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Half Yearly Examination – (2019-20)

Class: - 12th **Full Marks : 80**
Subject : Physics **Duration : 3 hrs**

General Instructions:-

- All questions are compulsory.
- Read the questions carefully and write the answers in the answer sheets provided.
- Do not answer the questions randomly. Attempt all the questions of one section before moving on to another section.
- Do not write anything on the question paper.
- All questions of Section –A carry 1 marks .
- All questions of Section –B carry 1 marks
- All questions of Section –C carry 3 marks
- All questions of Section – D carry 5 marks

SECTION –A

1. Electric field intensity € due to an electric dipole varies with distance (r) of the point from the centre of dipole as:

(a) E∞1/r (b) E∝ $\frac{1}{r^4}$ (c) E∝ $\frac{1}{r^2}$ (d) E∝ $\frac{1}{r^3}$

2. The correct relation between electricintestity E and electric potential V is

(a) E=– $\frac{dv}{dr}$ (b) E=$\frac{dV}{dr}$ (c) V=– $\frac{dE}{dr}$ (d) V=$\frac{dE}{dr}$

3. A positively charged particle is released from rest in a uniform electric field .The electric potential energy of the charge

(a)remain a constant because the electric field is uniform

(b) increases because the charge moves along the electric field

(c) decrease because the charge moves along the electric field

(d) decreses because the charge moves opposite to the electric field

4.Minimum number of 8 µF, 250 V capacitors used to make a combination of 16 µF and 1000 V are :

(a) 32 (b) 8 (c) 4 (d) 2

5. Ampere's circuital law can be derived from

(a) Ohm's law (b) Boit-Savart's law (d) Kirchhoff's law (d) Gauss's law

6. Huygen's principle of secondary wavelet may be used to : (More than one is correct)

(a) find the velocity of light in vacuum

(b) explain particle nature of light

(c) find the new position of wavefront

(d) explain Snell's law

7. The wavefront of light coming from a distance source of unknown shape are nearly

(a) plane (b)elliptical (c)cylindrical (d) spherical

8.The minimum orbital angular momentum of electron in a hydrogen atom :

(a) *h* (b) h/2 (c)h/2π (d) h/λ

9. The slpe of frequency of frequency of incident light and stopping potential for a given a surface will be :

(a) h (b)h/e (c) eh (d) e

10. The series of hydrogen spectrum which lies in visible region is

(a)Lyman series (b) Balmer series (c) Paschen series (d) none of the above

11. The capacitance od a conductor is 1 F . What do you mean by this statement .

12.Why should electrostatic field be zero inside a conductor ?

13. Write the expression in vector form , for the Lorentz magnetic force force **F** due to charge moving with velocity **v** in a magnetic field **B** .What is the direction of the magnetic force ?

14. Name the colours corresponding to the digit 5 and 7 in the colour code scheme for carbon resistors.

15.How does one explain increase in resistivity of a metal with increase in temperature?

16. Define intensity of radiation on the basis of photon picture of light . Write its S.I. unit .

17. Show graphically how the stopping potential for a given photosensitive surface varies with the frequency of incident radiations.

18. Write the relation for (i) the distance of closest approach and (ii) impact parameter .

19. How is nuclear size related to its mass number ?

20.How does the resolving power of telescope change when the aperture of the objective is increased?

SECTION -B

21.Using the concept of drift velocity of charge carriers in a conductor , deduce the relationship between current density and resistivity of the conductor.

22. Use Kirchhoff's rule to obtain condition for the balance condition in Wheatstone bridge.

23. Two point charges q_1 and q_2 are located at $\boldsymbol{r_1}$ and $\boldsymbol{r_2}$ respectively in an external electric field E. Obtain the expression for the total work done in assembling this configuration .

Or

Seven capacitors, each of capacitance 2 μF are to be connected in a configuration to obtain an effective capacitance of (10/11) μF .Suggest a suitable combination .

24.State Huygen's principle .Using it , Construct a ray diagram for plane wave front getting incident on a denser medium.

25. Two monochromatic radiations of fequencies υ_1 and υ_2 ($\upsilon_1 > \upsilon_2$) and having the same intensity are , in turn , incident on a photosensitive surface to cause photoelectric emission .Explain , giving reason , in which case (i) more number of electrons will be emmited photoelectrons will be more .

Or

The galvenometer , in each of the two case given circuits does not show any deflection . Find the ratio of the resistors R_1 and R_2 used in these two circuits.

26. Show that the radius of the orbit in hydrogen atom varies as n^2, where n is the principal quantum number of the atom .

Or

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 replaced by another cell and the balanced point shift 63.0 cm , what is the emf of the second cell ?

27. Show that the density of nucleus over a wide range of nuclei is constant independent of mass number .

Or

A 900 pF capacitor is charged by 100 V battery .

(i)How much electrostatic energy is stored by capacitor ? the capacitor is disconnected from the battery and connected to another 900 pF capacitor .How much is the electrostatic energy stored in the system ?

SECTION –C

28. A charge is distributed uniformly over ring of radius 'a' . Obtain an expression for the electric intensity E at a point on the axis of ring . Hence , Show that for point at large distances from the ring , it behaves like a p[oint charge

29.(i)Derive an expression for the capacitance of a parallel plate capacitor having plate area A and plate seperation d

(ii) Two charged spherical conductors of rediiR$_1$ and R$_2$ when connected by a conducting wire acquire charges q_1 and q_2 respectively . Find the ratio of their surface charge densities in term of their redii.

Or

A capacitor of unknown capacitor is connected across a battery of V volts .The charge stored in it is 360 μC . When potential across the capacitor is reduced by 120 V , the charge stored in it becomes 120 μC

(i)The potential V and the unknown capacitors C.

(ii)What will be the charge stored in the capacitor , if the voltage applied had increased by 120 V ?

30. A long straight wire , of circular cross-section (radius =a) carries a current I which is uniformly distributed across the crossection of wire .

Use Ampere's circuital law to calculate magnetic field B(r) ,due to this wire , at a point distance r< a and r >a from its axi .draw a grah showing the dependence of B (r) on r .

Or

A current element 3 *dl* is at (0,0,0,) along y-axis . If *dl* = 1cm , find the magnetic field at a distance 20 cm on the x- axis .

31.explain following , gining reason :

(i) When monochromatic light is incident on a surface seperating two media , the reflected and refracted light both have the same frequency as the incident frequency .

(ii) When light travel from a rarer to denser medium the speed decreases . Does this decrease in speed imply a reduction in the energy carried by wave ?

Or

(i)State law of Malus.

(ii) Draw a graph showing the variation of intencity (I) of polarised light transmitted by an analyser with angle (θ) between polariser and analyser .

32. (a) why photoelectric effect can not be explained on the basis of wave nature of light ? Give reason

(b) Write the basic features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based .

33. Show that the electron revolving around the nucleus in a radius ‘r’ with orbital speed ‘v’ has magnetic moment *evr/*2.

Hence ,using Bohr’s postulate of the quantization of angular momentum , obtain the expression for the magnetic moment of hydrogen atom in its ground state .

Or

A proton and an alpha particle enter at right angles into uniform magnetic fiel intensity B. Calculate the radii of their paths when they enter the field with the same .

(i)Momentum and

(ii) Kinetic energy

34.(a) Define the term ‘activity’ of a sample of radioactive nucleus .Write its S.I. unit

(b) The half life of $^{238}_{92}U$ undergoing α- decay is 4.5×10^{9} years . Determine the activity of 10 g sample of $^{238}_{92}U$. Given that 1 g og $^{238}_{92}U$contain 25.3 $\times10^{20}$ atoms.

SECTION –D

35. (I) Define electric dipole moment . Is it a scalar or vector quantity ? Derive the expression for the electric field of a dipole at a point on the equatorial plane of the dipole .

(ii) Draw the equipotential surface doe to an electric dipole .Locate the point where the potential due to the dipole is zero .

36.State the basic postulate of Bohr’s theory of atomic spectra . Hence obtain an expression for radius of orbit and the energy of orbital electron in hydrogen atom .

Or

Deduce the expression $N=N_o e^{-\frac{\lambda}{t}}$ for the law of radioactive decay .

36.Discuss the grouping of two unidentical cells in (i) series and (ii) parallel and find their equivalent emf and internal resistance .