3 (Sem–6) CHM M 4

2020

CHEMISTRY

(Major)

Paper : 6·4

(Inorganic Chemistry)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following : 1×7=7

(a) What states are expected in an octahedral field from a ^1G free ion term ?

(b) Between $[Ni(CN)_4]^{-2}$ and $[Co(NH_3)_6]^{+3}$ complex ions, which one is kinetically inert ?

(c) On which factor of the biological system the Hill constant depends ?

(d) Which complex of EDTA is used for the treatment of heavy metal toxicity ?

(e) Name the actinide whose compound is used as a reagent in your laboratory.

(f) Why are lanthanides known as inner transition elements ?

(g) Complete the following :

$$^{30}_{15}P \longrightarrow {}^{30}_{14}Si + ...$$

2. (a) In the reaction

$$[Co(NH_3)_4Cl_2]^+ + Cl^- \longrightarrow [Co(NH_3)_3Cl_3] + NH_3$$

only one isomer of the complex product is obtained. Is the initial complex *cis* or *trans* ? 2

(b) Define the following terms : 2

(i) Receptor

(ii) Sink.

(c) Describe the use of gold compounds in medicine. 2

(d) Calculate the binding energy of an α-particle. Mass of proton = 1·0078 *amu*, mass of neutron = 1·0089 *amu*, mass of α-particle = 4·0084 *amu*. Express the result in *MeV*. 2

3. Answer ***any three*** questions : 5×3=15

(a) How three isomeric $[Pt(NH_3)(Py)ClBr]$ complexes can be synthesized from $[PtCl_4]^{-2}$ ion ? 5

(b) Explain which one of the following complexes should have comparatively more intense *d-d* transition : 5

$Ni(CO)_4$ or $Fe(CO)_5$

(c) Write briefly about the antagonistic effect among the essential trace elements. 5

(d) What is meant by *Q*-value of nuclear reaction ? How is it calculated ? 2+3=5

(e) Write the outer electronic configuration of promethium. Why is it not found in nature ? 1+4=5

4. Answer ***any three*** of the following : 10×3=30

(a) (i) With the help of Orgel diagram, explain how many absorption bands are expected in the electronic spectrum of $[Cr(H_2O)_6]^{+3}$ ion. Level the energy levels and assign the transitions. 3+(1+1)=5

(ii) Discuss the theory of calorimetric determination of metals. 5

(b) (i) Write about the absorption and metabolic function of vitamin B12. 5

(ii) How does cyanide ion act as a poison in the human body? What is the antidote of cyanide poisoning? 3+2=5

(c) (i) Write about the radioactive disintegration series. 7

(ii) Write the theory of redox titration. 3

(d) (i) What are complexones ? Name the simplest complexone with its formula. Which complexone is widely used in analytical chemistry and why? How the charge of cation, pH of solution and stability of the complexes formed with it are correlated? ½+½+3+3=7

(ii) The reaction of actinides with hot water is faster than expected. Why? 3

(e) (i) Write about the characteristics of 'London smog' and 'Los Angeles smog'. 5

(ii) Explain the mechanism of Na^+-K^+ pump. 5

(f) (i) The absorption band of *Ce* (III) ion is broad, while that of other lanthanide ions are sharp. Explain. 3

(ii) Actinides have a greater tendency to form complexes than lanthanides. Explain. 4

(iii) A piece of wood taken from a cave is found to have *C*-14 activity only 0·636 times that of fresh wood sample. Estimate the age of the wood sample. The half-life of *C*-14 is 5700 years. 3
