

M. Sc. (Sem. – III) Examination- December-2016
Chemistry: Paper-XI (Nuclear and Radio Chemistry)
Subject Code: 3494

Time: 2.5 hours

Total Marks: 70

Instruction: All questions carry equal marks

Q-1 Answer the following (Any three):

14

- (a) Define: (i) Q value of a nuclear reaction
(ii) Rontgen
(iii) Thermonuclear reactions
(iv) Mass defect
(v) Dose
- (b) Give the synthesis of S^{35} and I^{131} .
- (c) State the following statements as true or false. If it is false, correct it.
(i) Graphite is used as moderator in nuclear reactors.
(ii) U^{238} is more fissionable by thermal neutrons than U^{235} .
(iii) Organic compounds are used in scintillation counters.
(iv) Stability of nucleus depends upon n/p ratio.
(v) Alpha rays are more harmful than beta or gamma rays.
- (d) (i) What are the properties of electron?
(ii) Complete the following β -decay mode
 ${}_{92}U^{238} \rightarrow {}_{90}Th^{234} + \text{---}$
- (e) Define the following terms with two examples of each
(i) Isobars (ii) Isotopes

Q-2(a) What is mass defect? How can it be calculated for the nucleus of mass A and atomic number Z. 08

Q-2(b) Calculate the disintegration constant of Cobalt-60, if its half-life to produce Nickel-60 is 5.2 years. 06

OR

Q-2(a) Explain the four factor formula in detail. 08

(b) Discuss Soddy-Fajan displacement law with suitable examples. 06

Q-3 Write short notes on (Any three): 14

- (i) Nuclear fission (ii) Van de Graff (iii) Geiger muller counter
(iv) Isotope dilution technique (v) Nuclear stability

Q-4(a) What are different types of radiation. Explain in detail 08

Q-4(b) The half life period of radioactive Ac is 19.5 days. In how much time will a gram of pure element 06

OR

Q-4(a) Describe the basic reactions involving active species produced in the primary act 08

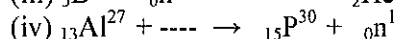
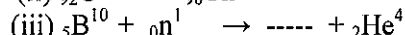
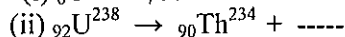
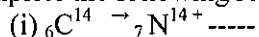
Q-4(b) The half life of a radioisotope is 47.2 second. Calculate N/N_0 left after one hour 06

Q-5(a) Discuss application of radiotracers in medical field 07

Q-5(b) Discuss radiometric titration. 07

OR

Q-5(a) (i) Complete the following reactions: 08



(ii) Give the synthesis of C^{14} and P^{32} .

Q-5(b) Calculate the half-life of radium-226 if 1 g of it emits 3.7×10^{10} alpha particles per second 06