

PRE-BOARD EXAMINATION

STD : XII

MARKS : 150

SUB : PHYSICS

TIME : 3.00 Hrs

I. Choose the correct answer:

30x1=30

- Which of the following quantities not a scalar?
a) electric flux b) electric potential c) electric field d) none of these
- A dipole is placed in a non 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 nor a torque
- If a point lies at a distance x from the midpoint of the dipole, the electric potential at this point is inversely proportional to---
a) $1/x^2$ b) $1/x^3$ c) $1/x^4$ d) x^2
- Two point charges $+4q$ and $+q$ are placed 30 cm apart. At what point on the line joining them the electric field is zero?
a) 15 cm from the charge q b) 7.5 cm from the charge q
c) 10 cm from the charge q d) 5 cm from the charge q
- The current flowing in a conductor is proportional to
a) drift velocity b) area of cross section
c) no of electrons d) all of these
- Of the following devices, which has high resistance?
a) moving coil galvanometer b. ammeter of range 0 - 1A
c) ammeter of range 0 - 10 A d. voltmeter
- In Joule's Calorimeter experiment, when a current of 1 ampere is passed through a coil for a known interval of time 't', the temperature of water increases from 30°C to 34°C . when a current of 2 A is passed through the same coil placed in the same quality of water and for the same time, the temperature of water increases form 30°C to :
a) 33° b) 46°C c) 39°C d) 42°C
- The unit henry can also be written as
a) VsA^{-1} b) Wb A c) $\Omega\text{ s}^{-1}$ d) all
- An emf of 12V is induced when the current in the coil changes at the rate of 0.4A s^{-1} . The coefficient of self induction of the coil is-----
a) 0.3 H b) 0.003 H c) 30 H d) 4.8 H
- A DC of 50A produces the same heating effect as an AC of
a) 50 A rms current b) 5 A peak current c) 5 A rms current d) none of these

11. In an AC circuit the applied emf $e = E_0 \sin(\omega t + \pi/4)$ leads the current $i = I_0 \sin(\omega t - \pi/4)$ by

- a) $\pi/2$ b) $\pi/4$ c) π d) 0

12. Electromagnetic induction is used in _____

- a) transformer b) room heater c) AC generator d) both (a,c)

13. If the wavelength of the light is doubled, then the amount of scattering is__

- a) increased by 16 times b) decreased by 16 times
c) increased by 256 times d) decreased by 256 times

14. A ray of light passes from a denser medium into a rarer medium. For an angle on incidence of 45° , the refracted ray grazes the surface of separation of the two media. The refractive index of the denser medium is

- a) $\frac{3}{2}$ b) $\frac{1}{\sqrt{2}}$ c) $\sqrt{2}$ d) 2

15. If the velocity of light in a medium is $2 \times 10^8 \text{ ms}^{-1}$, then the refractive index of the medium will be

- a) 1.5 b) 0.5 c) 1.33 d) 1.73

16. In hydrogen atom, which of the following transition produce spectral line of maximum wavelength -----

- a) $2 \rightarrow 1$ b) $4 \rightarrow 1$ c) $6 \rightarrow 5$ d) $7 \rightarrow 5$

17. A narrow electron beam passes undeviated through an electric field $E = 3 \times 10^4 \text{ V/m}$ and an overlapping magnetic field $B = 5 \times 10^2 \text{ Wb/m}^2$. The electron motion, electric field and magnetic field are mutually perpendicular. The speed of the electron is

- a) 60 ms^{-1} b) $10.3 \times 10^7 \text{ ms}^{-1}$ c) $1.5 \times 10^7 \text{ ms}^{-1}$ d) $0.67 \times 10^{-7} \text{ ms}^{-1}$

18. The energy of the electron in the first orbit of hydrogen atom is - 13.6 eV. Its potential energy is

- a) -13.6 eV b) 13.6 eV c) -27.2 eV d) 27.2 eV

19. The unit of coefficient of viscosity

- a) $\text{C}^2 \text{N}^{-1} \text{m}^{-2}$ b) $\text{Nm}^2 \text{C}^{-2}$ c) H m^{-1} d) Nsm^{-2}

20. If 1% of mass is converted into energy, then amount of mass required to produce energy of $18 \times 10^{10} \text{ J}$ is

- a) $2 \times 10^{-6} \text{ kg}$ b) $1 \times 10^{-4} \text{ kg}$ c) $2 \times 10^{-4} \text{ kg}$ d) $1 \times 10^{-6} \text{ kg}$

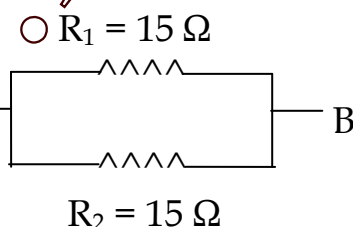
21. If one day in space ship corresponds to 2 days on earth, the speed of space ship is

- a) $1.414 \times 10^8 \text{ ms}^{-1}$ b) $2.598 \times 10^8 \text{ ms}^{-1}$
c) $1.0 \times 10^8 \text{ ms}^{-1}$ d) $0.5 \times 10^8 \text{ ms}^{-1}$

22. The nuclear diameter of ${}^8_4\text{Be}$ nucleus is
 a) $1.3 \times 10^{-15} \text{ m}$ b) $2.6 \times 10^{-15} \text{ m}$ c) $1.3 \times 10^{-13} \text{ m}$ d) $5.2 \times 10^{-15} \text{ m}$
23. The half life period of N_{13} is 10.1 min. Its mean life time is
 a) 5.05 min. b) 20.2 min c) $10.1/0.6931 \text{ min.}$ d) infinity
24. The binding energy of ${}^{56}_{26}\text{Fe}$ nucleus is
 a) 8.8 MeV b) 88 MeV c) 493 MeV d) 41.3 MeV
25. The ionization power is minimum for
 a) neutrons b) α - particles c) gamma rays d) β - particles
26. In the reverse bias characteristic curve, a diode appears as
 a) a high resistance b) a capacitor c) an OFF switch d) an ON switch
27. In a Colpitt's oscillator circuit---
 a) capacitive feedback is used b) tuned LC circuit is used
 c) capacitor is used d) all of these
28. The potential barrier of germanium PN junction is
 a) 1.1 eV b) 0.3 V c) 0.7 V d) 1.1 V
29. Printed documents to be transmitted by fax are converted into electrical signals by the process of
 a) reflection b) scanning c) modulation d) light variation.
30. An FM signal has a resting frequency of 105 MHz and highest frequency of 105.015 MHz, when modulated by a signal. Then the carrier swing is
 a) 0.03 MHz b) 0.06 MHz c) 0.03 kHz d) 60 MHz

II. Answer any FIFTEEN of the following questions in short: $15 \times 3 = 45$

31. Write a note on microwave oven.
 32. Define 'electric flux'. What is its unit?
 33. State Ohm's law.
 34. From the following network find the effective resistance between A and B.



35. Why is copper wire not suitable for a potentiometer?
 36. A long straight wire carrying current produces a magnetic induction of $4 \times 10^{-6} \text{ T}$ at a point 15 cm from the wire. Calculate the current through the wire.

37. Define unit of self – inductance.
38. What is resonant frequency in LCR circuit?
39. Distinguish between Fresnel and Fraunhofer diffraction.
40. A plano – convex lens of radius 3m is placed on an optically flat glass plate and is illuminated by a monochromatic light. Calculate the wavelength of light if the radius of the 8th dark ring is 3.6mm.
41. What are the characteristics of laser?
42. Calculate the longest wavelength that can be analysed by a rock salt crystal of spacing $d=2.82\text{\AA}$ in the first order.
43. Write the applications of photo electric cells (any three).
44. Tritium has a half-life of 12.5 years. What fraction of the sample will be left over after 50 years?
45. What do you mean by artificial radioactivity?
46. What is Zener break down?
47. What are the advantages of negative feedback?
48. For a transistor to work, how is the biasing provided?
49. When there is no feedback the gain of the amplifier is 100. if 5% of the output voltage is feedback into the input through a negative feedback network, find out the voltage gain after feedback.
50. Define directivity.

III. Answer the Question No. 54 compulsorily. Answer any six questions of the remaining 11 questions. **7 x 5 =35**

51. The plates of a parallel plate capacitor have an area of 90cm^2 each and are separated by 2.5mm. 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 straight wire of length 1 m and resistance 2 ohm is connected across a battery of emf 12 volt. The wire is placed normal to the magnetic field of induction $5 \times 10^{-3}\text{T}$. Find the force on the wire.

(OR)

A moving coil galvanometer of resistance 20Ω produces full scale deflection for a current of 50 mA. How will you convert it into (i) an ammeter of range 20 A and (ii) A voltmeter of range 120 V?

55. Explain the various energy losses in a transformer.
56. Derive the expression for the radius of the n^{th} dark ring.
57. What are the shortcomings of Bohr's theory.
58. What is photoelectric effect? With the help of a graph explain the effect of intensity of incident radiation on the photoelectric current.
59. Establish Einstein's mass-energy equivalence, $E = mc^2$.
60. Calculate the binding energy and binding energy per nucleon of ${}_{20}\text{Ca}^{40}$ nucleus. Given, mass of 1 proton = 1.007825 amu, mass of 1 neutron = 1.008665 amu; mass of ${}_{20}\text{Ca}^{40}$ nucleus = 39.96259 amu.
61. Explain the half wave rectification.
62. Draw the functional block diagram of AM radio transmitter

IV. (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 along the equatorial line.
64. Explain in detail the principle, construction and the theory of moving coil galvanometer.
65. A source of alternating emf is connected to a series combination of a resistor R, an inductor L and a capacitor C. Obtain with the help of a vector diagram i) the effective voltage ii) the impedance iii) the phase relationship between the current and the voltage.
66. Derive an expression for bandwidth of interference fringes in Young's double slit experiment.
67. State and obtain Bragg's law. Explain how Bragg's spectrometer can be used to determine the wavelength of x - rays.
68. Obtain an expression to deduce the amount of the radioactive substance present at any moment. Obtain the relation between half life period and decay constant.
69. Explain with neat circuit diagram, the working of single stage CE amplifier. Draw the frequency response curve of a CE amplifier. Discuss the results.
70. With the help of a functional block diagram, explain the operation of a super heterodyne AM receiver.

S.SIVATHANGANATHAN. Msc, MEd(physics) 8012165401