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## Previous Year Paper

Physics - 2007

1. State Gauss's theorem. Answer
2. What will be the net electric force acting on an electric dipole placed in a uniform electric field ? Answer
3. Calculate the electric current density in a uniform wire connected to a battery of emf 3.5 V and negligible internal resistance. The resistance of the wire is $2.0 \Omega$ and its area of cross section is $0.70 \times 10^{-6} \mathrm{~m}$. Answer
4. Name the two conservation laws implied in Kirchoffs laws for electric circuits. Answer
5. Write in vector form, the defining equation for a magnetic field $B$ at a point. Answer
6. Calculate the magnetic field (in SI unit) at the centre of a tangent galvanometer coil of 50 turns and radius 10 cm when a current of 1.0 A passes through it. Answer
7. The SI unit of coefficient of inductance is henry. Using any defining equation for $L$ or $M$ show that 1 henery $=1$ ohm second. Answer
8. In a graphical variation of emf induced with time for the output of an AC generator, mark the peak value of emf induced and the time period. Answer
9. Mention any two uses of geostationary satellites. Answer
10. The refractive indices of water, diamond and glass are 1.33, 2.0 and 1.5 respectively. In which of these will the speed of light be the maximum ? Justify your answer with a suitable reason. Answer
11. A ray of light incident in air for a certain air-glass surface of separation has a polarizing angle of $56^{\circ}$. What will be the angle of refraction in glass ? Answer
12. The angle of an equilateral glass prism is $59.5^{\circ}$. The angle of minimum deviation is $38.5^{\circ}$. Without using the value of refractive index of the glass, calculate the angle of incidence for a ray of light suffering minimum deviation. Answer
13. Draw a ray diagram for a convex lens illustrating linear chromatic aberration. Answer
14. Define luminous intensity of a point source. Answer
15. Calculate the momentum of a photon of green light of $\lambda=500 \mathrm{~nm}$ in SI unit. Answer
16. Mention any one postulate of Bohr's theory of hydrogen atom. Answer
17. Show graphically the variation in the mass of a radioactive substance with time. Mark the values of time on the $x$-axis in terms of half-life ( $T, 2 T, 3 T$ etc.) and the corresponding values of mass on the y-axis. Answer
18. Draw a labelled sketch to illustrate pair production. Answer

## 19. What Is meant oy energy gap in solias ? Answer




Answer
22. Three equal charges of $5.0 \mu \mathrm{C}$ each are placed at the three vertices of an equilateral triangle of side 5.0 cm each. Calculate the electrostatic potential energy of the system of charges. Answer
23. Define the emf of a cell in terms of the work done in moving a charge through the cell. Using Joule's law obtain the equation, emf $=1(R+r)$. (The symbols have their usual meaning.) Answer
24. (i) State one important difference between the Joule effect and the Peltier effect.
ii) The principle of a deflection magnetometer is expressed by the formula $B_{m}=B_{H} \tan \theta$. What is represented by the symbol $B_{m}$ and $B_{H}$ ? Answer
25. Obtain the formula, $I=k \theta$ for a moving coil galvanometer, given, the deflecting torque $T=m \times \vec{B}$
where $m$ is the magnetic dipole moment of the coil placed in the magnetic field $B, I$ is the current in the galvanometer and $\theta$ is the deflection.
Answer
26. (i) Define the terms magnetization (M) and magnetic susceptibility ( $\mathrm{X}_{\mathrm{m}}$ ).
(ii) What is the value of the magnetic susceptibility of aluminium if its relative permeability is 1.000022 ?

Answer
27. Obtain the relation for the current $I=I_{0} \sin (\omega t-\pi / 2)$ for a pure inductor across which an alternating emf $\varepsilon=\varepsilon_{0} \sin \psi t$ is applied. Answer
28. A resistance of $150 \Omega$ and capacitance of $15 \mu \mathrm{~F}$ are connected in series with an $A C$ source. The peak value of the current is 0.20 A . Calculate the average power consumed in the circuit. If the capacitor is removed but the current is kept the same, what is the average power consumed in the resistor alone ? Answer
29. In ac circuit resistance $R$, inductance $I$, and capacitance $C$ are connected in series. The value of $C$ is adjusted for resonance. State any three properties of this circuit which hold true for resonance only. (Give the properties in words or equations, relating $X_{L}, X_{C}, Z, R, \varphi$, power etc.) Answer
30. Name any two electromagnetic waves. State any one similarity and one difference between them. Answer
31. The distance between the first and the sixth bright fringes formed in Young's double slit experiment (measured by a spectrometer) is found to be 12.5 mm . The separation between the slits is 0.12 mm and the distance of the screen from the slits is 60 cm . Calculate :
(i) the fringe width
(ii) the wavelength of the light used (in nm).

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Exam Year
2007
32. Sketch yraptrically the intentity distribution in the diffraction patterाive a simgle stit. Labvethre axes. StudyAnsssignments, Solved Previous Year Papers. Questions and Answers. Free Forever.
33. (i) What is the difference between the electric field vector $E$ at any point in the path of a linearly polarized light and that of an un-polarized light ?
(ii) Briefly describe how a given beam of light can be analysed and determined if it is linearly polarized or un-polarized.
Answer
34. A plano-convex lens made of glass $(\mathrm{n}=15)$ has a focal length 10.0 cm .
(i) Calculate the radius of curvature of its curved surface.
(ii) If an identical plano-convex lens is placed in contact with the first (plane surfaces facing each other), what will be the power of the combination (in dioptres) ?

Answer
35. (i) State the three conditions for the formation of a pure spectrum.
(ii) Draw the ray diagram illustrating the measurement of the angle of a prism using a spectrometer.

Answer
36. With the help of a ray diagram obtain the expression for the magnifying power of a simple microscope when the image is formed at the least distance of distinct vision. Answer
37. An astronomical telescope is adjusted to form the final image at infinity. The separation between the lenses is 80 cm . The angular magnification is 15 . Calculate the focal lengths of the objective lens and the eyepiece. Answer
38. Draw the sketch of a simple model of a Bunsen's grease spot photometer to compare the luminous intensity of two candles. Mention the formula used. Answer
39. The work function for sodium is 2.28 eV .
(i) What is the minimum energy for a quantum of radiation to cause photoelectric emission from a sodium surface ?
(ii) Calculate the wavelength of this radiation.

Answer
40. What is meant by the mass defect ?

Calculate the disintegration energy Q when a heavy nucleus of mass number $\mathrm{A}=240$ with binding energy/nucleon $\sim 7.6 \mathrm{MeV}$ is split into two equal fragments of mass number $\mathrm{A}^{\prime}=120$, each with $\mathrm{BE} /$ nucleon $\sim 8.5 \mathrm{MeV}$. Answer
41. Calculate the equivalent energy in MeV of a unified atomic mass unit. Answer
42. What is meant by analogue and digital signal ? What is the symbol for a XOR gate ? Answer
43. Draw a labelled circuit diagram of a simple oscillator (using PNP or NPN transistor in common emitter configuration). On what factors does the frequency of the oscillator depend? Answer

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for an electron, derive the formula in terms of $\mathrm{E}, \mathrm{B}$ and V where E is the electric field intensity, B is the magnetic field intensity and V is the accelerating potential between anode and cathode. Answer
46. For Bohr's model of the hydrogen atom, the energy of electron in its ground state is found to be-13.6 eV.
(i) Draw an energy level diagram for the hydrogen atom and mark the values of energy (in eV) at $\mathrm{n}=2$ and $\mathrm{n}=\alpha$.
(ii) Obtain the maximum energy of a photon emitted by the hydrogen atom in eV .

Answer
47. (i) On what does the minimum wavelength of the continuous $x$-ray spectrum depend
(ii) When the filament current is increased, the intensity of the x-ray produced increases. Why?
(iii) Why is the structure of crystals studied by x-rays?

Answer

