Surendar.K M.Sc.,M.Ed.,M.Phil.,

Class : 12

Register Number

Higher Secondary Half Yearly Examination 2017-18

PHYSICS

Time Allowed : 3 Hours] [Max. Marks : 150

INSTRUCTION : 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 pencil to draw diagrams.

Part - I

N.B. (i) Answer All the questions.

(ii) Choose and write the correct answer. 30×1=30

1. The unit of permittivity is :
(a) $C^2N^{-1}m^{-2}$ (b) Nm^2C^{-2} (c) Hm^{-1} (d) $NC^{-2}m^{-2}$

2. Electric field intensity is 400 Vm^{-1}, at a distance of 2m from a point charge. It will be 100 Vm^{-1} at a distance ?
(a) 50 cm (b) 4 cm (c) 4 m (d) 1.5 m

3. Point charges +q, -q, +q, -q are placed at the corners A, B, C and D respectively ofa square of side 1m. 'O' is the point of intersection of the diagonals AC and BD. The potential and magnitude of the resultant electric field intensity at the point 'O' of the square are respectively.
(a) Zero Volt and Zero V/m (b) Zero Volt and $\frac{2q}{4\pi\epsilon_0}$ V/m
(c) $\frac{4q}{4\pi\epsilon_0}$ Volt and $\frac{4q}{4\pi\epsilon_0}$ V/m (d) Zero Volt and $\frac{8q}{4\pi\epsilon_0}$ V/m

4. The electric field in between the plates of two oppositely charged plane sheets of charge density 'σ' is :
(a) $\frac{+\sigma}{2\epsilon_0}$ (b) $\frac{-\sigma}{2\epsilon_0}$ (c) $\frac{\sigma}{\epsilon_0}$ (d) Zero

5. n resistors of equal resistance (R) are connected first in series and then in parallel. Then $\frac{R_s}{R_p}$ is :
(a) n : 1 (b) 1 : n^2 (c) n^2: 1 (d) 1 : n

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) 30° (b) 60° (c) 90° (d) 0°

7. Deutrons and α-particles are successively accelerated in a cyclotron. The ratio of the period of rotation of deutron to that of a-particle is :
(a) 1 : 1 (b) 1 : 2 (c) 2 : 1 (d) 4 : 1

8. Which of the following devices does not allow d.c to pass through ?
(a) resistor (b) capacitor (c) inductor (d) all the above

9. In ac circuit average power consumed per cycle is 100 watt, and apparent power consumed per cycle is 200 watt. The phase difference between the emf and current in the circuit is :
(a) 0 (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

10. The self-inductance of a straight conductor is :
(a) Zero (b) infinity (c) Very large (d) Very small

11. The part of the AC generator that passes the current from the coil to the external circuit is :
(a) field magnets (b) split rings (c) slip rings (d) brushes

12. A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by blue light ?
(a) bands disappear (b) no change
(c) diffraction pattern becomes narrower and crowded together
(d) diffraction pattern becomes broader and farther apart

13. Monochromatic light is incident on a reflecting surface at an angle of incidence other than the polarising angle. The reflected beam is :
(a) unpolarised (b) plane polarised (c) partially polarised (d) totally internally reflected

14. While a monochromatic light of wavelength 5000Å crosses a distance of 6.25 μm will have a phase 'ϕ' :
a) $\frac{\pi}{2}$ (b) an odd multiple of π (c) an even multiple of π (d) $\frac{\pi}{6}$

15. In Raman effect, the wavelength of incident monochromatic light is 5990Å. Raman shift is 10 Å. The wavelength of stoke's and antistoke's lines are respectively.
(a) 5980 Å and 6000 Å (b) 5970 Å and 5980 Å (c) 6000 Å and 5980 Å (d) 6000 Å and 6010 Å

16. The elliptical orbits of electron in the atom were proposed by :
(a) J.J. Thomson (b) Bohr (c) Sommerfeld (d) de Broglie

17. A Coolidge tube operates at 24800 V. The maximum frequency of X-radiation emitted from Coolidge tube is :
(a) 6×10^{18}Hz (b) 3×10^{18}Hz (c) 6×10^{8}Hz (d) 3×10^{8}Hz

18. According to Rutherford atom model, the spectral lines emitted by an atom is :
(a) line spectrum (b) continuous spectrum
(c) continuous absorption spectrum (d) band spectrum

19. If R is Rydberg constant, the ratio of minimum wavelength of Lyman series and the minimum wavelength of P fund series is :
(a) 1 : 25 (b) 25 : 1 (c) 900 : 11 (d) 11 : 900

20. The wavelength of matter wave is independent of :
(a) mass (b) velocity (c) momentum (d) charge

21. The photon of frequency ν is incident on a metal surface of threshold frequency ν_0 The kinetic energy of the emitted photoelectron is :
(a) $h(\nu - \nu_0)$ (b) $h\nu$ (c) $h\nu_0$ (d) $h(\nu + \nu_0)$

22. Example of isotones :
(a) ${}_6C^{12}, {}_7N^{14}$ (b) ${}_7N^{14}, {}_8O^{16}$ (c) ${}_4Be^{8}, {}_8O^{16}$ (d) ${}_8O^{16}, {}_6C^{14}$

23. In ß-decay
(a) atomic number decreases by one (b) mass number decreases by one
(c) proton number remains the same (d) neutron number decreases by one

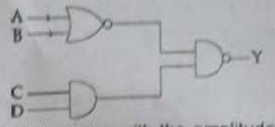
24. The nuclear charge and the nuclear radius of a nucleus are respectively 4.8×10^{-18}Cand 5.2 F. The number of neutrons in the nucleus is :
(a) 32 (b) 34 (c) 36 (d) 40

25. The average energy released per fission is :
(a) 200 eV (b) 200 MeV (c) 200 meV (d) 200 GeV

26. Avalanche breakdown is primarily dependent on the phenomenon of :
(a) collision (b) ionisation (c) doping (d) recombination

27. An oscillator is :
(a) an amplifier with feedback (b) a convertor of ac to dc energy
(c) nothing but an amplifier (d) an amplifier without feedback

28. The output Y of the given logic circuit is :



(a) $A + B + \overline{C}\,\overline{D}$ (b) $\overline{A + B} + \overline{C\,D}$

(c) $A + B + (\overline{CD})$ (d) $A + B + \overline{C + D}$

29. In amplitude modulation :

(a) The amplitude of the carrier wave varies in accordance with the amplitude of the modulating signal

(b) The amplitude of the carrier wave remains constant

(c) The amplitude of the carrier wave varies in accordance with the frequency of the modulating signal

(d) Modulating frequency lies in the audio range

30. The purpose of dividing each frame into two fields so as to transmit50 views of the picture per second is

(a) to avoid flicker in the picture

(b) the fact that handling higher frequencies is easier

(c) that 50 Hz is the power line frequency in India

(d) to avoid unwanted noises in the signals

Part- II

Note : Answer any *Fifteen* questions. 15X3=45

31. Write the applications of capacitors.

32. Calculate the potential at a point due to a charge of 4×10^{-7}C located at 0.09 m away.

33. State Kirchhoff's voltage law.

34. Distinguish between electric power and electric energy.

35. An incandescent lamp is operated at 240 V and the current is 0.5A. What is the resistance of the lamp ?

36. State Joule's law of heating.

37. Define rms value of alternating current.

38. Calculate the mutual inductance between two coils when a current of 4A changing to 8A in 0.5s in one coil, induces an emf of 50 mV in the other coil.

39. State Rayleigh's scattering law.

40. What is optic axis of a crystal ?

41. An electron beam passes through a transverse magnetic field of 2×10^{-3} tesla and anelectric field E of 3.4×10^{4} V/m acting simultaneously. If the path of the electrons remain undeviated calculate the speed of electrons.

42. Write the principle of Millikan's oil drop experiment.

43. What is stopping potential ?

44. Write the uses of nuclear reactor ?

45. Write short notes on leptons.

46. The gain of the amplifier is 100. If 5% of the output voltage is fed backinto the input through a negative feedback network, find out the voltage gain after feedback.

47. Write any three uses of C.R.O.

48. Draw the transfer characteristic curve of a transistor amplifier connected in CE mode.

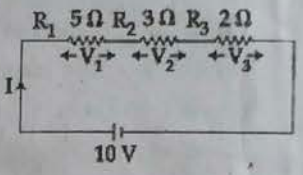
49. What are universal gates ? Why are they called so ?
50. What is skip distance ?

Part - III

Note : (i) Answer the questions number 60 is compulsorily.
(ii) Answer any *Six* of the remaining eleven questions.
(iii) Draw diagrams wherever necessary.

7X5=35

51. Prove that the energy stored in a parallel plate capacitor is $\frac{q^2}{2C}$
52. Explain the determination of the internal resistance of a cell using voltmeter.
53. Three resistors are connected in series with 10V supply as shown in the figure. Find the voltage drop across each resistor.



54. Explain how will you convert a galvanometer into an ammeter.
55. State Faraday's laws and Lenz's law of electromagnetic induction.
56. In young's experiment, a light of frequency 6×10^{14} Hz is used. Distance between the centres of adjacent fringes is 0.75 mm. Calculate the distance between the slits, if the screen is 1.5 m away.
57. Write the properties of X-rays. (Any five)
58. Derive Einstein's photo electric equation.
59. Explain length contraction.
60. Calculate the energy released in the reaction

$_{13}Al^{27} + {}_1H^2 \rightarrow {}_{12}Mg^{25} + {}_2He^4$

Given mass of $_{13}Al^{27}$ = 26.981535 amu
mass of $_1H^2$ = 2.014102 amu
mass of $_{12}Mg^{25}$ = 24.98584 amu
mass of $_2He^4$ = 4.002604 amu

(OR)

A reactor is developing energy at the rate of 32 MW. Calculate the required number of fissions per second of $_{92}U^{235}$. Assume that energy per fission is 200 MeV.

61. Draw the frequency response curve of a single stage C.E amplifier and discuss the results.
62. Write the advantages and disadvantages of digital communication.

Part - IV

Note : (i) Answer any *Four* questions in detail.
(ii) Draw diagrams wherever necessary.

4X10=40

63. Derive an expression for electric field due to an electric dipole at a point on the equitorial line.
64. Explain the motion of a charged particle in a uniform magnetic field.
65. Explain the principle, construction and working of a transformer. (Diagram not necessary). Define its efficiency.
66. Explain total internal reflection on the basis of wave theory.
67. Describe J.J. Thomson method for determining the specific charge of electron.
68. State the law of radioactive disintegration. Obtain the relation $N=N_0e^{-\lambda t}$. Derive the relation between half life period and decay constant.
69. What is an operational amplifier ? Describe the action of it as summing amplifier.
70. Explain the function of a Amplitude Modulated (AM) radio transmitter with a neat block diagram.