KENDRIYA VIDYALAYA SANGATHAN-NEW DELHI
ZIET BHUBANESWAR

TEST PAPERS IN PHYSICS FOR CLASS XII BASED ON NCERT TEXT BOOK

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Thank you for downloading this booklet on Test papers for class XII in physics. The idea of this booklet is mainly to make the readers to go through the NCERT Text book. Before answering this test series please go through the chapter in the NCERT text book and then proceed to answer the test papers related to that chapter. Answer to each question can be obtained from the text book itself. The advantage of this booklet is that the page number in which the answer to that particular question can be obtained is shown against the question itself.

These test papers can be used to evaluate one's performance with respect to a particular chapter. If the student evaluates himself one will come to know what type of questions will be given for 1 mark, 2 marks & 3 marks and how much time each question takes to answer and what type of preparation one requires.

My sincere thanks to those sites from which I have downloaded the images/material from the internet.

Please don't forget to give your feedback to the following address zietbbsr@gmail.com or samrajyalakshmi.kv@gmail.com

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ELECTROSTATICS

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

1   What is Electrostatics?   **Page:1**   1

2   Find the correct choice from the following

    a.   when two glass rods rubbed with wool or silk cloth are brought close to   2
each other , they Attract/repel

    b.   When the two strands of wool or two pieces of silk cloth with which the rods
were rubbed are brought each other, they attract/repel

    c.   Two plastic rods rubbed with cat's fur are brought close to each other, they
attract/repel

    d.   The pith ball touched with glass rod when brought nearer to another pith
ball touched with plastic rod they attract/repel   **Page:2**

3   What happens to the bodies when they are rubbed on each other?   **Page:2**   1

4   How many kinds of electrification are there? What are they?   **Page:2**   1

5   Name the property of charge which differentiates the two kinds of charges.   **Page:2**   1

6   What happens to the electrified glass rod When brought in contact with silk, with   2
which it was rubbed? Why?   **Page:2**

7   Who named the charges as positive and negative?   **Page:3**   1

8   What happens to a compass needle when a current carrying wire is placed nearer to
it? Who discovered this phenomenon?   **Page:3**   2

9   How can you say that electricity and magnetism are interdependent?   **Page:3**   1

10   What is electromagnetism?   **Page:3**   1

11   Who claimed that science of optics is intimately related to that of electricity and   1
magnetism?   **Page:3**

13   Name the device used to detect charge on a body? Give a brief description of it.   2
Page:3

14   How can you make a simple electroscope   **Page:4**   2

15   Is there a new charge is created in the process of rubbing? Give your answer. **Page:5**   1

16   What are conductors and insulators? What is the difference between them when   2
they are given charge to them   **Page:5**

17   Why nylon or plastic comb gets electrified on combing hair, but a spoon does not?   1
Give reason.   **Page:5**

| 18	What is meant by earthing? What is the other name for earthing? How earthing can be done? What is the advantage of it? **Page:5**	3
19	Explain What is charging by induction **Page:6**	3
20	How can you charge a metal sphere positively without touching it? **Page:7**	2

ELECTROSTATICS

## ELECTRIC CHARGES AND FIELDS–Test Paper-II

### MAX MARKS: 30   TIME: 90Mts

1   What are the basic properties of electric charge?   **Page:8**   2

2   Give the value of charge on an electron.   **Page:9**   1

3   If 10^9 electrons move out of a body to another body every second, how much time is required to get a total charge of 1C on the other body?   **Page:10**   2

4   How much positive and negative charge is there in a cup of water?   **Page:10**   2

5   State Coulomb's law. Give vector form of the equation for finding the force acting between any two charges.   **Page:10 &12**   2

6   Define the SI unit of electric charge.   **Page:11**   1

7

10 cm

3

5cm
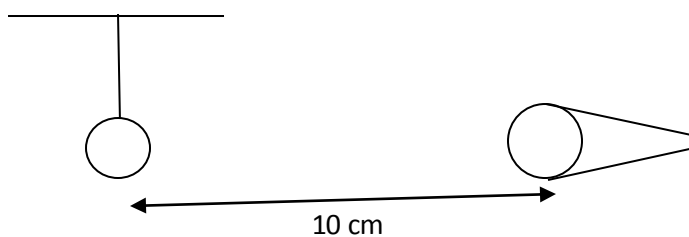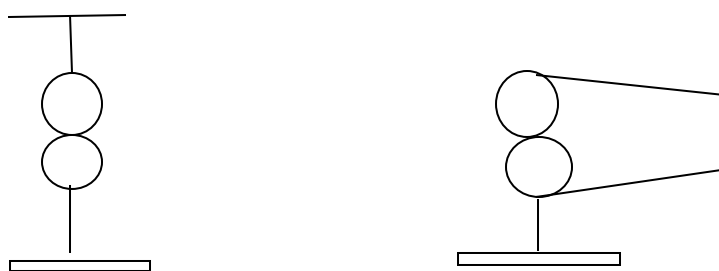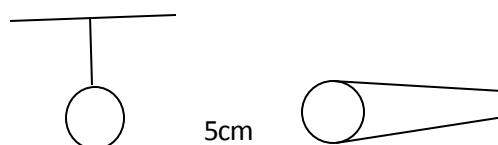
A metallic sphere A is suspended by a nylon thread. Another charged metallic sphere B held by an insulating handle is brought closed to A such that the distance between their centres is 10 cm. The resulting repulsion of A is noted. Spheres A and B are touched by uncharged spheres C and D respectively, as shown in fig. C and D are

then removed and B is brought closer to A to a distance of 5.0 cm between their centres, as own in fig© What is the expected repulsion of A on the basis of Coulomb's law? Spheres A and C and spheres B and D have identical sizes. Ignore the sizes of A and B in comparison to the separation between their centres.   **Page:14**
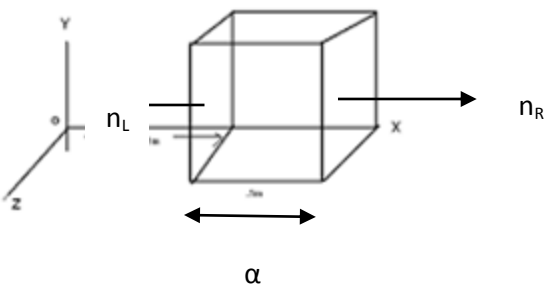
\

8	Give the formula to find the effective force on a given charge due to the forces exerted by the other charges. **Page:16**	1
10	Define electric field due to a charge. Give an expression to find the electric field due to a charge. What is the SI unit of electric field? **Page:18**	2
11	Show diagrammatically what is the electric field due to a positive charge and a negative charge. **Page18**	2
13	Give the properties of electric field lines. **Page25**	2
14	Define electric line of force. **Page24**	1
15	Define electric flux through an area element ΔS. Give the factors on which the electric flux depends upon. Also give the formula to find the electric flux through an area element. **Page26**	3
16	What is an electric dipole? Derive an expression to find the electric field at a point on the axis of an electric dipole. **Page27**	3
17	Derive an expression to find the electric field at a point on the equatorial line. Give the physical significance of dipole. **Page28**	3

ELECTROSTATICS

ELECTRIC CHARGES AND FIELDS

Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

SI.	QUESTION	ANSWER PAGE	MAR
1	Define Torque. Find the torque acting on an electric dipole placed in a uniform electric field. Give the conditions for torque acting on an electric dipole is (a) zero and (b) maximum **Page:31**		3
2	How can you explain a comb run through dry hair attracts pieces of paper? **Page:31**		2
3	Define linear charge density. Give its SI unit of measurement. Also give the formula to find the linear charge density. **Page:32**		2
4	Define the following. Also give their SI units of measurement? (a) Surface charge density (b) volume charge density. **Page:32**		3
5	State & prove Gauss's Law. **Page:33**		3
6	Give any four important points regarding Gauss's law. **Page:34**		2
7	The electric field components in fig are $E_x = \alpha x^{½}$. $E_y = E_z = 0$, in which $\alpha = 800$N/Cm^{½}. Calculate (a) the flux through the cube, and (b) the charge within the cube. Assume that $\alpha = 0.1$m. **Page:35**		

|			3
8	Derive an expression to find the electric field due to an infinitely long thin straight wire using Gauss's Law **Page:37**		3
9	Derive an expression to find the electric field due to a uniformly charged infinite plane sheet using Gauss's Law **Page:38**		3
10	Derive an expression to find the electric field due to a uniformly charged thin spherical shell using Gauss's Law **Page:39**		3
	Two charges $\pm 10\mu C$ are placed 5.0 mm apart. Determine the electric field at (a) a point on the axis of the dipole at 15 cm away from the center of the dipole on the axial line and (b) at 15 com away from the center of the dipole on the equatorial line of the dipole. **Page:30**		3

ELECTROSTATICS

ELECTROSTATIC POTENTIAL AND CAPACITANCE

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

Sl.	QUESTION	ANSWER PAGE	MAR
1	What are conservative forces? Give some examples. **Page:51**		2
2	Define electric potential energy difference between any two points. Also give the expression to find the same. **Page:52**		2
3	Define electrostatic potential at a point. Give the expression to find the same. **Page:54**		2
4	Plot a graph showing the variation of (i) Electrostatic potential (ii) electric intensity with distance r. **Page:55**		2
5	(a)Calculate the potential at a point P due to a charge of $4 \times 10^{-7}C$ located 9 cm away.(b) Hence obtain the work done in bringing a charge $2 \times 10^{-9}C$ from infinity to the point P. Does the answer depend on the path along which the charge is brought? **Page:55**		3
6	Derive an expression to find the potential due to an electric dipole (i) at a point on the axis of the dipole and (ii) at a point on the equatorial line. **Page:56**		3
7	Two charges $3 \times 10^{-8}C$ and $-2 \times 10^{-8}C$ are located 15cm apart. At what point on the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero. **Page:58**		3
8	Fig shows the field lines of a positive and negative charges respectively.		
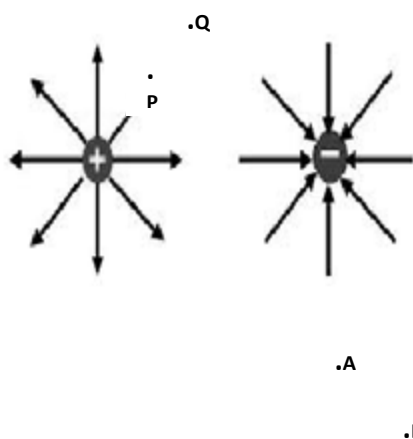
3

a. Give the signs of the potential difference $V_P - V_Q$; $V_B - V_A$.

b. Give the sign of the potential energy difference of a small negative charge between the points Q and P; A and B.

c. Give the sign of the work done by the field in moving a small positive charge from Q to P.

d. Give the sign of the work done by the external agency in moving a small charge from B to A.

e. Does the kinetic energy of a small negative charge increase or decrease in going from B to A? **Page:59**

9   What is an equipotential surface? Draw the equipotential surfaces for the following   3

   a. Uniform electric field

   b. A Dipole

   c. Two identical positive charges. **Page:60**

10   Give the relation between Electric field and electrostatic potential. What important conclusions that can be drawn from the relation? **Page:61**   3

11   Derive an expression to find the potential energy of a system of two charges in an external field. **Page:65**   3

12   How can you say that the electric field must be normal to the equipotential surface? **Page:60**   1

ELECTROSTATICS

ELECTROSTATIC POTENTIAL AND CAPACITANCE- Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

+S. N	QUESTION	ANSWER PAGE	MARK
1	What is the value of electrostatic field inside a conductor?	Page:68	1
2	What is the direction of electrostatic field at every point on the surface of a charged conductor?	Page:68	1
3	What is the difference in the movement of charge carriers in case of metal to that of electrolytic conductors?	Page:67	1
4	Derive an expression to find the potential energy of an electric dipole in an external field.	Page:66	3
5	What is the amount of net charge inside the charged conductor?	Page:68	1
6	What can you say about the electrostatic potential throughout the volume of a charged conductor**?**	Page:68	1
7	Derive the relation $E =| \sigma | / \varepsilon 0$ to find the electric field at the surface of a charged conductor.	Page:69	2
8	What is meant by electrostatic shielding? What is the advantage of it?	Page:69	2
9	A comb run through one's dry hair attracts small bits of paper why? What happens if the hair is wet or if it is a rainy day**?**	Page:70	2
10	Ordinary rubber is an insulator. But special rubber tyres of aircraft are made slightly conducting. Why is this necessary?	Page:70	2
11	A bird perches on a bare high power line, and nothing happens to the bird. A man standing on the ground touches the same line and gets a fatal shock. Why?	Page:70	1
12	Vehicles carrying inflammable materials usually have metallic ropes touching the ground during motion. Why?	Page:70	1
13	What are dielectric substances? How are they different from conductors?	Page:71	1
14	What is the effect of external electric field on a conductor and a dielectric substance?	Page:71	2
15	What are polar and non-polar molecules? give examples for each	Page:71	2
16	What is meant by polarization? Give the relation between polarization and applied electric field.	Page:72	2
17	A uniformly polarized dielectric amounts to induced surface charge density but no volume charge density. Explain.	Page:73	3
18	What is the effect of external electric field on a polar molecule and a non-polar molecule?		2

Page:72

ELECTROSTATICS-CAPACITANCE

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is a capacitor?	Page:74	1
2	Define capacitance of a capacitor. Give the factors on which the capacitance depends. What is the symbolic representation of a fixed capacitance and a variable capacitance?	Page:74	3
3	What is meant by the dielectric strength of a dielectric medium?	Page:74	1
4	Give the conditions for a capacitor to store charge without leaking.	Page:74	1
5	Give the common units of capacitance.	Page:74	1
6	Derive the formula to find the capacitance of a parallel plate capacitor.	Page:74	3
7	Show that 1 Farad is a big unit in practice.	Page:74	2
8	What happens to the capacitance of a parallel plate capacitor when a dielectric medium of dielectric constant K is introduced between the plates of the capacitor? Also show that $C=kC_0$.	Page:76	3
9	A slab of material of dielectric constant k has the same area as the plates of a parallel plate3 capacitor but has a thickness (3/4) d, where d is the separation of the plates. How is the capacitance changed when the slab is inserted between the plates? Page:77		3
10	Derive the formula to find the effective capacitance when capacitors are connected in series.	Page:78	3
11	Derive the formula to find the effective capacitance when capacitors are connected in Parallel	Page:79	3
12	Derive an expression to find the energy stored in a capacitor. Derive the formula to find the effective capacitance when capacitors are connected in series.	Page:81	3
13	A network of four 10 µF capacitors is connected to a 500V supply.as shown in the fig. Determine (a) the equivalent capacitance of the network (b) the charge on each capacitor. Refer to the diagram given in page79 Of the NCERT Text book	Page:79	3

CURRENT ELECTRICITY

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is an electric current? Give the formula to find the electric current. Define its SI unit.	Page:94	2
2	Name the phenomenon in which charges flow from the clouds to the earth through the atmosphere. .	Page:93	1
3	Name any two devices where a steady current flow through the device. .	Page:93	1
4	Name the layer of the atmosphere in which charged particles exist. .	Page:94	1
5	What are conductors? What is the effect of an electric field on a conductor?	Page:94	2
6	State Ohm's Law. .	Page:95	1
7	Define resistance of a conductor. Give the SI unit of resistance. Give the factors on which the resistance of a conductor depends upon. .	Page:95	2
8	Define current density. What is its SI unit of measurement? .	Page:96	1
9	What is resistivity of a material? Give the factors on which the resistivity of a material depends upon. How is different from conductivity?	Page:96	3
10	What are the limitations of Ohm's law?	Page:101	2
11	Define mobility. Derive an expression to find the mobility of a charged particle.	Page:100	2
12	The electron drift arises due to the force experienced by electrons in the electric field inside the conductor. But force should cause acceleration. Why then do the electrons acquired steady average drift sped?	Page:100	2
13	Are the paths of electrons straight lines between successive collisions (with the positive ins of the metal) in the (i) presence of electric field, (ii) presence of electric field?	Page:100	2
14	Name the materials that are used in wire bound resistors. Give reason why these materials are used in making these resistors?	Page:102	1
15	Give the colour code used in case of carbon resistors. Also give any two advantages of these resistors.	Page:103	3
16	Plot a graph showing the variation resistivity of the following materials with temperature (a) copper (b) nichrome (c) semiconductor. .	Page:104	2
17	Give the formula to find the resistivity of a material. State the factors on which the resistivity or the conductivity of a material depends upon.	Page:104	2

CURRENT ELECTRICITY

Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5Ω and at steam point is 5.23Ω when the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.795Ω. Calculate the temperature of the bath. **Page:105**		2
2	Find the effective resistance when resistances are connected in series **Page:107**		2
3	Find the effective resistance when resistances are connected in parallel. **Page:107**		2
4	Explain why a transformer is required to lower the voltage to a value suitable for use at a station? **Page:107**		2
5	Derive the expression to find the power dissipated when current I is allowed to flow through a conductor? **Page:106**		2
6	What is an emf of a cell? Derive an expression to find the current flowing in a circuit in which a resistor R is connected across a cell of emf ε. **Page:110**		3
7	Derive an expression to find the effective emf of cells in series **Page:113**		2
8	Derive an expression to find the effective emf of cells in parallel **Page:114**		2
9	State Kirchhoff's rules. **Page:116**		2
10	What is a Wheatstone Bridge? What is the advantage of it? **Page:118**		1
11	What is a Meter Bridge? Explain with a neat circuit diagram how a meter bridge can be Used to determine the unknown resistance of the given wire. **Page:120**		3
12	In a meter bridge, the null point is found at a distance of 33.7 cm from one end of the meter bridge. If now a resistance of 12Ω is connected in parallel with S, the null point occurs at 51.9 cm. Determine the values of R and S. **Page:121**		2
13	Give the principle of working of a potentiometer. Explain with a neat circuit diagram how potentiometer can be used to compare the emf of two primary cells. **Page:122**		3
14	Explain with a neat circuit diagram how potentiometer can be used to find the internal resistance of a cell. **Page:122**		2

CURRENT ELECTRICITY

Test Paper-II

MAX MARKS: 30   **TIME: 30MTS**

Match the following   **Page: 126**

	Part-A	Part-B
1	Electric current	$[T]$
2	Charge	$[LT^{-1}]$
3	Voltage, Potential difference	$[\ A\ ]$
4	Electromotive force	$[\ TA\ ]$
5	Resistance	$[\ ML^2T^{-3}A^{-1}\ ]$
6	Resistivity	$[ML^2T^{-3}A^{-1}\ ]$
7	Electrical Conductivity	$[\ ML^2T^{-3}A^{-2}\ ]$
8	Electric Field	$[\ ML^3T^{-4}A^{-1}\ ]$
9	Relaxation Time	$[\ L^{-2}A\ ]$
10	Current density	$[MLT^{-3}A^{-1}\ ]$
11	Mobility	$[\ ML^3T^{-3}A^{-2}\ ]$
12	Drift speed	$[\ M^{-1}L^{-3}T^3A^2\ ]$

Match the following   **Page: 126**

	Part-A	Part-B
1	Electric current	$m^2V^{-1}s^{-1}$
2	Charge	Am^{-2}
3	Voltage, Potential difference	s
4	Electromotive force	ms^{-1}
5	Resistance	Vm^{-1}
6	Resistivity	S
7	Electrical Conductivity	Ωm
8	Electric Field	Ω
9	Relaxation Time	V
10	Current density	V
11	Mobility	C

| 12 | Drift speed | $[M^{-1}L^{-3}T^3A^2]$ |

Match the following

	Part-A	**Part-B** **Page: 126**
1	Voltage, Potential difference	V_d/E
2	Electromotive force	Current/Area
3	Electric field	Electric force/ Charge
4	Current density	$V_d=eE\tau/m$
5	Mobility	W/Q
6	Drift speed	W/Q

MAGNETIC EFFECTS OF CURRENT

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

| Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Give the results of Oersted's experiment on current carrying conductor kept nearer to a magnetic needle. **Page:132**		2
2	What is the force acting on an electric charge q moving with a velocity v in the presence of both the electric field and magnetic field? Give the features of the force of interaction of charge with the magnetic field. **Page:134**		3
3	What is the SI unit of magnetic field? Give the value of it in terms of gauss. Also give the value of earth's magnetic field. **Page:135**		2
4	Derive an expression to find the magnetic force acting on a current-carrying conductor. **Page:135**		2
5	Give the physical significance of permittivity and permeability of a medium. **Page:136**		2
6	A straight wire of mass 200 g and length 1.5m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field B. What is the magnitude of the magnetic field? **Page:137**		2
7	Derive an expression to find the radius of the circular path traced out by a charged particle q moving with a velocity v perpendicular to the direction of the magnetic field. Also find its angular frequency. **Page:138**		3
8	How will you select charged particles of a particular velocity out of a beam containing charges moving with different speeds? **Page:140**		2
9	Define pitch of the helical path described by a charged particle moving inside a magnetic field B with a velocity v. **Page:138**		1
10	Give the principle of working of a cyclotron. What is the use of a cyclotron? **Page:140**		2
11	With a neat diagram explain the working of a cyclotron. **Page:141**		3
12	show that kinetic energy attained by the particles moving inside the cyclotron is $KE = q^2 B^2 R^2 / 2m$ **Page:141**		3
13	A cyclotron's oscillator frequency is 10 MHz What should be the operating magnetic field for accelerating protons? If the radius of its 'dees' is 60cm, what is the kinetic energy (in MeV) of the proton beam produced by the accelerator. **Page:142**		3

MAGNETIC EFFECTS OF CURRENT

Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	State Biot-Savart law. Compare Biot-Savart Law with that of Coulomb's law for the electrostatic field. **Page:143**		3
2	Derive the expression for finding the magnetic field on the axis of a circular current loop using Biot –Savart Law. **Page:145**		3
3	An element $\Delta l = \Delta x\ \hat{i}$ is placed at the origin and carries a large current I= 10A. What is the magnetic field on the y-axis at a distance of 0.5m? Δx=1 cm. **Page:144**		

			2
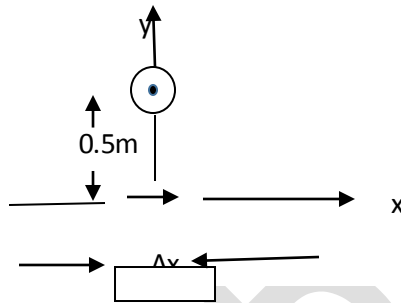
4	State the rule to find the direction of magnetic field surrounding a current carrying conductor. **Page:146**		1
5	Give the formula to find the magnetic field at the center of a circular coil carrying current. Consider a tightly wound 100 turn coil of radius 10cm, carrying a current of 1A. What is the magnitude of the magnetic field at the center of the coil? **Page:147**		3
6	State Ampere's circuital law. Also derive an expression to find the magnetic field due to a straight current –carrying wire. **Page:147**		3
7	State the conditions under which Ampere's circuital holds good. **Page:148**		1
8	What is a solenoid? Draw a diagram showing the magnetic field due to a current carrying solenoid. . **Page:151**		2
9	Using Ampere's circuital law find the magnetic field due to a solenoid. . **Page:152**		2
10	What is a toroid? Derive the expression to find the magnetic field due to a toroid. How is different from that of a solenoid**?** **Page:153**		3

11   A solenoid of length 0.5m has a radius of 1 cm and is made up of 500 turns. It carries a current of 5A. What is the magnitude of the magnetic field inside the solenoid?   3

Page:154

12   Derive the expression to find the force between two parallel current carrying conductors separated by some distance. What is the nature of the force if the current flowing through the conductors is (a) in the same direction and (ii) in the opposite direction?   3

Page:154

13   Define Ampere in terms of force existing between any two parallel current carrying conductors separated by some distance.   1

Page:155

MAGNETIC EFFECTS OF CURRENT

Test Paper-III

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Find the Torque on a rectangular current loop placed in a uniform magnetic field.	**Page:157**	3
2	Define magnetic moment of the current loop. Is it a vector or scalar?	**Page:158**	2
3	A current carrying circular loop is free to turn, what is its orientation of stable equilibrium? Show that in this orientation, the flux of the total field is maximum.	**Page:160**	2
4	A loop of irregular shape carrying current is located in an external magnetic field. If the wire is flexible, why does it change to a circular shape?	**Page:160**	1
5	What is the principle of working of Moving Coil Galvanometer?	**Page:164**	1
6	With a neat labelled diagram explain the working of a Moving Coil Galvanometer.	**Page:164**	3
7	What is the type of magnetic field used in Moving coil Galvanometer? Also give the various uses of Moving coil galvanometer	**Page:164**	2
8	How will you convert a galvanometer into an Ammeter? Derive the expression to find the resistance for the same.	**Page:165**	3
9	How will you convert a galvanometer into a Voltmeter? Derive the expression to find the resistance for the same.	**Page:165**	3
10	Define voltage sensitivity of a Galvanometer. Give the factors on which the voltage sensitivity depends on.	**Page:165**	2
11	Define current sensitivity of a Galvanometer. Give the factors on which the current sensitivity depends on. **Page:165**		2
12	In the circuit shown in figure the current is to be measured. What is the value of the current if the ammeter shown (a) is a galvanometer with a resistance R_G=60Ω; (b) is a galvanometer described in (a) but converted to an ammeter by a shunt resistance r_s=0.02Ω ;(c) is an ideal ammeter with zero resistance? **Page:165**		3
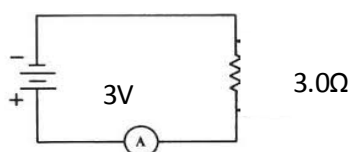
13   Give any two differences between an Ammeter and a Voltmeter. A 100 turn closely
      wound circular coil of radius 10cm carries a current of 3.2A (a) What is the magnetic   3
      moment of this coil? The coil is placed in a vertical plane and is free to rotate about a
      horizontal axis which coincides with its diameter. A uniform magnetic field of 2T in the
      horizontal direction exists such that initially the axis of the coil is in the direction of the
      field. The coil rotates through an angle of 90⁰ under the influence of the magnetic field.
      What are the magnitudes of the torques on the coil in the initial and final position?

                                                                                       Page:159

MAGNETISM

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is gyromagnetic ratio? Give the value of it.	Page:163	1
2	What is Bohr magneton? Find the value of it.	Page:163	2
3	Show that an electron moving around the central nucleus has a magnetic moment μ_l is given by $\mu_l = el/2m$ where l is the magnitude of the angular momentum of the circulating electron about the central nucleus.	Page:162	2
4	Fill-in the blanks. .	Page:174	

a. The earth behaves as a magnet with the magnetic field pointing from _____to _____.

b. When a bar magnet is freely suspended, it points in the _____ direction. The tip which points to the geographic north is called the _____ pole and the tip which points to the geographic south is called the _____ of the magnet.

c. Magnetic _____poles do not exist.

(Marks: 3)

5	Give the properties of magnetic field lines.	Page:175	2
6	Give the points basing on which we can consider a bar magnet as equivalent to a solenoid.	Page:176	2
7	Magnetic field lines can be entirely confined within the core of a toroid, but not within a straight solenoid. Why?	Page:184	1
8	If magnetic monopoles existed, how would the Gauss's law of magnetism be modified?	Page:184	1
9	Magnetic field arises due to charges in motion. Can a system have magnetic moments even though its net charge is zero?	Page:184	1
10	What is dynamo effect?	Page:185	1
11	What is the angle made by the axis of earth's magnetic dipole with that of axis of rotation of the earth? Give the locations of earth's magnetic north pole and that of the earth's magnetic south pole. ?	Page:185	2
12	The earth's magnetic field at the equator is approximately 0.4 G. Estimate the earth's dipole moment. ?	Page:185	2
13	What are the elements of earth's magnetic field?	Page:187	1
14	Define magnetic declination. What is its value in India? What is the significance of this value?	Page:187	3

Sl. No.	Question		Marks
15	What is angle of dip? How a magnetic needle gets tilted in the northern and southern hemisphere of the earth? **Page:187**		2
16	In the magnetic meridian of a certain place, the horizontal component of the earth's magnetic field is 0.26G and the dip angle is 60°. What is the magnetic file of the earth at this location? **Page:188**		2
17	Explain briefly what happens to the magnetic needle at the poles? **Page:188**		1
18	State Gauss's law in magnetism. **Page:182**		1

MAGNETISM

Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What are diamagnetic substances? Briefly explain what is the cause for diamagnetism? Give any two examples of diamagnetic substances.	Page:192	3
2	What type of materials are superconductors? Give any one application of a superconductor. .	Page:192	2
3	What are paramagnetic materials? Give an example. How do they behave inside an external magnetic field?	Page:193	2
4	What is Curie's law? State the factors on which the susceptibility and relative permeability of a paramagnetic material depends upon. What is the effect of increasing the field on a paramagnetic material?	Page:193	3
5	What is a Ferro magnetic substance? What is the importance of a domain in a ferromagnetic substance?	Page:193	2
6	What are hard and soft Ferro magnets? Give examples for the same. Name the material that is used in permanent magnets.	Page:194	3
7	What is the effect of temperature on a Ferromagnetic substance? How is related to curie temperature? How susceptibility is related to temperature for a temperature above the curie temperature.	Page:194	3
8	What are permanent magnets? Give different ways of making a permanent magnet. Also state what is the efficient way to make a permanent magnet?	Page:196	3
9	What are the properties of a material so that it can be used in making permanent magnet? Give any two examples for the same.	Page:196	2
10	Give the properties of a material that can be used as a Core of electromagnets .Give an example for the same.	Page:196	2
11	Briefly explain how a soft iron core in solenoid acts as an electromagnet? Page:196		2

12   Give the properties of a material that can be used in transformer cores.   **Page:196**   1

13   Give any two applications of electromagnets.   **Page:196**   1

14   A magnetic needle in a uniform magnetic field experiences a torque but not net force. An iron nail near a bar magnet, however, experiences a force of attraction in addition to a torque. Why?   **Page:179**   1

ELECTROMAGNETIC INDUCTION

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is Electromagnetic Induction?	Page:204	1
2	What are the different methods of producing current in a coil?	Page:205	2
3	Define Magnetic flux. Give the expression to find the same. What is its SI unit of measurement? Is it a scalar or vector quantity?	Page:207	2
4	State Faradays laws of electromagnetic Induction?	Page:207	2
5	Give the expression to find the induced emf set up inside a coil. What are the different ways of producing induced emf	Page:208	2

6
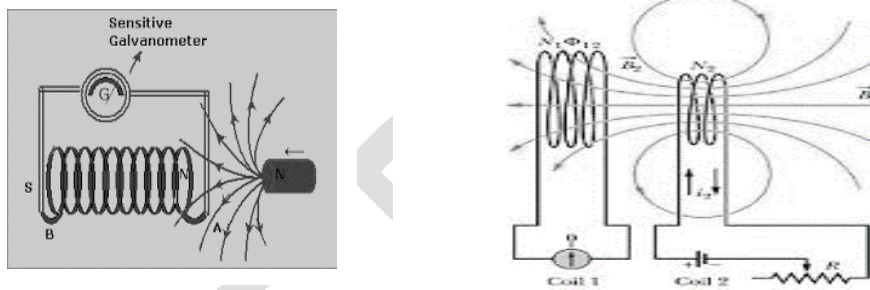
In the above experiments (a) what would you do to obtain a large deflection of the galvanometer? (b) How would you demonstrate the presence of an induced current in the absence of a galvanometer?   Page:208

                                                                                    3

7   A square loop of side 10 cm and resistance 0.5Ω is placed vertically in the east-west plane. A uniform magnetic field of 0.10 T is set up across the plane in the north-east direction. The magnetic field is decreased to zero in .070 s at a steady rate. Determine the magnitudes of induced emf and current during this time – interval.   Page:208   3

8   A circular coil of radius 10cm, 500 turns and resistance 2Ω is placed with its plane perpendicular to the horizontal component of the earth's magnetic field. It is rotated about its vertical diameter through 180° in 0.25 s. Estimate the magnitudes of the emf and current induced in the coil. Horizontal component of the earth's magnetic field at the place is 3.0×10^{-5}T   Page:208   3

9 State Lenz's law   **Page:208**   1

10 Show that Lenz's law is in accordance with the law of conservation of energy. **Page:208**   2

11 A closed loop moves normal to the constant electric field between the plates of a large   2
    capacitor. Is a current induced in the loop

        a.   When it is wholly inside the region between the capacitor
    plates

        b.   When it is partially outside the plates of the capacitor?

    Electric field is normal to the plane of the loop.   **Page:211**

12 What is motional emf? Derive an expression for finding the same. **Page:212**   2

13
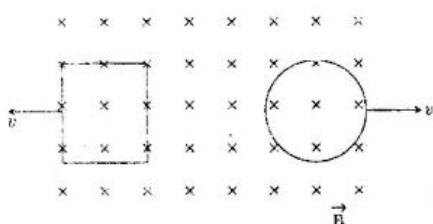
   **Page:211**   3

    a.   A closed loop is held stationary in the magnetic field between the north and
    south poles of two permanent magnets held fixed. Can we hope to generate
    current in the loop by using very strong magnets?

    b.   A rectangular loop and a triangular loop are moving out of a uniform magnetic
    field region to a field-free region with a constant velocity v. In which loop do
    you expect the induced emf to be constant during the passage out of the field
    region? The field is normal to the loops.

14
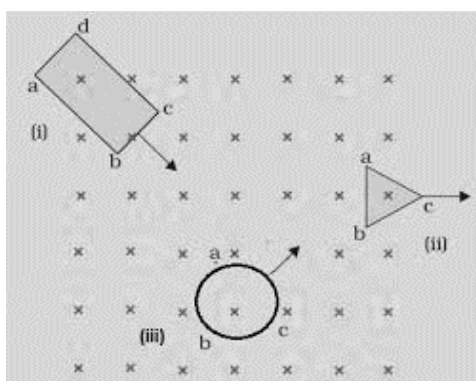
                                                                                              2

    Figure shows planar loops of different shapes moving out of or into a region of a
    magnetic field which is directed normal to the plane of the loop away from the reader.
    Determine the direction of induced current in loops (i) & (ii) using Lenz's law.

MAGNETISM

Test Paper-I

MAX MARKS: 10   **TIME: 10MTS**

Match the following   **Page: 198**

	Part-A	**Part-B**
1	Permeability of free space	T(tesla)
2	Magnetic field	TmA^{-1}
3	Magnetic moment	T(tesla)
4	Magnetic Induction	Am^{-1}
5	Magnetic flux	Am^2
6	Magnetic flux density	Am^{-1}
7	Magnetisation	T(tesla)
8	Magnetic Intensity	W(weber)
9	Magnetic permeability	Am^{-1}
10	Magnetic field strength	TmA^{-1}/NA^{-2}

ELECTROMAGNETIC INDUCTION– Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What are eddy currents? How they are produced?	Page:218	2
2	Explain why do the motion of a copper plate comes to a halt when allowed to swing between the poles of a strong magenet.How can you reduce this damping so that the plate moves freely?	Page:218	3
3	How can you minimize eddy currents in the metallic cores of a transformer? Why it is necessary to reduce eddy currents?	Page:218	2
4	Give any two applications of eddy currents.	Page:218	2
5	Explain how eddy currents help in the working of Induction furnace.	Page:219	1
6	Explain how does the flux linked with a coil change with current flowing through it. What is Inductance? Give the dimensional formula of it. What is its SI unit of measurement?	Pa:219	3
7	Give the factors on which the inductance of a coil depends upon.	Page:219	1
8	What is mutual inductance of a solenoid? Give the formula to find the Mutual Inductance of a co-axial solenoid. Also give the factors on which the mutual inductance of a pair of coils depends upon.	Page:220	2
9	What is an AC generator? Explain the working of an AC generator with a neat labelled diagram.	Page:225	3
10	Kamla peddles a stationary bicycle the pedals of the bicycle are attached to a 100 turn coil of area 0.10 m². The coil rotates at half a revolution per second and it is placed in a uniform magnetic field of 0.01 T perpendicular to the axis of rotation of the coil. What is the maximum voltage generated in the coil?	Page:226	3
11	Explain how a coil responds to the current flowing through it .Define self-inductance of the coil. Also give the factors on which the self-inductance of the coil depends upon.	Page:222	3
12	Give the graphical representation of alternating emf generated by a loop of wire rotating in a magnetic field.	Page:226	2
13	What is the frequency of power supply in India? How is it different from that of USA?	Page:226	½ + ½
14	Give the dimensional formula of the following a. Mutual Inductance b. Magnetic Flux.	Page:228	½ + ½

15 Give the SI unit of measurement of the following   ½ + ½

    a. Magnetic Flux   **Page:228**
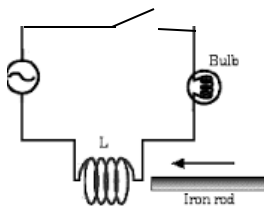
    b. Self-Inductance

ALTERNATING CURRENT

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is an alternating voltage? Give an equation to represent the same. **Page:233**		2
2	Explain how a resistor responds to an alternating voltage with relevant equations. Give the graphical representations of current and voltage across the resistor. **Page:234**		3
3	Define mean value of current and derive the relation between the peak value of current and mean value of current. What is the value of average power consumed in a complete cycle? **Page:235**		3
4	Define the rms value of current. Derive the relation between the peak value and rms value of current. **Page:236**		3
5	A light bulb is rated at 100 W for a 220 V supply. Find (a) the resistance of the bulb; (b) the peak voltage of the source; and (c) the rms current through the bulb. **Page:236**		3
6	What is a phasor? Give the phasor diagram showing the voltage and current phasors and their relationship at time t in case of an ac source connected to a resistor. **Page:237**		3
7	Explain how an inductor responds to an alternating voltage with relevant equations. Give the phasor diagram for the same. **Page:238**		3
8	Show that the average power through an ac circuit consisting of inductor over one complete cycle is zero. **Page:239**		2
9	A pure inductor of 25 mH is connected to a source of 220 V. Find the inductive reactance and rms current in the circuit if the frequency of the source is 50 Hz. **Page:239**		2
10	Give the formula to find the reactance due to an inductor. What is the function of reactance in a circuit? What is the relationship between the current and voltage when alternating current is allowed to flow through an ac circuit? Explain **Page:240**		3
11	Explain what happens to ac current when it is allowed to flow through a circuit consisting of a capacitor. What is the phase relationship between the current and voltage? **Page:241**		3

ALTERNATING CURRENT

Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS

1   Show that the average power though over a completer cycle in an ac circuit consisting   **2**
of capacitance is zero.   **Page:242**

2   A lamp is connected in series with a capacitor. Predict your observations for dc and ac   **2**
connections. What happens in each case if the capacitance of the capacitor is reduced?
                                                              Page:242

3   A 15 µF capacitor is connected to a 22V, 50Hz source. Find the capacitive reactance   **2**
and the current (rms and peak) in the circuit. If the frequency is doubled, what
happens to the capacitive reactance and the current?   **Page:244**

4   A light bulb and an open coil inductor are connected to an ac source through a key as
shown in fig.The switch is closed and after sometime, an iron rod is inserted into the   **2**
interior of the inductor. The glow of the light bulb (a) increases; (b) de creases ;(c) is
unchanged, as the iron rod is inserted. Give your answer with reasons.   **Page:244**

5   Discuss about an LCR circuit with the help of a phasor diagram with relevant equations
for current and voltage   **Page:245**   **3**

6   What is meant by resonance? How it is achieved in case of an LCR circuit? Give the
graph showing the variation of current with frequency.   Can this condition be   **3**
achieved in case of LR circuit? Explain   **Page:248**

7	Give the condition at which one can allow maximum value of current through an LCR circuit. What can you say about the current for frequencies other than resonant frequency? **Page:251**	½ + ½
8	What is Q- factor of an LCR circuit? What is the role of Q-factor in measuring the sharpness of resonance? Give an expression to find the Q-factor. **Page:251**	2
9	A resistor of 200Ω and a capacitor of 15 µF are connected in series to a 220V, 50 Hz ac source. (a) Calculate the current in the circuit; (b) Calculate the voltage (rms) across the resistor and the capacitor. Is the algebraic sum of theses voltages more than the source voltage? If yes, resolve the paradox. **Page:251**	3
10	Derive an expression to find the power in an Ac circuit. What is the importance of power factor in an LC R circuit? **Page:252**	3
11	A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R= 3Ω, L=25.48mH, and C=796µF. Find (a) the impedance of the circuit ;(b) the phase difference between the voltage across the source and the current; (c) the power dissipated in the circuit; and (d) the power factor. **Page:253**	3
12	A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R= 3Ω, L=25.48mH, and C=796µF .(a)What is the frequency of the source at which resonance occurs?(b) Calculate the impedance, the current, and the power dissipated at the resonant condition. **Page:254**	3
13	At an airport, a person is made to walk through the doorway of a metal detector, for security reasons. If she/he is carrying anything made of metal, the metal detector emits a sound. On what principle does this detector work? **Page:255**	1

ALTERNATING CURRENT

Test Paper-III

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is purpose of a transformer? Give the principle on which a transformer works.	Page:259	½ + ½
2	Explain the working of a transformer with a neat labelled diagram	Page:260	3
3	Give any two arrangements in which the coils can be placed to form transformer	Page:260	½ + ½
4	Give the differences between step up transformer and step down transformer	Page:261	2
5	What are the different losses in case of a transformer? How will you reduce these losses?	Page:261	3

Marks: 12 marks   **Match the following**   **Page: 262**

	Part-A	Part-B
1	Rms value of current	I= 0.707im
2	Mean value of current over complete cycle	$V=V_m \sin\omega t$
3	Ac voltage	$X_L=\omega L$
4	Capacitive reactance	$\cos\phi$
5	Inductive reactance	$\omega_0 L/R$
6	Power factor	zero
7	Q-factor	$\omega_0 =1/\sqrt{LC}$
8	Resonant frequency	VI cosϕ
9	Average power loss over a complete cycle	$Z = \sqrt{R^2 + (X_L - X_c)^2}$
10	Impedance of LCR series circuit	$Is = \left[\frac{Np}{Ns}\right] Ip$
11	Voltage across the secondary of a transformer	Xc= 1/ωC
12	Current through the primary of a transformer	$Vs = \left[\frac{Ns}{Np}\right] Vp$

Write the dimensional formula of the following   **8 marks**

Page: 264

1   Rms value of current --------------------

2   rms voltage---------------------------

3   Capacitive reactance---------------------------

4   Inductive reactance------------------------

5   Power factor-------------------------------------

6   Q-factor---

7   Resonant frequency-----------------------------

8   Impedance of LCR series circuit---------------------
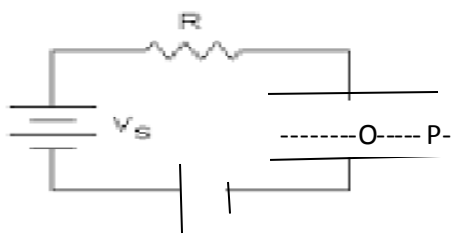
ELECTROMAGNETIC WAVES

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Which effect explains the existence electromagnetic waves?	**Page:270**	1
2	Give the Maxwell's equations of Electromagnetic waves.	**Page:273**	2
3	Give the length of Electromagnetic spectrum.	**Page:270**	1
4	What is meant by conduction current?	**Page:271**	1
5	What is displacement current? Give the formula to find the displacement current.	**Page:271**	2
6	Explain how Gauss's law gets modified when applied to the region between the plates of a capacitor. What is Ampere-Maxwell law?	**Page:271**	3
7	State Faraday's law of electromagnetic induction in terms of changing magnetic field. What is the consequence of displacement current as a source of magnetic field? How can you get existence of electromagnetic waves? (Or) Give the importance of Ampere-Maxwell law.	**Page:272**	3
8	A parallel plate capacitor with circular plates of radius 1m has a capacitance of 1nF. At t=0, it is connected for charging in series with a resistor R=1MΩ across a 2V battery. Calculate the magnetic field at a point P, halfway between the centre and the periphery of the plates, after t= 10^{-3}s. (The charge on the capacitor at time t is q(t)= CV[1-exp(-t/τ)], where the time constant τ is equal to CR).	**Page:273**	

			3
9	How electromagnetic waves can be produced?	**Page:274**	2
10	Give any four properties of electromagnetic waves	**Page:276**	2
11	Give the formula to find the velocity of light. State the factors on which the velocity of light depends upon.	**Page:276**	2
12	What is the basis on which unit of time can be defined accurately?	**Page:277**	1
13	Give one practical evidence that electromagnetic waves are polarised.	**Page:277**	1
14	What is meant by radiation pressure of an electromagnetic wave?	**Page:277**	1

15   A Plane electromagnetic wave of frequency 25 MHz travels in free space along the X-
     direction. At a particular point in space and time, E=6.3j^ V/m. What is B at this point   2

     Page: 278

16   The magnetic field in a plane electromagnetic wave is given by   **Page:278**

     B_y= 2X 10-7 sin (0.5X10^3x + 1.5 X 10^{11}t) T.   3

     a.   What is the wave length and frequency of the wave?

     b.   Write an expression for the electric field.

ELECTROMAGNETIC WAVES

Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Light with an energy flux of 18 W/cm^2 falls on a non-reflecting surface at normal incidence. If the surface has an area of 20cm^2, find the average force exerted on the surface during a 30 minute time span. **Page:279**		3
2	Draw the Electromagnetic spectrum showing the various regions of the spectrum. **Page:280**		2

3

Match the following   **Page: 281**

Part-A

1. AM Band
2. FM Band
3. Shortwave Band
4. Cellular Phones
5. TV Waves

Part-B

a. Radio waves to transmit voice communication in the UHF band
b. 530kHz to 1710kHz
c. 54MHz to 890MHz
d. Higher frequencies upto 54MHz
e. 88MHz to 108MHz

2

Sl. No.	QUESTION	ANSWER PAGE	MARKS
4	How Radio waves are produced? Give any two uses of radio waves	**Page:281**	2
5	How Microwaves are produced? Give any two uses of Microwaves.	**Page:281**	2
6	Explain how the phenomenon of Resonance helps in making g use of Micro Ovens.	**Page:281**	2
7	How Infrared waves are produced? Give any four uses of Infra-red rays.	**Page:282**	4
8	What are heat waves? Explain how these waves help in keeping their surroundings warm.	**Page:282**	2
9	Name the radiations given out by the Light emitting diodes used in the remote switches of TV sets, Video recorders.	**Page:282**	1
10	Give the frequency range of visible spectrum.	**Page:282**	1
11	Name the rays that can be detected by snakes	**Page:282**	1
12	What are Ultra violet rays? Give the important source of ultraviolet light. Name the layer of the atmosphere which can absorb these rays.	**Page:282**	2
13	What are the ill effects of UV light radiation	**Page:282**	1
14	Why do welders use goggles?	**Page:282**	1

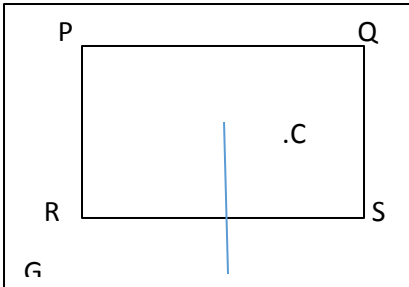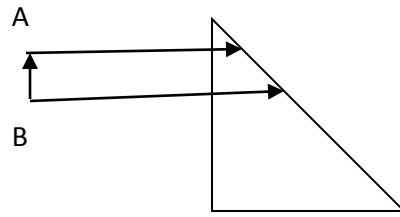| 15	Give the expansion of LASIK eye surgery? Name the radiations that are used for this purpose.	**Page:282**	2
16	Give the frequency range of X-Rays. What are the uses of X-rays?	**Page:283**	2
17	What is the wavelength range of Gamma rays? Also give one use of these rays	**Page:283**	1

RAY OPTICS & OPTICAL INSTRUMENTS

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Which spectrum of EMR defines light? Give any two properties of light.	Page 309	1+2
2	Define normal to the spherical surface. Also derive the expression for finding the relation between the focal length and radius of curvature of the mirror.	Page 312	1+2
3	Derive Mirror formula for a concave mirror	Page 313.	1+2
4	Suppose that the lower half of the concave mirror's reflecting surface is covered with an opaque material. What effect will this have on the image of an object placed in front of the mirror?	Page 315	2
5	An object is placed at (i) 10cm, (ii) 5 cm in front of a concave mirror of radius of curvature 15 cm. Find the position, nature, and magnification of the image in each case.	Page:315	11/2 +11/2
6	A mobile phone lies along the principal axis of a concave mirror. Show with the help of a suitable diagram, the formation of its image. Explain why magnification is not uniform.	Page:315	1+2
7	How is the focal length of a spherical mirror affected when the wavelength of the light used is increased? (Hint: working of mirror depends on the property of reflection.)		2
8	Define optical density. Give the physical significance of it.	Page317	2
9	Define refraction of light. Give the laws of refraction.	Page 317	2
10	Give the formula to find the apparent depth of the bottom of a tank filled with water .Also explain why the sun is visible a little before the actual sunrise and until a little after the actual sunset.	Page318	1+2
11	Consider a rectangular swimming pool PQRS. A lifeguard sitting at G outside the pool notices a child drowning at a point C. Then find the shortest time taken by the guard to reach the child.		3

		Page319	
13	Trace the path of the light ray in the following ray diagram	Page:322	

1

RAY OPTICS & OPTICAL INSTRUMENTS

Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Define Total internal reflection. Give the conditions that are necessary for total internal reflection to take place. **Page319**		1+2
2	Write the relation between the refractive index and critical angle for a pair of optical media. **Page320**		1
3	Draw the diagrams showing the phenomenon of total internal reflection in the following. a. Refraction due to glass of beaker b. Refraction through a glass test tube **Page:321**		2
4	Explain the principle and working of an optical fibre. **Page 322**		3
5	Explain the formation of Mirage. Also state the principle on which the formation of mirage takes place. **Page321**		2+1
6	What is the main requirement in fabricating optical fibre and how it can be achieved? **Page323**		1+1
7	Show by drawing ray diagram how total reflecting prisms can be used to bend rays by 90⁰ and 180⁰. **Page322**		1+1
8	Derive an expression for finding the refraction at a spherical surface. **Page 323**		1+2
9	Light from a point source in air falls on a spherical glass surface (n=1.5 and radius of curvature = 20cm). The distance of the light source from the glass surface is 100cm.At what position the image is formed? **Page325**		2
10	Derive Lens maker's formula. **Page326**		3
11	Draw a ray diagram showing the image formation in case of a concave lens. Also derive the lens formula for the same. **Page327**		1+2
12	(i)Why does the sun appear reddish at sunset or sunrise? (ii) For which colour, the refractive index of prism material is maximum and minimum? **Page318**		2 +1

RAY OPTICS & OPTICAL INSTRUMENTS

Test Paper-III

MAX MARKS: 30   **TIME: 90Mts**

Answer the following

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Define Magnification of a lens. Compare the magnification of a convex lens with that of a concave lens.	Page327	**2**
2	A magician during a show makes a glass lens with n= 1.47 disappear in a trough of liquid. What will be the nature of the lens inside the liquid? What is the refractive index of the liquid? Could the liquid be water?	Page327	**1+1+1**
3	Define power of a lens. What is the physical significance of it? Give the formula for finding the power of a lens and the SI unit of measurement of it.	Page328	**1+1+ 1/2 +1/2**
4	A converging lens of refractive index 1.5 is kept in a liquid medium having same refractive index. What would be the focal length of the lens in this medium? (Hint: Refraction of light depends upon the passage of light from one medium to another)		**2**
5	If f= 0.5m for a glass lens, what is the power of the lens? (ii) 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? (iii) A convex lens has 20 cm focal length in air. What is the focal length in water? (Refractive index of air-water=1.33. refractive index of air-glass=1.	Page:328	**3**
6	What is the relation between critical angle and refractive index of a material? Does critical angle depend on the colour of light? Explain	Page :320	**3**
7	Show that $P = P_1+P_2+P_3+P_4$......for combination of thin lenses in contact	Page:329	**3**
8	What is photometry? Define the term related to photometry that can be measured directly. Also give the formula for finding the same.	Page:324	**3**
9	Draw the ray diagram showing the formation of image in case of a convex & concave lens for virtual image & compare them(refer to class X- science NCERT Text Book)		**3**
10	Give the principle involved in the figure. What is the purpose of magnifying g glass in this figure?		**2**

11   Draw the ray diagram showing the

    i.   Apparent depth for   **Page:317&318**   **2+1**

    a. Normal and

    b. Oblique viewing

    ii.   Lateral shift of a ray refracted through a parallel- sided slab.

RAY OPTICS & OPTICAL INSTRUMENTS

Test Paper-IV

MAX MARKS: 30   **TIME: 90Mts**

Answer the following

Sl. No.	QUESTION	ANSWER PAGE	MARKS

1   Trace the path of a light ray refracting through a prism. Also give the graphical relation between the angle of incidence with that of angle of deviation. **Page331**   **2**

2   Derive the relation $\mu = \frac{\sin(A+Dm)}{2}/\sin(A/2)$ for a prism where A is the angle of the prism and D_m is the angle of minimum deviation   **Page331**   **3**

3   Name the medium in which the speed of light is independent of wavelength of wavelength. Give the differences between the spectrum formed by a prism and a rainbow.   **3**

4   What is meant by dispersion of light? Give the reason why dispersion takes place when white light is allowed to pass through the prism?   **Page 332**   **2**

5   Give reason why thick lenses show chromatic aberration?   **Page 333**   **1**

6   Give an example of non- dispersive medium.   **Page 333**   **1**

7   Name the phenomenon that are involved in the formation of rainbow. Give the conditions under which a person can see the rainbow.   **Page333**   **2**

8   Explain the formation of Primary rainbow with the help of suitable ray diagrams.   **Page334 & 335**   **3**

9   Why secondary rainbow is fainter than the primary rainbow.   **Page335**   **1**

10   Show diagrammatically how you will place two prisms so that the incident and emergent light are same.   **Page No:332**   **3**

11   The following table gives the values of the angle of deviation for different values of the angle of incidence for a triangular prism.

Angle of incidence	33⁰	38⁰	42⁰	52⁰	60⁰	71⁰	3
Angle of deviation	60⁰	50⁰	46⁰	40⁰	43⁰	50⁰	

(i)   For what value of the angle of incidence, is the angle of emergence likely to be equal to the angle of incidence itself?

(ii)   Draw a ray diagram showing the passage of a ray of light through this prism when the angle of incidence has the above value.

(**Hint**: Draw the graph between the angle of incidence and the angle of deviation as in the case of lab practical and find the angle of minimum deviation from the graph. Find the corresponding angle of incidence from the graph corresponding to the angle of minimum deviation)

| 12 | Explain why the sky appears blue in colour. | **Page335** | 3 |
| 13 | Explain why the sky appears red in colour during the sunrise or sunset | **Page 335** | 3 |

OPTICAL INSTRUMENTS

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Draw a ray diagram of a reflecting type of telescope. State two advantages of this telescope over a refracting telescope.	Page:336	**3**
2	Draw the structure of the eye and label its parts.	Page:336	**3**
3	With a neat labelled diagram explain what is myopia is and how it can be corrected?	Page:337	**3**
4	With a neat labelled diagram explain what Hypermetropia is and how it can be corrected?	Page:337	**3**
5	What is mean t by power of accommodation of eye? What is its value for a normal human eye?	**Page:336**	**3**
6	What focal length should the reading spectacles have for a person for whom the least distance of distinct vision is 50 cm?	**Page:337**	**3**
7	a. The far point of a myopic person is 80cm in front of the eye. What is the power of the lens required to enable him to see very distant objects clearly?		
	b. In what way does the corrective lens help the above person? Does the lens magnify very distant objects? Explain carefully?		**3**
	c. The above person prefers to remove his spectacles while reading a book. Explain why?	Page 338	
8	Give the principle and working of a simple microscope with a neat labelled ray diagram	Page 339	3

| 9 | Define magnifying power of a simple microscope. Also show that $m = 1 + D/f$ in case of a simple microscope. **Page 339** | 3 |
| 10 | Define angular magnification of a simple microscope and derive an expression for finding the same. **Page 340** | 3 |

OPTICAL INSTRUMENTS

Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Draw a schematic diagram of refracting telescope. Write its two important limitations.	**Page 342**	3
2	Draw a ray diagram for the formation of image by a compound microscope. Write the expression for total magnification when the image is formed at infinity.	**Page340**	3
3	Draw a schematic arrangement of a reflecting telescope showing how rays coming from a distant object are received at the eyepiece. Write its two important advantages over a refracting telescope.	**Page:342**	3
4	Draw a ray diagram of an astronomical telescope in the normal adjustment position. State two drawbacks of this type of telescope.	**Page:342**	3
5	Find the magnification of a compound microscope with an objective of focal length 1.0cm and an eyepiece with focal length of 2.0cm and a tube length of 20 cm.	**Page:341**	2
6	Two convex lenses of same focal length but of apertures A1and A2 (A2<A1), are used as the objective lenses in two astronomical telescopes having identical eyepieces. What is the ratio of their resolving power? Which telescope will you prefer and why? Give reason.	**Page:342**	3
7	a. Why must both the objective and the eyepiece of a compound microscope have short focal lengths? b. When viewing through a compound microscope, our eyes should be positioned not on the eyepiece but a short distance away from it for best viewing. Why? How much should be that short distance between the eye eyepiece. **Page:341 &349 Q No(9.32 e)**		3
8	Name the largest telescope in India & in the world and where they are placed?	**Page:343**	2

9   Define magnifying power of a telescope. Give the expression for it. Also State the   3

     factors on which the magnifying power depends Upon.   **Page:341**

10   Magnifying Power of a simple microscope is inversely proportional to the focal   2

     length of the lens. What then stops us from using a convex lens of smaller focal length

     and achieving greater and greater magnifying power?

                                       Page:538; Ans Qno 9(32c)

11   A small telescope has an objective lens of focal length 140 cm and an eyepiece of

     focal length 5.0 cm. What is the magnifying power of the telescope for viewing distant   3

     objects when

         a.   The telescope is in normal adjustment(i.e., when the final image is at infinity)

         b.   The final image is formed at the least distance of distinct vision (25cm)?

                                         Page:349 Q No: 9.34

Wave optics-Interference

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Give the property of light that forms the basis of ray optics	Page :353	1
2	Show the following by drawing a diagram		
	a. Plane wave front from a spherical wave front		3
	b. Light diverging from a point source		
	c. The portion of the wave front of light from a distant star intercepted by the Earth	Page:358	
3	State Huygens Principle of wave fronts	Page:358	2
4	Differentiate between a ray and a wave front.	Page:353	1
5	Show how a plane wave gets reflected from a surface. Hence, verify laws of reflection.	Page:357	3
6	Show how a plane wave gets refracted as it travels from one medium to another. Also verify the laws of refraction using the same.	Page:355	3
7	Show the following by drawing a ray diagram		
	Refraction of a plane wave by		3
	a. Thin prism		
	b. A convex lens	Page:358	
	c. Concave mirror		

| 8 | When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency. Explain why? **Page359** | 2 |

| 9 | When light travels from a rarer to a denser medium, the speed decreases. Does the reduction in speed imply a reduction in the energy carried by the light wave? **Page359** | 2 |

| 10 | In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity of light in the photon picture of light? **Page359** | 2 |

| 11 | State superposition principle. Give the conditions for constructive interference and destructive interference. **Page360** | 2 |

| 12 | What is meant by interference? What type of waves produce the interference | 2 |

| 13 | Give the relationship between the intensity and amplitude. **Page360** | 1 |

| 14 | Describe Young's double slit experiment to produce interference pattern due to a monochromatic source of light. Deduce the expression for the fringe width. **Page363** | 3 |

Wave optics-Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	a. Plot the graph showing the intensity distribution in case of Young's double slit experiment.		3
	b. Two slits are made 1mm apart and the screen is placed one metre away. What is the fringe separation when blue-green light of wavelength 500 nm is used? **Page:366**		
2	What is the effect on the interference fringes in a Young's double slit experiment due to each of the following operations.		
	a. The screen is moved away from the plane of the slits.		3
	b. The source is replaced by another source of shorter wavelength		
	c. The separation between the two slits is increased		
	Page:367		
3	What is the effect on the interference fringes in a Young's double slit experiment due to each of the following operations.		

    a. The source slit is moved closer to the double-slit plane   3

    b. The width of the source slit is increased

    c. The monochromatic source is replaced by a source of white light?

                                                    Page:367

4   a. What is a polarised wave and an unpolarised wave?   **Page:377**

    b. What is the Brewster angle for air to glass transition?   **Page:383**

(refractive index of glass = 1.5)   2

5 State Malus Law. Discuss the intensity of transmitted light when a polaroid sheet is rotated between two crossed polaroids?   **Page:378**   2

6 State Brewster's Law. Unpolarised light is incident on a plane glass surface. What should be the angle of incidence so that the reflected and refracted rays are perpendicular to each other?   **Page:380**   3

7 What are coherent sources? Why are they necessary for observing a sustained interference pattern? How are the two coherent sources obtained in the Young's double slit experiment?   **Page:362 & 363**   3

8 What is the shape of the locus of the point P lying in the x-y plane such that S2P-S1P= is a constant? Give reason why the fringe pattern appears to be straight lines.   **Page:364**   2

9 What is meant by Interference? How can you produce interference?   **Page:365**   3

10 Explain through an experiment light exhibits the property of polarization.   **Page:377**   3

11 Give the condition to find out the path difference between the waves to produce constructive interference and destructive interference. Also give any two difference between constructive interference and destructive interference.   3

                                                    Page:364

Wave optics

Test Paper-III-Diffraction

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is meant by diffraction? Give the condition under which diffraction can be felt?	Page:367	2

2   How will you obtain diffraction pattern? Give the conditions for obtaining the maximum intensity and minimum intensity in case of diffraction. Also give the graphical representation of diffraction.   **Page:368 & 369**   3

3   Give the differences interference and diffraction.   **Page 371**   3

4   What is the size of the central maximum when a converging lens of focal length f is placed in the path of the light coming from the two slits and the screen is placed at the focal length of the lens? Also what is the angular separation of the central maximum from the first dark fringe of the diffraction pattern?   **Page 371**   2

5   Name the factor on which the angular resolution of the telescope depends upon.   1
Page:372

6   What is the effect of diffraction on a beam falling on a lens?   **Page:372**   1

7   Two slits are made one millimeter apart and the screen is placed one metre away. What should the width of each slit be to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern?   **Page:370**   3

8   What is the radius of the central bright maximum formed by a single –slit diffraction pattern formed in the focal plane of a lens?   **Page:372**   1

9   Draw a diagram showing the diffraction effects on a parallel beam of light incident on a convex lens   **Page:372**   2

10 Assume that light of wavelength 6000 A° is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 254cm?   **Page:373**   2

11 Define The resolving power of a microscope and derive an expression for finding the same.   **Page:374**   3

12 What is Fresnel distance? What is the importance of it? Give an expression to find the same.   **Page:375**   3

13 For what distance is ray optics a good approximation when the aperture is 3mm and the wavelength is 500nm?   **Page:376**   2

14 Two students are separated by a 7m partition wall in a room 10m high. If both light and sound waves can bend around obstacles, how is it that the students are unable to see each other even though they can converse easily?   **Page 384**   2

Dual nature of matter and radiation

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Who discovered X-rays and in which year?	Page:386	1
2	Who discovered an electron and in which year?	Page:386	1
3	Who discovered cathode rays and in which year?	Page:386	1
4	What is the value of e/m?	Page:387	1
5	Define work function of a metal. What is the SI unit of measurement of work function?	Page:387	2
6	Define one electron volt. What is its value in joules	Page:387	2
7	Name the unit of energy commonly used in atomic and nuclear physics. What are the factors on which the work function of a metal depends upon?	Page:387	2
8	What are the different physical processes by which energy can be supplied to a metal surface so that it can eject an electron?	Page:388	3
9	Give the observations made by Hertz regarding Photoelectric effect.	Page:388	2
10	Give any three observations made by Hallwach's and Lenard on photo electric effect.	Page:389	3
11	Define threshold frequency. Give the factors on which the threshold frequency depends upon.	Page:389	3
12	Find from the following the metals which respond to ultraviolet light only and visible light even Zinc, cadmium, Caesium, rubidium, and magnesium.	Page:389	2
13	What is a photosensitive material? Give an example	Page:389	2

14	Draw a neat diagram showing the experimental setup to study the photoelectric effect.
	
	Also plot a graph showing
	
	  a. the variation of photoelectric effect with intensity of incident radiation
	  b. Effect of plate potential on photoelectric current for different intensities of incident radiation having same frequency.
		Page:390	3

15	What is the effect of frequency of incident radiation on stopping potential	Page:391	2

Dual nature of matter and radiation

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS

1. Plot a graph showing the variation of photoelectric current with collector plate potential for light of same intensity at various frequencies. Also give any two inferences from the graph. **Page:391** — 3

2. Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work-functions W1 and W2(W1>W2). On what factors does the
   i. Slope and
   ii. Intercept of the lines depend? **Page:392** — 2

3. Two monochromatic radiations of frequencies n1 and n2 (n1>n2) and having the same intensity are in turn, incident on a photosensitive surface to cause photoelectric emission. Explain giving reason in which case (i) more number of electrons will be emitted and (ii) maximum kinetic energy of the emitted photoelectrons will be more. **Page:392** — 2

4. Find the statement which is not true from the following **Page:392**
   a. The stopping potential varies linearly with the frequency of incident radiation for a given photosensitive material.
   b. There exists a certain minimum cutoff frequency for which the stopping potential is zero.
   c. For a frequency v of incident radiation, lower than the cut-off frequency v_0, no photoelectric emission is possible even if the intensity is large.
   d. The maximum kinetic energy of the photoelectrons does not vary linearly with the frequency of incident radiation, but is independent of its intensity. — 1

5. Find from the following which is not as per the experimental features and observations of photoelectric effect. **Page:392**
   a. For a given photosensitive material and frequency of incident radiation, the photoelectric current is directly proportional to the intensity of incident light.
   b. For a given photosensitive material and frequency of incident radiation, saturation current is found to be proportional to the intensity of incident radiation — 1

	c.	Stopping potential is dependent on intensity of the incident radiation	
	d.	For a given photosensitive material, there exists a certain minimum frequency called threshold frequency below which no emission takes place.	
6	a.	Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons. **Page:393**	3
	b.	Write the basic features of photon picture of Electromagnetic radiation on which Einstein's photoelectric equation is based.	
7		What is the expression to find the maximum kinetic energy of the electron emitted from the metal surface when a quantum of energy hν is incident on the metal surface? What do you call the equation? **Page:394**	1 +1
8		Give the factors on which maximum kinetic energy of the electron emitted in photoelectric effect depends upon. **Page:394**	1
9		Define threshold frequency. **Page:394**	1
10		Explain why for a frequency $\nu > \nu_0$, the threshold frequency Photoelectric current is proportional to intensity **Page:394**	1
11		What is the basic elementary process involved in photoelectric effect? What type of process it is? **Page:395**	1+1
12		How the frequency does varies with stopping potential. What type of graphical relation do you expect from the relation? **Page:395**	1+1
13		What are the properties of photon? **Page:395**	1
14		Which experiment confirms the particle nature of light **Page:395**	1
15		During which year Einstein was awarded Noble prize for his contribution to photoelectric effect. **Page:395**	1
16		Who is the other scientist awarded noble prize for the Photoelectric effect same and in which year? **Page:395**	1
17		Give any three points on the photon picture of Electromagnetic radiation. Page:396	3
18		Monochromatic light of frequency 6×10^{14} Hz is produced by a laser. The power emitted is 2×10^{-3} W. **Page:396**	2
	a.	What is the energy of a photon in the light beam?	
	b.	How many photons per second on an average, are emitted by the source?	

Dual nature of matter and radiation

Test Paper-II

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is dual nature of light?	Page:398	1
2	Name the Physical phenomenon which shows the wave nature of light.	Page:398	1
3	Name the physical phenomenon which shows the participle nature of light?	Page:398	1
4	Give the relation that connects the wave and particle nature of light. What do you call the relation	Page:398	1+1
5	Calculate the de-Broglie wavelength of a ball of mass 0.12kg moving with a speed of $20ms^{-1.}$.	Page:399	2
6	Name the device which is called an electric eye. Also give the principle on which its works.	Page:399	2
7	Give any three applications of photo cell.	Page:399	3
8	Explain how a photo cell can be used as a door opener.	Page:399	2
9	Explain how photo cell helps in the detection of traffic law defaulters.	Page:399	2
10	Derive an expression to find the de-Broglie wavelength of an electron	Page:400	2
11	Give the experimental arrangement of Davisson and Germer Experiment.	Page:402	2
12	What is the de-Broglie wavelength associated with an electron, accelerated through a potential difference of 100 Volts?	Page:402	2
13	Find the value of de-Broglie wavelength associated with an electron accelerated through a potential difference of 54Volts.	Page:404	2
14	The wavelength of light in the visible region is about 390nm for violet colour, about 550 nm for yellow-green colour and about 760 nm for red colour. What are the energies of photons in (eV) at the		3

     i.   violet end

     ii.   Average wavelength, yellow-green colour, and

     iii.   Red end of the visible spectrum?

     (Take h= 6.63×10^{-34} Js and 1eV = 1.6×10^{-19J})   **Page: 397**

| 15 | The work function of cesium is 2.14 eV. Find(a) the threshold frequency for cesium, and (b) the wavelength of the light if the photocurrent is brought to zero by a stopping potential of 0.60 V **Page:397** | 3 |

ATOMS

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is the cause for continuous EMR emitted by condensed matter and dense gases at all temperatures	page:414	1
2	Give the difference between the radiation given out by condensed matter and rarefied gases heated in a flame.	page:415	1
3	What is nuclear model of atom?	page:415	1
4	Draw a neat labelled diagram showing the Geiger-Marsden scattering experiment.	page:416	2
5	Show the graphical variation of Number of scattered particles detected with scattering angle obtained by Geiger-Marsden.	Page:417	2
6	Give the experimental results of Rutherford α-ray scattering experiment.	Page:417	3
7	What are α-particles?	Page:417	1
8	Define impact parameter.	Page:418	1
9	Name the factor on which the trajectory traced out by a α-particle depends upon. What is its impact on the trajectory of the α-particle?	Page:418	2
10	Derive an expression to find the total energy of an electron in a hydrogen atom.	Page:420	3
11	Give the significance of negative sign in the expression for total energy of an electron.	Page:420	1
12	How do you identify a gas using emission line spectra?	Page:421	2
13	Give the different spectral series emitted by Hydrogen atom.	Page:422	2
14	What are the draw backs of Rutherford model of atom?	Page:423	2
15	Give the postulates of Bohr Model of atom	Page:424	2
16	Derive an expression to find total energy of an electron in the nth orbit.	Page:425	2
17	How can you explain the quantized electron orbits and energy states of an atom?	Page:431	2

NUCLEI

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Give a point of evidence that most of the space in an atom is empty.	Page:438	1
2	What are isotopes? Give an example.	Page:439	2
3	Name the isotope of Hydrogen which do not occur naturally?	Page:439	1
4	Who discovered neutron? In which year he was awarded the noble prize.	Page:440	1
5	Discuss about the stability of a free neutron.	Page:440	2
6	What are isobars? Give an example	Page:441	1
7	What are isotones? Give an example.	Page:441	1
8	What is the relationship existing between the radius(R) of a nucleus and mass number A?	Page:441	1
9	Given the mass of iron nucleus as 55.85amu and A=56, find the nuclear density?	Page:442	2
10	Give the equation of mass-energy equivalence. Also Calculate the energy equivalent of 1 g of substance.	Page:442	2
11	What is mass defect Give the formula for finding mass defect. What is the corresponding energy related to the mass defect.	Page:443	3
12	Draw a graph showing the variation of binding energy per nucleon as a function of mass number. Also give the important features of it. Give the important conclusions from the graph	Page:444	3
13	Draw a graph showing the variation of potential energy of a pair of nucleons as a function of their separation. Give any two important conclusions from the graph.	Page:445	3
14	What are the properties of nuclear forces?	Page:445	2
15	Who discovered Radioactivity?	Page:446	1
16	What is meant by radioactive decay? How many types of radioactive decay are there? What are they?	Page:446	2
17	Derive the expression $N(t) = N0\, e - \lambda t$	Page:447	2

NUCLEI-Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Define total decay rate of a radioactive substance. Also give an expression for finding the same .Plot a graph showing the variation of number of undecayed nuclei with time	Page:447	2
2	Define SI unit of measurement of activity of a radioactive substance. What is the relationship between curie and Becquerel	Page:448	2
3	What is meant by Half-life period of a radioactive substance? Give an expression for finding the same. What is the difference between Half-life and mean life of a radioactive substance?	Page:448	3
4	The half-life of $_{92}U^{232}$ undergoing α-decay is 4.5×10^9 years. What is the activity of 1g sample of $_{92}U^{232}$?	Page:448	2
5	Tritium has a half-life of 12.5 years undergoing beta decay. What fraction of a sample of pure tritium will remain undecayed after 25 years?	Page:449	1
6	What is meant by disintegration energy of a nuclear reaction? Find the value of the same for an α- decay?	Page:449	1
7	Give an example of a reaction showing β^+ decay and β^- decay.	Page:450	1
8	Give any three properties of neutrinos.	Page:450	3
9	What is the difference between β^+ decay and β^- decay?	Page:451	1
10	Discuss the stability of a free neutron	Page:451	1
11	What is the difference in the order of the atomic and nuclear energy levels	Page:451	1
12	Explain briefly how gamma decay takes place by giving an example.	Page:451	2
13	What is the difference between a chemical reaction and a nuclear reaction	Page:452	1
14	What is meant by a nuclear fission reaction? Give an example.	Page:452	2
15	What is meant by nuclear fusion reaction? Give an example.	Page:453	2
16	Name the reaction taking place in a nuclear reactor. What is a chain reaction?	Page:453	2
17	What is a moderator in a nuclear reactor? Name the materials that can be used as moderators.	Page:454	2
18	Give the reactions taking place in a nuclear reactor.	Page:454	2

SEMICONDUCTOR DEVICES

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

SI. No.	QUESTION	ANSWER PAGE	MARKS
1	Briefly explain how a vacuum tube works does and what the other name for it is.	Page:467	2
2	What are the limitations of vacuum tubes?	Page:467	2
3	Give any two differences between a vacuum tube and a semiconductor device.	Page:468	2
4	What are energy bands?	Page:469	2
5	What is a valence band, a conduction band?	Page:469	
6	Differentiate between a metallic conductor, semiconductor, and an insulator basing on the energy band theory of solids.	Page:471	3
7	What is an intrinsic semiconductor? Discuss its behaviour as the temperature increases.	Page:474	2
8	C, Si and Ge have same lattice structure. Why is C insulator while Si, and Ge intrinsic semiconductors?	Page:474	2
9	What is an extrinsic semiconductor? How is it different from an intrinsic semiconductor	Page:474	1
10	Name the different types of extrinsic semiconductors. Briefly explain how an n –type semiconductor is formed?	Page:475	3
11	Briefly explain how a p-type semiconductor is formed? Give any two differences between a p-type semiconductor and a n-type semiconductor.	Page:476 & 477	3
12	Give the relation between electron and hole concentration in a semiconductor in thermal equilibrium.	Page:477	1
13	Suppose a pure Si crystal has 5×10^{28} atoms m^{-3}. It is doped by 1 ppm concentration of pentavalent As. Calculate the number of electrons and holes. Given that $n_i=1.5 \times 10^{16} m^{-3}$.	Page:477	2
14	Explain how p-n junction diode is formed. What are the process involved in it?	Page:478	3
15	Can we take one slab of p-type semiconductor and physically join to another n-type semiconductor to get p-n junction?	Page:479	2

SEMICONDUCTOR DEVICES

Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What is a semiconductor diode? Give the symbol representing the same.	Page:478	1
2	Discuss about the forward bias condition of a p-n junction diode. Also draw its characteristic curve.	Page:479	3
3	Discuss about the reverse bias condition of a p-n junction diode. Also draw its characteristic curve.	Page:480	3
4	Explain the working of a semiconductor diode as a Half - wave rectifier. Give the input and output waveforms.	Page:483	3
5	Explain the working of a diode as a Full wave rectifier and give its input output waveforms.	Page:484	3
6	What is a zener Diode? Explain the working of a zener diode as a voltage regulator.	Page:485	3
7	In a zener regulated power supply a zener diode with Vz=6.0V is used for regulation. The load current is to be 4.0mA and the unregulated input is 10.0V. What should be the value of series resistors?	Page:486	3
8	What is a photodiode? Explain the working of it.	Page:487	3
9	The current in the forward bias (mA) is known to be more than the current in the reverse bias (μA). What is the reason then to operate the photodiode in reverse bias? Page:487		3
10	What is an LED? Briefly explain the working of it. What are its advantages over incandescent low power lamps?	Page:488	3
11	Match the following	Page:486 to 489	

Group-A   Group-B

1. LED   a. When illuminated with light electron –hole

                                 Pairs are generated

2. Photodiode   b. convert electrical energy into light

3. Solar cell   c. voltage regulator

4. Zener diode   d.genrates emf when light falls on it.

(Marks: 2)

SEMICONDUCTOR DEVICES

Test Paper-III

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Why Si and GaAs are preferred materials for solar cells?	Page:490	3
2	What must be the minimum band gap for a semiconductor to be used for the fabrication of visible LEDs?	Page:488	1
3	Give the V-I characteristic curve of a		2
	a. Solar cell.	Page:489	
	b. Photo diode	Page:487	
4	What is an n-p-n transistor give the symbol representing the same. Give the biasing condition of the transistor with a suitable circuit diagram. Also give the relation between the base current, collect current and emitter current.	Page:491	3
5	Explain why base region is thin, emitter is heavily doped when compared to the collector and the base in case of a transistor.	Page:492	2
6	What is a pnp transistor? Give the symbol representing the same. Also give the biasing condition of the transistor with a suitable circuit diagram.	Page:492	3
7	Explain how an npn transistor works as a CE amplifier with a suitable circuit diagram by giving the input and output waveforms.	Page:498	3
8	Give the circuit arrangement for studying the input and output characteristics of npn transistor in CE configuration Also give the input and output characteristic curves of CE Configuration.	Page:494	3
9	Define the following terms for a transistor in CE Mode		3
	a. Input resistance		
	b. Output resistance		
	c. Current amplification factor	Page:494	
10	For a transistor amplifier, the audio signal voltage across the collector resistance of $2.0k\Omega$ is 2.0 V. Suppose the current amplification factor of the transistor is 100, what should be the value of RB in series with VBB supply of 2.0V if the dc base current has		3

to be 10 times the signal current? Also calculate the dc drop across the collector
resistance.   **Page:500**

11	Give any two differences between an analog signal and a digital signal	**Page:502**	2
12	Draw the input and output waveforms of AND gate.	**Page:504**	1
13	What is a NAND gate Give the Truth table and logic symbol of the same?	**Page:504**	1

COMMUNICATION SYSTEMS

Test Paper-I

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	What are the essential elements of a communication system? Also draw a neat block diagram of a communication system.	**Page:515**	2
2	Give the functions of the following (a) Transmitter (b) Transducer	**Page:515**	2
3	What are the basic modes of communication? Give an example for each.	**Page:515**	3
4	Match the following	**Page:516**	

Group -A	Group-B	
1. Transducer	a. Loss of strength of a signal as it propagates through a medium	
2. Signal	b. An unwanted signal that disturb the transmission	
3. Noise	c. Which processes the incoming message signal	3
4. Transmitter	d. Information converted in electrical form and suitable for transmission	
5. Attenuation	e. That extracts the desired message signal from the received signals	
6. Receiver	f. Device that converts one form of energy into another	

5	What is meant by amplification? Why amplification is necessary in communication systems ?	**Page:516**	2
6	Define the following terms. (a)Range (b) Repeater	**Page:517**	2
7	What is modulation? What are the different types of modulation?	**Page:517**	2
8	Select the required bandwidth for transmitting speech, music, and TV signals from the following frequencies. (a) 20kHz (b) 6MHz (c)2.8kHz	**Page:518**	3

9	Draw diagram showing a fundamental sine wave and its harmonics. **Page:518**	2
10	Find the bandwidth of transmission medium required from the following for coaxial cable, and optical communication using fibres , satellite communication Uplink Downlink for BW 750 MHz and excess of 100GHz.5.9-6.4 GHz, 3.7-4.2GHZ **Page:519**	2
11	What are the different modes of propagation of electromagnetic waves? What is ground wave propagation? What are the limitations of ground wave propagation? **Page:519**	3
12	Waves of which frequency range propagate through sky wave. Briefly explain what is sky wave propagation? Name the phenomenon by which the wave gets reflected towards the earth. **Page:520**	3
13	Give the range of frequencies for which the ionosphere acts as a reflector. **Page:520**	1

COMMUNICATION SYSTEMS

Test Paper-II

MAX MARKS: 30   TIME: 90Mts

Sl. No.	QUESTION	ANSWER PAGE	MARKS
1	Name the waves that are used for line of sight communication and satellite communication.	Page:521	1
2	Communication of which type of waves are limited to line of sight paths? Why?	Page:521	2
3	Give an expression to find the maximum line of sight distance between the transmitting antenna and receiving antenna.	Page:521	1
4	A transmitting antenna at the top of a tower has a height of 32m and the height of the receiving antenna is 50m. What is the maximum distance between them for satisfactory communication in LOS mode? Given radius of earth is 6.4×10^6m. Page:522		2
5	Give the diagram representing various modes of propagation of em waves. Page:522		2
6	What is the need of modulation?	Page:522	2
7	Explain how effective power radiated by an antenna depends upon the wavelength?	Page:523	2
8	What is meant by Amplitude Modulation? Also give a plot of amplitude versus frequency for an Amplitude Modulated wave.	Page:524	3
9	Give the differences between AM and FM.	Page:524	2
10	A message signal of frequency 10kHz and peak voltage of 10volts is used to modulate a carrier of frequency 1 MHz and Peak voltage of 20 volts. Determine (a) modulation index (b) the side bands produced.	Page:525	2

11	What is HTML?	**Page:528**	1
12	What is E-mail? What is the use of it?	**Page:528**	2
13	Explain how a document can be sent from one location to another using FAX.	**Page:528**	2
14	What is a cell? What is the function of a cell?	**Page:528**	2
15	In which region of em spectrum mobile telephony works? Define the term handover in mobile telephony	**Page:528**	2
16	Give a note on World Wide Web.	**Page:528**	2