

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**

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in a word **1** or **2** sentences. Each question carries **1** mark.

1. State Bohrs correspondence principle.
2. Define spatial quantization.
3. Define Meissner effect.
4. What are type I superconductors?
5. Define wavefunction.
6. Define electromagnetic spectrum.
7. Define avalanche breakdown.

8. Explain the principle of a rectifier.
9. Define Q point.
10. Write the truth table of OR gate.

[10 × 1 = 10 Marks]

SECTION – B

Answer **any eight** questions, not exceeding a paragraph. Each question carries **2 marks**.

11. State the postulates of Bohr atom model.
12. Explain LS Coupling scheme.
13. Explain the properties of superconductors.
14. Briefly discuss the application of superconductors.
15. Briefly mention the inadequacy of classical physics.
16. Define eigen values and eigen functions.
17. Explain Planck's quantum theory of radiation.
18. Briefly explain emission spectroscopy.
19. Briefly discuss the principle of spectrometer used in the microwave region.
20. Explain the current voltage characteristics of a diode.
21. Explain thermal runaway.
22. Compare three transistor configurations.

(8 × 2 = 16 Marks)

SECTION – C

Answer **any SIX** questions Each question carries **4** marks

23. Find the longest wavelength limit of Lyman series, given Rydberg constant as $1.097 \times 10^2 \text{ m}^{-1}$.
24. The energy of an excited hydrogen atom is 0.85eV Calculate the angular momentum of the electron according to Bohrs theory.
25. For an electron in a one dimensional infinite potential well of width $1\text{\AA}$, calculate the separation between the two lowest energy levels.
26. In a single stage transistor amplifier circuit emitter bias is used. The paramerts of the transistor are
- $\beta_{ac} = 100$ and $r_i = 2 \text{ k}\Omega$. Calculate
- (a) voltage gain
- (b) power gain.
- $V_{cc} = 15 \text{ V}$, $R_1 = 75 \text{ k}\Omega$, $R_2 = 7.5 \text{ k}\Omega$, $R_E = 1.2 \text{ k}\Omega$, $R_C = 4.7 \text{ k}\Omega$ and $R_L = 12 \text{ k}\Omega$.
27. A 7.2V zener is used in the circuit and the load current is to vary from 12 to 100 mA. Find the value of series resistance R to maintain a voltage of 7.2V across the load. The input voltage is constant at 12V and the minimum zener current is 10mA.
28. In the centre-tap rectifier, the diodes are assumed to be ideal ie, having zero internal resistance. Find the dc output voltage and peak inverse voltage. Ratio of number of turns in primary to secondary is 5:1 and ac supply voltage = 230V and load resistance = 100Ω
29. Find the 2's complement of
- (a) 1101 and
- (b) 0101

30. Convert each hexadecimal number into decimal

(a) 38_{16}

(b) $1F_{16}$

(c) DB_{16}

31. Find the frequencies of revolution of electron in $n = 1$ and $n = 2$ Bohr orbits. What is the frequency of photon emitted when an electron in $n = 2$ orbit drops to $n = 1$ orbit?

(6 × 4 = 24 Marks)

SECTION – D

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

32. State and explain quantum numbers associated with the vector atom model.

33. Obtain Schrodinger time-independent equation.

34. Explain the rectifying action of a pn junction diode. With the help of a neat circuit diagram, explain the working of a full wave rectifier using two diodes.

35. What is the need for biasing a transistor? Describe voltage divider biasing.

(2 × 15 = 30 Marks)