

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, May 2021

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry

PY 1431.2 : ATOMIC PHYSICS, QUANTUM MECHANICS AND ELECTRONICS

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Very short answer type questions (Answer all **ten** questions of **1** mark each)

1. What is transistor biasing?
2. What is a Zener diode?
3. What are the conditions for faithful amplification of a transistor amplifier?
4. Write the quantum mechanical operator corresponding to linear momentum.
5. What is the physical significance of wave function Ψ ?
6. What is an eigen value equation?
7. Convert $(1010)_2$ into its decimal equivalent.
8. Multiply the binary numbers 10110 and 110.

9. What is Bohr magneton?
10. What is Ritz combination principle?

(10 × 1 = 10 Marks)

SECTION – B

Short answer type questions (Answer any **eight** questions of **2** marks each)

11. Discuss fixed bias circuit.
12. Why should the emitter-base junction be forward biased while the collector-base junction be reverse biased in a transistor circuit?
13. Draw the circuit diagram of a bridge rectifier.
14. Prove the relationship between phase velocity and group velocity.
15. What are the assumptions of the Planck's quantum theory of radiation?
16. What are the drawback's of Bohr's theory?
17. Distinguish between excitation and ionisation potential of a gas.
18. Explain Meissner effect.
19. Draw the circuit of two-input AND gate using two diodes.
20. How can superconductivity be destroyed?
21. Draw the block diagram of an absorption spectrometer.
22. Discuss the principle of a Double-Beam Spectrophotometer
23. State Heisenberg's uncertainty principle.
24. What are the requirements of a physically acceptable wave function?
25. Find the decimal equivalent of the binary number 1101.101.
26. Obtain an expression for the magnetic moment due to orbital motion of the electron.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

27. The constant α of a transistor is 0.95. What would be the change in the collector current corresponding to a change of 0.4 mA in the base-current in a common-emitter arrangement?
28. The lifetime of an excited state of an atom is about 10^{-8} sec. Calculate the minimum uncertainty in the determination of the energy of the excited state.
29. Obtain the steady state form of Schrodinger equation.
30. Calculate the permitted energy levels of an electron, in a box 1 Å wide.
31. Distinguish between type I and type II superconductors.
32. Prove the following Boolean identities.
 - (a) $AC + ABC = AC$
 - (b) $A + \overline{AB} = A + B$
33. The equivalent wavelength of a moving electron is 0.24×10^{-10} m. What voltage applied between two grids will bring it to rest?
34. If the Rydberg constant is $1.097 \times 10^7 \text{ m}^{-1}$, what are the wavelengths of the first three lines of the Paschen series?
35. Find the de-Broglie wavelength in angstroms for an electron of energy V electron volts.
36. Magnetic field intensity in tin is zero at 3.69 K and $\frac{3 \times 10^5}{4\pi}$ at 0 K. Calculate the temperature of superconductor if field intensity is measured as $\frac{2 \times 10^5}{4\pi}$.
37. What are the basic postulates of wave mechanics?
38. Convert $(21.6)_{10}$ into its binary number and $(425.350)_8$ into its decimal equivalent.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

39. Describe the vector model of the atom and explain the different quantum numbers associated with it.
40. With the help of a neat diagram describe the working of a common emitter transistor amplifier. Also define DC current gain, AC current gain, AC voltage gain, AC power gain, and discuss the phase relationship between the input and the output signal.
41. Discuss the spectroscopic technique employed in Double-beam Infrared Spectrometer. Mention its advantages and disadvantages.
42. What is a NOR gate? Give its truth table. Illustrate how a NOR gate acts as a universal gate.
43. Discuss the characteristics of a transistor connected in common base configuration.
44. Discuss the phenomenon of superconductivity and the experimental facts associated with it. Also list its applications.

(2 × 15 = 30 Marks)