

## SEMESTER-TWO

## PHYSICS

Class XII

### Sample Paper–2

Max. Marks: 50

Time Allowed: 90 minutes

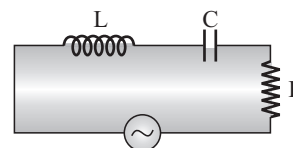
#### General Instructions:

- This question paper consists of 40 questions in 4 sections.
- All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- Section A consists of 10 Objective type questions carrying 1 mark each.
- Section B consists of 10 Fill in the blanks type questions carrying 1 mark each.
- Section C consists of 10 True or False statement type questions carrying 1 mark each.
- 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. Given LCR circuit has  $L = 5 \text{ H}$ ,  $C = 80 \mu\text{F}$ ,  $R = 40 \Omega$  and variable frequency source of 200 V. What is the source frequency which drives the circuit at resonance ?



- (a) 25 Hz                      (b)  $\frac{25}{\pi}$  Hz                      (c) 50 Hz                      (d)  $\frac{50}{\pi}$  Hz.
2. The instantaneous values of current and voltage in an ac circuit are given by

$$I = 6 \sin \left( 100 \pi t + \frac{\pi}{4} \right), \quad V = 5 \sin \left( 100 \pi t - \frac{\pi}{4} \right). \text{ Then}$$

- (a) current leads the voltage by  $45^\circ$ .  
(b) voltage leads the current by  $90^\circ$ .  
(c) current leads the voltage by  $90^\circ$ .  
(d) voltage leads the current by  $45^\circ$ .
- 3.** A resistor and a capacitor are connected in series with an ac source. If the potential drop across the capacitor is 5 V and that across resistor is 12 V, the applied voltage is  
(a) 13 V                      (b) 17 V                      (c) 5 V                      (d) 12 V.
- 4.** A radioactive element  $x$  converts into another stable element  $y$ . Half-life of  $x$  is 2 h, initially only  $x$  is present. After time  $t$ , the ratio of atoms of  $x$  and  $y$  is found to be 1 : 4, then  $t$  in hour is  
(a) 2    (b) 4  
(c) between 4 and 6                      (d) 6.
- 5.** A radioactive isotope has a half-life of 2 yr. How long will it take the activity to reduce to 3% of its original value?  
(a) 4.8 yr                      (b) 7 yr                      (c) 10 yr                      (d) 9.6 yr.
- 6.** A radioactive isotope A with a half-life of  $1.25 \times 10^{10}$  years decays into B which is stable. A sample of rock from a planet is found to contain both A and B present in the ratio 1 : 15. The age of the rock is (in years)  
(a)  $9.6 \times 10^{10}$                       (b)  $4.2 \times 10^{10}$                       (c)  $5 \times 10^{10}$                       (d)  $1.95 \times 10^{10}$ .
- 7.** Assuming the velocity to be the same, which particle is having longest wavelength  
(a) an electron                      (b) a proton                      (c) a neutron                      (d) an  $\alpha$ -particle
- 8.** The uncertainty principle states that the error in measurement is due to:  
(a) dual nature of particles  
(b) due to the small size of particles  
(c) due to large size of particles  
(d) due to error in measuring instrument
- 9.** The Eigen value of a particle in a box is \_\_\_\_\_  
(a)  $\frac{L}{2}$                       (b)  $\frac{2}{L}$                       (c)  $\sqrt{\frac{L}{2}}$                       (d)  $\sqrt{\frac{2}{L}}$
- 10.** What is the minimum Energy possessed by the particle in a box?  
(a) Zero                      (b)  $\frac{\pi^2 \hbar^2}{2mL^2}$                       (c)  $\frac{\pi^2 \hbar^2}{2mL}$                       (d)  $\frac{\pi^2 \hbar}{2mL}$

**Section B**

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

11. An alternating supply of 220 volt is applied across a circuit with resistance 22 ohm and impedance of 44 ohm. The power dissipated in the circuit is .....
12. A fully charged capacitor C with initial charge  $q_0$  is connected to a coil of self-inductance L at  $t = 0$ . The time at which the energy is stored equally between the electric and the magnetic fields is .....
13. When a  $p$ - $n$  junction is forward biased, the flow of current across the junction is mainly due to .....
14. The half-life of a radioactive isotope X is 50 years. It decays to another element Y which is stable. The two elements X and Y were found to be in the ratio of 1 : 15 in a sample of a given rock. The age of the rock was estimated to be .....
15. The power obtained in a reactor using  $^{235}\text{U}$  disintegration is 1000 kW. The mass decay of  $^{235}\text{U}$  per hour is .....
16. A radioactive nucleus of mass M emits a photon of frequency  $\nu$  and the nucleus recoils. The recoil energy will be .....
17. The Energy of the particle is proportional to \_\_\_\_\_
18. For a particle inside a box, the potential is maximum at  $x =$  \_\_\_\_\_
19. In the nuclear reaction  $^{14}_7\text{N} + \text{X} \longrightarrow ^{14}_6\text{C} + ^1_1\text{H}$ , the X will be .....
20. If the nuclear radius of  $^{27}\text{Al}$  is 3.6 fermi, the approximate nuclear radius of  $^{64}\text{Cu}$  in fermi is .....

**Section C**

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

21. For a nuclear fusion process, suitable nuclei are nuclei lying in the middle of periodic table.
22. In ...X... water is circulated through the reactor vessel and transfers energy to steam generator in the ...Y... Here, X and Y refer to primary loop, secondary loop.
23. A nuclei having same number of neutron but different number of protons/atomic number are called isotones.
24. Chemical property is one of the following has the identical property for isotopes.

25. The number of protons in an atom of atomic number  $Z$  and mass number  $A$  is  $Z$ .
26. When the number of nucleons in nuclei increases, the binding energy per nucleon increases continuously with mass number.
27. Current in a circuit is wattless if resistance in the circuit is zero.
28. Power factor is one for either an inductor or a capacitor.
29. The graph between inductive reactance and frequency is hyperbola.
30. For minimum dissipation of energy in the circuit the power factor should be large.

#### Section D

*Answer each of the questions 31 – 40.*

31. Write the truth table of NAND gate.
32. Give the logic symbol of NOR gate.
33. How many joule are contained in 1 kWh?
34. What exactly makes large nuclei unstable?
35. An electron and a photon each have a wavelength of 1.00 nm. Find
  - (i) their momentum,
  - (ii) the energy of the photon, and
  - (iii) the kinetic energy of the electron.
36. The output of a two-input NAND gate is fed as input to a NOT gate. Write down the truth table for the final output of the combination.
37. What will be the values of inputs  $A$  and  $B$  for the Boolean equation  $\overline{(A + B)} \cdot \overline{(A \cdot B)} = 1$  ?
38. The nucleus of an atom of  ${}_{92}^{235}\text{Y}$ , initially at rest, decays by emitting an  $\alpha$ -particle as per the equation :
 
$${}_{92}^{235}\text{Y} \longrightarrow {}_{90}^{231}\text{X} + {}_2^4\text{He} + \text{Energy}$$
39. Find the uncertainty in the position of an electron when the mass of an electron is  $9.1 \times 10^{-28}$  g and the uncertainty in velocity is equal to  $2 \times 10^{-3}$  cm/sec.
40. When ultraviolet radiation of wavelength 1200 Å. is incident on a photo sensitive surface, the electrons emitted have a stopping potential of 5.6 volt. Calculate the work function, threshold frequency and cut off wavelength.