UP Board Class 12 Physics 2024 (Code 346 FS) 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). The Louis de Broglie wavelength of a particle having kinetic energy E is:

(A) $\lambda = \frac{h}{\sqrt{2mE}}$

(B) $\lambda = \frac{h}{\sqrt{mE}}$

(C) $\lambda = \frac{\sqrt{2mE}}{h}$

(D) $\lambda = \frac{\sqrt{mE}}{h}$

1(b). If drift velocity of electron be v_d and intensity of electric field E, then which relation among the following obeys Ohm's law?

(A) $v_d \propto E^2$

(B) $v_d =$ Constant

(C) $v_d \propto E$

(D) $v_d \propto \sqrt{E}$

1(c).

The path of scattered α-particle is:

(A) Circular

(B) Parabolic

(C) Elliptical

(D) Hyperbolic

1(d).

The maximum focal length of convex lens is for:

(A) Blue light

(B) Green light

(C) Red light

(D) Yellow light

1(e).

The power consumed in alternating current in a circuit containing only a capacitor will be:

(A) $P = -1$

(B) $P = 0$

(C) $P = +1$

(D) None of the above

1(f).

Force of 80 Newton works between two point charges placed at a fixed distance apart in air. When these charges are placed at the same distance apart in a dielectric medium, then the force of 8 Newton works on it. The dielectric constant of the medium will be:

(A) $K = -10$

(B) $K = 10$

(C) $K = 0.01$

(D) $K = -0.01$

2(a).

Find the ratio of the focal length of lens in air and that of lens when it is immersed in liquid.

2(b).

In hydrogen atom, what is the ionization potential of the electron in the ground state?

2(c).

Write the definition and dimensional formula of electrical conductivity.

2(d).

Which value of current does the ammeter used in A.C. circuit measure?

2(e).

How much charge is there on a hole? Draw the circuit symbol of p-n junction diode.

2(f).

Between radio waves and microwaves, which one has a higher frequency?

3(a).

Define the mass defect and binding energy of nucleus.

3(b).

A double concave lens has to be made from crown glass. How much should the radii of surfaces of lens be kept to make the power of lens -2.5 D? Refractive index of crown glass is 1.65.

3(c).

Explain the operation of p-n junction diode in forward bias.

3(d).

What is the effect on range and sensitivity of an ammeter when the value of its shunt resistance increases?

4(a).

If a thin prism of glass is immersed in water, then prove that the minimum deviation produced by the prism becomes one-fourth with respect to air. Given refractive index of glass with respect to air = $\frac{3}{2}$ and that of water with respect to air = $\frac{4}{3}$.

4(b).

Discuss the significance of displacement current and find the phase difference between it and the conduction current.

4(c). Explain nuclear fission and nuclear fusion with examples.

4(d).

A plastic ball P of mass 3.2×10^{-15} kg is suspended between two horizontal parallel charged plates in a balanced state. How many electrons on the ball will be increased or decreased? ($g = 10\,m/s^2$)

4(e). What are electromagnetic waves? Draw their propagation diagram. Show the electric field amplitude and magnetic field amplitude in propagation diagram.

5(a).

Define interference. Mention the condition for constructive and destructive interference.

5(b).

The atomic mass of ^{16}O is 16.0000 amu. Calculate its binding energy per nucleon. Mass of electron = 0.00055 amu, mass of proton = 1.007593 amu, mass of neutron = 1.008982 amu, and 1 amu = 931 MeV.

5(c).

Determine the nature of force acting between two parallel current-carrying conductors when:
(i) Current is in the same direction in conductors,
(ii) Current is in the opposite direction in conductors.

5(d).

Establish the relation between resistances of arms of Wheatstone bridge in balanced condition.

OR

The resistance of a wire is 16 ohms. By melting it, the wire is stretched to half of its original length. What will be the resistance of the new wire?

5(e).

Obtain the expression for capacity of a parallel plate capacitor. How will the capacity of the capacitor be increased?

6.

What is Bohr's quantum condition postulate? How is it explained by de Broglie? What are the shortcomings of Bohr's atomic model?

OR

Energy of a particle at absolute temperature T is of the order of kT. Calculate the wavelength of thermal neutrons at 27Â°C. Find the energy of a photon having the same wavelength. Here, k is the Boltzmann constant.

7.

By drawing a ray diagram, explain the formation of image in a compound microscope. Establish the formula for magnifying power for it.

OR

In a circuit, the equation for alternating voltage V is represented by $V = 40\sin(100\pi t)$ volt. Here t is in seconds. Draw the time-voltage (t-V) graph with proper scale for one cycle. Calculate the root mean square value of voltage.

8.

What is atomic model of magnetism? Differentiate between paramagnetic, diamagnetic, and ferromagnetic substances on this basis. Also, give one example of each.

OR

There is minimum deviation of light ray on passing through a prism (n = $\sqrt{3}$). If the angle of incidence is twice the angle of refraction for this ray, then what will be the angle of prism and the angle of refraction?

9.

Compare features of p-type and n-type semiconductors. Draw circuit diagram of half-wave rectifier of p-n junction diode and explain it.

OR

State Gauss's Law in electrostatics. Using it (i) find electric field due to a point source charge q and (ii) deduce Coulomb's law between source charge q and test charge q_0.