

SEMESTER-TWO

PHYSICS

Class XII

Sample Paper–1

Max. Marks: 50

Time Allowed: 90 minutes

General Instructions:

- (i) This question paper consists of 40 questions in 4 sections.
- (ii) All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- (iii) Section A consists of 10 Objective type questions carrying 1 mark each.
- (iv) Section B consists of 10 Fill in the blanks type questions carrying 1 mark each.
- (v) Section C consists of 10 True or False statement type questions carrying 1 mark each.
- (vi) Section D consists of 10 Short answer and Numerical type questions carrying 2 marks each.

Section A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 10.

1. In a circuit containing a capacitor, an inductor and a resistor in series, V_C , V_L and V_R represent the potential differences across those components and I represents the current through them. Which of the following statements is true ?
 1. V_C and I are 180° out of phase.
 2. V_R and I are 90° out of phase.
 3. V_L and V_C are 180° out of phase.

(a) if 1, 2, 3 are correct (b) if 1, 2 are correct
(c) if 2, 3 are correct (d) if 1 only
(e) if 3 only.

2. An alternating current of 1.5 mA rms and angular frequency $\omega = 100 \text{ rad s}^{-1}$ flows through a $10 \text{ k}\Omega$ resistor and a $0.50 \mu\text{F}$ capacitor in series. The rms potential difference across the capacitor is
 (a) 4.8 V (b) 15 V (c) 30 V (d) 34 V
 (e) 190 V.
3. An LCR series circuit with $R = 100 \Omega$ is connected to a 200 V, 50 Hz ac source. When only the capacitance is removed, the current lags the voltage by 60° . When only the inductance is removed, the current leads the voltage by 60° . The current in the circuit is
 (a) 2 A (b) 1 A (c) $\frac{\sqrt{3}}{2}$ A (d) $\frac{2}{\sqrt{3}}$ A.
4. In the nuclear decay given below :

$${}^A_Z X \longrightarrow {}^A_{Z+1} Y \longrightarrow {}^{A-4}_{Z-1} B^* \longrightarrow {}^{A-4}_{Z-1} B,$$
 the particles emitted in the sequence are :
 (a) α, β, γ (b) β, α, γ (c) γ, β, α (d) β, γ, α .
5. An element A decays into an element C by a two step process
 $A \rightarrow B + {}^4_2\text{He}$ and $B \rightarrow C + 2e^-$.
 Then,
 (a) A and C are isotopes. (b) A and C are isobars.
 (c) B and C are isotopes. (d) A and B are isobars.
6. If the radius of a nucleus of ${}^{256}\text{X}$ is 8 fermi, then the radius of ${}^4\text{He}$ nucleus will be
 (a) 16 fermi (b) 2 fermi (c) 32 fermi (d) 4 fermi.
7. Choose the wrong statement about the spin of an electron, according to quantum mechanics:
 (a) It is related to intrinsic angular momentum.
 (b) Spin is the rotation of an electron about its own axis.
 (c) Value of the spin quantum number must not be 1.
 (d) $+1/2$ value of spin quantum number represents up spin.
8. The Quantum Mechanical Model of the atom was proposed by:
 (a) Louis de Broglie (b) Erwin Schrodinger
 (c) Neil Bohr (d) Werner Heisenberg
9. The wavelength of the matter waves is independent of:
 (a) mass (b) velocity (c) charge (d) momentum

10. Assuming the velocity to be the same, which particle is having longest wavelength
(a) an electron (b) a proton (c) a neutron (d) an α -particle

Section B

Fill in the blanks with a suitable word for each of the questions 11 – 20.

11. A light bulb is rated 100 W for a 220 V supply. The resistance of the bulb and the peak voltage of the source respectively are
12. The Q-factor of an LCR circuit in series is largest when
13. An LCR series ac circuit is at resonance with 10 V each across L, C and R. If the resistance is halved, the respective voltage across L, C and R are
14. The nucleus which has radius one-third of the radius of ^{189}Os is
15. If half-life of radio isotope is 2 second and number of atoms is only 4, then after one half-life, the remaining atoms are
16. The energy released by the fission of one uranium atom is 200 MeV. The number of fissions per second required to produce 3.2 W of power is
(Take $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$)
17. The walls of a particle in a box are supposed to be
18. The wave function of the particle lies in which region
19. The particle loses energy when it collides with the wall
20. The Energy of the particle is proportional to

Section C

State whether the following statements are true or false for each of the questions 21–30.

21. The frequency of A.C. mains in India is 60 c/s.
22. A.C. power is transmitted from a power house at a high voltage as the rate of transmission is faster at high voltages.
23. Alternating currents can be produced by a dynamo.
24. The peak value of the a.c. current flowing through a resistor is given by $I_0 = e_0/R$.
25. The alternating current can be measured with the help of moving magnet galvanometer.
26. In an L.C.R. series a.c. circuit, the current always leads the generator voltage.

27. The radius of a nucleus is directly proportional to its mass number.
28. Nucleus of an atom whose atomic mass is 24 consists of 11 protons and 13 neutrons.
29. Particles which can be added to the nucleus of an atom without changing its chemical properties are called neutrons.
30. In the uranium radioactive series, the initial nucleus is ${}^{92}\text{U}_{238}$ and that the final nucleus is ${}^{82}\text{Pb}_{206}$. When uranium nucleus decays to lead, the number of α particles and β particles emitted are 8α , 6β .

Section D

Answer each of the questions 31 – 40.

31. What is a logic gate?
32. Write down the truth table of NOR gate and also draw its logic symbol.
33. What is an integrated circuit?
34. Write the truth table of NAND gate.
35. Name three nuclei which are on the 'bottom points' of binding energy curve.
36. Name five nuclei which lie on the peaks in binding energy curve.
37. Why electron capture is more common in heavy atoms?
38. If the uncertainty in the velocity of a moving object is $1.0 \times 10^{-6} \text{ ms}^{-1}$ and the uncertainty in its positions is 58 m, the mass of this object is approximately equal to that of:
39. Define the law of Stefan-Boltzmann.
40. How many NAND gates are required to get an AND gate?