## **AP Question Paper 2015**

### **Class 12 Physics, Paper-II**

**Time allowed : 3hours** 

**Maximum Marks : 60** 

#### SECTION-A $(10 \times 2 = 20)$

Note: i) Answer all the questions.

ii) Each question carries two marks.

iii) All are very short answer type questions.

**1.** Draw a neat (labelled) diagram for the formation of image in a simple microscope.

Ans: Diagram for the formation of a simple microscope.



# 2. Define Magnetic inclination or Angle of dip.

Ans: Magnetic inclination is that angle made with the horizontal by the Earth's magnetic field lines. The angle changes at different points on the Earth's surface.

# 3. Define Magnetic susceptibility. Mention its unit.

Ans : We know that In electromagnetism the magnetic susceptibility is a measure of how much a material will become magnetized in the presence of magnetic field.

# 4. Distinguish between Ammeter and Voltmeter.

#### Ans : Ammeter

- It is a low resistance instrument.
- Shunt resistance is very less.
- It is always connected in series.
- Resistance of an ideal ammeter is zero.
- Its resistance is less than that of the galvanometer.

## Voltmeter

- It is a high resistance instrument.
- Series resistance is high.
- It is always connected in parallel.
- Resistance of an ideal voltmeter is infinity.
- Its resistance is greater than that of voltmter.

**Class XII** 

# 5. A light bulb is rated at 100 W for a 220 V supply. Find the resistance of the bulb.

Ans : Power = 100w; Vrms= 220v;

p=v.J

J=p/v=100/220=0.45A

we know that

V=IR

R=V/I = 220/0.45 = 488.88 ohm

### 6. How are Microwaves produced?

Ans : Microwaves are form of electromagnetic radiatiation that are produced by vacuum tubes devices that operate on the ballistic motion of electron controlled by magnetic or electric fields.

# 7. What is the de-Broglie wavelength associated with an electron accelerated through a potential difference of 100 volts?

Ans : According to de Broglie equation. Wavelength associated with an electron through potential difference V is,

lamda= (12.27/V1/2) angstrom

→ 12.27/ 1001/2

**Class XII** 

### $\rightarrow$ 1.227 angstrom

# 8. Write down Einstein's photoelectric equation.

Ans : . let m be mass of electron and Vmax be the maximum velocity of photo electron by which it will be ejected.

 $1/2mv \times vmax = h(V - V_0)$ 

this equation is known as Einstein's Photoelectric equation.

# 9. What are Intrinsic and Extrinsic semi-conductors?

Ans : INTRINSIC SEMICONDUCTORS:

1. It ispure semi-conducting material and no impurity atoms are added to it.

2.Examples: crystalline forms of pure silicon and germanium.

3. The number of free electrons in the conduction band and the no. of holes in valence band is exactly equal and very small indeed.

4.Its electrical conductivity is low.

EXTRINSIC SEMICONDUCTORS:

1. It is prepared by doping a small quantity of impurity atoms to the pure semi-conducting material.

2.Examples: silicon "Si" and germanium "Ge" crystals with impurity atoms of As, Sb, P etc. or In B, A $\ell$  etc.

**Class XII** 

3. The number of free electrons and holes is never equal. There is excess of electrons in n-type semi-conductors and excess of holes in p-type semi-conductors.

4.Its electrical conductivity is high.

# 10. Which type of communication is employed in mobile phones ?

Ans: GSM also known as (global system for mobile communication) it is employed in mobile phones for communication. GSM consists of 2G i.e (second generation) system. this helps in the world wide communication.

**Class XII** 

#### **SECTION-B**

 $(6 \times 4 = 24)$ 

Note: i) Answer Any Six of the following questions.

ii) Each question carries four marks.

iii) All are short answer type questions

#### **11. Explain the formation of a Rainbow.**

Ans : A rainbow is a natural spectrum of sunlight in the form of colour bar like a bowe appearing in the sky after the reain the sun shines. It is combined result of reflection, refraction and dispersion of sunlight from water droplets, in atmosphere. Always it formed in the direction opposite to the sun. we can also explain as A rainbow is a natural spectrum of sunlight in the form of bows appearing in the sky when the sun shines on rain drops.It is combined result of reflection, refraction and sunlight dispersion of from water droplets, in atmosphere. Always it formed in the direction opposite to the sun. the sun must behind us and the water droplets falls infront of us. When a sunlight enters into a spherical rain-drop, it is refracted and dispersed. The different colours of light bent in different angles. When different colours of light fall on the back inner surface of drop, it (water drop) reflects (different colours of light) internally (total internal reflection). The water drops again refracts the different colours, when it comes out from the raindrop.After leaving this different colours from the raindrop

as rainbow, reach our eye. Thus, we see a rainbow.

# 12. Explain polarisation of light by reflection and arrive at Brewster's law from it.

Ans : If light strikes an interface so that there is a  $90^{\circ}$  angle between the reflected and refracted rays, the reflected light will be linearly polarized. If light strikes an interface so that there is a  $90^{\circ}$  angle between the reflected and refracted rays, the reflected light will be linearly polarized. The direction of polarization (the way the electric field vectors point) is parallel to the plane of the interface. The special angle of incidence that produces a 90° angle between the reflected and refracted ray is called the Brewster angle, qp. shows that tan(qp) = n2/n1.Let's say the incident light is unpolarized. When the incident light crosses the interface the light is absorbed temporarily by atoms in the seond medium. Electrons in these atoms oscillate back and forth in the direction of the electric field vectors in the refracted ray, perpendicular to the direction the refracted light is traveling. The light is re-emitted by the atoms to form both the reflected and refracted rays. The electric field vectors in the light match the direction the electrons were oscillating, and they must be perpendicular to the direction of propagation of the wave. When light comes in at the Brewster angle the reflected wave has no electric field vectors parallel to the refracted ray, because the electrons do not oscillate along that direction. The reflected wave also has no electric field vectors parallel to the reflected ray, because that's the direction of propagation of the wave. The only direction possible is perpendicular to the plane of the picture, so the reflected ray is linearly polarized. The refracted ray is partly polarized because it has more light with electric field vectors in the plane of the picture than perpendicular to it. If the angle of incidence is something other than  $0^{\circ}$  and the Brewster angle, the reflected ray is also partly polarized. If the angle of incidence is something other than  $0^{\circ}$  and the Brewster angle, the reflected ray is also partly polarized. If the angle of incidence is

# 13. Derive an expression for the electric field at a point on the equatorial plane of an electric dipole.

Ans : Electric Field at an Equatorial Point of Dipole



Electric field at P due to negative charge

**Class XII** 

$$E_1 = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2 + d^2/4}$$

Electric field at P due to positive charge

$$E_2 = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2 + d^2 / 4}$$

Fields E1 and E2 are equal in magnitude

Resolving E1 and E2 into two components one along OP and other perpendicular to OP

We field,  $E_1 = E_1 \cos \theta + E_2 \cos \theta = 2E_1 \cos \theta = 2E_2 \cos \theta$ 

$$E_{1} = 2 \frac{q}{4\pi\varepsilon_{0}} \frac{1}{(r^{2} + d^{2} / 4)} \frac{d / 2}{\sqrt{r^{2} + d^{2} / 4}}$$
  
=  $\frac{qd}{4\pi\varepsilon_{0} (r^{2} + d^{2} / 4)^{3/2}}$   
 $\frac{p}{4\pi\varepsilon_{0} (r^{2} + d^{2} / 4)^{3/2}}$   
If  $r \rightarrow d \vec{E_{1}} = \frac{1}{4\pi\varepsilon_{0}} \frac{p}{r^{3}} (-r)$ 

i.e. field at equatorial point is antiparallel to dipole moment.

# 14. Explain series combination of Capacitors. Derive the formula for equivalent capacitance.

**Class XII** 

Ans: When capacitors are connected in series the total capacitance is less than any one of the series capacitors individual capacitances. If two or more capacitors are connected in series the overall effect is that of a single (equivalent) capacitor having the sum total of the plate spacings of the individual capacitors.



$$q_1/C_1 = V_1$$

$$q^{2}/C_{2} = V^{2}$$

qtotal/ctotal = vtotal

vtotal =  $V_1 + V_2$ 

 $qtotal/ctotal = q_1/C_1 + q_2/C_2$ 

 $qtotal = q_1 = q_2$ 

 $1/\text{ctotal} = 1/C_1 + 1/C_2$ 

Reciprocal formula gives the total capacitance.

 $ctotal = 1/1/C_1 + 1/C_2$ 

**Class XII** 

therefore we get the formula for the capitance in series.

15. A current of 10 A passes through two very long wires held parallel to each other and separated by a distance of 2 m. What is the force per unit length between them ?

## Ans: distance of seperation between them is 2m

10 A of current is passing through them

so, force between is

 $F/L = uo/2pie \times i1 i2 /r$ 

where r is the distance between the wire

 $\rightarrow$  4pie× 10 $\rightarrow$ 7/2pie×10×10/2

 $2 \times 10 \rightarrow 7 \times 50$ 

 $\rightarrow 100 \times 10 + 7$  N/m.

# 16. What are Eddy currents ? Describe the ways in which they are used to advantage.

Ans: Eddy currents are loops of electrical current induced within conductors by a changing magnetic field in the conductor according to Faraday's law of induction. Eddy currents flow in closed loops within conductors in planes perpendicular to the magnetic field.

They are used to perform non-contact heating as in metal refineries, stove top containers. They can slow the movement of a moving conductor without contact. An example might be a spinning disc such as in a wheel of a vehicle. It could be used to perform heating for thermal stabilization in satellite or probes far from a warming source such as a star with long duration operation without resorting to a mechanical means.

# 17. Write the different types of Hydrogen Spectral series. The Lyman series of Hydrogen spectrum lies in the ultraviolet region. Why ?

Ans: the following different types of hydrogen spectral series

Lyman series (n' = 1)

Balmer series (n' = 2)

Paschen series (Bohr series, n' = 3)

Brackett series (n' = 4)

Pfund series (n' = 5)

Humphreys series (n' = 6)

Further (n' > 6)

the lyman series lies in the uv region because the Lyman series is a hydrogen spectral series of transitions and resulting ultraviolet emission lines of the hydrogen atom as an electron goes from  $n \ge 2$  to n = 1 (where n is the principal quantum number) the lowest energy level of the electron.

# 18. What is Rectification ? Explain the working of a full wave rectifier.

Ans: A rectifier is an electrical device that converts alternating current which periodically reverses direction, to direct current, which flows in only one direction. The process is known as rectification since it straighten the direction of current.



A full-wave rectifier uses 4 diodes to convert an AC voltage source into rectified output. A diode is an active component that freely allows current to flow in one direction from anode to cathode but blocks current in the opposite direction.

A Full Wave Rectifier is a circuit, which converts an ac voltage into a pulsating dc voltage using both half cycles of the applied ac voltage. It uses two diodes of which one conducts during one half cycle while the other conducts during the other half cycle of the applied ac voltage.

**Class XII** 

# **SECTION –**C $(2 \times 18 = 16)$

Note: i) Answer ANY TWO of the following questions.

ii) Each question carries Eight marks.

### iii) All are long answer type questions

19. How are Stationary waves formed in closed pipes and open pipes? Explain the various modes of vibrations and obtain relations for their frequencies.

Ans: Stationary Waves in a Closed Organ Pipe. Due to a superposition of incident and reflected waves, stationary waves are produced. In the simplest mode of vibration, there is a displacement node, N at the closed end air is at rest there and a displacement antinode, An at the open end as the air can vibrate freely.

stationary wave in a tube which is open on both ends, and in a tube, which is open on one end and closed on the other end. Open and closed ends reflect waves differently. The closed end of a tube is an antinode in the pressure or a node in the longitudinal displacement.

Stationary or standing waves are formed in a medium when two waves having equal amplitude and frequency moving in opposite directions along the same line, interfere in a confined space. Generally such waves are formed by the superposition of a forward wave and the reflected wave.

**Class XII** 

# 20. State the working principle of Potentiometer. Explain with the help of circuit diagram, how the potentiometer is used to determine the internal resistance of the given Primary cell.

Ans: The principle of a potentiometer is that the potential dropped across a segment of a wire of uniform cross-section carrying a constant current is directly proportional to its length. The potentiometer is a simple device used to measure the electrical potentials (or compare the e.m.f of a cell).

potentiometer works on the principal of galvanometer.



to determine the internal resultance of a cell to measure the internal resistance of a cell to compare the e.m.f. of two cells and potential difference across a resistor. It consists of a long wire of uniform cross sectional area and of 10 m in length. The material of wire should have a high resistivity and low temperature coefficient. The wires are stretched parallel to each other on a wooden board. The wires are joined in series by using thick copper strips. A metre scale is also attached on the wooden board. It works on the principle that when a constant current flows through a wire of uniform cross sectional area, potential difference between its two points is directly proportional to the length of the wire between the two points.

k=E/L = potential gradient

 $E_1/L_1 = E_2/L_2$ 

 $\rightarrow 1.25/35 = E2/63$ 

 $\rightarrow$  E2= 2.24 V

In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm, what is the emf of the second cell ?

# 21. Explain the principle and working of Nuclear Reactor with the help of a labelled diagram.

In most power plants, you need to spin a turbine to generate electricity. Coal, natural gas, oil and nuclear energy use their fuel to turn water into steam and use that steam to turn the turbine. Nuclear plants are different because they do not burn anything to create steam. Instead, they split uranium atoms in a process called fission. As a result, unlike other energy sources, nuclear power plants do not release carbon or pollutants like nitrogen and sulfur oxides into the air. Nuclear reactors are designed to sustain an ongoing chain reaction of fission; they are filled with a specially designed, solid uranium fuel and surrounded by water, which facilitates the process. When the reactor starts, uranium atoms will split, releasing neutrons and heat. Those neutrons will hit other uranium atoms causing them to split and continue the process, generating more neutrons and more heat. This heat is used to create the steam that will spin a turbine, which powers a generator to make electricity.



**Class XII**