

SAMPLE PAPER --- MARCH 2023

CLASS 10+2

SUBJECT:- PHYSICS

Time 3hrs

M. Marks: 70

Note:- Question NO.1 has 28 parts carrying 1 mark each

Question NO. 2 to 8 carry 2 marks each.

Question NO. 9 to 14 carry 3 marks each.

Question NO. 15-16 carry 5 marks each.

Q (1) Multiple choice Questions:

(I) cgs unit of electric charge is

- (a) coulomb (b) joule (c) Faraday (d) stat coulomb

(II) Electric dipole moment is:

- (a) Scalar (b) A Vector directed from  $-q$  to  $+q$   
(c) neither scalar nor vector (d) a vector directed from  $+q$  to  $-q$

(III) Kirchoff's first law is based on the law of conservation of

- (a) energy (b) Momentum (c) Charge (d) All of these

(IV) What material is a potentiometer wire normally made?

- (a) constantan or manganin (b) Nickel (c) copper (d) Zinc

(V) Magnetic field inside current carrying solenoid depends upon.

- (a) current (b) nature of material  
(c) No. of turns per unit length (d) All of these

(VI) The angle between magnetic meridian and geographic meridian is called.

- (a) angle of declination (b) angle of dip  
(c) some time angle of declination and some time angle of dip  
(d) None of these

(VII) Path of charged particle entering uniform magnetic field at an angle  $60^\circ$  is

- (a) Straight line (b) helical (c) Parabola (d) Circular

(VIII) In moving coil galvanometer, we use radial magnetic field so that the scale is

- (a) Logarithmic (b) exponential (c) linear (d) none

(IX) Henry is the unit of:

- (a) Resistance (b) Magnetic field (c) Magnetic field (d) Inductance

(X) Which of the following radiations has least wavelength ?

- (a) X-rays (b)  $\gamma$  - rays (c)  $\beta$  - rays (d)  $\alpha$  - rays

(XI) Select the rays which are being emitted by a human body.

- (a) Visible rays (b) X rays (c) UV rays (d) Infra red rays

(XII) A double Convex lens is called a

- (a) Convergent lens (b) Divergent lenses  
(c) None of these (d) Convergent or divergent depending upon conditions

upon conditions

(XIII) The Least distance of distinct vision is.

- (a) 10cm (b) 15cm (c) 25cm (d) None of these

(XIV) Critical angle of light passing from glass to air is minimum for.

- (a) Red (b) Green (c) Yellow (d) Violet

(XV) The idea of secondary wave let for propagation of a wave was first given by

- (a) Huygens (b) Newton (c) Maxwell (d) Fresnel

(XVI) The Phenomenon of interference is shown by.

- (a) Longitudinal mechanical wave (b) Transverse mechanical wave  
(c) Electromagnetic wave (d) All the above types of waves

(XVII) Photo electric effect shows:

- (a) Wave nature of electron (b) particle nature of light  
(c) both a & b (d) none

(XVIII) Energy of a photon of frequency  $\nu$  is

- (a)  $\frac{h}{\nu}$  (b)  $\frac{\nu}{h}$  (c)  $h\nu$  (d)  $\frac{h\nu}{c}$

(XIX) The total energy of electron orbiting around the nucleus in the ground state of the atom is

- (a) Zero (b) Less than zero (c) more than zero (d) Cannot say

(XX) Wave length in a spectrum is inversely proportional to.

- (a) Difference in energy levels (b) Velocity of electrons  
(c) Number of electron (d) None of these

(XXI) The energy band gap is maximum in.

- (a) Metals (b) Super conductors (c) insulators (d) semiconductor

(XXII) Holes can exist in.

- (a) metals (b) insulators (c) Semiconductors (d) None of these

(XXIII) When semiconductor is heated, its resistance

- (a) Decreases (b) Increases (c) Remains unchanged (d) Nothing is definite

**True/False statements:-**

(XXIV) On doping the conductivity of a semiconductor increases.

(XXV) Photo electric emission is not possible at all frequencies.

(XXVI) The power of thick lens is smaller than that of a thin lens.

(XXVII) The self inductance of a straight conductor is zero.

(XXVIII) The angle of dip varies between  $0^\circ$  and  $90^\circ$

Q 2. Why no work done in moving a test charge from One point to another point on equipotential surface. Give proof.

OR

Two similar charges repel each other with a force of 44.1 N when placed 2cm apart in air. Calculate the strength of charge.

Q 3. Define drift velocity of electrons and derive it relation with electric current.

OR

A Cell of e.m.f. 1.0v gives a balance point at 40cm length of a potentiometer wire. For another cell the balance point shifts to 60cm. Find the e.m.f. of second cell.

Q 4. How can the current sensitivity of moving coil galvanometer be increased.

Q 5. State and explain Faraday's Law of electromagnetic induction

Q 6. Write four properties of X rays.

Q 7. What will be value of stopping potential if frequency of incident radiation is just equal to threshold frequency?

OR

Two metals X and Y have work function  $2\text{eV}$  and  $5\text{eV}$  respectively. Which metal will emit electron, when irradiated with light of wave length  $400\text{nm}$  and why?

Q 8. What are drawbacks of Rutherford's atomic model. How did Bohr remove this?

Q 9. With the help of circuit diagram, explain how a meter bridge is used to find the unknown resistance of given wire.

Q 10. State Ampere's circuital law and find magnetic field intensity at point well within the solenoid carrying current.

OR

An ammeter of resistance  $0.80\Omega$  can measure current up to  $1.0\text{ A}$  (i) what must be the shunt resistance to enable the ammeter to measure the current up to  $5.0\text{A}$ ? (ii) What is the combined resistance of the ammeter and shunt?

Q 11. Describe principle and working of transformer.

OR

Find the coefficient of mutual inductance of a pair of coil if a current of  $3\text{A}$  in one coil cause the flux in the second coil of  $1000$  turns to change by  $10$  weber in each turn.

Q 12. Prove the Laws of refraction using Huygens's principle.

OR

The distance of needle is  $45\text{cm}$  from a lens which forms an image on the screen placed  $90\text{cm}$  on other side of the lens. What is type of lens? What is focal length and the length of image if size of needle is  $5\text{cm}$ .

Q 13. Draw and explain energy level diagram for hydrogen atom showing spectral series emitted by it.

Q 14. What is a rectifier? Explain the working of junction diode as full wave rectifier.

Q 15. State Gauss's theorem? Derive electric field intensity due to uniformly charged infinite plane sheet.

OR

Derive an expression for the electric potential at any point due to electric dipole. Rewrite this expression if point of observation lies on:

(i) axial line of dipole

(ii) equatorial line of dipole

Q 16. With the help of labelled diagram, give the principle and magnifying power of compound microscope, when final image is formed at least distance of distinct vision.

OR

Describe Young's double slit experiment for interference of light and obtain an expression for fringe width.

### ANSWER KEY

Q (1) Multiple choice Questions:

- (I) (d) stat coulomb
- (II) (b) A Vector directed from  $-q$  to  $+q$
- (III) (c) Charge
- (IV) (a) Constantan or manganin
- (V) (d) All of these
- (VI) (a) angle of declination
- (VII) (b) helical
- (VIII) (c) linear
- (IX) (d) Inductance
- (X) (b)  $\gamma$  - rays

- (XI) (d) Infra red rays  
 (XII) (a) Convergent lens  
 (XIII) (c) 25cm  
 (XIV) (d) Violet  
 (XV) (a) Huygens  
 (XVI) (d) All the above types of waves  
 (XVII) (b) particle nature of light  
 (XVIII) (c)  $h\nu$   
 (XIX) (b) Less than zero  
 (XX) (a) Difference in energy levels  
 (XXI) (c) insulators  
 (XXII) (c) Semiconductors  
 (XXIII) (a) Decreases

True/False statements:-

- (XXIV) TRUE  
 (XXV) TRUE  
 (XXVI) FALSE  
 (XXVII) TRUE  
 (XXVIII) TRUE

Q 2.  $F = 44.1N, r = 2cm = 2 \times 10^{-2}$

$$q_1 = q_2 = q$$

$$F = \frac{1}{4\pi\epsilon_0} \times \frac{q_1 q_2}{r^2}$$

$$44.1 = 9 \times 10^9 \times \frac{q^2}{(2 \times 10^{-2})^2}$$

$$q^2 = \frac{(44.1) \times 4 \times 10^{-4}}{9 \times 10^9} = \frac{441 \times 4 \times 10^{-4}}{9 \times 10^{10}}$$

$$q^2 = \frac{1764}{9} \times 10^{-14} = 196 \times 10^{-14}$$

$$q^2 = \sqrt{(14)^2 \times (10^{-7})^2} = 14 \times 10^{-14}$$

$$q = 1.4 \times 10^{-6} C$$

Q 3.  $E_1 = 1.0V$

$$l_1 = 40cm$$

$$E_2 = ?, l_2 = 60cm$$

$$\frac{E_1}{E_2} = \frac{l_1}{l_2}$$

$$E_2 = \frac{E_1 l_2}{l_1} = \frac{1 \times 60}{40} = \frac{3}{2} = 1.5V$$

Q 7. From Einstein's Photoelectric equation

$$h\nu = h\nu_0 + eV_0$$

$$\nu = \nu_0$$

$$h\nu_0 = h\nu_0 + eV_0$$

$$V_0 = 0$$

Stopping Potential is 0 volt.

OR

$$\lambda = 400\text{nm} = 400 \times 10^{-9}\text{m} = 4 \times 10^{-7}\text{m}$$

$$\text{Energy of Incident Light} = E = \frac{hc}{\lambda}$$

$$E = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{4 \times 10^{-7}}$$

$$= \frac{19.86}{4} \times 10^{-34+8+7}$$

$$E = 4.965 \times 10^{-19}\text{J}$$

$$= \frac{4.965 \times 10^{-19}}{1.6 \times 10^{-19}} \text{eV}$$

$$E = 3.1\text{eV}$$

This energy is more than work function of metal X

∴ Metal X will emit electrons.

Q 10.  $I_g = 1.0\text{A}$

$$G = 0.80\Omega$$

$$I = 5.0\text{A}$$

(i)  $S = \frac{I_g G}{I - I_g}$

$$= \frac{1 \times 0.80}{5 - 1} = \frac{0.8}{4} = 0.2\Omega$$

(ii) Since S and G are connected in parallel, so the combined resistance is given by

$$\frac{1}{R} = \frac{1}{S} + \frac{1}{G}$$

$$R = \frac{GS}{G+S}$$

$$= \frac{0.80 \times 0.20}{1.0} = 0.16\Omega$$

Q 11.  $I_1 = 3\text{A}$ ,  $M = ?$

$$\phi_2 = 10^{-4}\text{wb} \quad N = 1000$$

$$\text{Total flux } \phi = N\phi_2$$

$$= 1000 \times 10^{-4} = \frac{1}{10}$$

$$\phi = 0.1wb$$

$$\phi = MI$$

$$M = \frac{\phi}{I}$$

$$= \frac{0.1}{3} = \frac{1}{30} = 0.0333H$$

$$M = 3.33 \times 10^{-2}H$$

Q 12.  $u = -45cm$

$$v = 90cm$$

$$h = 5cm$$

using Lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{90} - \left[ \frac{1}{-45} \right] = \frac{1}{90} + \frac{1}{45}$$

$$\frac{1}{f} = \frac{1+2}{90} = \frac{3}{90} = \frac{1}{30}$$

$$\frac{1}{f} = \frac{1}{30}$$

$$f = 30cm$$

Since focal length is positive, so lens is convex lens

∴ We know that

$$m = \frac{v}{u} = \frac{90}{-45} = -2$$

$$m = \frac{h'}{h} \Rightarrow h' = mh = -2 \times 5 = -10cm$$

Size of image is 10cm and image is inverted. Negative sign indicates that the image formed will be real and inverted.

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