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
$_{92}U^{238} \rightarrow {}_{90}{}^{Th234} + \_\_\_$

(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**
(i) $_6C^{14} \rightarrow {}_7N^{14+}$ -----
(ii) $_{92}U^{238} \rightarrow {}_{90}Th^{234}$ + -----
(iii) $_5B^{10} + {}_0n^1 \rightarrow$ ----- + $_2He^4$
(iv) $_{13}Al^{27}$ + ---- → $_{15}P^{30} + {}_0n^1$
(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**

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