UP Board Class 12 Physics 2024 (Code 346 FX) 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). In lens maker formula $\frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$, which focal length is used?

(A)

Always first

(B)

Always second

(C)

First or second any one

(D)

None of these

1(b). What is the nature of n-type semiconductor?

(A)

Negatively charged

(B)

Positively charged

(C)

Neutral

(D)

None of these

1(c). In nuclear reaction, $^{15}_{7}N + ^{1}_{0}n \rightarrow ^{14}_{6}C + P$, what is P?

(A)

Proton

(B)

Deuteron

(C)

Alpha particle

(D)

Electron

1(d). The equivalent resistance of 5 equal resistances connected in series and parallel are R_1 and R_2 respectively. If $R_1 = nR_2$, then what will be the possible value of n?

(A) $\frac{1}{25}$

(B) $\frac{1}{5}$

(C) 5

(D) 25

1(e). Which of the following is the unit of electric flux?

(A) \text{volt Ã— second}

(B) \text{volt Ã— metre}

(C) \text{coulomb Ã— second}

(D) \text{coulomb Ã— metre}

1(f). If the resistance of ammeter and milli-ammeter are x_1 and x_2 respectively, then:

(A) $x_1 > x_2$

(B) $x_1 = x_2$

(C) $x_1 < x_2$

(D) $x_1 \geq x_2$

2(a). Write the relation between SI and MKS units of electric power.

2(b). Which type of field is produced around a current carrying conductor and why?

2(c). If ε_0 and μ_0 represent permittivity and permeability of free space, then $\frac{1}{\sqrt{\varepsilon_0 \mu_0}}$ represents which physical quantity?

2(d). How are optical ray and wavefront related with each other?

2(e). Define energy band in solids.

2(f). Who discovered the photoelectric effect?

3(a). A capacitor of capacity $10\,\mu F$ is charged with a source of 2 volt. Calculate (i) the energy obtained from the source and (ii) the energy stored in the capacitor.

3(b). A cell has electromotive force 1.5 volt and internal resistance 0.2 ohm. It is connected with an external resistance of 2.8 ohm. Calculate (i) the potential difference across the open ends of the cell and (ii) the current obtained from the cell.

3(c). If wavelength λ represents wave property and momentum p represents the particle property, then what will the expressions $\lambda = \frac{h}{p}$ and $p = \frac{h}{\lambda}$ represent?

3(d). If the mass defect of a nucleus is 2×10^{-6} kg, then calculate its binding energy in (i) joule and (ii) electron-volt.

4(a).

On which factors and how do the following depend?

(i) Internal resistance of cell

(ii) Resistance of conductor

4(b). A plane electromagnetic wave is represented by the equation

$$E = 100\cos(6 \times 10^8 t + 4x)\,\text{volt/metre.}$$

Calculate the following:
(i) The refractive index of the medium
(ii) The velocity of electromagnetic wave in the medium
(iii) The expression for magnetic field

4(c).

Explain the difference between the following substances with the help of examples:

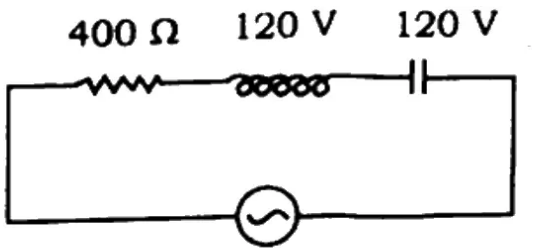
(i) Paramagnetic
(ii) Diamagnetic
(iii) Ferromagnetic

4(d). The angle of prism is equal to its minimum deviation angle (δ_m). In minimum deviation condition, calculate the following:
(i) The angle of incidence
(ii) The angle of refraction
(iii) The refractive index of the material of the prism.

4(e). What are forward biasing and reverse biasing in p-n junction? Explain the difference between forward current and reverse current.

5(a). A proton, a deuteron and an alpha particle of same velocity enter perpendicularly in an uniform magnetic field of 10^5 tesla. Calculate the ratio of their time periods of revolution.

5(b).



V = 200 cos 50πt volt

Calculate the following for given circuit :
i) Current in the circuit
ii) The potential across resistance
iii) The phase difference between the potentials across inductor and capacitor.

5(c). In a spherical mirror, the distance between the focus point and centre of curvature is 20 cm. Calculate the following and write their names: (i) The distance of pole of mirror from its focal point.
(ii) The distance of pole of mirror from its centre of curvature.
\vspace{0.5cm} **(i) The distance of pole of mirror from its focal point**

5(d). What is meant by threshold wavelength λ_0 and threshold frequency ν_0 in photoelectric effect? On which factors do the saturation current and the value of cut-off voltage depend?

5(e). What is *p-n* junction rectifier? Draw circuit diagram of (i) half-wave rectifier (HWR) and (ii) full-wave rectifier (FWR). (i) Half-Wave Rectifier (HWR)

OR

Compare *n*-type and *p*-type semiconductors on the basis of following :
i) The nature of doping material
ii) Majority and minority charge carriers
iii) The relation between conductivity and mobility.

6. When a capacitor of capacity C is charged with charge q and potential difference V, the electric field E and the electrostatic energy U is obtained between plates of capacitor. If the capacitor is disconnected from the source and a slab of medium having the same thickness and dielectric constant k is introduced completely between the plates, calculate the new values of the following:
(i)Capacity
(ii) Potential difference
(iii) Charge
(iv) Electric field
(v) Electrostatic potential energy
(i) Capacity

OR

What is the main difference between a cell and a battery? In which conditions do the following combinations of cells become useful and why?

(i) Series combination

(ii) Parallel combination

(iii) Mixed combination

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7. The focal lengths of a convergent and a divergent lens are f_1 and f_2 respectively. If the lenses are placed in contact, then in the following conditions of combination, write the nature of the combined lens and also draw the ray diagram: (i) $f_1 > f_2$

(ii) $f_1 < f_2$

(iii) $f_1 = f_2$

(i) Condition: $f_1 > f_2$

OR

Compare the Astronomical Telescope and Compound Microscope on the basis of the following:

(i) Components

(ii)Magnifying power

Explain with reason whether any one of the above devices can be used as the other device.

(i) Components

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8. Represent the variation of binding energy per nucleon with mass number. On the basis of it, explain the following: (i) Nuclear fission
(ii) Nuclear fusion
(iii) Nuclear energy

OR

The energy of a hydrogen atom in an energy state is −3.4 electron-volts. For an electron in this energy state, calculate the following: (i) Binding energy
(ii) Ionization potential
(iii) The number of energy states
(iv) The angular momentum
(v) Kinetic energy
(i) Binding Energy

9. On what factors does the magnetic flux linked with a coil depend? Explain the induced electromotive force on the basis of the following:
(i) Cause
(ii) Magnitude
(iii) Direction

OR

On what principle does the transformer work? State the following conditions for an ideal transformer:
(i) Leakage of magnetic flux
(ii) Resistance of primary coil
(iii) Resistance of secondary coil
(iv)Dissipation of power