(c) In your own words explain "Neutron Activation Analysis". Why do you think "Proton Activation Analysis" is not so well established technique ? $2+^1/_2$

(d) ^{235}U can undergo fission with slow neutrons whereas ^{238}U require high energy neutrons to cause fission. Explain the fact. $2^1/_2$

(e) Write down and explain Fermi's four factor formula. $^1/_2+2$

(f) From the concept of nuclear fission, derive the condition for the fission parameter Z^2/A. What is the significance of such a parameter ? $2+^1/_2$

(g) What is a "fast breeder reactor" ? Explain with the help of appropriate equations. $1^1/_2+1$

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Ex./M.Sc/CH/I/U-1031/9/2018

M.Sc. CHEMISTRY EXAMINATION, 2018

(1st Semester)

INORGANIC CHEMISTRY

Paper - III

Time : Two hours Full Marks : 50

(25 marks for each unit)
Use a separate answerscript for each unit.

UNIT - 1031

1. Answer the following questions :

   (a) The $[CrF_6]^{3-}$ shows three absorption bands at 14,900, 22,700, and 34,400 cm^{-1}, respectively. Assign the bands. Calculate 10 Dq and B values. What is the expected color of the complex ? 4

   (b) Construct the Ligand Group Orbitals (LGO) and hence the Symmetry Adopted Linear Combination (SALC) to from the bonding and antibonding orbitals in an octahedral complex of the type ML_6 including π -interactions and draw the appropriate MO diagram of the complex. 5

   (c) Taking suitable example how you will demonostrate the overlap between metal and ligand orbitals in an octahedral complex ? 2

(d) Addition of a Fe^{3+} salt into an aqueous solution of $K_4[Fe(CN)_6]$ leads to the formation of a deep blue color of the resulting solution. Explain the origin of the color. 2

2. Answer the following questions :
   (a) With the help of molecular orbital diagram, explain why the octahedral transition metal carbonyls obey the 18 electron rule. 2
   (b) Discuss the probable modes of addition reaction in square planar complexes. 2
   (c) Discuss any one of the mechanisms of cyclometalation reaction. Mention the importance of transition metal cyclometalated complexes. 2+1
   (d) Define oxidative addition and reductive elimination reactions. Discuss the concerted mechanism of oxidative addition reaction. 1+2
   (e) Describe 1,1 and 1,2-insertion reactions with examples. 2

UNIT - 1032A

3. (a) Discuss with one example of a chemical system which is thermodynamically unstable but inert. $2^1/_2$
   (b) $[Co(NH_3)_5(CO_3)]^+$ rapidly aquates although low-spin Co(III) is inert to substitution. Explain with proper reasoning. 4

(c) Consider the acid catalyzed aquation of $[M(NH_3)_5X]^{2+}$. When X = F, then the aquation rate is higher than that for X = Cl, Br or I. What conclusions we can draw from this obsrvation ? $2^1/_2$

(d) For the reaction

$A + B \rightleftarrows C \quad k_1, k_{-1}$

$C \rightarrow P \qquad k_2$

where A and B are reactants to form an intermediate C in equilibrium (Equilibrium constant $K = k_1/k_{-1}$) and then C gives rise to products in the rate step k_2. Given the initial condition $[A]_0 << [B]_0$, how could you determine K and k_2 ? $3^1/_2$

UNIT - 1032B

Answer any ***five*** questions.

4. (a) Derive the equation to calculate recoil energy of daughter nucleus based on energy of γ-photon and mass number related with Szilard-Chalmer reaction. $2^1/_2$
   (b) In a ^{79}Br (n, γ) ^{80} Br reaction the energy of γ-photon is 5 MeV and C-Br bond energy is 2.16 eV. Comment on the formation of ^{80}Br from $C_2H_5{}^{79}Br$. How one can isolate $Ag^{38}Cl(s)$ from an aqueous solution of $Na^{37}ClO_3$? $1^1/_2$+1