UP Board Class 12 Physics 2024 (Code 346 FT) Question Paper

General Instructions

(i) This question paper contains 9 questions. All questions are compulsory.

(ii) It has multiple-choice questions as well as questions that need a written answer.

(iii) Attempt every question; detailed solutions are provided in the companion solutions booklet.

1(a).

Electric charges are uniformly distributed in a small volume. The flux of electric field through a spherical surface of radius 2 cm surrounding the total charge is 10 V x m. The flux over a sphere of radius 4 cm will be:

(A) 10 V x m

(B) 20 V x m

(C) 40 V x m

(D) 80 V x m

1(b).

A moving charge produces:

(A) electric field only

(B) magnetic field only

(C) both electric and magnetic fields

(D) none of the above

1(c).

An electromagnetic wave propagating through vacuum, described by $E = E_0 \sin(kx - \omega t)$, $B = B_0 \sin(kx - \omega t)$, then:

(A) $E_0 k = B_0 \omega$

(B) $E_0 \omega = B_0 k$

(C) $E_0 B_0 = \omega k$

(D) $E_0 B_0 = \sqrt{\omega k}$

1(d).

A double convex lens is made of a material having refractive index 1.2. Both the surfaces of the lens are convex. If it is dipped into water of refractive index 1.33, it will behave like:

(A) a convergent lens

(B) a divergent lens

(C) a rectangular slab

(D) a prism

1(e).

The equation $E = pc$, (where E and p are energy and momentum respectively) is valid:

(A) for an electron as well as for a photon.

(B) for an electron but not for a photon.

(C) for a photon but not for an electron.

(D) neither for an electron nor for a photon.

1(f).

Diffusion current in a p-n junction is greater than the drift current in magnitude:

(A) if the junction is forward biased

(B) if the junction is reverse biased

(C) if the junction is unbiased

(D) in none of them

2(a).

Write the equation for the relationship between specific conductivity (σ) and drift velocity (v_d).

2(b).

State Ampere's Circuital Law.

2(c).

Find the value of 1 kWh in Joules.

2(d).

Deduce the dimensional equation of self-inductance.

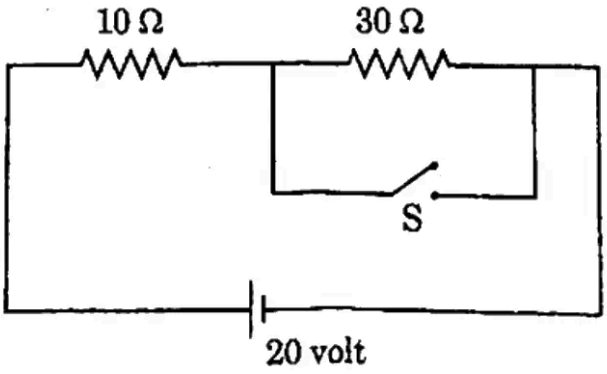
2(e).

Ionisation energy of Hydrogen atom is 13.6 eV. In a state where $n = 2$, what will be ionisation energy of its electron?

2(f).

Define the 'wavefront' of a wave.

3(a).

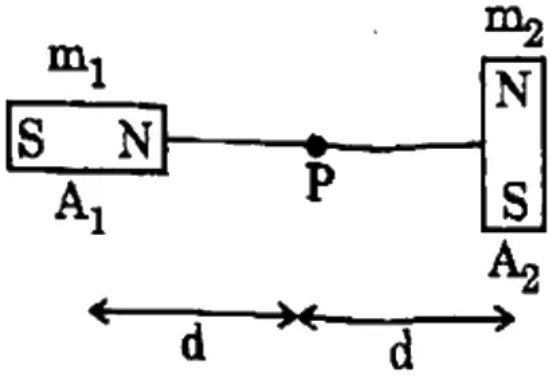


Find the current through the 10 Ω resistor when the switch S is open and closed in the given circuit.

3(b).

Calculate the energy equivalence of unified atomic mass unit.

3(c).



Two magnets of equal magnetic moment ($m_1 = m_2$) are placed as shown in the figure. If magnetic field intensity at P due to magnet A_1 is 2×10^{-3} Tesla, then find out total magnetic field intensity at P due to both the magnets.

3(d). In a Silicon p-n junction diode, for 20 V forward voltage the forward current produced is 10 mA. Calculate its forward resistance.

4(a).

Deduce the formula of torque on an electric dipole placed in a uniform electric field.

4(b).

The intensity of the magnetic field B due to a current-carrying circular coil of radius 12 cm at its center is 0.5×10^{-4} Tesla perpendicular to the plane of the coil upward. Calculate the magnitude and direction of current flowing in the coil.

4(c).

What is total internal reflection and critical angle? What is the working principle of Optical Fibre.

4(d).

In the given circuit, find the potential difference between A and B.

4(e). Define Mutual Inductance. Show that $\frac{\text{Henry}}{\text{Meter}} = \frac{\text{Newton}}{\text{Ampere}^2}$.

5(a).

What is the value of resistance of ideal ammeter and ideal voltmeter? Why are an ammeter and a voltmeter respectively connected in series and parallel in a circuit?

5(b).

A coil has a resistance of 10 Ω and inductance of 0.4 Henry. It is connected to an AC source of 6.5 V, 30 Hz. Find the average power consumed in the circuit.

5(c).

Explain Maxwell's displacement current and write its equation. What is the phase difference between it and the conduction current?

5(d).

What is interference of light? Mention the condition for (A) constructive and (B) destructive interference.

OR

What is polarization of light ? State the principle and two uses of a polaroid.

5(e).

Find the maximum magnitude of velocity and linear momentum of a photoelectron emitted when light of wavelength 4000 Ã... falls on a metal having work function 2.5 eV.

6.

State and explain Gauss's law in electrostatics. Using it, find the electric field due to a uniformly charged thin spherical shell (charge = q and radius = R) at

(A) external point of shell

(B) internal point of shell

(C) on the surface of shell.

OR

Calculate the following in the given circuit:
(A) The equivalent capacitance of the circuit.
(B) The charge on $3\,\mu$F and $2\,\mu$F capacitors.
\includegraphics[]{equivalent capac.PNG}

7. Explain image formation in a reflecting telescope with the help of a ray diagram. Compare its qualities with a refracting telescope.

OR

Explain the differences between diffraction and interference of waves. Observe qualitatively the diffraction pattern of a single slit.

8. Explain postulates of Bohr's model for Hydrogen atom. Show the number of lines in the (A) emission and (B) absorption spectra of Hydrogen atom corresponding to transition between energy states $n = 1$ and $n = 4$.

OR

What is meant by binding energy of a nucleus ? Draw variation of binding energy per nucleon against the mass number. Discuss fission and fusion with the help of this variation.

9. Calculate the conductivity of an n-type semiconductor from the following data: Density of conduction electrons = $8 \times 10^{13}\ cm^{-3}$ Density of holes = $5 \times 10^{12}\ cm^{-3}$ Mobility of electrons = $2.3 \times 10^{4}\ cm^{2}/V\text{-}s$ Mobility of holes = $100\ cm^{2}/V\text{-}s$

OR

Explain the depletion layer and potential barrier in the formation of p-n junction. How are both changing in the condition of forward biasing and reverse biasing ?