M2022

No. of Printed Pages : 4

Register Number

A

PART – III

, awgpay; / **PHYSICS**

(English Version)

Time Allowed   : 3.00 Hours]   [Maximum Marks   : 70

Instructions   :   (1)   Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2)   Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART – I

Note   :   (i)   Answer **all** the questions.   **15x1=15**

(ii)   Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1.   Which one of the following is the natural nanomaterial?

(a)   Grain of sand   (b)   Peacock feather

(c)   Skin of the whale   (d)   Peacock beak

2.   In an electron microscope, the electrons are accelerated by a voltage of 14kV. If the voltage is charged to 224 kV, the de-Broglie wavelength associated with the electrons would:

(a)   decrease by 4 times   (b)   increase by 2 times

(c)   increase by 4 times   (d)   decrease by 2 times

3.   The variation of frequency of carrier wave with respect to the instantaneous amplitude of the modulating signal is called:

(a)   Phase modulation   (b)   Amplitude modulation

(c)   Pulse width modulation   (d)   Frequency modulation

4.   Q factor is equal to _____.

(a) $\dfrac{\omega_r L}{R}$ (b) $\dfrac{1}{R}\sqrt{\dfrac{L}{C}}$

(c) $\dfrac{X_L}{R}$ (d)   All the above

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5.   The metallic spheres of radii 1 cm and 3 cm are given charges of – 1 x 10⁻² C and 5 x 10⁻² C respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is:

   (a) 1×10^{-2} C   (b) 3×10^{-2} C

   (c) 2×10^{-2} C   (d) 4×10^{-2} C

6.   Which of the following is an electromagnetic wave?

   (a)   β – rays   (b)   γ – rays

   (c)   α – rays   (d)   All of the above

7.   An air bubble in glass slab of refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness of the slab is :

   (a)   12 cm   (b)   8 cm

   (c)   16 cm   (d)   10 cm

8.   In India electricity is supplied for domestic use at 220 V. It is supplied at 110 V in USA. If the resistance of a 60 W bulb for use in India is R, the resistance of a 60 W bulb for use in USA will be :

   (a)   R/4   (b)   R

   (c)   R/2   (d)   2R

9.   A wire of length *l* carries a current I along the Y direction and magnetic field is given by $\vec{B} = \frac{\beta}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})T.$ The magnitude of Lorentz force acting on the wire is

   (a) $\sqrt{2}\beta Il$ (b) $\sqrt{\frac{2}{\sqrt{3}}}\beta Il$

   (c) $\sqrt{\frac{1}{\sqrt{2}}}\beta Il$ (d) $\sqrt{\frac{1}{\sqrt{3}}}\beta Il$

10. Emission of electrons by the absorption of heat energy is called _____ emission.

   (a)   Thermionic   (b)   Photo electric

   (c)   Secondary   (d)   Filed

11. If a current of 7.5 A is maintained in a wire for 45 seconds then the charge flowing through the wire is :

   (a)   6 C   (b)   365.5 C

   (c)   3 C   (d)   337.5 C

12. The charge of cathode ray is :

   (a)   neutral   (b)   positive

   (c)   not defined   (d)   negative

13. A step-down transformer reduces the supply voltage from 220 V to 11 V and increases the current from 6 A to 100 A. Then its efficiency is :

   (a)   0.12   (b)   1.2

   (c)   0.9   (d)   0.83

14. The electric potential between a proton and an electron is given by $V = V_0 \ln\left(\frac{r}{r_0}\right)$, where r_0 is a constant. Assume that Bohr atom model is applicable to potential, then variation of radius of nth orbit r_n with the principal quantum number n is

   (a) $r_n \propto \frac{1}{n^2}$ (b) $r_n \propto \frac{1}{n}$

   (c) $r_n \propto n^2$ (d) $r_n \propto n$

15. Transverse nature of light is shown in :

   (a)   scattering   (b)   interference

   (c)   polarization   (d)   diffraction

PART – II

Note :   Answer **any six** questions. Question No. **24** is **compulsory.**   6x2=12

16. What is corona discharge?

17. How will you increase the current sensitivity of a galvanometer?

18. Define work function of a metal. Mention its unit.

19. Calculate the radius of $^{197}_{79}$ Au nucleus.

20. State Fleming's right hand rule.

21. What do you mean by Doping?

22. What is displacement current?

23. Define electrical resistivity.

24. The angle of minimum deviation for the equilateral prism is 40^0. Find the refractive index of the material of the prism.

PART – III

Note :   Answer **any six** questions. Question No. **33** is **compulsory.**   6x3=18

25. Derive the relation between f and R for a spherical mirror.

26. Obtain a relation between current and drift velocity.

27. List out the laws of photo electric effect.

28. Draw the circuit diagram of NPN transistor in Common Emitter Configuration.

29. Give the uses of Polaroids.

30. Derive the expression for resultant capacitance, when capacitors are connected in series.

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31. Find the:

    (i)   Angular momentum

    (ii)   Velocity of the electron revolving in the 5th orbit of hydrogen atom.

        (h = 6.6 x 10^{-34} Js; m = 9.1 x 10^{-31} kg)

32. List out salient features of magnetic Lorentz force.

33. Find the impedance of a series RLC circuit, if the inductive reactance, capacitive reactance and resistance are 184 Ω, 144 Ω, and 30 Ω respectively. Also calculate the phase angle between voltage and current.

PART – IV

Note :   **Answer all the questions.**   **5x5=25**

34. (a)   Explain the construction and working of full wave rectifier.

                     (OR)

    (b)   Explain the construction and working of transformer.

35. (a)   Derive an expression for electrostatic potential due to an electric dipole.

                     (OR)

    (b)   Obtain the equation for bandwidth in Young's Double Slit Experiment.

36. (a)   Using Biot-Savart Law deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current.

                     (OR)

    (b)   Discuss the spectral series of hydrogen atom.

37. (a)   (i)   How do you we obtain characteristic X-ray spectra?

       (ii)   Calculate the cut-off wavelength and cut-off frequency of X-rays from an X-ray tube of accelerating potential 20,000 V.

                     (OR)

    (b)   What is spectrum? Explain the types of emission spectrum.

38. (a)   Obtain Lens maker's formula.

                     (OR)

    (b)   Explain the determination of the internal resistance of cell using voltmeter.

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