2023

1. A basic communication system consists of:-
a) transmitter **b) Information** **c) User of information**
d) channel **e) receiver**
Choose the correct sequence in which these are arranged in a basic communication system:
a) ABCDE **b) BADEC** **c) BDACE** **d) BEADC**
2. Attenuation in optical fibre is mainly dueo:-
a) scattering **b) absorption and scattering**

c) dispersion **d) None of these**

Each question carries 2 marks:-

Year-2016

1. What is Logic gate? Convert decimal number 27 into binary number.

Year-2019

1. Draw a labeled diagram of communication system.

Year-2020

1. Give the Boolean expression, symbolic diagram and truth table of 'NOT' Gate.
2. Write Boolean expression, truth table and symbolic diagram of "OR" Gate.

Year-2023

1. Give the logic symbol, truth table and Boolean expression for 'AND' gate.
2. Give the logic symbol, truth table and Boolean expression of 'OR' gate.
3. Give the logic symbol, truth table and Boolean expression of 'NOR' gate.

Each question carries 3 marks:-

Year-2016

1. What is modulation? Explain amplitude and frequency modulation.

Year-2017

1. Give :-
a) Logic symbol
b) Truth table
c) Boolean expression .
d) Electronic circuit of "OR", "AND" and "NOT" gate.

Year-2018

1. What is modulation? Explain the need of modulation.
2. Define carrier waves. Why do we need carrier waves of high frequency in the modulation of signals?

Year-2020

1. Distinguish between analog and digital communication.

Year-2021

1. Explain the different elements of a communication system using a block diagram.
2. Define:-a) Transducer **b) Transmitter**
c) Receiver **d) Attenuation**
e) Modulation **f) Demodulation**
3. Define the following terms used in communication:-a) Signal
b) Noise **c) Amplification** **d) Range** **d) Bandwidth** **e) Repeater**

Year-2022

1. Explain the three factors which justify the need for modulating a signal

Year-2023

1. What is communication system? Give the block diagram of communication system.