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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, March 2020

First Degree Programme under CBCSS

Complementary Course

PY 1431.2 – ATOMIC PHYSICS, QUANTUM MECHANICS AND ELECTRONICS

(For Chemistry)

(2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **ALL** questions in **one** or **two** sentences. Each question carries **1** mark

1. State Paul's exclusion principle.
2. Define magnetic moment of orbital electrons.
3. Define isotope effect.
4. Define superconductivity.
5. Define probability density.
6. Define emission spectra.
7. What type of source is used to produce microwave radiations.
8. What are the materials of the prism used in ultraviolet spectrometers.
9. Define ripple factor.
10. Write the truth table of AND gate.

(10 × 1 = 10 Marks)

P.T.O.

SECTION– B

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

11. Briefly explain the quantum numbers associated with vector atom model.
12. Explain the various Coupling schemes.
13. Discuss briefly the modern periodic table
14. Distinguish between type I and type II superconductors.
15. Briefly discuss the limitations of classical physics.
16. Explain the physical significance of wave function.
17. State and explain Planck's hypothesis.
18. Write the Schrodinger time-independent equation.
19. Briefly discuss the principle of spectrometer used in the infrared region.
20. Distinguish between zener breakdown and avalanche breakdown.
21. Distinguish between ac and dc load lines.
22. Define NAND operator and write its troth table.

(8 × 2 = 16 Marks)

SECTION– C

Answer **any six** questions, Each question carries **four** marks

23. Find the longest wavelength limit of Balmer series, given Rydberg constant as $1.097 \times 10^{7}\ m^{-1}$.
24. Calculate the frequency of revolution of the electron of the Bohr hydrogen atom in its ground state.

$E_0 = 8.85 \times 10^{-12} C^2 N^{-1} M^{-2}$ $h = 6.625 \times 10^{-34} J$

25. An electron typically spends about 10^{-8} s in an excited state before it drops to a lower state by emitting a photon. How many revolutions does an electron in an n=2 Bohr orbit make in 10^{-8} s ?

26. A particle limited to the x axis has the wavefunction $\Psi = ax$ between x=0 and x=1; $\Psi = 0$ elsewhere. Find the probability that the particle can be found between x=0.45 and x=0.55.

27. For an electron in a one dimensional infinite potential well of width 1A°, Calculate the separation between the two lowest energy levels.

28. An ac supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10:1.Find (i) the output dc voltage and (ii) peak inverse voltage. Assume the diode to be ideal.

29. The zener diode has $V_z = 18V$. The voltage across the load stays at 18V as long as I_z maintained between 200mA and 2A. Find the value of series resistance R so that E_0 remains 18V while input voltage E_i is free to vary between 22V and 28V.

30. If the collector current changes from 2mA to 3mA in a transistor when collector-emitter voltage is increased from 2V to 10V,what is the output resistance?

31. Find the 2's complement of

    (a) 1001_2

    (b) 1110_2

    (c) 100_2

(6 × 4 = 24 Marks)

SECTION– D

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

32. (a) State the important postulates of Bohr atom model. What are its limitations?

    (b) Derive an expression for the energy of the electron in the n^{th} orbit of hydrogen atom.

33. Using Schrodinger wave equation for a particle in a potential box, obtain the eigen functions and eigen values.

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 bridge rectifier.

35. With the help of a neat circuit diagram, explain the working of a single stage transistor amplifier. Obtain expression for its current gain, voltage gain and power gain.

(2 × 15 = 30 Marks)
