UP Board Class 12 Physics Code 346 BV 2023 Question Paper

Time Allowed :3 Hours	**Maximum Marks :**70	**Total questions :**35

General Instructions

Instruction:

i) *All* questions are compulsory. Marks allotted to each question are given in the margin.

ii) In numerical questions, give all the steps of calculation.

iii) Give relevant answers to the questions.

iv) Give chemical equations, wherever necessary.

1. (a) Unit of electric flux is :

(i) Nm^2C

(ii) Nm^2C^{-1}

(iii) Vm^{-1}

(iv) NmC^{-2}

(b) Sensitivity of moving coil galvanometer can be increased by :

(i) decreasing area of the coil

(ii) decreasing number of turns in the coil

(iii) increasing area of the coil

(iv) decreasing value of magnetic field

(c) Resistance of an ideal p-n junction in forward and reverse bias respectively will be :

(i) infinite and zero

(ii) finite and zero

(iii) zero and finite

(iv) zero and infinite

(d) True statement with reference to matter waves is :

(i) These are electromagnetic waves.

(ii) These are mechanical waves.

(iii) Wavelength of these waves does not depend on charge of the particle.

(iv) Velocity of matter waves is equal to velocity of light.

(e) Angular momentum of electron in the second orbit of hydrogen atom is :

(i) 1.05×10^{-34} **J** $\cdot$ s

(ii) 1.05×10^{-36} **J** $\cdot$ s

(iii) 2.1×10^{-34} **J** $\cdot$ s

(iv) 2.1×10^{-31} **J** $\cdot$ s

(f) Focal length of a thin convex lens placed in air is 10 cm. An object is placed at a distance of 5 cm from the first focus. The distance of the image from the second focus is :

(i) 20 cm

(ii) 15 cm

(iii) 30 cm

(iv) 25 cm

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2. (a) Draw symbol of NOR gate and draw truth table for its output.

(b) Write the formula for the momentum of a photon.

(c) Write down the difference between the chain reaction occurring in nuclear bombs and nuclear reactors.

(d) Equation of electric field of a plane electromagnetic wave is
$E_y = 60 \sin(500x - 1.5 \times 10^{11} t)$ **V/m. Write the equation for the magnetic field of the wave.**

(e) Write down the phase difference between voltage and current in a pure inductive alternating circuit.

(f) e.m.f. of a cell is 1.5 volt and internal resistance is $0.1\,\Omega$. On connecting the cell with an external resistance of $2.9\,\Omega$, what will be the potential difference at the terminals of the cell?

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3. (a) What is meant by the binding energy of a nucleus? If mass defect for a nucleus is 10^{-6} kg, then find its binding energy in electron volt.

(b) On the basis of Ampere's circuital law, find the expression for the magnetic field produced by an infinitely long straight current-carrying conductor.

(c) Give the definition of isotopic and isobaric nuclei and mention the difference between them.

(d) The wavelength of light incident on a metal surface of work function 2.14 eV is 5000 $\mathring{A}$. Find the maximum kinetic energy and the maximum velocity of the emitted photoelectrons.

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4. (a) Define electric dipole and dipole moment. An electric dipole of dipole moment 2×10^{-8} C $\cdot$ m is inclined at an angle of 30° from a uniform electric field of 2×10^{5} V/m. Find the potential energy of the dipole and the moment of the couple acting on it.

(b) What is a transformer? Describe the energy losses occurring in a transformer.

(c) Explain transverse nature of electromagnetic waves. Give a brief description of the uses of radio waves.

(d) Draw a circuit diagram of a transistor amplifier in common emitter configuration and explain its working in brief.

(e) Diameter of two spheres of metal are 6 cm and 4 cm. They are charged to the same potential. Find out the ratio of the surface densities of charge on the sphere.

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5. (a) Write lens maker's formula for a thin lens. On its basis, discuss the effect of refractive index of lens material and radius of curvature of lens surfaces on its focal length.

(b) Write down the definition of coefficient of self-induction and coefficient of mutual induction. Current of 5 A decreases to zero in 0.1 s in a coil of 5 H self-inductance. Find out induced e.m.f. produced in the coil.

(c) How can the capacity of a conductor be increased? Radius of the plates of a parallel plate air capacitor is 3×10^{-2} **m and the capacitance is equal to the capacitance of a charged sphere of radius 1 m. Find the distance between the plates of the capacitor.**

(d) Give the relationship of temperature with the resistance and resistivity of a conductor. Define the temperature coefficient of the resistance and give its unit.

OR

What is the photoelectric effect? For any photosensitive surface, the threshold frequency is 3.3×10^{14} **Hz. If the frequency of incident light becomes** 8.2×10^{14} **Hz, then**

calculate the stopping potential and give the value of the work function of the surface also.

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6. State Gauss's theorem of electrostatics. What is the meaning of equipotential surface? Two insulator plates having equal charge density are placed as shown in the figure. Find the electric field intensity at points P and Q.

OR

Explain the principle of potentiometer. Why is it superior to a voltmeter? How will you compare the e.m.f. of two cells by potentiometer? Explain by drawing a relevant circuit diagram.

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7. Stating Huygens' principle of secondary wavelets, throw light on its success and failure. Draw the wavefront of light emerging from a convex lens due to a point source of light placed on its focus.

OR

What is the meaning of interference? Derive the expression for the intensity of the resulting wave due to interference of the waves $y_1 = a_1 \sin(\omega t)$ and $y_2 = a_2 \sin(\omega t + \phi)$. If $a_1 = 5$ cm and $a_2 = 3$ cm, then find the ratio of maximum and minimum intensities of the resulting wave.

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8. What are light emitting diodes? Describe the principle and working of a light emitting diode. Why are they more useful than traditional filament lamps?

OR

Draw a ray diagram for an astronomical telescope when the final image is formed at infinity. A building of height 100 m and at a distance of 2 km is seen through this telescope. Then what will be the height of the image formed by the objective of the telescope? Focal length of the objective is 150 cm.

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9. State Biot-Savart law. Find the expression for the magnetic field due to a current carrying circular loop at its centre. Also, write down the formula for the magnetic moment of this current loop.

OR

Write down the relationship between root-mean-square value and peak value of an alternating voltage. In the given circuit, find the value of inductive reactance and the potential difference between the ends of the resistance.