

Physics 12th Public Exam Question Paper 2012

OCTOBER – 2012
PHYSICS

Time Allowed: 3 Hours

Maximum Marks: 150

PART - I

30 x 1 = 30

Note: i) Answer all the questions.

ii) Choose and write the correct answer.

iii) Each question carries one mark.

- In proton – proton cycle four protons fuse together to give
 - an α particle, two electrons, two neutrinos and energy of 26.7MeV
 - an α particle, two positrons, two neutrinos and energy of 26.7MeV
 - a helium atom, two positrons, two neutrinos and energy of 26.7eV
 - an α particle, two positrons, two antineutrinos and energy of 26.7MeV
- Electric field intensity is 400Vm^{-1} at a distance of 2m from a point charge. It will be 100Vm^{-1} at a distance of
 - 50cm
 - 4cm
 - 4m
 - 1.5cm
- Electric potential energy (μ) of two point charges is
 - $\frac{q_1 q_2}{4\pi\epsilon_0 r^2}$
 - $\frac{q_1 q_2}{4\pi\epsilon_0 r}$
 - $pE \cos \theta$
 - $pE \sin \theta$
- The unit of permittivity is
 - $\text{C}^2\text{N}^{-1}\text{m}^{-2}$
 - Nm^2C^{-2}
 - Hm^{-1}
 - $\text{NC}^{-2}\text{m}^{-2}$
- Electric field intensity at a distance r from an infinitely long uniformly charged straight wire is directly proportional to
 - r
 - r^{-1}
 - r^2
 - r^{-2}

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- The principle that is used in fibre optical communication is
 - reflection
 - refraction
 - total internal reflection
 - polarisation
- Nichrome wire is used as the heating element because it has
 - low specific resistance
 - low melting point
 - high specific resistance
 - high conductivity
- In the experiment to verify joule's law when the current passed through the circuit is doubled keeping resistance (R) and time of passage of current (t) constant, temperature of the liquid
 - increases twice
 - increases four times
 - increases sixteen times
 - decreases four times
- The coefficient of self-induction of a solenoid is independent of
 - the number of turns in coil
 - the area of cross-section of the coil
 - the length of the coil
 - the current passing through the coil.
- A.D.C. of 5 A produces the same heating effect as an A.C. of
 - 50 A rms current
 - 5 A peak current
 - 5 A rms current
 - none of these

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11. In an electromagnetic wave
(a) power is equally transferred along the electric and magnetic fields
(b) power is transmitted in a direction perpendicular to both the fields
(c) power is transmitted along electric field
(d) power is transmitted along magnetic field
12. Atomic spectrum should be
(a) pure line spectrum (b) emission band spectrum
(c) absorption line spectrum (d) absorption band spectrum
13. In a plane transmission grating the width of a ruling is 12000 Å and the width of a slit is 8000 Å.
(a) 20 μ (b) 2 μ (c) 1 μ (d) 10 μ
14. Which of the following is used to study crystal structure?
(a) Microwaves (b) infrared rays (c) Ultraviolet rays (d) X-rays
15. At the threshold frequency the velocity of the electron is
(a) zero (b) maximum (c) minimum (d) infinite
16. A narrow electron beam passes undeviated through an electric field $E=3 \times 10^4$ V/m and an overlapping magnetic field $B = 2 \times 10^{-3}$ Wb/m². The electron motion, electric field and magnetic field are mutually perpendicular. The speed of the electron is
(a) 60ms⁻¹ (b) 10.3×10^7 ms⁻¹ (c) 1.5×10^7 ms⁻¹ (d) 0.67×10^{-7} ms⁻¹
17. The first excitation potential energy or minimum energy required to excite the atom from ground state of hydrogen atom is
(a) 13.6eV (b) 10.2eV (c) 3.4eV (d) 1.89eV
18. In hydrogen atom which of the following transitions produces a spectral line of maximum frequency?
(a) 2→1 (b) 6→2 (c) 4→3 (d) 5→2

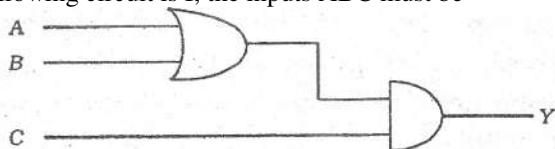
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19. In holography which of the following is / are recorded on the photographic film
(a) Amplitude only (b) Frequency only
(c) Amplitude and phase (d) Frequency and phase
20. When n resistors of equal resistance (R) are connected in series the effective resistance is
(a) n / R (b) R / n (c) 1 / nR (d) nR
21. Which of the following devices does not allow D.C. to pass through?
(a) Resistor (b) Capacitor (c) Inductor (d) All of these
22. The part of the A.C. generator that passes the current from the coil to the external circuit is
(a) Field magnet (b) Split rings (c) Slip rings (d) Brushes
23. The radius of a nucleus is 5.2F. The number of nucleons in the nucleus is
(a) 52 (b) 104 (c) 64 (d) 128
24. The half-life period of a certain radioactive element with disintegration constant 0.0693 per days is
(a) 10 days (b) 14 days (c) 140 days (d) 1.4 days

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25. The radio-isotope used in agriculture is
 (a) $_{15}\text{P}^{31}$ (b) $_{15}\text{P}^{32}$ (c) $_{11}\text{P}^{23}$ (d) $_{11}\text{P}^{24}$
26. When an electron is accelerated with potential difference V , its de Broglie wavelength is directly proportional to
 (a) V (b) V^{-1} (c) $V^{\frac{1}{2}}$ (d) $V^{-\frac{1}{2}}$
27. In N type semiconductor donor level lies
 (a) just below the conduction band (b) just above the conduction band
 (c) just below the valence band (d) just above the valence band

28. If the output (Y) of the following circuit is 1, the inputs ABC must be



- (a) 010 (b) 100 (c) 101 (d) 110
29. In the forward bias characteristic curve a diode appears as
 (a) A high resistance (b) A capacitor (c) An OFF switch (d) An ON switch
30. 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

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PART – II

15 x 3 = 45

Note: i) Answer any *fifteen* questions.

31. Write any three properties of electric lines of force.
32. What is a capacitor? Define its capacitance.
33. The resistance of a nichrome wire at 0°C is $10\ \Omega$. If the temperature co-efficient of resistance is $0.004/^\circ\text{C}$. Find its resistance at boiling point of water. Comment on the result.
34. Define resistivity of a material.
35. State Ohm's Law.
36. Define Thomson co-efficient.
37. Define efficiency of transformer.
38. Define quality factor.
39. What is Tyndall scattering?
40. The refractive index of a medium is $\sqrt{3}$. Calculate the angle of refraction if the unpolarised light is incident on it at the polarising angle of the medium.

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41. What are the important characteristics of laser?
42. Write the applications of Moseley's law.
43. Define stopping potential.
44. What do you mean by artificial radioactivity?
45. Tritium has a half-life of 12.5 years. What fraction of the sample will be left over after 25 years?
46. Prove the Boolean identity $(A+B)(A+C) = A+BC$.
47. Define bandwidth of an amplifier.
48. What is an integrated circuit?
49. The base current of a transistor is $50\mu\text{A}$ and collector current is 25mA . Determine the values of β and α .
50. What is interlaced scanning?

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PART – III

7 x 5 = 35

Note: i) Answer the question No.56 compulsorily.

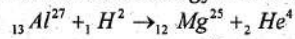
ii) Answer any six of the remaining 11 questions.

iii) Draw diagrams wherever necessary.

51. Derive an expression for the torque acting on the electric dipole when placed in a uniform electric field.
52. List some applications of superconductors.
53. Explain the construction and working of a Leclanche cell.
54. The deflection of a galvanometer falls from 50 divisions to 10 divisions when 12Ω resistance is connected across the galvanometer. Calculate the galvanometer resistance.
55. Explain how an emf can be induced by changing the area enclosed by the coil.
56. State and explain Brewster's law.
57. Explain the origin of characteristic X-rays.
58. What is the de Broglie wavelength of an electron of kinetic energy 120 eV ?
59. Derive Einstein's photoelectric equation.

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a) Calculate the energy released in the reaction



Given, mass of ${}_{13}\text{Al}^{27} = 26.981535 \text{ amu}$, Mass of ${}_1\text{H}^2 = 2.014102 \text{ amu}$

Mass of ${}_{12}\text{Mg}^{25} = 24.98584 \text{ amu}$, Mass of ${}_2\text{He}^4 = 4.002604 \text{ amu}$

(OR)

b) Find the energy released when two ${}_1\text{H}^2$ nuclei fuse together to form a single ${}_2\text{He}^4$ nucleus.

60. Given, the binding energy per nucleon of ${}_1\text{H}^2$ and ${}_2\text{He}^4$ are 1.1 MeV and 7.0 MeV respectively.

61. Explain the action of a Zener diode as a voltage regulator with a necessary circuit.

62. Explain the function of Frequency Modulated (FM) transmitter with neat block diagram.

PART – IV

4 x 10 = 40

Note: i) Answer any *four* questions in detail.

ii) Draw diagrams wherever necessary.

63. State the principle and explain the construction and working of Van de Graaff generator.

64. Obtain an expression for the force on a current carrying conductor placed in a magnetic field. Give the magnitude and direction of the force.

65. Obtain expressions for (i) the effective voltage, (ii) the impedance, (iii) the phase relationship between current and voltage in an LCR series a.c. circuit with the help of vector diagram.

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66. Explain emission and absorption spectra.

67. Explain the working of Ruby laser with the help of energy level diagram.

68. Discuss the principle and action of a Bainbridge mass spectrometer to determine the isotopic masses.

69. Discuss the output characteristics of a transistor connected in CE mode with a neat circuit diagram.

70. Explain transmission and reception of Radar with a block diagram.