

B.R.MODERN SCHOOL (PHYSICS QUESTIONS FOR CLASS 12TH)

Q1-A hollow cylindrical box of length 1m and area of cross-section 36cm^2 is placed in a three dimensional coordinate system as shown in the figure. The electric field in the region is given by $E = 50x\hat{i}$, where E is in N/C and x is in metres. Find: (i) Net flux through the cylinder. (ii) Charge enclosed by the cylinder.

Q2-Find the ratio of potential differences that must be applied across the parallel and series combination of two capacitors with their capacitances in the ratio 1:2 so that the energy stored in the two cases becomes the same.

Q3-A cell of emf 'E' and internal resistance 'r' is connected across a variable load resistor R. Draw the plots of terminal voltage V versus (i) R and (ii) current I.

It is found that when $R = 4\ \Omega$, the current is 1 A and when R is increased to 9 Ohm, the current reduces to 0.5 A. Find the values of the emf E and internal resistance r.

Q4-A galvanometer coil of $50\ \Omega$ resistance shows full scale deflection for a current of 5 mA. How will you convert this galvanometer into a voltmeter of range 0 to 15 V.

Q5-A small compass needle of magnetic moment 'M' and moment of inertia 'I' is free to oscillate in a magnetic field 'B'. It is slightly disturbed from its equilibrium position and then released. Show that it executes simple harmonic motion. Hence, write the expression for its time period.

Q6-An inductor 200 mH, capacitor 500 μF , resistor $10\ \Omega$ are connected in series with a 100 V variable frequency a.c. source. Calculate the

- (i) Frequency at which the power factor of the circuit is unity. (ii) Current amplitude at this frequency
- (ii) Q-factor

Q7-Define mutual inductance of a pair of coils and derive the expression for mutual inductance between two coils.

Q8-When an ideal capacitor is charged by a dc battery, no current flows. However, when an ac source is used, the current flows continuously. How does one explain this, based on the concept of displacement current?

Q9- A capacitor of capacitance, C is being charged by connecting it across a DC source along with an ammeter. Will the ammeter show a momentary deflection during the process of charging? If so, how would you explain this momentary deflection and the resulting continuity of current in the circuit? Write the expression for the current inside the capacitor.

Q10-A small telescope has an objective lens of focal length 150 cm and an eye piece of focal length 5 cm. If this telescope is used to view a 100 m high tower 3 Km away, find the height of the final image when it is formed 25 cm away from the eye piece.

Q11-Two wavelengths of sodium light 590 nm and 596 nm are used, in turn to study the diffraction taking place at a single slit of aperture $2 \times 10^{-4}\text{m}$. The distance between the slit and the screen is 1.5 m. Calculate the separation between the positions of the first maxima of the diffraction pattern obtained in the two cases.

Q12-Plot a graph showing the variation of photoelectric current with the intensity of light. The work function for the following metals is given. Na: 2.75 eV and Mo: 4.175 eV.

Which of these will not give photoelectron emission from a radiation of wavelength $3300\ \text{\AA}$ from a laser beam? What happens if the source of laser beam is brought closer?

Q13-An alpha particle and a proton are accelerated from rest by the same potential. Find the ratio of their de Broglie wavelengths.

Q14-A 12.5 eV electron beam is used to bombard gaseous hydrogen at room temperature. Upto which energy level the hydrogen atoms would be excited? Calculate the wavelengths of the first member of Lyman and first member of Balmer series.

Q15-Draw the circuit diagram of a p-n diode used as half-wave rectifier. Explain its working.

Q16-By what percentage will the transmission range of a TV tower be affected when the height of the tower is increased by 21%.

Q17-Two isolated metal spheres A and B have radii R and 2R respectively, and same charge q. Find which of the two spheres have greater (i) Capacitance and (ii) energy density just outside the surface of the spheres.

Q18-In a transistor, doping level in base is increased slightly. How will it affect (i) collector current and (ii) base current.

Q19-Show graphically, the variation of the de Broglie wavelength λ with the potential (V) through which an electron is accelerated from rest.

Q20-Why is the magnetic field radial in a moving coil galvanometer? Explain how it is achieved.

Q21-The horizontal component of earth's magnetic field at a certain place is $3 \times 10^{-5}\text{ T}$ and the direction of the field is from the geographic south to geographic north. A very long straight conductor is carrying a steady current of 1 A. What is the force per unit length on it when it is placed on a horizontal table and the direction of current is (a) east to west (b) south to north?

- Q22-How does the fringe width of interference fringes change , when the whole apparatus of Young's experiment is kept in a liquid of refractive index 1.3 ?
- Q23-Prove that an ideal capacitor in an ac circuit does not dissipate power.
- Q24-A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q . A charge q is placed at the centre of the shell .What is the surface charge density on the inner and outer surface of the shell ?
- Q25-A slit of width 'a' is illuminated by a monochromatic light of wavelength 700 nm at normal incidence .Calculate the value of 'a' for position of
- First minimum at an angle of diffraction of 30°
 - First maximum at an angle of diffraction of 30°
- Q26-A screen is placed 90 cm from an object .The image of the object on the screen is formed by a convex lens at two different locations separated by 20 cm .Determine the focal length of the lens .
- Q27-A ray of light is incident on an equilateral glass prism shows minimum deviation of 30° .Calculate the speed of light through the glass prism.
- Q28-Explain with the help of an example ,whether the neutron – proton ratio in a nucleus increases or decreases due to beta decay .
- Q29-If the input frequency is 50 Hz , find the output frequency for (i) Half-wave rectifier (ii) full –wave rectifier
- Q30-In a zener regulated power supply a Zener diode with $V_z = 6.0$ V is used for regulation .The load current is to be 4.0 mA and the regulated input is 10.0 V .What should be the value of series resistor R_s .
- Q31- Magnetic field lines can be entirely confined within the core of a toroid , but not within a straight solenoid .Why?
- Q32-What is the de Broglie wavelength associated with an electron , accelerated through a potential of 100 V ?
- Q33-Two point charges $4 \mu\text{C}$ and $-2 \mu\text{C}$ are separated by a distance of 1 m in air. Calculate at what point on the line joining the two charges is the electric potential zero?
- Q34-Two capacitors of unknown capacitances are connected first in series and then in parallel across a battery of 100 V .If the energy stored in the two combinations is 0.045 J and 0.25 J respectively ,determine the value of each capacitance .Also calculate the charge on each capacitor.
- Q35-A jet plane is travelling towards west at a speed of 1800 Km/h (i) Estimate voltage difference developed between the ends of the wing having a span of 25 m if the earth's magnetic field at the location
- Q36-Draw the circuit diagram of CE transistor amplifier .Briefly explain its working and derive the expression for voltage gain.
- Q37-Draw a sketch of plane em wave travelling along the z-direction .Depict clearly the directions of electric and magnetic fields .
- Q38-A long straight wire of a circular cross section of radius 'a' carries a steady current 'I' .The current is uniformly distributed across the cross-section .Apply Ampere's circuital law to calculate the magnetic field at a point 'r' in the region for (i) $r < a$ and (ii) $r > a$
- Q39- Why is it necessary to (a) use a long wire (b) have uniform area of cross –section of the wire and (c) use a driving cell whose emf is taken to be greater than the emf of primary cell ?
- Q40-Current in a circuit falls steadily from 5 A to 0 A in 100 ms .If an average emf of 200 V is induced ,calculate the self inductance of the circuit .
- Q41-Draw the plot of binding energy per nucleon as a function of mass number A .Write two important conclusions that can be drawn from this graph.
- Q42-State Gauss' law in electrostatics .Use this law to derive an expression for the electric field due to an infinitely long straight wire.
- Q43-Write Einstein's photoelectric equation and explain the laws of photoelectric emission on the basis of this equation.
- Q44-How are infrared rays produced ? Why are these referred as heat waves?Write its frequency range and one use.
- Q45-A convex lens of refractive index 1.5 has a focal length of 18 cm in air .Calculate the change in focal length when it is immersed in water of refractive index $\frac{4}{3}$.
- Q46-Increasing the current sensitivity may not necessarily increase voltage sensitivity .Why?
- Q47-Using ampere's circuital law ,obtain an expression for the magnetic field along the axis of a current carrying solenoid of length l and having N number of turns .
- Q48-Define activity of a radioactive substance and write its SI unit.
- Q49-What is the role of bandpass filter in communication system?
- Q50-A proton and an alpha particle are accelerated through the same potential .Which one of the two has
- greater de-broglie wavelength
 - less kinetic energy .