U.G. 4th Semester Examination - 2021

CHEMISTRY

[HONOURS]

Course Code : CHEM-H-CC-T-9

Full Marks : 20 Time : 1 Hour

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **five** questions: 1×5=5

   a) Give example of a Linkage isomer.

   b) What is CGS and SI unit of radioactivity?

   c) What do you mean by diagonal relationship?

   d) What is artificial radioactivity?

   e) What do you mean by allotropy?

   f) Give two differences between double salt and complex salt.

   g) Draw the structure of one hexadentate chelating ligand.

   h) Cr(III)-SCN bonded thiocyanato complexes are slowly transformed to give the Cr(III)-NCS bonded thiocyanato complexes. Explain.

2. Answer any **one** question: 5×1=5

   a) i) Draw the structure of a 'purely inorganic' optically active compound.

      ii) The maximum kinetic energy of positrons emitted by $^{13}N_7$ is 1.20 MeV. Calculate the mass of the $^{13}N_7$ nuclide (m_N) from the masses of $^{13}C_6$ (m_C = 13.00335 u) and an electron (m_e = 0.00055 u). 2+3=5

   b) i) What do you mean by 'stepwise' and 'overall' stability constants of a complex?

      ii) Establish the relation between them for the formation of an ML_4 type complex. 2+3=5

   c) i) Show that the half-life is independent of the amount of radio element taken initially.

      ii) Discuss the 2c-3e bond in B_2H_6. 2+3=5

3. Answer any **one** question: 10×1=10

a) i) What do you mean by magic numbers? Explain.

ii) State how does radioactive equilibrium differs from chemical equilibrium.

iii) What is meant by spallation reaction? Give example.

iv) Calculate the binding energy per nucleon of the $^{40}Ar_{18}$ nucleus. The experimental mass of $^{40}Ar_{18}$ is 39.962384 *u*. M_H = 1.007825 *u* and M_n = 1.008665 *u*.

v) What do you mean by packing fraction? 2+2+2+2+2=10

b) i) Write the IUPAC name of $[CoCl(NO_2)(NH_3)_4]Cl$ and $[CoN_3(NH_3)_5]^{2+}$.

ii) What do you mean by 1st order and 2nd order innermetallic complexes? Give examples.

iii) Give one preparative route of borazine.

iv) Complete the following reaction and draw its structure:

$6S_2Cl_2 + 16NH_3 = ? + 12NH_4Cl + S_8$

v) What is silicone? Draw the structure of I_3^+ ion. 2+2+2+2+2=10

c) i) How does the meson theory of exchange force explain the nuclear stability?

ii) What is the principle of 'Radioactive dating'?

iii) Explain primary and secondary valency of a complex.

iv) What are phosphazenes? Write one laboratory preparative reaction of $(NPCl_2)_n$.

v) In the case of Japanese nuclear accident (2011), the spent fuel rods kept in storage pools created problems. What types of safety measures are usually taken in nuclear power plants to avoid such incident? 2+2+2+2+2=10

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