This question paper contains **3** printed pages]

AI—46—2017

FACULTY OF SCIENCE

M.Sc. (Second Year) (Fourth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2017

(CBCS Pattern)

PHYSICAL CHEMISTRY

Paper XX (CH-541/3)

(Radiation Chemistry)

(Saturday, 11-11-2017)   **Time : 2.00 p.m. to 5.00 p.m.**

Time—3 Hours   *Maximum Marks—75*

N.B. :— (i) Attempt *All* questions.

    (ii) Use of log table and calculator is allowed.

    (iii) Solve MCQ's in one attempt only.

1. Solve any *three* of the following :   15

    (a) Explain characteristics of β-decay.

    (b) Explain Bethe's notation for nuclear reaction.

    (c) Explain atomic absorption coefficient.

    (d) Write a short note on hydrated electrons.

    (e) Write a note on Tunnel effect.

2. Attempt any *three* of the following :   15

    (a) Derive the expression : $N = N_0 \cdot e^{-\lambda t}$.

    (b) Explain in brief uses of Nuclear radiations.

    (c) Write a note on Linear energy transfer.

    (d) How will you explain evaporation and spallation ?

    (e) Write a note on radiolysis of water.

                                            P.T.O.

3. Solve the following :

(a) What is fission energy ? Explain in brief reproduction factor (K). 7

Or

Discuss the stability of nucleus in terms of neutron proton ratio and binding energy. 2 g of radioactive element degraded to 0.5 g in 60 hours. In what time will it be reduced to 10% of its original amount ?

(b) Explain thermonuclear reactions in the sun and stars. 8

Or

A old wooden article shows 2.0 counts per minute per gm. A fresh sample of wood shows 15.2 count per minute per gram. Calculate the age of the wooden article. [$t\frac{1}{2}$ of C^{14} = 5460 yr.]

4. Attempt the following : 15

(a) Explain energetics of β-decay.

(b) How is conservation observed in Nuclear reaction ?

Or

(a) What is nuclear reactor ? Describe its main parts briefly.

(b) What do you mean by Tracer technique ? Write different application of Tracer technique.

5. (A) Select the *correct* alternatives from the following : 5

(i) Radioactive isotopes that have an excessive neutron-proton ratio generally exhibit which one of the following :

(a) Alpha emission

(b) Beta emission

(c) Positron capture

(d) K-capture

(ii) When hydrogen nuclei trap neutrons they form :

(a) Alpha particle

(b) Deuterium

(c) Beta rays

(d) Positron

(iii) Packing fraction is most closely related with :

(a) Dipole moment

(b) Electron spin

(c) Increase in relativistic mass

(d) Mass defect

(iv) The unit of effective cross-section in nuclear reaction is :

(a) 10^{-16} cm^2

(b) 10^{-18} cm^2

(c) 10^{-20} cm^2

(d) 10^{-24} cm^2

(v) The following isotope, the one that is not radioactive is :

(a) $^{60}_{90}Co$

(b) ^{131}I

(c) ^{40}Ca

(d) ^{90}Sr

(B) Write short notes on (any two) :   10

(i) Buckshot Hypothesis

(ii) Chemical Dosimeter

(iii) Radioisotope as a source of electricity.