The Open University of Sri Lanka
B.Sc. Degree Programme – Level 5
Department of Physics
Nuclear and Particle Physics – PYU 3160
No Book Test 2 - 2016/2017

Date: 04th November 2017 Time: 01.00 pm – 02.00 pm

Answer all the questions.

Part A: Write down the best choice in the answer book quoting the respective question number

(15 minutes; 4 marks x 10 = 40 marks)

(01) Which one of the following is a unit used with radioactivity?
(a) Rutherford (b) Hertz (c) Henry (d) Fermi

(02) Semi empirical mass formula is developed based on,
(a) Rutherford's model (b) Thomson's model (c) Liquid drop model (d) Shell model

(03) Which one of the following **cannot** be deflected by a magnetic field?
(a) electron beam (b) alpha rays (c) beta rays (d) gamma rays

(04) A process in which heavy nucleus splits into two by bombarding a slow moving neutron is called,
(a) radioactive decay (b) nuclear fusion (c) nuclear fission (d) elastic collision

(05) Nuclear fusion occurs typically in,
(a) Laser source (b) LED bulbs (c) Sun (d) Moon

(06) Which one of the following is **NOT** a property of the weak nuclear force?
(a) Weaker than gravitational force. (b) It mediate through $W^{\pm}$ and Z bosons.
(c) Short range force. (d) Stronger than gravitational force.

(07) Which force is responsible for instability in certain nuclei?
(a) Electromagnetic (b) Gravitational (c) Strong (d) Weak

(08) To which category of elementary particles does the **electron** belong?
(a) Baryons (b) Bosons (c) Hadrons (d) Leptons

(09) Which one of the following is **NOT** a quark?
(a) Top (b) Low (c) Charm (d) Up

(10) The major advantage of linear accelerators is, they **do not** require,
(a) magnets to guide the particles (b) long space
(c) large number of driver devices (d) ultra-high frequency oscillators

Part B:

(45 minutes; 20 marks x 3 = 60 marks)

(I) (a) Write down the **similarities** between a liquid drop and a nucleus that led to the formation of liquid drop model.

(b) Briefly discuss the contribution of (i) volume energy term, (ii) surface energy term and (iii) Coulomb energy term to the semi empirical mass formula.

(II) A reactor is generating power at the rate of 200 MW. How many atoms of U^{235} undergo fission per second? How many kilograms of U^{235} would be used in one week of operation, assuming that on an average 180 MeV energy is released per fission?

(III) (a) Write down the universal conservation laws for elementary particles and briefly describe them.

(b) Write down the family conservation laws for elementary particles and briefly describe them.

Useful Physical Data

1 MeV	=	1.602×10^{-13} J
Avogadro constant	=	6.022×10^{23} mol^{-1}

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