MODEL QUESTION PAPER

Higher Secondary – Second Year – Physics

Time : 3 hrs. **Mark : 150**

PART – I

Note : ***(i) Answer all the questions.*** **30 x 1 = 30**

(ii) Choose and write the correct answer.

(iii) Each question carries one mark.

1. A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences

   (a) only a net force (b) only a torque

   (c) both a net force and torque (d) neither a net force not a torque

2. The unit of permittivity is

   (a) $NC^{-2}m^{-2}$ (b) Hm^{-1}

   (c) $C^2N^{-1}m^{-2}$ (d) Nm^2C^{-2}

3. The number of lines of force that radiate outwards from one coulomb charge is

   (a) 1.13×10^{11} (b) 8.85×10^{-11}

   (c) 9×10^9 (d) infinite

4. On moving a charge of 20 C by 2 cm, 2J of work is done, then the potential difference between the points is

   (a) 0.5 V (b) 0.1 V

   (c) 8 V (d) 2 V

5. In the case of insulators, as the temperature decreases, resistivity

   (a) increases (b) decreases

   (c) becomes zero (d) remains contant

6. In a tangent galvanometer, for a constant current, the deflection is 30°. The plane of the coil is rotated through 90°. Now, for the same current, the deflection will be

   (a) 0° (b) 30°

   (c) 60° (d) 90°

7. In a thermocouple, the temperature of the cold junction is 20°C, the temperature of inversion is 520°C. The neutral temperature is

   (a) 500°C (b) 540°C

   (c) 270°C (d) 510°C

8. Electromagnetic induction is not used in

(a) transformer (b) room heater

(c) AC generator (d) choke coil

9. Which of the following devices does not allow d.c. to pass through?

(a) resistor (b) capacitor

(c) inductor (d) all the above

10. The unit henry can also be written as

(a) $VA^{-1}s$ (b) Ωs

(c) wb A^{-1} (d) all

11. In an AC circuit, the current $I = I_o \sin(\omega t - \pi/2)$ lags behind the emf $e = E_o \sin(\omega t + \pi/2)$ by

(a) 0 (b) $\pi/4$

(c) $\pi/2$ (d) π

12. In an electromagnetic wave, the phase difference between electric field and magnetic field is

(a) 0 (b) $\pi/4$

(c) $\pi/2$ (d) π

13. Of the following, which one is a biaxial crystal?

(a) tourmaline (b) ice

(d) calcite (d) mica

14. If the wavelength of the light is reduced to half, then the amount of scattering will

(a) increase by 16 times (b) decrease by 16 times

(c) increase by 256 times (d) decrease by 256 times

15. A Nicol prism is based on the principle of

(a) refraction (b) reflection

(c) double refraction (d) diffraction

16. The ratio of radii of the first three Bhor orbits is

(a) 1 : 2 : 3 (b) $1 : \frac{1}{2} : \frac{1}{3}$

(c) 1 : 8 : 27 (d) 1 : 4 : 9

17. In hydrogen atom, which of the following transitions produce a speetral line of maximum frequency?

(a) 2 →1 (b) 6 → 2

(c) 4 → 3 (d) 5 → 2

18. In Millikan's experiment, an oil drop of mass 4.9 × 10-14 kg is balanced by applying a potential difference of 2 kV between the two plates which are 2 mm apart. The charge of the drop is

(a) 1.96×10^{-18} C (b) 1.602×10^{-19} C

(c) 12 C (d) 4.9×10^{-19} C

19. If the potential difference between the cathode and the target of coolidge tube is 1.24×10^5V, then the minimum wavelength of continuous x–rays is

(a) 10Å (b) 1Å

(c) 0.1Å (d) 0.01Å

20. The photoelectric effect can be explained on the basis of

(a) corpuscular theory (b) wave theory

(c) electromagnetic theory (d) quantum thery

21. The wavelength of the matter wave is independent of

(a) mass (b) velocity

(c) momentum (d) charge

22. The time taken by the radioactive element to reduce to 1/e times is

(a) half life (b) mean life

(c) half life/2 (d) twice the mean life

23. The ionisation power is maximum for

(a) neutrons (b) alpha particles

(c) gamma rays (d) beta particles

24. When $_5B^{10}$ is bombarded with neutron and α–particle is emitted, the residual nucleus is

(a) $_3Li^7$ (b) $_1H^2$

(c) $_1H^3$ (d) $_2He^4$

25. In a nuclear reactor cadmium rods are used to

(a) speed up neutrons (b) slow down neutrons

(c) absorb neutrons (d) remove heat

26. In a Colpitt's oscillator circuit

(a) capacitive feedback is used (b) tapped coil is used

(c) no tuned LC circuit is used (d) no capacitor is used

27. An example of n–type semiconductor is

(a) pure germanium (b) pure silicon

(c) silicon doped with phosphorus (d) germanium doped with boron

28. What will be the input of A and B for the Boolean experession (A + B) . (A . B) = 1?

(a) 0, 1 (b) 1, 0

(c) 0, 0 (d) 1, 1

29. In T.V. transmission, the picture should not be scanned during the return journey of the scanning. This is done by

(a) blanking pulse (b) saw tooth potential

(c) horizontal synchronising pulse (d) vertical synchronising pulse

30. Through which mode of propagation, the radio waves can be sent from one place to another

(a) Ground wave propagation (b) Sky wave propagation

(c) Space wave propagation (d) All the above

PART – II

Note : (i) Answer any 15 questions. **15 x 3 = 45**

31. State coulomb's law in electrostatics.

32. Why is it safer to be inside a car than standing under a tree during lightning?

33. What are the advantages of secondary cells?

34. The resistance of a nichrome wire at 0°C is 10 Ω. If its temperature coefficient of resistance is 0.004/°C, find its resistance at boiling point of water.

35. What is called superconductivity?

36. Define; amperein terms of force.

37. What happens to the value of current in RLC series circuit, if freqency of the source is increased?

38. If the rate of change of current of 2 As^{-1} induces an emf of 10 mV in a solenoid, what is the self inductance of the solenoid?

39. Why does the sky appear blue in colour?

40. The refractive index of the medium is √3. Calculate the angle of refraction if the unpolarised light is incident on it at the polarising angle.

41. State the postulates of Bohr atom model.

42. In Bragg's spectrometer, the glancing angle for first order spectrum was observed to be 8°. Calculate the crystal lattice spacing, if the wavelength of the x–ray is 0.7849Å.

43. Mention any threee applications of photo electric cells.

44. What is α – decay? Give an example.

45. Define: Curie

46. Draw the block diagram of an oscillator and mention the components.

47. The gain of the amplifier is 100. If 5% of the output voltage is fedback into the input through a negative feed back network, find out the voltage gain after feedback.

48. Mention the advantages of ICS.

49. Define the input impedance of a transistor in CE mode.

50. What is meant by skip distance?

Part – III

Note : ***(i) Answer the question 60 compulsorily.*** **7 x 5 = 35**

(ii) Of the remaining 11 questions, answer any six questions.

(iii) Draw diagrams wherever necessary

51. The plates of a parallel plate capacitor have an area of 90 cm^2 each and are separated by 2.5 mm. The capacitor is charged by connecting it into a 400 V supply. How much electrostatic energy is stored by the capacitor.

52. Obtain the condition for bridge balance in Wheatstone's bridge.

53. Explain the method to compare the emfs of two cells using potentiometer.

54. A circular coil of 50 turns and radius 25 cm carries a current of 6A. It is suspended in a uniform magnetic field of induction 10^{-3} T. The normal to the plane of the coil makes an angle of 60° with the field. Calculate torque of the coil.

55. Explain the various energy losses in a transformer.

56. Derive the expression for the radius of the n^{th} dark ring.

57. Explain the spectral series of hydrogen atom.

58. Obtain Einstein's photo electric equation.

59. Establish Einstein's mass-energy equivalence, $E = mc^2$.

60. Calculate the binding energy and binding energy per nucleon of $_{20}Ca^{40}$ nucleus. Given, mass of 1 proton = 1.007825 amu; mass of 1 neutron = 1.008665 amu; mass of $_{20}Ca^{40}$ nucleus = 39.96259 amu.

Or

Calculate the mass of coal in ton required to produce the same energy as that produced by the fission of 1 kg of U^{235}. Given : Heat of combustion of coal = 33.6×10^6 J/kg ; 1 ton = 1000 kg ; Energy per fission of U^{235} = 200 MeV ; Avagadro number = 6.023×10^{23}.

61. Draw the frequency response curve of single stage CE amplifier and discuss the results.

62. Draw the functional block diagram of AM radio transmitter.

PART – IV

Note : ***(i) Answer any 4 questions in detail.*** **4 x 10 = 40**

(ii) Draw diagrams wherever necessary

63. What is an electric dipole? Derive an expression for the electric field due to an electric dipole at a point on its axial line.

64. Discuss the motion of a charged particle in a uniform magnetic field.

65. Discuss with theory, the method of inducing emf in a coil by changing its orientation with respect to the direction of the magnetic field.

66. What is known as interference? Derive an expression for bandwidth of interference fringes in young's double slit experiment.

67. With the help of energy level diagram explain the working of He–Ne laser.

68. Describe Bainbridge mass spectrometer to determine the isotopic masses of nuclei.

69. What is known as rectification? Explain the bridge rectifier.

70. With the help of block diagram, explain the monochrome TV receiver.