MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…………………   Name :………………….

Fourth Semester B.Sc. Degree Examination, June 2016
First Degree Programme under CBCSS
Complementary Course: Physics – IV (for Chemistry)
AUPY431.2b: Atomic Physics, Quantum Mechanics & Electronics

Time: **3** Hours   Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. Write down the expression for the wave number of hydrogen spectrum in the visible region.
2. What do you mean by magnetic spin quantum number ? What are the permitted values of this number ?
3. State Pauli exclusion principle.
4. What do you mean by superconductivity and critical temperature ?
5. What do you understand by the de Broglie wave length ?
6. Write down the condition for a wave function said to be normalized.
7. What is meant by an absorption spectrum ?
8. What do you mean by the d.c forward resistance and a.c forward resistance of a junction diode ?
9. Show the output characteristics of a transistor in CE configuration and give the expression for the output resistance.
10. Define the voltage gain of a CE amplifier. Give an expression for the voltage gain.

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. Explain the basic postulates of Bohr atom model.
12. Explain the doublet fine structure of sodium D – lines.

13. Distinguish between groups and periods in a periodic table.
14. Explain Meissner effect.
15. What do you understand by Eigen values and Eigen functions ?
16. What is the physical significance of wave function ?
17. Explain any two applications of spectroscopy.
18. What are the important components of a mass spectrometer ?
19. Explain the term potential barrier of a p – n junction. What is its significance ?
20. Explain the breakdown mechanisms of p – n junction.
21. What do you mean by transistor biasing ? What are the essential requirements of a biasing circuit ?
22. What do you understand by the frequency response of an amplifier ? What is its importance ?

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type / Problems : Answer any **SIX** questions.*

23. A beam of electrons is used to bombard gaseous hydrogen. What is the minimum energy in eV the electrons must have, if the first member of Balmer series is to be emitted. $(m_e = 9 \times 10^{-31}$ kg$)$
24. Explain the quantum numbers associated with the vector atom model.
25. The life time of an excited state of an atom is about 10^{-8} sec. Calculate the minimum uncertainty in the determination of energy of the excited state.
26. i). What do you understand by high temperature super conductors ? Give examples.
    ii). Explain any two applications of super conductivity.
27. An electron is confined to a box 1 Å wide. Obtain the first four eigen values of energy of the electron in eV.
28. Write a note on ESR spectroscopy.
29. With the help of necessary diagrams, explain the action of Zener diode as a voltage regulator.
30. A half wave rectifier is used to supply 50 V dc to a resistive load of 800 Ohms. The diode has a resistance of 25 Ohms .Calculate the a.c. voltage required.
31. With the help of circuit diagram, explain the operation of a single stage CE transistor amplifier.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. i). Explain the basic concepts of vector atom model.

    ii). Explain the different coupling scheme in vector atom model.

33. Derive the Schrodinger's wave equation for a particle in an one dimensional box and evaluate the eigen values and eigen functions.

34. Explain the principle of NMR. With the help of a block diagram describe the working of an NMR spectrometer.

35. With necessary diagrams, explain the operation of a full wave rectifier using centre tap transformer and p–n junction diodes. Obtain expressions for efficiency and ripple factor.

(2 × 15 = 30 Marks)

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