

**E 1343**

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Reg. No.....

Name.....

**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2015**

**Third Semester**

Complementary Course—PHYSICS—QUANTUM MECHANICS, SPECTROSCOPY,  
NUCLEAR PHYSICS AND ELECTRONICS

(For Chemistry and Geology)

[2013 Admission onwards]

Time : Three Hours

Maximum : 60 Marks

**Part A (Short Answer Questions)**

*Answer all questions .  
1 mark each.*

1. What are matter waves ?
2. What is meant by normalization of wave functions ?
3. What are the drawbacks of Rutherford's atom model ?
4. What is Raman Effect ?
5. What is artificial radio activity ?
6. Briefly explain the size and shape of a nucleus.
7. What is a breeder reactor ?
8. Draw the forward and reverse characteristics of a junction diode.

(8 × 1 = 8)

**Part B (Brief Answer Questions)**

*Answer any six questions.  
2 marks each*

9. State and explain Planks quantum hypothesis.
10. Briefly explain the conclusions of the Davisson- Germer experiment.
11. Explain the fine structure of Hydrogen atom.
12. List the salient features of vector atom model.
13. Differentiate between half life and mean life of a nucleus.
14. State the properties of nuclear forces.
15. Briefly explain the liquid drop model of nucleus.

**Turn over**

16. Explain the proton-proton cycle of nuclear reactions for stellar energy.
17. Bring out voltage regulating action of Zener diode.
18. How does a transistor act as an amplifier ?

(6 × 2 = 12)

**Part C (Problems /Derivations)**

*Answer any four questions.*

*4 marks each.*

19. Calculate the frequency of radiation, and also the wave number, when an electron jumps from the third orbit to second orbit of hydrogen atom.
20. A piece of an ancient wooden boat shows an activity of  $^{14}\text{C}$  of 3.9 disintegrations per minute per gm of carbon. Estimate the age of the boat if the half life of  $^{14}\text{C}$  is 5.568 years. Assume that the activity of fresh carbon -14 is 15.6 dpm. gm.
21. The binding energy of neon isotope  $_{10}^{20}\text{Ne}$  is 160.647 MeV. Find its atomic mass.
22. Find the de Broglie wave length of the 40 KeV electrons used in a certain electron microscope.
23. Use the semi empirical binding energy formula to calculate the energy that would be released if a  $\text{U}^{238}$  nucleus were to split into two identical fragments.
24. A half wave rectifier is used to supply 50 V d.c. to a resistive load of  $800\ \Omega$ . The diode has a resistance of  $25\ \Omega$ . Calculate the a.c. voltage required.

(4 × 4 = 16)

**Part D (Long Answer /Problem Questions)**

*Answer any two questions.*

*12 marks each.*

25. What is Photoelectric effect ? What are the experimental results observed with the Photoelectric effect ? How Einstein explained these results ?
26. Discuss the theory of vibrational spectra of rigid diatomic molecules.
27. Explain nuclear fission and chain reaction. Describe the construction and working of a nuclear reactor.
28. Explain the working of centre tap full-wave rectifier. Obtain the expression for its efficiency. What are its advantages and disadvantages ?

(2 × 12 = 24)