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AHSEC (ASSAM)

Dreamers

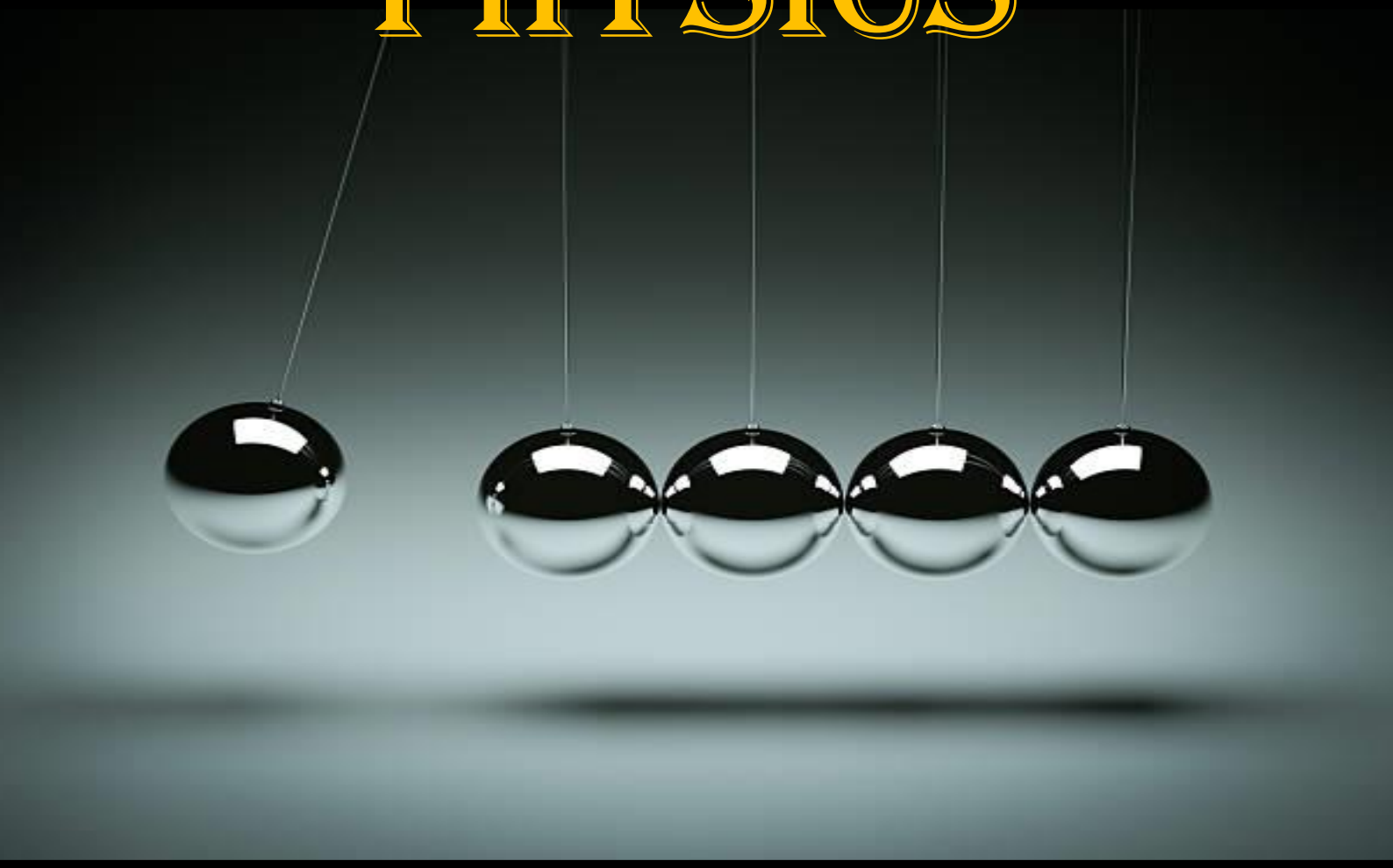
500+ Questions

10 years'

CHAPTERWISE QUESTIONS

2012 - 2021

PHYSICS



By: Unknown

ELECTRIC FIELD AND CHARGES

2012

1. Can a bopdy a have a charge of 1.8 x 10^{-19}C ? Justify your answer.
2. Usiong gauss's theorem find the field due to a charged thin shephrical shell at a point outside the shell.
3. Find an expression for electric field at any position on an axial line of an electric dipole.

2013

1. Define one electron volt.
2. State Gauss's Law of electrostatics.
3. What is an electric dipole? Find an expression for the torque acting on an electric dipole placed in an external uniform electric field.
4. What is electrostatic shielding? How can it be achieved?

2014

1. State Coulomb's law of electrostatics. Express it in vector form.
2. What is electric polarisation vector ? Define the electric susceptibility
3. Apply the gauss's theorem to calculate the electric field due to an infinite plane sheet.
4. If $\vec{E} = (3\hat{\imath} + 6\hat{\jmath} + 4\hat{k})\frac{N}{C}$, calculate the electric flux through a surface of area 20cm² in Y-Z plane.

2015

1. What is quantization of charge?
2. Calculate the magnitude of electrostatic force between a proton and an electron separated by a distance 0.5$\dot{A}$. Given

that magnitude of charge of a proton and electron to be 1.6x10^{-19}C each and $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 N - m^2.C^{-2}$.

3. Define electric dipole and dipole moment. Derive the expression for electric field intensity at a point on the axial line of an electric dipole.
4. Explain the concept of electric field. Express electric flux through a surface in terms of electric field intensity. Show that the electric flux through a cylindrical surface with its axis parallel to a uniform electric field is zero.

2016

1. What is SI unit of permittivity ?
2. Define mobility of a charge carrier.
3. State two basic property of electric charges.
4. What is electrostatic shielding ? How can it be achieved ?

2017

1. In an electric field a unit positive charge is displaced from one point to another point along a straight line of length 2 cm and the work done is 2mJ. If it is displaced along a parabolic path between the same points of length 5 cm, what will be the work done?
2. The product of permeability of free space and permittivity is – (Choose the right option)

   (i)c, (ii)c^{-1} , (iii)c^2 , (iv)c^{-2}

   Where c is the velocity of light.
3. Three electric point charges q_o , q_1 and q_2 are at distance $\vec{r}_0$, $\vec{r}_1$ and $\vec{r}_2$ respectively with respect to same origin. What is the force on charge q_o in the field of charges q_1 and q_2 ?
4. The volume charge density within a volume Vis p(r). What is the force on a small test charge do placed outside the volume

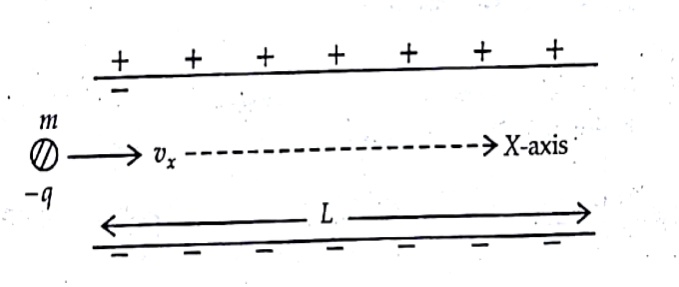
having position vector with respect to the same origin considered to specify the position vector of the charge distribution within the volume.

5. What is the net electric flux through a closed surface surrounding an electric dipole? Derive the expressions for electric field intensity both inside and outside a uniformly charged spherical cell. What is the total charge enclosed by a closed surface if the electric flux entering and leaving the surface are 20000 N/cm^2 and 30000 N/cm^2 respectively. Given ε_0=8.85 x $10^{-12}C^2N^{-1}m^2$.

2018

1. Which experiment established the fact that electric charge is quantized ?
2. Apply Gauss's law to derive the expression for electric field intensity due to an infinitely long straight uniformly charged wire. What is the direction of the field intensity if it is positively charged?
3. Derive the expression for field intensity due to an electric dipole in vacuum for points on its axis. Compare the variation of field intensity with distance for an electric dipole and a point charge when both are kept in vacuum.
4. Give the statement of Coulomb's law for the force between two point charges. Write this law in vector notation for two point charges of same magnitude and opposite sign separated by a distance r in vacuum.
5. Two point charges 0.01μC and -0.01μC are placed 10cm apart in vaccume. Calculate the magnitude of electric field intensity at the middle point of the line joining the charges and mention its direction.

6.



In the above diagram, a particle of mass "m" and charge (-q) initially moving along X-axis with velocity "v_x " enters the region between two charged plates. The length of the plate system is "L" and uniform electric field between the plates is "E". What is the vertical deflection of the particle at the far edge of the plate?

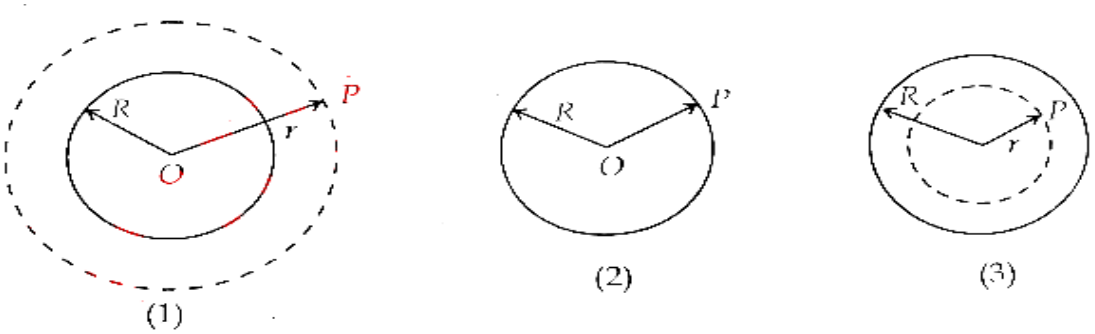
2019

1. Mention one similarity between Coulomb force and gravitational force acting between two stationary charges.
2. Define one coulomb charge. Two point charges at a distance r in air exert a force F on each other. At what distance will these charges experience the same force F in a medium of dielectric constant k ?
3. There is an electric dipole on the X-Y plane. Its dipole moment is $4x10^{-9}$ cm. On the same plane there is also a uniform electric field of magnitude $5x10^{4}$ NC^{-1} . If the axis of the dipole makes an angle 30^{o} with the electric field, calculate the magnitude of the torque acting on the dipole and also mention the direction of torque.

2020

1. Mention one difference between mass and charge.
2. A closed spherical surface encloses a charge q at its centre. Show that electric flux through the closed surface is $^{q}/_{\varepsilon_0}$.

3. A pair of charge +q and –q, separated by a small distance 2a is placed in electric field $\vec{E}$, so that the line joining the charges makes an angle θ with $\vec{E}$. Write the expressions for torque $\vec{\tau}$ and also $|\vec{\tau}|$.
4. State Gauss's law in electrostatics and write it in its mathematical form. Calculate the electric field $\vec{E}$ at the point P due to a charged thin spherical shell, shown in figure (1). What will be the field $\vec{E}$ shown in figures (2) and (3) ? Given surface charge density is σ.



5. You are bring two charges q_1 and q_2 from infinity to the points represented by the potentials V_1 and V_2 in an electric field $\vec{E}$. If the distance between q_1 and q_2 within the field $\vec{E}$ is r, find the total work done in assembling the configuration. Imagine an electric field $\vec{E} = (20\hat{\imath} + 30\hat{\jmath})NC^{-1}$ in a space. The potential at origin is zero. Find the potential at the point (2,2)m.

ELECTRIC POTENTIAL AND CAPACIOTANCE

2012

1. A condencer of capacity 500pf is charged to a potential 100v. find the charge on the condencer and energy stored in it.

2013

1. If electric field E = 0 in a region do you think potential at the region should also be zero ? Justify your answer.
2. Find an expression for potential at a point due to a point charge.
3. A 400 pF capacitor is charged by a 100V Battery. How much electrostatic energy is stored by the capacitor?

2014

1. Deduce the expression for the capacity of a parallel plate condenser.

2015

1. A 100pF capacitor is charged by a potential difference of 100V. what is the amount of charge stored? What is the electrostatic energy stored in the capacitor ?
2.

2016

1. Define dielectric constant of a medium.
2. The work done in moving a charge $2x10^{-9}C$ from a point of potential -3kV to another point p is $5x10^{-5}J$. find the potential at point p.
3. Two spheres of radii 3 cm and 8cm are charged with 4x10 °C and 16 x 10 °C of electricity respectively. If they are joined by

a wire, how much charge will flow from one to the other sphere?

4. A parallel plate capacitor has plate separation "d" and the area of each plate is "A". The space between the plates is completely filled with a dielectric of constant K. Derive the expression for the capacity of the parallel plate capacitor.

2017

1. Why is an insulator sometimes called a dielectric? What is the main difference between free and bound charge? Generally one of the two plates of a Capacitor System is earthed, why? Derive the expression for the energy stored in a charged capacitor.

2018

1. A 600μF capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged 600μF capacitor. How much electrostatic energy is lost in this process ?

2019

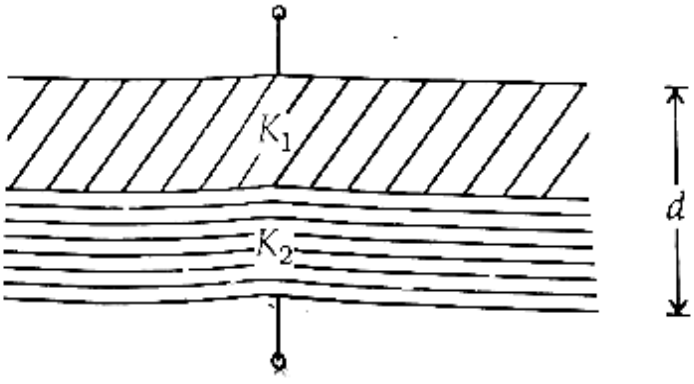
1. The capacity of a parallel plate capacitor with air is 18pF . When a dielectric material is inserted in the space between the plates, its capacity becomes 108pF . Calculate the permittivity of the material. What is the material ?

2020

1. Taking example of charging capacitor, name the currents that are responsible for the process of charging and also state

which current flows outside and which flows inside the capacitor.

2. What is capacitor ? You know that the capacitance of a parallel plate air capacitor is $C = {}^{\varepsilon_0 A}/_{d}$. what will be its new capacitance C' of the capacitor if a material of d.e.c. K is inserted between the plates ? Calculate the capacitance of the capacitor shown below.



CURRENT ELECTRICITY

2012

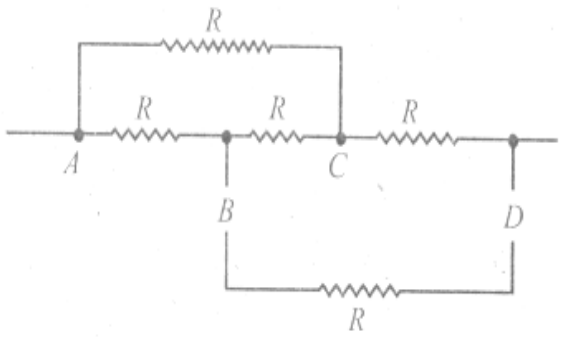
1. Give the dimensional representation of resistance.
2. Draw the circuit diagram for the comparison emf of two cells by a potentiometer.
3. Applying kirchoff's laws, establish the balanced condition of wheatstone 's bridge.

2013

1. State Kirchoff's laws of current electricity.
2. Establish the following relation for current flowing through a circuit conta external resistance R, a battery of e.m.f E and internal resistance r
3. How do you define mobility of a charge carrier in a conductor ? Establish the following relation for mobility

2014

1. State Ohm's law of current electricity. Define One Ohm resistance.
2. Find the equivalent resistance between A and D.

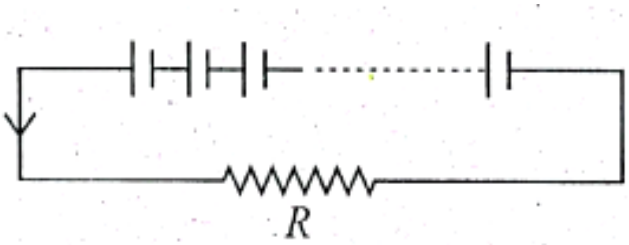


3. What do you mean by specific resistance of a conductor ? what is its S.I. unit ?

4. What is potentiometer ? would yopu prefer a voltmeter or a potentiometer to measure the EMF of a battery?
5. Apply the kirchoff's law of current electricity to establish the condition of a balanced wheatstone's bridge.

2015

1. n-identical cells each of emf E and internal resistance r connected in series. Find the expression for current in the circuit given below.



2. Establish the following relation for drift velocity.

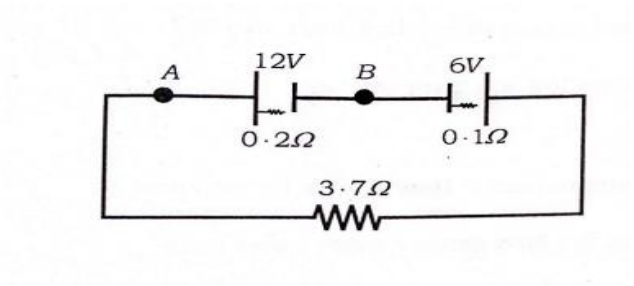
$$v_d = \frac{eE}{m}\tau$$

Where symbols have their usual meaning.

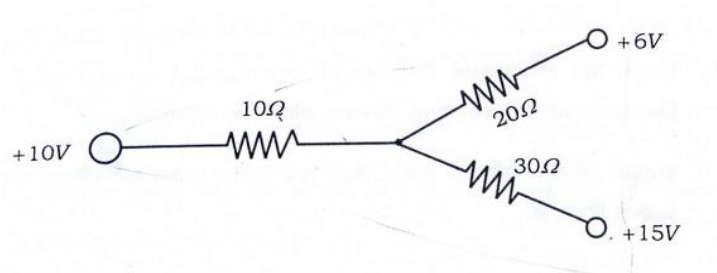
3. A 100W heater coil is rated 200V. Find the resistance of the coil.
4. A copper wire is stretched so to increase its length by 0.2%. Calculate the percentage change in the resistance of the wire.
5. Draw the circuit diagram of a potentiometer to compare the emf of two cells and briefly describe the procedure.
6. Draw the circuit diagram of a potentiometer to determine the internal resistance of the cell and briefly describe the procedure.

2016

1. You are given a potentiometer, a rheostat, one key, a driving cell for potentiometer, one galvanometer, two cells of unknown c.m.f, one two way key and some connecting wires. Using all those given draw a circuit diagram for finding the ratio of the emf of the two cells.
2. A battery of e.m.f 2V and internal resistance 1Ω is used to send a current through a potentiometer wire of length 200cm and resistance 4Ω. What length of the wire will be required to balance a cell of em.f 1.08V?
3. Compare the amount of heat developed in three similar wires having lengths in the ratio 1:5:8 and radii 1:2:3 when joined in parallel.
4. In the circuit given below, find the potential difference between A and B.

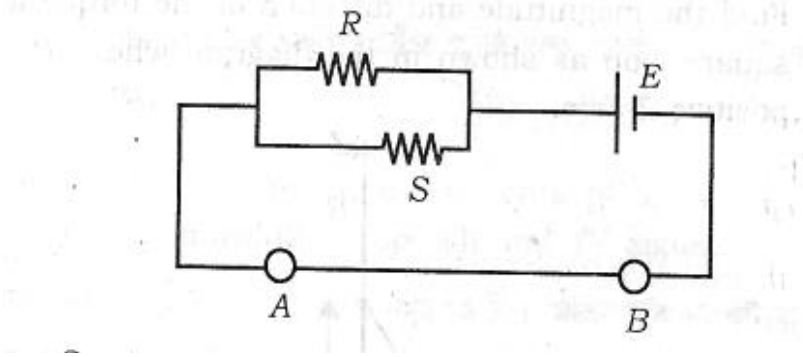


5. State and explain kirchoff's second law of electricity.
6. In the circuit given below find the current through 10Ω

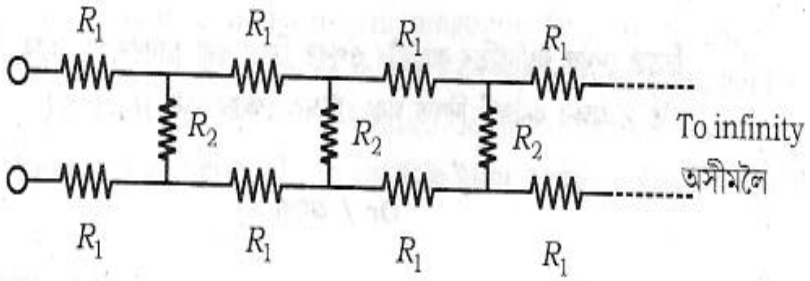


2017

1. On a resistor, the four colour bands are green, violet, red and gold. Give the complete information about the resistor.
2. How is the changing electric field between the plates of a parallel plate capacitor during its charging, related to the idea of displacement current ?
3. A potentiometer wire AB has a length 0.5m and resistance 0.5Ω. As shown in the diagram, it is connected with a cell of e.m.f. 3V and a combination of resistance R=S=5Ω. Find the potential drop per unit length of the wire.



4. As shown in the diagram, network of resistors R_1 and R_2 extends off to the infinity to the right. Find the equivalent resistance.

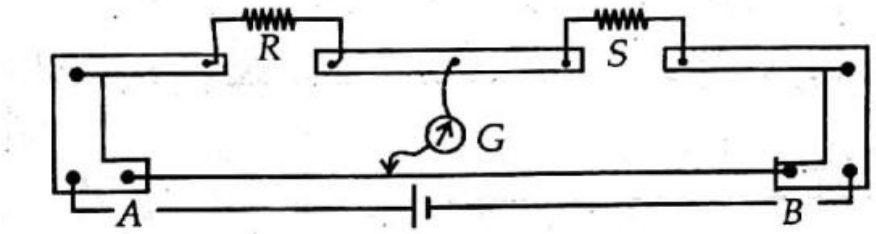


5. What is the drift speed of electrons in a conductor ? Establish the following relation for drift speed where the symbols have their usual meaning.

$$v_d = \frac{eE}{m}\tau$$

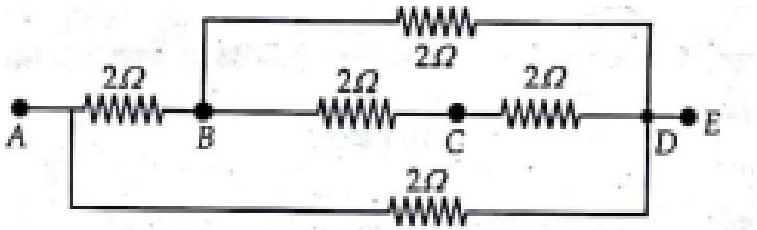
6. With the help of graph, show, How resistivity changes with temperature in the case of (i)Copper, (ii)Nichrome and (iii)Semiconductor.

2018

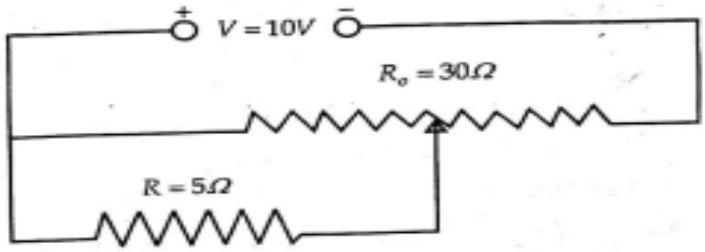
1. Establish the expression for current flowing through an external resistance R connected to a cell of e.m.f. E and internal resistance r.
2. State and explain Kirchoff's rules used for analysis of an electric circuit.
3. 

   In the meter bridge shown in the above figure, the null point is found at a distance 33.7cm from A and of the wire for particular values of R and S. If a resistance of 12Ω is connected parallel with S, the null point is found to be at 48.1cm from B end. Determine the value of R and S.
4. Define drift velocity of free electrons in a conductor across which a potential difference is applied. How is it related to mobility ?

5. Calculate the equivalent resistance between the points A and C of the following circuit.



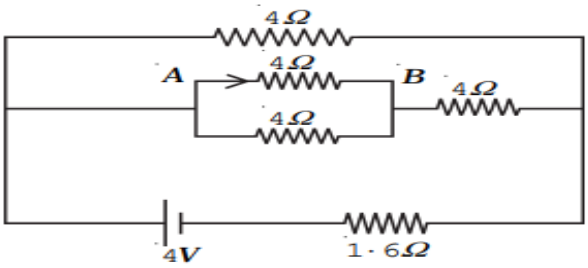
6.



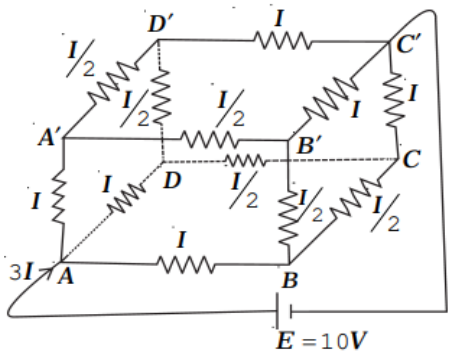
As shown in the figure above, a resistance of R=5Ω draws current from a potentiometer of total resistance R_0=30Ω A voltage V=10V is supplied to the potentiometer. What is the voltage across R when the sliding contact is in the middle of the potentiometer ?

2019

1. Find the value of current I flowing from A to B in the following circuit.

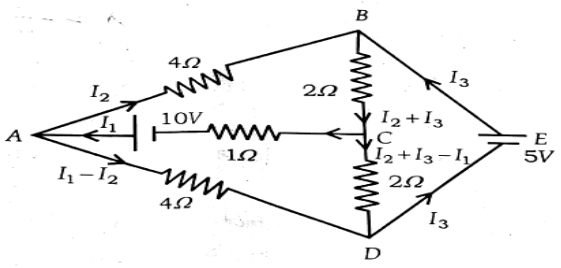


2. Obtain an expression for drift velocity of an electron in a conductor.
3. State Kirchhoff's (i) Junction rule and (ii) Loop rule. Determine the equivalent resistance of the network given below and the total current going out of the battery. Given, each resistor has resistance of 1Ω.

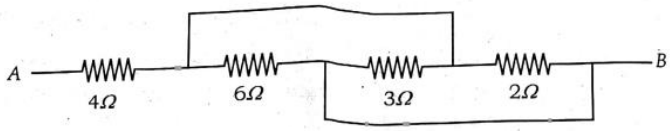


2020

1. the colours on a carbon resistanc are yellow, violet, brown and golden respectively from left to right. If the corresponding numbers for the colours are 4, 7, 1, and 5, what will be the resistance of the resistance of the resistor ?
2. In the following network, $I_1 = {}^{5}/_{2}\,A$, $I_2 = {}^{5}/_{8}\,A$ *and* $I_3 = {}^{15}/_{8}\,A$. calculate the total volatage drop over the closed loop BADEB.

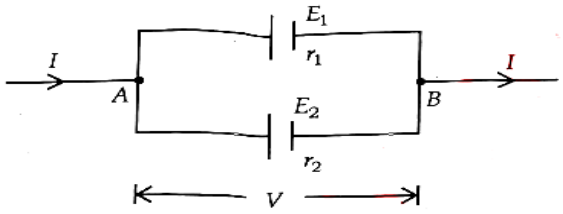


3. find the equivalent resistance across the terminals A and B, shown in the figure below.



4. How would you connect resistance 1Ω , 2Ω and 3Ω so as to get an equivalent resistance of 3.66Ω. Draw the required circuit digram.
5. Draw a circuit diagram required to compare the emfs of two cells using potentiometer. Write also the mathematical formula required required for it.
6. In the following diagram the potential difference between the points A and B is V. Find an expression for total current I. Show that

$$V = \frac{E_1 r_1 + E_2 r_2}{r_1 + r_2} - I\frac{r_1 r_2}{r_1 + r_2}$$



7. R_1 and R_2 are two resistors. $R_{eq(s)}$ and $R_{eq(p)}$ are their equivalent resistances when they are connected in (1) series and (2) in parallel. Draw two circuit diagrams for (1) and (2) and show that $R_{eq(s)}$ x $R_{eq(p)}$ $= R_1 \times R_2$.

MOVING CHARGES AND MAGNETISM

2012

1. Write down the biot-saverts law In vector form.
2. Define 1 tesla. Write down the expression of Lorentz force acting on a charged particle.
3. Find an expression for the magnetic field at points. on the axis of a circular current loop.

2013

1. Write the expression for Lorentz force acting on a charged particle.
2. Show that the angular frequency of a charged particle moving in a circular path in a magnetic field is independent of its velocity.
3. Find the following expression for the magnetic moment of an electron moving in a circular path where I is the angular momentum of the electron about the nucleus, e and m, are its charge and mass.

2014

1. Give the dimensions of Tesla.
2. Show that Weber Volt x Second.
3. State Ampere's circuital law.
4. Using ampere's circuital law, find the magnetic flux density at the centre of a long solenoid carrying current.
5. Describe the working of moving coil galvanometer.
6. Obtain an expression for torque acting on a rectangular coil carrying current placed in a uniform magnetic field.

2015

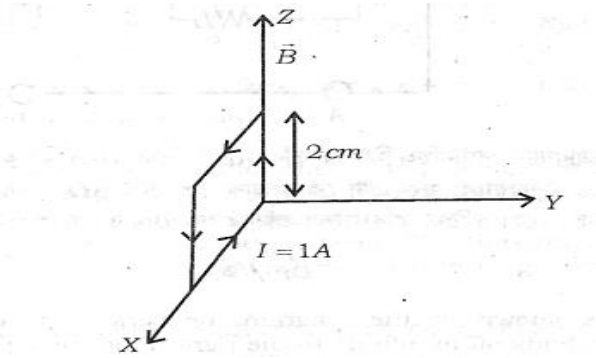
1. Why is the cyclotron not used to accelerate electrons ?
2. A coil of area A, number of turns N and resistance R is rotated in a radial magnetic field B with angular speed ω. What is the maximum power consumed by the coil.
3. A charged particle of mass m and charge q is projected with a velocity v making an angle θ with the direction of a uniform magnetic field of induction B. Find the expression for –
   i. Time period of revolution.
   ii. Pitch of the helical path followed by the particle.
4. Two long straight thin conductors carrying current I_1 *and* I_2 respectively along the same direction are placed parallel to each other in air. Derive an expression for the force per unit length acting on any one of the conductors and hence define one ampere current.

2016

1. What is the missing term in ampere's circuital law ?
2. Using Biot-Savart Law find the magnetic field intensity due to a current carrying loop at an external point on the axis that passes perpendicularly to the plane of the loop through the centre. What is the field intensity at the centre ?
3. How can you convert a galvanometer into (i)an ammeter and (ii) a voltmeter ? Explain with diagram.

2017

1. Find the magnitude and direction of the torque acting on the square loop as shown in the diagram where B = 1.5T along positive Z-axis.



2. A uniform magnetic field of 2T is produced in a Cylindrical region of free space having radius 5cm. A conductor carrying a current 500 mA passes through the region intersecting the axis normally. What is the magnitude of the force acting on The conductor ?
3. A conductor of mass m and length l is placed on a table along east-west direction. Suddenly a certain amount of charge is passed through it and it is found to jump to a height h. What was the amount of charge passed? The horizontal magnetic induction of earth is B. Acceleration due to gravity is g.
4. Two parallel Co-axial Coils of equal radius R and numbers of turn N carrying equal currents I in same direction are separated by a distance R. Show that the magnetic field intensity B on the axis around the mid point between the coils is uniform over a very small distance as compared to R and is given by—

$$B = \left(\frac{4}{3}\right)^{3/2} \frac{\mu_0 IN}{R}$$

2018

1. What is current sensitivity of a galvanometer ?
2. Derive the expression for the magnetic force on a current carrying straight conductor placed in a uniform magnetic field and express it in vector form.
3. What is the basic principle of a moving coil galvanometer ? Derive an expression for current flowing through the galvanometer in terms of steady angular deflection of its coil. Define voltage sensitivity of the galvanometer. What is a convenient way to increase its sensitivity?

2019

1. You know that Ampere's circuital law is mathematically expressed as given below.

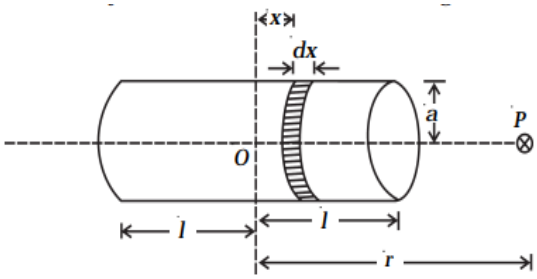
$$\oint \vec{B}.\overrightarrow{dl} = \mu_0 i$$

Also you know that this law was corrected by Maxwell and which is known as Ampere-Maxwell law. Write the general form of the law and name the additional term.

2. A current carrying solenoid is shown below. Show that the magnetic field intensity at point P be

$$B = \frac{\mu_o}{4\pi}\frac{2m}{r^3}$$

where the symbols have their usual meaning.



3. Two long straight thin conductors carrying currents I_1 and I_2 respectively along the same direction are placed parallel to each other at distance d in air. Find the force per unit length acting on any one of the conductors. Hence define one ampere.

2020

1. You know if a charge q, moving with velocity $\vec{v}$ enters a uniform magnetic field $\vec{B}$, it experiences a force $\vec{F} = q(\vec{v} + \vec{B})$. Name the path described by q when the angle between $\vec{v}$ and $\vec{B}$ is
   (1) $\angle\theta = 90^\circ$ and (2) $\angle\theta < 90^\circ$.
2. A beam of ions with velocity 2×10^5 ms^{-1} enters normally into a uniform magnetic field of 0.04T. If the specific charge (i.e. $^q/_m$) of ion is 5×10^7 Ckg^{-1}, find the radius of the circular path described.
3. Write Biot-Savart law in vector form and mention the direction of magnetic field. Which term in the law works as a vector source and produces the magnetic field? Mention one similarity and one dissimilarity between Biot-Savart law for magnetic field and Coulomb's law for electrostatic field.

2013

1. What is Curie temperature of a ferromagnetic material? Give one example of a ferromagnetic material.
2. What are hard ferromagnetic and soft ferromagnetic materials? Give one example of each.

2014

1. Distinguish among paramagnetic, ferromagnetic and diamagnetic materials qualitatively.

2016

1. In an orbit of radius R, an electron is moving round a proton with uniform circular velocity. Derive the gyromagnetic ratio of the electron of Charge (-e) and mass (m). What is Bohr magneton ?

2017

1. There exists a non uniform magnetic field in free space. A charged particle of mass m and velocity v enters the field and comes out after a certain time. Comment with reason about the Kinetic energy of the particle after coming out of the field.

2018

1. Define the elements of earth magnetic field.
2. Define magnetisation and magnetic intensity. Deduce the relation among relative magnetic permeability, permeability of vacuum and magnetic susceptibility. What is the value of susceptibility of a super conductor ?

2019

1. What did Meissner actually observe which is known as Meissner effect ?
2. A magnetic dipole is oscillating in a magnetic field obeying the following expression.

$$\frac{d^2\theta}{dt^2} = -\frac{mB}{I}\theta$$

What is the time period of oscillation and mention the nature of oscillation ?

2020

1. Of two metals A and B, it is found that $x_A \gg 1$ and $-1 \leq x_B < 0$. Name the types of material to which the materials to which the metals A and B do belong. Give one example of each.
2. Define magnetic declination. How does it depends on latitudes ?
3. An electron of charge e is revolving around a nucleus along a circular path of radius r and with speed v. Starting from the relation $\mu_l = IA$, where the symbols have their usual meaning, show that,

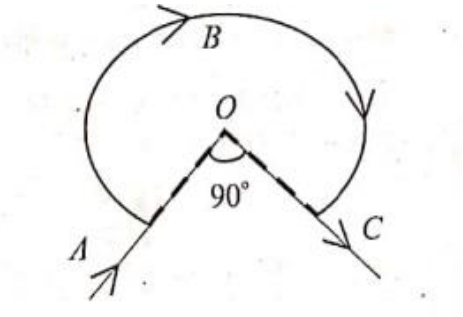
(i) $\mu_1 = \frac{evr}{2}$ and (ii) $\vec{\mu_l} = -\frac{e\vec{l}}{2m_e}$

Here l is the magnitude of angular momentum of the electron of mass m_e.

ELECTROMAGNETIC INDUCTION

2012

1. The wire shown in the figure carriesd a current of 10A. what is the magnitude of magnetic field induction at the centre O ? Given the radius of the bent coil is 3cm.



2. An α particle is moving in a magnetic field of $(3i\hat{\imath} + 2\hat{\jmath})$ tesla with in velocity of $5x\ 10^5\hat{\imath} ms^{-1}$. What will be the magnetic force acting on a particle ?
3. State lenz's law of electromagnetic induction. Establish that lenz's law is the magnification of law is the magnification of law of conservation of energy.
4. A rectangular coil canying current is placed in a uniform magnetic field in such a way that nonnal to the plane of the coil makes an angle o with the direction of magnetic flux density Find the magnitude of torque acting on the coil. Define magnetic moment of a current loop

2013

1. A charged particle enters a magnetic field with velocity v in a direction perpendicular to the field. Find an expression for the radius of the circular path of the particle

2014

1. Explain how lenz's law establishes the law of conservation of energy.
2. Explain briefly with the help of a labeled diagram the basic principal of the working of an AC generator.

2015

1. Show that total energy required to build up a current I in an inductor of coefficient of induction L is $\frac{1}{2}LI^2$.
2. Find the expression for mutual inductance between a pair of co-axial coils.
3. A metal rod of length L meter rotates about one end in a vertical plane at right angles to the magnetic meridian. Frequency of revolution is f Hz. If the Horizontal component of earth's magnetic field is H Tesla then find expression of induced emf between the ends of the rod.

2016

1. How does a microwave oven work ?
2. Why inferred waves are called heat waves ?
3. A thin dielectric disc uniformly distributed with charge q has radius r and is rotated n times per second about an axis perpendicular to the disc and passing through the centre. Find the magnetic induction at the centre of the disc.
4. What is eddy current? State two applications of eddy current.

2017

1. State one utility of eddy currents.
2. Explain lenz's law considering a closed conducting coil and a bar magnet.

3. A square loop of a conducting material of side 1 and resistance r is dragged through a uniform magnetic field B with uniform velocity v keeping the plane of the loop perpendicular to the direction of the field. What is the current flowing through the loop?
4. A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.25T experiences a torque of 4.5×10^{-2} J. What is its magnetic moment?

2018

1. How are eddy currents , minimized in a transformer ?
2. Define coefficient of self induction and mutual induction and write their SI units.
3. Briefly explain the working of an A.C. generator.

2019

1. Define mutual inductance of 1 Henry.
2. Explain Lenz's law from the principle of conservation of energy.
3. "The phenomenon of electro-magnetic induction has been technologically important application in the generation of alternating currents." Name the device which can generate alternating currents. Draw a neat diagram of it. A rectangular coil having area vector $\vec{A}$ and number of turns N is rotating in a magnetic field $\vec{B}$ with angular speed ω . If θ be the angle made by the area vector $\vec{A}$ with the field $\vec{B}$ at time t , derive an expression for alternating emf ε starting directly from Faraday's law. Draw a graph to show the generated emf at time 0, $T/4$, $T/2$, $3T/4$ *and* T.

2020

1. What is eddy current ?
2. In a circuit current decreases from 5A to 0A is 0.1s. If the average induced e.m.f. is 200V, calculate the self inductance of circuit and write its unit also.
3. When a coil of area $5m^2$ and number of turns 100 is placed perpendicular to magnetic field of 10T, the flux passing through it is $5x10^3Wb$. If the coil is removed from the field in 0.1s, calculate the induced e.m.f.
4. What do you mean by electromagnetic induction ? Name two great experimentalists who carried a long series of experiments on electromagnetic induction. You are given two coils, one galvanometer, one battery and some connecting wires. Describe an experiment that can show the production of electromagnetic induction.
5. What is motional e.m.f. ? Deduce an expression for it from the following diagram. If R be the resistance of the loop PQRS at a given instant, what will be the induced current at that instant ? A straight conductor of length 0.1m moves with a speed of $10ms^{-1}$ perpendicular to a magnetic field of induction $1Wbm^{-2}$. Calculate the induced e.m.f. State Lenz's law.

ALTERNATING CURRENT

2012

1. What is the maximum value of power factor and when does it occurs ?
2. the frequency of ac is doubled. How do X_L and X_C get affected ?

2013

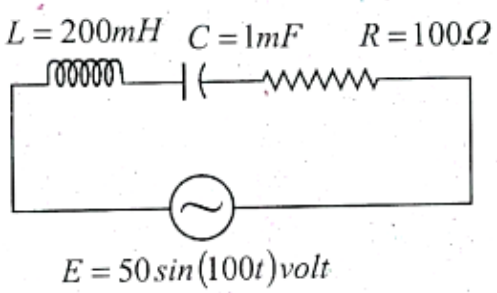
1. A coil of self inductance 20mH is connected to an ac source of 2207 and of frequency 50H. What is the inductive reactance and r.m.s current in the circuit?
2. In a series LCR circuit in which R-32, L=25mH and C=800uF a sinusoidal a.c voltage of peak value 250Vis applied. Find (i) frequency at which resonance occurs (ii) current in the circuit at resonant condition.
3. A rectangular coil of turns n and area A is rotating with angular velocity in a uniform magnetic field B. Find an expression for the e.m.f generated in the coil.
4. What is step up and step down transformer? To transfer electric energy from generating station initially step up transformer is used. Why?

2014

1. An inductor of self inductance L=50mH is connected in series with a non inductive resistor of resistance R=10Ω. A source of EMF $\varepsilon = (100sin50\pi t)$ volt is connected in the circuit. Find the
   a) Reactance of the coil
   b) Impedance of the circuit
   c) Rms voltage drop across the inductor.

2015

1. If R and L represent resistance and inductance respectively then what is the dimension of L/R ?
2. Find the peak current in the circuit given below



3. What is power factor of L-C-R circuit ? Explain on the basis of power factor that an ideal inductor is a wattless component.
4. Why is electrical energy transmitted at high voltage from a distant power generating station?
5. An AC source of emf E=200sin(100πt) is connected across an inductor having resistance 100Ω and self inductance 2H. Calculate –
   (i) Frequency of AC.
   (ii) Total impedance of the circuit.
   (iii) Peak value of the current flowing through the circuit.

2016

1. State the working principle of a transformer. What is hysteresis loss in transformer?
2. An a.c. source of e.m.f. V sinut is connected with a circuit which contains an inductor L, a capacitor C and a resistor R in series. Establish the differential equation of e.m.f and find the total impedance of the series LCR Circuit. What is the quality factor of the circuit?

3. A 40W-110V bulb is to be used with 220V-50Hz AC. Calculate the inductance required for this purpose.

2017

1. Explain the physical process on the basis of which the r.m.s. value of AC is defined. Derive the expression for r.m.s. value of an alternating voltage. How does the value of Capacitative reactance of a capacitor change with the frequency of the applied alternating e.m.f across it.
2. A charged capacitor is connected to an inductor at an instant of time t = 0. If the capacitor and the inductor are taken to be pure, write down the equation of effective potential difference across the combination at any instant of time t and solve it for instantaneous current through the combination. Explain briefly the exchange of electric and magnetic energy between the capacitor and the inductor.

2018

1. Show that average power dissipated by a pure inductor and a pure capacitor are zero when they are connected to AC voltage source.
2. The amplitude of current in series LCR circuit connected to an AC of frequency "ω" is given by

$$i_m = \frac{v_m}{\sqrt{R^2+(X_L-X_C)^2}}$$

Where X_L and X_C are inductive and capacitive reactances respectively and "v_m" is amplitude of voltage. Starting from this equation show that sharpness of resonance in the circuit is equal to the quality factor of the circuit.

2019

1. A source of emf , $V_m \sin\omega t$ is connected in series with an inductor L, capacitor C and resistor R. Calculate the impedance and resonant frequency of the circuit. Also write an application of the resonance circuit.

2020

1. Draw a labelled diagram of an AC generator. Show that it produces sinusoidal e.m.f. or current. What is its frequency of rotation in India?

ELECTROMAGNETIC WAVES

2012

1. the magnetic field in a plane electromagnetic wave is given by $B_Y=5x10^{-7}\sin(2\pi \text{ x } 10^8 t + \frac{2\pi}{3}x)$ tesla Find (i)wavelength (ii)frequency.

2014

1. Describe in brief the concept of displacement current.
2. How does a charge 'q' oscillating at certain frequency produce electromagnetic waves ?

2015

1. Out of the four Maxwell's equations, which equation establishes the non-existance of magnetic monopole ?
2. Write down the expression for the velocity electromagnetic wave in a medium and hence find out an expression for the refractive index of the medium.
3. What is radiation pressure ?
4. Describe in brief the process of gamma radiation.

2016

1. What is the range of wavelength of electromagnetic radiation that nature has endowed our retina to detect ?

2017

1. Write down the Gauss's Law of magnetism as written in Mexwell's equations.
2. Mention the relative positions of X-Rays and γ-Rays in the EM wave spectrum and give examples of their usage.

2018

1. Which layer in our atmosphere protect us from ultra violet rays ?
2. Some scientists have predicted that global nuclear war on the earth would be followed a severe "Nuclear Winter". What might be the basis of this prediction?
3. A plane EM wave moving with a velocity $3x10^8$m/s has an electric field which oscillates sinusoidally with a frequency $2x10^{10}$Hz and amplitude 48V/m. What is the amplitude of the oscillating magnetic field ?

2019

1. Explain in brief — "Infrared waves are sometimes referred to as heat waves."
2. Consider that the electric field amplitude of an electromagnetic wave is $E_o=120NC^{-1}$ and its frequency is v=50Hz . Determine B_o , ω and k .

2020

1. Name the portion of electromagnetic spectrum in between ultraviolet and infrared regions.
2. What is the radiation pressure on earth's surface ?

3. Mention the following and rewrite :

(1) $\oint \vec{E}.\overrightarrow{dA}$	(1) $\mu_0 i_c$
(2) $\oint \vec{B}.\overrightarrow{dA}$	(2) $-{}^{d\emptyset_B}/_{dt}$
(3) $\oint \vec{E}.\overrightarrow{dl}$	(3) ${}^{Q}/_{\varepsilon_0}$
(4) $\oint \vec{E}.\overrightarrow{dl}$	(4) 0

RAY OPTICS

2012

1. what is magnifying power of an astronomical telescope? Draw the necessary ray diagram for the final image at distinct vision by an astronomical telescope.
2. Draw the ray diagram to show the formation of final image by a compound microscope.

2013

1. What step can be taken to achieve high resolving power of a telescope.
2. Draw a ray diagram to show formation of virtual image by a concave mirror.
3. Establish the following relation for total deviation of a ray of light refracted through a triangular glass prism.

   where i is the angle of incidence, e is the angle of emergence and A is the angle of

2014

1. State Snell's law of refraction of light.
2. Two lenses of powers +5D and +3D are contact. Find the focal length of the combination.
3. Deduce the relation $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ for a concave lens.
4. An image is placed 30cm away from a concave lens of focal length 15cm. find the position, size and nature of image.
5. Find the value of angle of minimum deviation of prism. $[Given\ \ \mu = \sqrt{2},\ \ A = 60°]$

2015

1. Draw a ray diagram to show the formation of final image at least distance of distinct vision by a compound microscope.
2. Draw a ray diagram for the formation of an image by a reflecting telescope.
3. Derive the expression for equivalent focal length of a combination of two thin convex lenses in contact.
4. Deduce the relation $\frac{1}{v} - \frac{1}{u} = {}^{1}/_{f}$ for a convex Lens producing virtual image.

2016

1. What is astigmatism ? How it can be removed ?
2. A man stands on vertical tower of height 20m. Calculate the distance upto which he will be able to see the surface of the earth. Given radius of earth is 6.4×10^3km.
3. Draw the ray diagram for the formation of image by a compound microscope. What is its magnification ?
4. The objective lens and eye piece lens of a Compound microscope have focal lengths 1-5 cm and 5cm respectively. The object is placed at a distance 1-8cm. What is its magnification?
5. Establish the lens maker's formula for a biconvex lens.
6. Two identical equiconvex lenses of refractive index 32 and focal length 16cm are kept in contact. The space between the lenses is filled with water of refractive index 1/3 What is the focal length of the combination?

2017

1. An object is placed at the focus of a convex lens. Where will the image be formed ?
2. Draw the ray diagram to show the location of the principal focus of a convex mirror. Identify the pole and centre of curvature.
3. A square loop of side 3 cm is placed 25 cm away from a Concave mirror of focal length 10cm. The axis of the mirror passes through the intersecting point of the diagonals of the loop and is perpendicular to the plane of the loop. What is the area enclosed by the image of the loop?
4. Show that when a ray of light is incident on the surface of a transparent medium at polarising angle, the reflected and the refracted rays are at right angles to each other.
5. A convex lens and a concave lens of focal length 0.1m each are placed co-axially 0.03m apart. Find the position of the image of an object placed 0.15m in front of the convex lens.
6. You are given a prism in which the two refracting surfaces are at 90^{o} with each other. Draw ray diagram using this prism so that (i) the image of an object is rotated by 90^{o} and (ii) the image of the object is rotated by 180^{o}.
7. What are the main considerations in the construction of an astronomical telescope and how are they achieved? Why are mirror objectives rather than lens objectives used in modern telescope ? Clarify giving schematic diagram how the problem of partial obstruction of ray of light by the eyepiece and observer is overcome in the improved version of reflection. telescope.
8. The focal lengths of objective and eyepiece of a telescope are 200cm and 10cm respectively. It is used to get an image of the Sun on a screen placed 40cm behind the eyepiece. The diameter of the image is 6cm. What is the diameter of the Sun ? Given, the distance from earth the Sun is to $1.5x10^{11}$ m.

2018

1. Draw the schematic diagram of a cassegrain telescope.
2. Deduce the equivalent focal length of two convex lenses of focal lengths F_1 and F_2 when placed in contact.
3. A miopic person uses a lens of power -1.25D. what is his farpoint ?
4. A pair of stars of actual separation one minute of arc is observed with an astronomical telescope of magnifying power 100. What will be the separation of the image of the pair in degree ?
5. "In between a fixed object and a fixed screen, a convex lens can cast two images at two different positions of the lens." Taking this to be a true statement show that product of the image sizes is equal to the square of the object size.

2019

1. Draw a neat diagram to show lateral shift of a ray refracted through a parallel-sided slab. Indicate the lateral shift in the diagram by a double-headed arrow.
2. Establish the relation between the focal length (f) and radius of curvature (R) for a spherical mirror.
3. Draw a ray diagram to show the correction of a myopic eye. The near point of a person with defective eye is 75cm from the eye. Find the power of lens required to see clearly at 25cm from the eye.
4. For refraction at a convex spherical surface of radius of curvature R from a medium of refractive index n_1 to a medium of refractive index n_2 $(n_2 > n_1)$, establish the relation $\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$.

What will be the behaviour of a convex lens of refractive index 1.47 when it is immersed in a liquid of refractive index 1.47 ?

2020

1. A concave mirror of focal length 18cm produces 3 times magnified errect image of an object. Find the position of the object.
2. In a combination of lenses in contact, the power of the first lens is +2.5D and the focal length of the second lens is -25cm. Calculate the power or focal length of the lens combination.
3. Draw a ray diagram of a compund microscope forming an inverted and magnified image of an object. Which lens in the compound microscope acts as a simple microscope? If f_o =1cm, f_e =2cm and L=20 cm respectively, calculate the total magnification of the microscope.
4. You know the phenomenon of scattering of light by the atmospheric particles. Write a few lines about the blue colour of sky and reddish colour of sky in the morning as well as in the evening.
5. In a prism $r_1 + r_2 = A$ and $\delta = i + e - A$. When the prism is at the position of minimum deviation D_m , show that, refractive index of the material of the prism of the prism is

$$\mu = \frac{\sin\left(\frac{A+D_m}{2}\right)}{\sin\frac{A}{2}}$$

Also derive the expression for D_m , for angled prism.
6. Which optical device can produce optical dispersion and which property is responsible for dispersion of light ? draw a diagram to show that it is possible to obtain white light again after dispersion.

2012

1. Which of the following waves can be polarized (i) X-rays (ii) sound waves. Give reasons.
2. Find the expression for frindge width $\beta = \frac{\lambda D}{d}$ for young's double slit interference pattern, where d is the separation between the two coherent sources.

2013

1. How is wavefront defined ? state huygen's principle of propagation of light wave.
2. In a young's double slit experiment two slits are made one millimeter apart and the screen is placed one meter away. What is fringe separation when a monochromatic light of wavelength 500nm is used ?
3. Describe young's double slit experiment and determine the conditions for obtaining bright and dark fringes.

2014

1. State two important differences between interference and diffraction ?
2. Find the expression for frindge width $\beta = \frac{\lambda D}{2d}$ for young's double slit interference pattern, where 2d is the separation between the two coherent sources.
3. What are unpolarised and linearly polarized light waves ? establish Brewster's law. What is a Polaroid ?

2015

1. establish Brewster's law of polarization of light.
2. What is coherent sources ? state two differences between interference and diffraction.
3. Explain the huygen's principle of wave optic. Use this principal to prove the law of refraction in case ofd plane surface.
4. What is blue shift ? Sodium light of wavelength 5890$\dot{A}$ travelling from galaxy is observed to be 5896$\dot{A}$. What is the speed of the galaxy ?

2016

1. Choose the correct answer-
   Accelerated electrons can show
   i. Interference only
   ii. Diffraction only
   iii. Both interference and diffraction
2. Draw the schematic diagram of experimental arrangement used by Davisson and Germer to observe electron diffraction.
3. In a diffraction phenomenon, radius of the central bright region is given as $r_0 \approx \frac{1.22\lambda f}{2a}$, where λ is wavelength of the light, f is the focal length of the lens used and 2a is the diameter of the aperture. Show that in order to observe two objects clearly by a microscope, the minimum separation between them must be $\frac{1.22\lambda}{2\sin\beta}$, where β is the angle between principal axis of the objective and the ray of light from the object to the apex of the lens.
4. A beam of light consisting of wavelengths 6500 Å and 5200 Å is used in Young's double slit experiment of slit separation 2mm and where the screen is 120cm away. Find the distance

to the third fringe from the central maximum for the wavelength 6500 Å. What is the least distance from the central maximum at which the bright fringes due to both wavelengths coincide?

2017

1. The equation of light wave from two sources are $y_1 = a_1 \sin \omega t$ and $y_2 = a_2 \sin(\omega t + \Phi)$ where the symbols have their usual meaning. The individual intensities are I_1 and I_2 . show that the minimum resultant intensity due to superposition is $I_{min} = I_1 + I_2 - 2\sqrt{I_1 I_2}$.

2018

1. Which quantity associated with light wave sets the limit of ability to distinguish very close object ?
2. Two slits are 1mm apart and a screen is placed at same distance. When the slits are illuminated with light of wavelength 500nm, fringe separation obtained on the screen is 0.5mm. what is the distance between the screen and the slits ?
3. With what speed should a galaxy move with respect to the earth so that sodium line at 589nm is observed at 589.6nm ?
4. Deduce snell's law of refraction for a plane wave using Huygen's principle.
5. What is the effect on the interference fringes in young's double slit experiment when the monochromatic sources is replaced by a sources of white light ?
6. If you move the source slit closer to the double slit in young's experiment, what will be effect on the fringes ?
7. "When monochromatic light is incident on a surface separating two media, the reflected and refracted light both

have same frequency as the incident frequency". Is this statement true? If yes, why? If you think it is not true, why?

2019

1. Under what conditions Doppler effect is called (i) red shift and (ii) blue shift ?
2. What are coherent sources ? In a Young's double slit experiment the intensity of light at a point on the screen where path difference λ is k units. Find the intensity at a point where the path difference is $\lambda/3$.

2020

1. State Huygens' principle in optics. Using this principle derive the law of reflection or refraction. Which quantity remains unchanged when a light wave suffers reflection or refraction?
2. With the help of Young's double-slit arrangement to produce interference pattern, derive an expression for fringe width β. Mention at least one difference between the interference fringes and diffraction fringes. Are two identical bulbs of same power and manufactured by the same company coherent sources ?
3. Write short notes on any two of the following :
   (1) Diffraction
   (2) Doppler effect
   (3) Polarisation of wave

DUAL NATURE

2012

1. Express wavelength of matter wave at
2. Write down the einstein's photo-electric equation and then explain the concept of threshold frequency.

2013

1. What is photo electric effect ? Why is photo electric current proportional to the intensity of incident radiation ?

2014

1. Write down Einstein's photo electric equation and explain each of its term.
2. Work function of caesium is 2.14 eV.
   (a) Find its threshold frequency.
   (b) If its stoping potential is 0.60V, find the wavelenghth of the incident radiation.
3. Find wavelenghth of an electron acelerated through a potential difference of 1Volt.

2015

1. What is reverse saturation current ?
2. A monochromatic sources of light operating at 200W emits $4x10^{20}$ photons/sec. Find the wavelength of light. Given $h=6.63x10^{-34}$ J-S, $C=3x10^{8}$ m/s.

3. What is de-brooglie wavelength of an electron in bohr's orbit of radius 0.51$\dot{A}$ in hydrogen atom ?

2016

1. What is the dimension of work function ?
2. A photo electric surface has work function 2eV. What is the maximum velocity of the photoelectrons ejected by light of wavelength 3000$\dot{A}$.

2017

1. There are mainly three ways to eject an electron from the surface of metals. What are those ?
2. If the kinetic energy of a free electron is increased by two times then by how many times will the De-Broglie wavelength be changed ?

2018

1. What is the De.Broglie wavelength associated with (a)an electron of mass 9.11×10^{-34}kg moving with a speed 5.5×10^{6} m/s and (b) a ball of mass 150g travelling at 30m/s ? Given $h=6.63 \times 10^{-34}$ J-s.
2. A laser emits light of frequency 6×10^{14} Hz and power emitted is 2×10^{-3} W. How many photons per second on an average are emitted by the source ?
3. What determines the intensity of light in the photon picture of light ?

2019

1. If the work function of two metals X and Y are 4.17eV and 8.24×10^{-19} J respectively, then for which metal lesser amount of energy will be required to emit an electron ?

2020

1. Guess the shape of the curve which shows the variation of V_o with v in the case of photoelectric emission shown by the relation where the symbols have their usual meaning.

$$V_0 = \left(\frac{h}{e}\right) v - \frac{\emptyset_0}{e}$$

2. De-broglie wavelength of heavier particle is _____ (fill up the blank)
3. What did De-Broglie propose regarding wavelength (λ) associated with a particle of mass m ? An electron of mass m and charge e is accelerated from rest through a potential V. show that the De-Broglie wavelength of the electron is

$$\lambda = \frac{1.227}{\sqrt{V}}$$

$$\left[Given, \frac{h}{\sqrt{2me}} = 1.227\right]$$

4. The threshold frequency for a certain metal is 3.3×10^{14} H_Z is incident on the metal, predict the cutoff voltage for the photoelectric emission.

2012

1. Mention two limitation of Ratherford's model of atom.
2. Explain what is red shift and blue shift of light wave.

2013

1. State Bohr's postulates regarding Bohr's model of the hydrogen atom. FindFind an expression for the radii of the orbits of the electron of the hydrogen atom.
2. State one drawback of Rutherford's model of the atom. What modifications Rutherford's model were suggested by Bohr ? State two limitations of Bohr's mo

2015

1. Obtain Bohr's quantization condition on the basis of the wave nature of an electron
2. Derive an expression for the radius of the first orbit of the electron of the hydrogen atom.

2016

1. Deduce the expression for the total energy of the electron in n^{th} orbit of a hydrogen atom in the bohr model.
2. In hydrogen spectrum the shortest wave length in balmer series is λ. What will be the shortest wavelength in brackett series ?

2017

1. Write down the results of ratherford's α-particle scattering experiment. Which result nullifies the idea of uniform distribution of positive and negative charges in an atom ?
2. In the light of Ratherford's atom model discuss the stability of an atom and state its inability to explain line emission spectrum.

2018

1. What is impact parameter ?

2019

1. If the radius of the first orbit of hydrogen atom is 5.3×10^{-11} m, what is the radius of the third orbit ?
2. Show that the total energy of an electron in an atom is negative and it is

$$E = -\frac{e^2}{8\pi\varepsilon_0}.$$

What is the significance of the negative energy.

2020

1. Write a few lines on bohr model of hydrogen atom.

NUCLEI

2012

1. Define mass defect and how it is related to binding energy? Three a-particles join in succession to form $C^{1}2$ nucleus in a star What amount of energy is released in thir reaction ? (Take mass of Cl2 as 12r and mass of a-particle as 4-002604u).
2. What is nuclear fission and nuclear fusion Name one moderator used in nuclear reaction.

2013

1. Find the dimension of Planck's constant.
2. What is the change of atomic number Z of a nucleus when it emits a B-pa 77thrticle

2014

1. Explain mass defect and binding energy.
2. If $m(^{14}_{7}N) = 14.00307\ u$, calculate the binding energy of the nitrogen nucleus in MeV. $m_n = 1.008665u, m_e = 0.00548u, m_p = 1.00727u$

2015

1. Give the dimension of planck's constant.
2. What is an α-particle ?
3. Obtain the binding energy of the nuclei $^{56}_{26}Fe$ and $^{209}_{83}Bi$ in units of MeV from the given data

   $m_H = 1.007825amu$

$m_n = 1.008665amu$

$m\left(^{56}_{26}Fe\right) = 55.934939amu$

$m(^{209}_{83}Bi) = 208.980388amu$

1amu=931.5Mev

Which nucleus has greater binding energy per nucleon ?

2016

1. How much energy is produced inside the sun ? Explain with the proton-proton cycle.
2. How much energy should be given to uranium to eject one proton from its nucleus ?

   Given

   $^{238}_{92}U = 238.05079\ amu$

   $^{237}_{91}Pa = 237.05121\ amu$

   $^{1}_{1}H = 1.00783\ amu,$

   1amu= 931.5 MeV

2017

1. What is the dimension of planck's constant ?
2. If you free a neutron from a nuvleus, it will decay into three particles. Two of them are proton and electron. What is the third particle ?
3. How was the neutron discovered by James Chadwick ?
4. By which process does a Cobalt nucleus change into a Nickel nucleus ?

2018

1. Briefly describe the working of a nuclear reactor.
2. Give one example each of Alpha, Beta and Gamma decay.

3. Derive an expression for the mean life of a radioactive substance.
4. Write down the different sets of reaction of proton-proton cycle of fusion reaction in the sun.

2019

1. Explain the source of solar energy with the help of proton-proton cycle. What is the role of cadmium rods in a nuclear reactor ?

2020

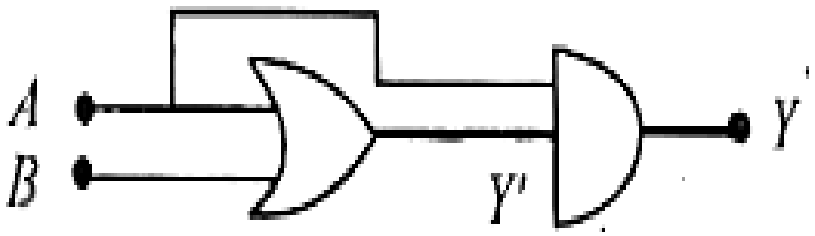
1. In 1885, a Swedish school teacher observed a series of spectral lines in the visible region of the hydrogen spectrum. Name the spectral series. If R (Rydberg constant) = 1.097 x $10^{-7}m^{-1}$ and $(^1/_2\,2 - {}^1/_3\,2)$=0.138, calculate the wavelength λ of H_α line.
2. A difference of 2.3 eV separates two energy levels in an atom. What is the frequency of radiation emitted when the atom makes a transition from the upper level to the lower level ?
3. Write complete expression of conversions of (1) $^{32}_{15}P$ to S due to β^- decay and (2) $^{22}_{11}Na$ to Ne due β^+ decay.
4. Explain in brief, how do the positively charged protons reside unitedly within the nucleus.
5. What are the types in which radioactive decay takes place ? If N is the number of nuclei in a radioactive sample and ΔN undergo decay in time Δt, show that

$$N(t) = N_0 e^{-\lambda t}$$

SEMICONDUCTORS

2012

1. β of a given transistor is 99. What is the value of α.
2. Draw the circuit diagram of a common emitter n-p-n transistor is an amplifier. Would you prefer to use a transistor as a common base or a common emitter amplifier and why?
3. Draw the circuit diagram of a full wave rectifier. Explain the principal of a photo diode with necessary circuit diagram.
4. Explain the principal of light emitting diode (LED) with proper symbolic representation. State two advantages of LED over incandescent lamps.
5. Complete the truth table for the logic circuit shown below:



6. Draw the circuit diagram of full-wave rectifier. How output can be smoothed after rectification ?
7. Briefly describe the construction and working of a typical p-n junction solar cell.

2013

1. State the basic process involved in the generation of emf in solar cell when light falls on it.

2. What is energy band gap of a semiconductor ? what range of energy band gap of semiconductors is suitable for using in solar cells ?
3. Draw the diagram to show how a p-n junctions is (a) forward biased and (b) reverse bised. Draw V-I characteristics of the diode in both conditions and show in it break down voltage. Mention one important use zener diode.
4. Draw a circuit diagram of a transistor amplifier in CE configuration. Find a expression for its AC current gain.

2014

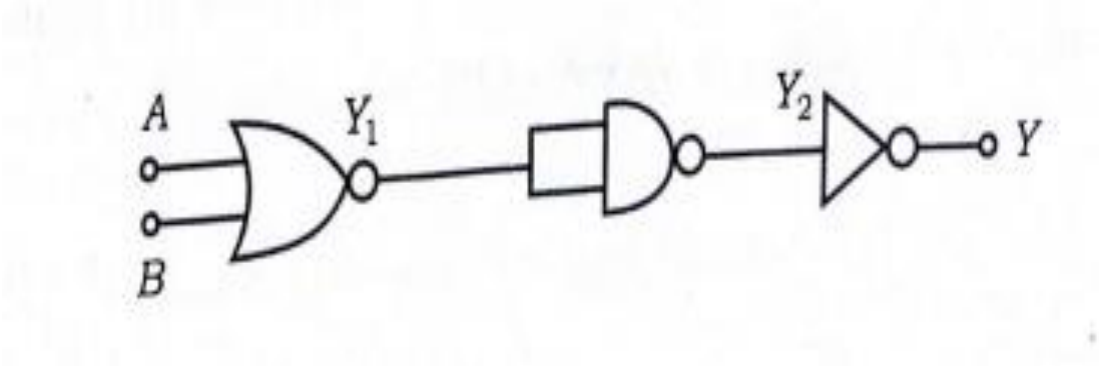
1. Write down truth table of NAND gate.
2. Give one use of solar cell.
3. Draw common-emitter amplifier circuit using an n-p-n transistor and explain the amplifier action. Find an expression of AC voltage gain.
4. What is photodiode? Explain its working principal. What is a solar cell ?

2015

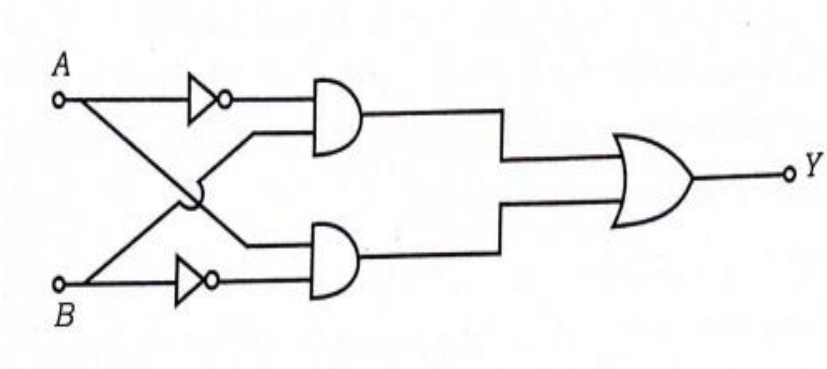
1. How is a NOT gate realized with the help of a transistor ? give its truth table.
2. B is a transistor is 120. What is the change in collector current for 100uA change in base current ? draw at least two input characteristics of a CE mode transistor.
3. What is break down voltage of zener diode ? Explain its use as a voltage regulator.
4. Draw a circuit diagram of a full wave rectifier and explain its working.

2016

1. Why is photo diode preferably used in the reverse bias condition for measuring light intensity ?
2. Explain how a transistor can be used as a switch with the help of a circuit diagram ?
3. For a common emitter amplifier the voltage across collector resistance 2kohm is 2V. if the current amplification factor is 200 and base resistance is 1.5 ohm , what is the input volage ?
4. What is equivalent circuit of the combination given below ? Answer with proper truth table.



5. Give the truth table for the following logic circuit.



2017

1. What is zener diode ? How is it biased in normal operation ?
2. Compare the working principal of a LED and a photodiode.
3. How will you dope a pure silicon crystal to obtan a p-type and an n-type Semiconductor.

4. Give the comparative discussion on majority and minority carriers in n-type and p-type Semiconductors.
5. With the help of graphs, show, how resistivity changes with temperature in the cases of (i) Copper , (ii) Nichrome and (iii) Semiconductor.
6. Draw the circuit diagram of a full wave rectifier and explain its working.
7. Sketch inputs A,B and output Y from a NAND gate from the table given below.

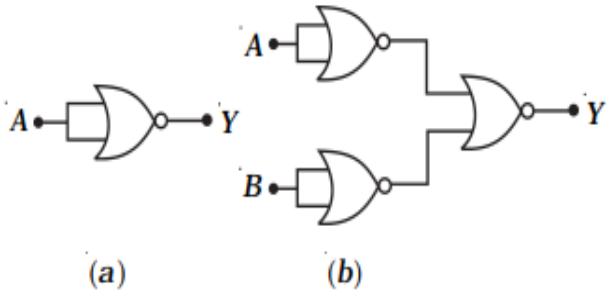
Time	*Input A*	*Input B*
$t < t_1$	1	1
t_1 to t_2	0	0
t_2 to t_3	0	1
t_3 to t_4	1	0
t_4 to t_5	1	1
t_5 to t_6	0	0

2018

1. ICs can be grouped in two categories. What are they?
2. Describe the action of a transistor as a switch with the help of a circuit diagram.
3. For a common emitter transistor amplifier, the output voltage across the collector resistance of 2kohm is 2V. If the current amplification factor B=100 find the input signal voltage. The base resistance is 1kohm.

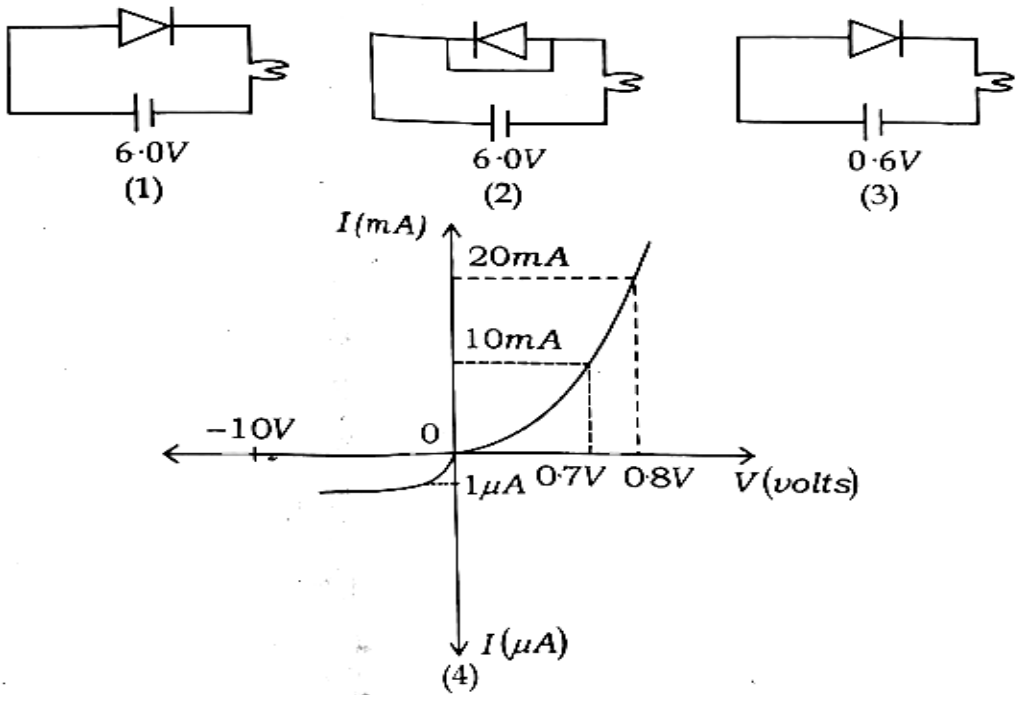
2019

1. Name the only gate which is used in the following circuit. Write the truth table for each of the circuits. Identify the logic operation (i.e. OR, AND, NOT etc) performed by the circuis.



2020

1. When si is doped with B, what will be the type of resulting semiconductor ? Will it possess overall charge neutrality ? Under what condition $n_e n_h = n_i^2$?
2. In which of the following case(s) the bulb will not glow, explain in very brief. Calculate the forward and reverse resistance of a si diode from the following V-I characteristics shown in the figure 4.



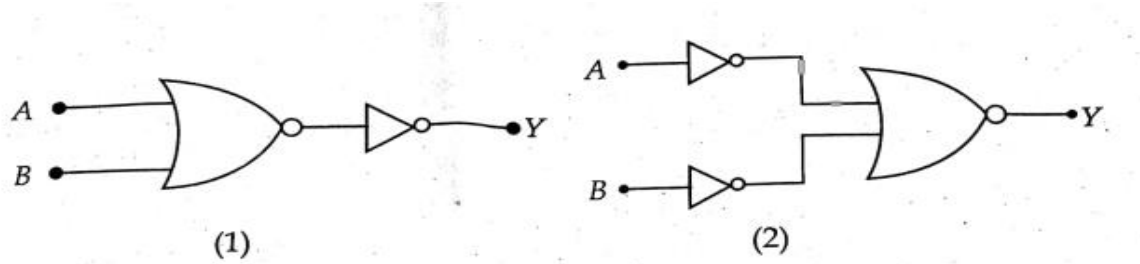
3. You know the in order get a regulated DC voltage we connect a zener diode across the outrput terminals of a rectifier. Draw a circuit diagram comprising a zener diode, series resistor (R_s) and a load resistor (R_L). Indicate the directions of currents I_z, I_S (=I, the total current) and I_L passing through a zener diode, R_S And R_L respectively. Choose the correct option from the following

(1) $I_L = I_Z$ (2) $I_L > I_Z$ (3) $I_L < I_Z$

How can we achive the right option ?

In such a circuit if V_Z=6.0 V , I_L=20mA and the unregulated input is 10V , calculate the value of series resistor to work satishfactorily.

4. What is a logic gate ? Identify the logic operation carried out by the circuit shown below and write the truth table for each of them.



5. You want to run an electric motor using a self-made full wave rectifier. Draw a neatly labelled diagram to serve your purpose. (Use the symbol ⊙ for the electric motor)

COMUNICATION

2012

1. Draw block diagram of a generalised communication system.

2013

1. What is differernce between analog and digital signals.
2. What is transducer ?
3. Why is modulation necessary ? what is amplitude modulation ? Draw a block diagram of a simple modulator circuitfor for obtaining A.M. signal.
4. What is mopdulation index ? A massage signal of frequency 10KH_Z and peak voltage 10 volt is used to modulate a carrier wave of frequency 1MH_Z and peak voltage 20volts. Determine its modulation index.

2014

1. Define 1 curie unit of radio-activity. What do you mean by 'half life' ?
2. Draw a labeled block diagram of a radio transmitter.
3. What is demodulation ? why is satellite communication necessary for TV signal ? What is nibble ?
4. What is the basic difference between amplitude modulation and frequency modulation ? Discuss the role of ionosphere in radio-wave communication.

2015

1. What percentage of power of AM wave is carried by the side brands for modulation index m=1 ?
2. How is the critical frequency related to electron density in the ionosphere ?
3. What is digital communication ? Mention two advantages of digital communication.
4. What are sidebands of an AM wave ? Compare AM with FM wave.

2016

1. What is Communication ?
2. In a communication system, what do you mean by (i) Transducer and (ii) Signal ?
3. The transmitting antenna at the top of a tower has a height of 32m. The height of the receiving antenna is 50m. what is the maximum distance between them for satisfactory LOS mode Communication ? Radius of earth is 6.4×10^3 Km
4. Draw a block diagram of generalised communication system.
5. For an AM wave, the maximum amplitude is found to be 10V while minimum amplitude is found to be 2V. Determine the modulation index.

2017

1. What is the different component of a TV signal ? write down the bandwidth of speech and TV signal.
2. What are the different transmission media for communication ? Give their bandwidth.

3. How will you you detect amplitude modulated waves ? Explain with block diagram.
4. Discuss briefly the three modes of propagation of electromagnetic waves.

2018

1. What is attenuation of signal in communication system ?
2. Define the following terms used in electronic communication —
   (a) Transducer, (b)Noise
3. Give a short description of the following mode of propagation of an electromagnetic wave—
   (a) Sky waves, (b) Space waves.
4. Draw the block diagram of a detector for AM signal wuth waveforms at different stages.
5. Draw the block diagram of generalised communication system.

2019

1. A very interesting fact regarding electromagnetic waves can be seen with the help of a portable AM radio. What is it ?
2. Arrange the following communication methods / modes in descending order on the basis of their operating frequency.
   (i)AM Radio transmission
   (ii) Cellular communication
   (iii) Sky wave propagation
   (iv) Satellite communication

3. What is modulation index ? If the maximum amplitude of an amplitude modulated wave is 10V and the minimum amplitude is 2V, what is the value of modulation index ?
4. You know that the modulated signal in amplitude modulation (AM) is expressed as given below

$$C_m(t) = A_C \sin \omega_C t + \frac{\mu A_C}{2} \cos(\omega_C - \omega_m)t - \frac{\mu A_C}{2} \cos(\omega_C + \omega_m)t.$$

Plot the frequency spectrum of the signal i.e. a plot of amplitude
versus ω. Write what will happen if the modulation index $\mu > 1$. What are sidebands ? Write the full forms of PAM, PDM, PWM and PPM.

2020

1. Name the equipment which can transmit optical signal through it and are used as 'light pipe'.
2. The loss of strength of a signal while propagating through a medium is called_____.
3. Video signals for transmission of pictures require about 4.2 MHz of bandwidth. A TV signal requires 6 MHz of bandwidth for transmission. Explain in brief. Mention the bandwidth for speech signal.

Note:

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