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Total Number of Pages : 02

M.Sc.
16MCYF409

4th Semester Regular Examination 2017-18

NUCLEAR CHEMISTRY

BRANCH : M.Sc.(AC)

Time : 3 Hours

Max Marks : 70

Q.CODE : C302

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

(Given masses : $^1\text{H} = 1.0078\text{u}$; $n = 1.0087\text{ u}$; $^{15}\text{N} = 14.9449\text{u}$; $^9\text{Be} = 9.0129\text{u}$; $^9\text{B} = 9.0085\text{u}$; $^{18}\text{O} = 17.9989\text{u}$; $^{18}\text{F} = 18.0023\text{u}$)

Q1. Answer all questions : (2 x 10)

- (a) Write the nucleons configuration and parity of the following nuclei –
(i) ^{41}K ; (ii) ^{81}Br
- (b) What is a stripping reaction? Give an example of it.
- (c) How much of ^{64}Ni ($\tau = 70\text{ h}$) is left if 4g of it is decayed for 210 hour?
- (d) On the basis of semi-empirical mass equation, determine the stable nuclide of isobaric series $A = 125$.
- (e) Define Geiger-Nuttall's law.
- (f) What is the kinetic energy (in J and eV) of an electron whose de Broglie wavelength is 10^{-8}cm ?
- (g) The atoms of ^{235}U releases 200MeV energy per fission. Calculate the total energy in Joules released when 1 kg of it undergo fission.
- (h) What is FBTR? Where it is located in India? Name the fuel used in it.
- (i) Describe the fusion reaction takes place in sun.
- (j) Calculate the mass and number of atoms in a mCi of ^{24}Na ($\tau = 15\text{h}$).

Q2. (a) Describe the various factors considered for calculation of binding energy using semi-empirical equation on the basis of liquid drop model. (7)

(b) Discuss the various units used for determination of radiation energy. (3)

Q3. (a) Describe the four-factor formula used for functioning of the reactors. (7)

(b) Describe the functioning of Ceric Sulphate dosimeter. (3)

Q4. (a) Describe the salient features of collective model of nuclei and discuss its merits. (6)

(b) Write the photonuclear reactions occurred in the earth. (4)

Q5. (a) Enumerate the details on theory of α -decay. (6)

(b) Write the four types of applications of radioactive isotopes in our day-to-day life. (4)

- Q6. (a)** Derive the general expression to determine the activity of a daughter nuclide. Find its application to different cases. **(6)**
- (b)** What are the important steps to be taken during handling of nuclear wastes? **(4)**
- Q7. (a)** Describe at least four types of nuclear reactions with charged particles. **(6)**
- (b)** The reactions (i) ${}^9\text{Be} (p, n) {}^9\text{B}$ and (ii) ${}^{18}\text{O} (p, n) {}^{18}\text{F}$ have threshold energies of 2.059 and 2.90 MeV, respectively. Find their Q values. **(4)**
- Q8. (a)** Discuss the salient features of neutron activation analysis and give its applications **(Two)**. **(5)**
- (b)** Describe the theory of nuclear fission. **(5)**