

**B. Sc. (Physics) Semester – V**

**Paper – 503 Sub Code 4296 : Atomic Physics and Nuclear Instrumentation**

**Time [2:30 Hours]**

*Nov-2014*

**[Total Marks 70]**

- Instructions: 1. Symbols have their usual meaning.  
2. Figures on right hand side show marks of that question.

**Q:1:**

- (a) Explain the Stark effect with experimental setup. [10]  
(b) Explain with example how L, S & J are obtained from the components of spectral term. [04]

**OR**

**Q:1:**

- (a) Draw the energy transition diagram of  $^2P_{3/2} \rightarrow ^2S_{1/2}$  line of Anomalous Zeeman effect with tabulation. [10]  
(b) Calculate the change in energy for the sodium source emitting the light of wavelength 5890 Å in the presence of magnetic field of 1T strength. [04]

**Q:2:**

- (a) What is Paschen-Back effect? Derive an expression for change in energy with an example of principal series of lithium. [09]  
(b) Calculate Lande's "g" splitting factor for the terms  $^{10}H_{1/2}$  and  $^{10}G_{1/2}$  [05]

**OR**

**Q:2:**

- (a) Discuss about the Orbital and Spin magnetic moment of an atom. [07]  
(b) Explain experimental verification of Lande's "g" splitting factor. [07]

**Q:3:**

- (a) Derive Weizsacher's semi-empirical Binding Energy formula in the case of liquid drop model. [10]  
(b) Write a short on binding energies of nuclei. [04]

**OR**

**Q:3:**

- (a) Explain magic numbers for protons with diagram. [07]  
(b) Explain in short: Predictions of the Shell model. [07]

**Q:4:**

- (a) Discuss evidences that support the existence of magic numbers. [07]  
(b) Write a note on Standard model of elementary particles. [07]

**OR**

**Q:4:**

- (a) Discuss the fundamental interactions and conservation laws in Physics. [08]  
(b) Justify why neutron possess little magnetic moment though it doesn't have net charge. [06]

**Q:5:**

- (a) Explain in detail the technique of NMR. [09]  
(b) Explain applications of NMR in chemistry. [05]

**OR**

**Q:5:**

- (a) What is Mossbauer effect ? Explain the Mossbauer effect with experimental setup. [08]  
(b) Explain application of Mossbauer effect for precise energy measurement. [06]

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