

B.A/B.Sc. - 6th Semester (old sylb 2018-19)

(2721)

Paper: Physics Paper-A (Nuclear Physics)

Time Allowed: 2 hrs.

Max. Marks: 35

Note: There are EIGHT questions of equal marks. Candidates are required to attempt any FOUR questions.

1. (a) What are nuclear forces? Give a quantitative discussion of these forces.  
(b) The mass of deuteron ( ${}_1\text{H}^2$ ) nucleus is 2.014103 a.m.u. if the masses of proton and neutron are 1.007825 a.m.u and 1.008665 a.m.u respectively. Calculate the mass defect, binding energy and binding energy per nucleon. (6,2.75)
2. What is proton-electron hypotheses? Explain why an electron cannot exist inside the nucleus. (8.75)
3. What do you understand by half-life and mean-life of a radioactive substance? Derive expressions for them and establish the relation between them. (8.75)
4. Explain radioactive dating and give two important methods (Uranium dating and Carbon dating) used for it. (8.75)
5. What is Q-value of a nuclear reaction? Derive an expression for the Q-value of a nuclear reaction in terms of masses and Kinetic energies of incident particles, product particles and nuclei? (8.75)
6. (a) State and explain the conservation laws that apply to nuclear reactions. (5)  
(b) What is nuclear reaction Cross-section? (3.75)
7. Explain the postulates of liquid drop model. Give a simple derivation of semi-empirical mass formula. (8.75)

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8. Outline the basic features of the shell model of the nucleus. How does it account for the existence of magic numbers? Just explain magic numbers 2,8,20,28,50,82 or 126. (8.75)

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