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[55] SEAT No._____ No. of Printed Pages : 2

Sardar Patel University

M. Sc THIRD SEMESTER (**Physical Chemistry**) Examination – 2019

Friday, 22nd March 2019

2.00 p.m. to 5.00 p.m.

PS03CPHC 22, Nuclear and Radiation Chemistry

N. B: (i) Attempt all questions

(ii) Figures to the right indicate full marks

(iii) $u = 1.6605 \times 10^{-27}$ kg, $h = 6.6262 \times 10^{-34}$ J.s, $1eV = 1.6022 \times 10^{-19}$ J

$m^1H = 1.0078$ u, $m^2D = 2.0141$ u, $m^3H = 3.0160$ u

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1. Multiple Choice Questions

(i) Which of the following has highest cross section ?

(a) (d,t) (b) (t,n) (c) (d,p) (d) (t,d)

(ii) In n T_c, T_c is defined as:

(a) Fusion temp. (b) break even point (c) critical temp. (d) combustion temp.

(iii) $e^- + ? \rightarrow H^\cdot$

(a) H+ (b) H (c) H_2O^+ (d) OH^-

(iv) The zig zag path indicates:

(a) alpha particles (b) aqueous electrons (c) beta particles (d) gamma particles

(v) $d + p \rightarrow ? + \gamma$

(a) ^2_3He (a) ^2_3He (c) ^3_2He (d) ^4_2He

(vi) 1 C_i is equal to :

(a) 3.70×10^{10} dps (b) 2.40×10^{10} dps (c) 3.70×10^{-10} dps (d) 2.40×10^{-10} dps

(vii) Following radation does not produce ion-pairs:

(a) gamma rays (b) alpha rays (c) atomic electrons (d) beta rays

(viii) Barn is the unit of:

(a) flux (b) cross section (c) yield (d) both b and c

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2. Attempt **ANY SEVEN**:

(i) How one can express the force of repulsion in nuclear reaction ?

(ii) $^{63}Cu\ (^2H,^1H)^{64}Cu$: is this reaction an example of stripping or pick up reaction ?

(iii) Consider the reactions: *(γ,n) and (γ,p)* and classify them by their type

(iv) Give two basic characters of a tracer nuclei.

(v) Prove that the hydrogen of the water goes to the alcohol in the ester hydrolysis reaction.

(vi) How one can determine the antibiotic produced in a bacterial broth ?

(vii) Derive $\mathbf{p = h / \lambda}$

(viii) Give two examples of reactions that involve charged partices.

(ix) What are scintillation counters ?

(P.T.O.)

3.(a) Explain in detail different types of particle – particle reactions and give the unique features of (d,p) reactions 6

(b) (i) A deuteron particle is accelerated under 1 MeV energy and estimate its velocity. 3

(ii) Describe the elements of Bethe`s notation and explain with two examples. 3

OR

(b) (i) Define and discuss nuclear instability. 3

(ii) Which one is correct $E_{th} > Q$ or $Q > E_{th}$? Prove it with proper explanation. 3

4. (a) Discuss the different features and conditions used under magnetic and inertial confinement to control the nuclear fusion reactions. 6

(b) (i) Give at least three reactions of importance for fusion process. 3

(ii) What is a breeding cycle ? Why it is required. 3

OR

(b) Explain the inverse law. 6

5. (a) Are the all the P-Cl bonds in PCl_5 are equivalent or not ? Justify your answer taking the help of the tracer technique. 6

(b) What is DID analysis method ? Describe how it can be used to estimate the volume of blood in humans 6

OR

(b) Give the features of neutron activation analysis and how it is useful in tracing the arsenic poisoning. 6

6. (a) What is meant by BREMSSTRHALUNG ? Discuss features of interaction of Beta Particles with matter. 6

(b) Describe and discuss various physical effects and photochemical reactions during the slowing down of ionizing radiation. 6

OR

(b) Write a note on Solid State Ionization detectors. 6

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