Inter B.Sc. Examination, 2019
(1ST SEMESTER)
CHEMISTRY (HONOURS)
INORGANIC CHEMISTRY
OLD SYLLABUS
Paper – VII

TIME: 2HRS. **FULL MARKS: 50**

ATTEMPT *ALL* QUESTIONS

1. (a) Show:

$$t_{av} = \frac{1}{\lambda}$$

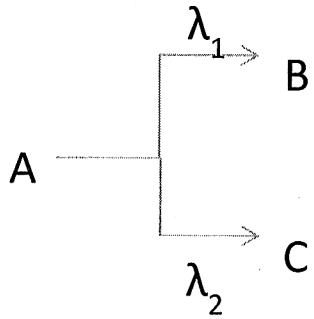
Where t_{av} is average half-life period and λ is the decay constant. [2]

(b) Explain the heavy ion projectile induced reactions in the light of nucleon transfer and particle emission reactions. [2]

(c) What is branching decay? [2]

Show $t_{\frac{1}{2}} = \frac{0.693}{\lambda_1+\lambda_2}$

For



(d) 'In the heavier nuclei the fission and spallation reactions may occur simultaneously—explain with example. [2]

(e) How would you determine the Avogadro's number (N) from radioactive decay measurement? [2]

[Turn over

(f) The half-life of a radio element is 231 min. How long will it take for 9/10th fraction of a sample of this element to decay? [2½]

2. (a) $MnO_2 + 4H^+ + 2e^- \rightleftharpoons Mn^{2+} + 2H_2O$ ($E^0 = 1.23$ V)

$Cl_2 + 2e^- \rightleftharpoons 2Cl^-$ ($E^0 = 1.36$ V)

The E^0 values suggest than MnO_2 should not oxidize Cl^- to Cl_2, but yet it happens. Explain.

[3½]

(b) The E^0 value of the Cu^{2+}/Cu^0 half-cell is 0.34 V, and that of the Cu^{2+}/Cu^+ half-cell is 0.15 V. Find out the E^0 of the Cu^+/Cu^0 half-cell. [2]

OR

State and explain Brönsted theory of acids and bases. [2]

(c) Describe, with appropriate example, the basis of choosing a suitable redox indicator for a redox titration. [3]

(d) (i) State the Pearson's HSAB principle, and explain it with an example. [2½]
(ii) Give example of a reaction where this principle is not obeyed. [1½]

3. (a) Explain the bonding pattern in $[Mo_2Cl_8]^{4-}$. why it is intense red in colour. [3½]

(b) Draw MO diagram of O_2. Mention its different molecular states, spin multiplicity and chemical reactivity at different molecular states. [3]

(c) CO is quite reactive and acts as a potential *pi* (π) acid ligand - Justify [3]

(d) Mention type of bonding, nodal plane and centre of inversion present in the following types of atomic orbitals overlapping

(i) d_{xy} and d_{xy} (ii) p_y and p_y (iii) p_x and s [3]

4. (a) Be_2 may exist at very low temperature. Comment. [2]

(b) Comment on the structure of basic beryllium acetate. [2]

(c) Explain the ability of ethylene as a ligand with transition metals having filled π_d orbitals. Give example of one such complex. [2]

(d) The solubility of BeO in water increases on adding aqueous $BeSO_4$ solution. Suggest a reason. [2]

(e) Write a short note on the structure of basic beryllium acetate. [2]

(f) Write notes on ortho and para hydrogen. [2]

(g) What is meant by lithia water ? [½]