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AG—284—2018

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2018

(Revised Course)

CHEMISTRY

Paper XXIII (CH-544/1)

(Nuclear and Radiochemistry)

(Tuesday, 4-12-2018)

Time : 2.00 p.m. to 5.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

1. Answer any *three* out of five : 15

- (a) What are the characteristics of α radiation ?
- (b) Explain the application of Radiation Dosimetry.
- (c) Draw layout of nuclear reactor for power generation.
- (d) Discuss the principle of electron capture reaction with suitable example.
- (e) What is symmetric fission ? Give example.

2. Answer any *three* out of five : 15

- (a) How are nuclear reactions controlled ?
- (b) Describe the characteristics of β particle.
- (c) Describe the penetrating power γ radiation.
- (d) What is Hydrated electron ? Explain with example.
- (e) Discuss the energetics of nuclear fusion.

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3. Answer the following :

(A) Discuss the theory of γ decays. 8

Or

What are the different important features of nuclear fusion reactor ?

(B) Compare the characteristics of α rays with γ rays. 7

Or

Explain Radiolysis of water with respect to energy and products obtained.

4. Answer the following :

(A) Describe the working of Natural uranium reactor. 8

Or

Discuss the chemical effects of nuclear reaction.

(B) Enlist various characteristics of liquid drop model. 7

Or

Enlist features of Enriched aqueous homogeneous reactors.

5. (A) Choose the *correct* option from the given alternatives : 5

(i) The nuclear Coulomb energy with the increase in average distance between the Nuclear protons.

- (a) decreases
- (b) increases
- (c) unaffected
- (d) becomes zero

(ii) The is defined as a ratio of Coulomb energy on charged sphere to surface area of the sphere.

- (a) Nucleus parameter
- (b) Decay parameter
- (c) Fusion parameter
- (d) Fissionability parameter

- (iii) With longer time scale, the neutron rich fragments emit :
- (a) γ -particle
 - (b) β -particles
 - (c) α -particles
 - (d) Meson particles
- (iv) The spontaneous fission half-lives change by a factor of 10^{29} in going from the longest lived U nuclei to the short-lived isotopes of :
- (a) Thorium
 - (b) Neptunium
 - (c) Fermnium
 - (d) Americium
- (v) Uranium-238 decays to form Th^{234} by :
- (a) α decay
 - (b) β decay
 - (c) Electron capture
 - (d) Positron decay
- (B) Write brief notes on (any two) :
- (a) Optical model
 - (b) Dirac's theory of positron
 - (c) Relation between mass and energy.

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