**Sample Paper – 2013
Class – XII
 Subject –Physics**

**Note: - Questions 1 to 8 carry one mark each, questions 9 to 18 carry two marks each, questions 19-27 carry three marks each and questions 28-30 carry five marks each.**

**Section-A (Very Short Answer Questions-1 Mark Each)**

**Q1.** When a glass rod is rubbed with a silk cloth, charges appear on both. A similar phenomenon is observed with many other pairs of bodies. Explain how this observation is consistent with the law of conservation of charge.

**Q2.** The horizontal component of the earth’s magnetic field at a place B and angle of dip is 60o. What is the value of vertical component of earth’s magnetic field at equator?

**Q3.**Will an induced current develop in the conductor moved in direction parallel to magnetic field?

**Q4.**Which physical quantity remains same for gamma rays of wavelength 10-12m and micro waves of wavelength 10-1m in vacuum?

**Q5.**Suppose that the lower half of a concave mirror’s reflecting surface is covered with an opaque non-reflecting material. What effect this have on the image of an object placed in front of the mirror?

**Q6.**Why is de-Broglie wave associated with a moving football not visible?

**Q7.**How does the energy gap of an intrinsic semiconductor vary, when doped with trivalent impurity?

**Q8.**Can two p-n junction diodes placed back to back work as PnP transistor?

**Section-B (Short Answer Questions (Type-I)-2 Marks Each)**

**Q9.**Electric potential at a point O due to number of point charges equidistant from O is V1 when charges are uniformly distributed and it is V2 when charges are non-uniformly distributed. Is V1=V2? Justify?

**Q10. (a)** When the resistance connected in series with a cell is halved, the current is equal to or slightly less or slightly greater than double. Why?

**(b)** What is the color code for a resistor of resistance 350mΩ with 5% tolerance?

**Q11.**Two cells of emfs 4.5V and 6.0V and internal resistance 6Ω and 3Ω respectively have their negative terminals joined by a wire of 18Ω and positive terminals by a wire of 12Ω resistance. A third resistance wire of 24Ω connects middle points of these wires. Using Kirchhoff’s laws, find the potential difference at the ends of this third wire.

**Q12.**A charged particle is moving on a circular path of radius R in a uniform magnetic field under the Lorentz force F. How much work is done by the force in one round? Is the momentum of the particle changing?

**Q13.**Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self-inductance L is given by ½ LI2.

**Or**

Show that an ideal inductor does not consume any power in an a.c. circuit.

**Q14. (a)** How does low power factor account for large power loss in lines?

**(b)** Sketch a graph showing the variation of impedance of LCR circuit with the frequency of applied voltage.

**Q15.**Draw a labeled diagram of Hertz’s experiment set-up to produce electromagnetic waves. Explain the generation of electromagnetic waves using this set-up.

**Q16. (a)** The focal length of an equiconvex lens placed in air is equal to radius of curvature of either face. Is it true?

**(b)** Sketch a graph showing the variation of power of lens with the wavelength of incident light.

**Q17.**How does a light emitting diode (LED) works? Give two advantages of LED’s over the conventional incandescent lamps.

**Q18.**Figure shows block diagram of a transmitter identify the boxes ‘X’ and ‘Y’ and write their functions.



**Section-C (Short Answer Questions (Type-II)-3 Marks Each)**

**Q19.**Two cells of emf E1, E2 and internal resistance r1 and r2 respectively are connected in parallel as shown in the figure.



Deduce the expressions for:-

1. The equivalent emf of the combination
2. The equivalent resistance of the combination, and
3. The potential difference between the points A and B.

**Q20.**When a circuit element X is connected across an a.c. source, a current of √2 A flows through it and this current is in phase with applied voltage. When another element Y is connected across same a.c. source, the same current flows in the circuit, but it leads voltage by π/2. Name the circuit elements X and Y. Find the current that flows in the circuit when series combination of X and Y is connected across same a.c. voltage. Plot graph showing variation of net impedance of series combination of X and Y as a function of angular frequency of applied voltage.

**Q21.**Define power of lens. Write its units. Deduce the relation$\frac{1}{f}=\frac{1}{f1}+\frac{1}{f2}$ for two thin lenses kept in contact coaxially.

**Q22.**Define a wave front. Use Huygen’s geometrical construction to show the propagation of plane wave front from a rarer medium **(a)** to a denser medium **(b)** undergoing refraction. Hence derive Snell’s law of refraction.

**Or**

1. Use Huygen’s geometrical construction to show the behavior of a plane wavefront.
2. Passing through a biconvex lens;
3. Reflecting by a concave mirror
4. When a monochromatic light is incident on a surface separating two media, why does the refracted light have the same frequency as that of the incident light?

**Q23. (a)**State De Broglie dualistic hypothesis.

**(b)** A photon and electron have got same de-Broglie wavelength, which has greater kinetic energy?

**Q24.**There is a stream of neutrons with a kinetic energy of 0.0327eV. If the half-life of neutrons is 700seconds, what fraction of neutrons will decay before they travel a distance of 10m? Given mass of neutron=1.675X10-27kg.

**Q25.**Using Bohr’s postulates for hydrogen atom, show that the total energy (E) of the electron in the stationary states can be expressed as the sum Kinetic energy (K) and the Potential energy (U), where K=-2U. Hence deduce the expression for the total energy in the nth energy level of hydrogen atom.

**Q26.**Explain the working of n-p-n transistor as an amplifier and determine its voltage gain.

**Q27. (a)**How does the following be affected in the absence of atmosphere around earth?

 **(1).** Surface temperature of earth. **(2).** Range of radio waves transmission.

**(b)** A T.V. tower has a height 100m. By how much the height of tower is increased to triple its coverage range.

**Section-D (Long Answer Questions -5 Marks Each)**

**Q28.**Derive an expression for potential at a point due to electric dipole. Hence deduce values for potential at a point on: - **(a)** Dipole Axis **(b)** Equatorial Plane

**Or**

1. Define electric flux. Write its S.I. unit.
2. Using Gauss’s law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.
3. How field is directed if **(I)** the sheet is positively charged, **(II)** negatively charged?

**Q29. (a)** A long solenoid with closely wound turns has n turns per unit of its length. A steady current I flow through this solenoid. Use Ampere’s circuital law to obtain an expression, for the magnetic field, at a point on its axis and close to its mid-point.

**(b)**A magnet suspended at 30o with magnetic meridian makes an angle of 45o with the horizontal. What shall be the actual value of the angle of dip?

**Or**

1. Explain, giving reasons, the basic difference in converting a galvanometer into **(I)** a voltmeter and **(II)** an ammeter.
2. Two long straight parallel conductors carrying currents I1 and I2 are separated by a distance‘d’. Explain briefly, with the help of a suitable diagram, how magnetic field due to one conductor acts on the other. Hence deduce the expression for the force acting between the two conductors. Mention the nature of this force.

**Q30. (a)** What is the effect on the interference fringes to a Young’s double slit experiment when

1. The separation between the two slits is decreased?
2. The width of a source slit is increased?
3. The monochromatic source is replaced by a source of white light?

Justify your answer in each case.

**(b)**The intensity at the central maxima in Young’s double slit experimental set-up is I0. Show that the intensity at a point where the path difference is **λ**/3 is I0/4.

**Or**

1. Discuss the intensity of transmitted light when a Polaroid sheet is rotated between two crossed Polaroids.
2. A slit or an aperture diffracts light. Even then we say light travels in a straight line and ray optics is valid. Comment

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