

2017

CHEMISTRY

(Major)

Paper : 6.4

(Inorganic Chemistry)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following : 1×7=7

(a) For an atom with configuration d^2 , write the possible values of L and S .

(b) Identify the ground state term in

$1P \quad 3P \quad 3F \quad 1G$

(c) Which two metals are responsible for stabilization of DNA?

(d) What is Wilson disease?

(e) Mention one example where an actinide element is used for the identification of a soluble metal ion.

(f) In which oxidation state Ac and Th are diamagnetic?

(g) How many α and β particles will be released when ${}_{92}^{238}\text{U}$ successively

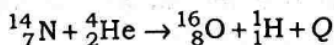
disintegrates to be transformed to ${}_{82}^{206}\text{Pb}$?

2. (a) Give explanation that $[\text{CoCl}_4]^{2-}$ is intense coloured compound whereas $[\text{CoCl}_6]^{3-}$ is faint in colour. 2
- (b) Describe the use of gold compounds in medicine. 2
- (c) Why classical smog has a reducing character but Los Angeles smog has an oxidizing character? 2

Or

What are hypercalcemia and hypocalcemia? What should be the blood calcium level?

- (d) Calculate Q -value for the following nuclear reaction : 2



Given, $M_{\text{N}} = 14.0031$

$M_{\text{O}} = 16.9991$

$M_{\text{He}} = 4.0026$

$M_{\text{H}} = 1.0078$

3. (a) Though three electronic transitions are expected only two are observed in the visible region of $[\text{V}(\text{H}_2\text{O})_6]^{3+}$. Discuss the aspect with the help of Orgel diagram. 5

- (b) What are the causes of carbon monoxide pollution in air? Why does concentration of carbon monoxide not increase to a significant extent in atmosphere? What is the main reason for high concentration of carbon monoxide in urban areas compared to countryside? 2+2+1=5

Or

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

- (c) Describe one method of separation of ^{235}U and ^{238}U . 5

Or

Why is it difficult to separate lanthanide elements? Write briefly about oxidation states of lanthanides. 3+2=5

4. (a) The molar extinction coefficients for tetrahedral complexes are about 10^2 times greater than those for octahedral complexes. Elaborate this statement. 5

- (b) Explain the use of EDTA in complexometric determination of Ca^{2+} and Mg^{2+} ions from its mixture. 5

Or

- (c) Define the terms 'labile' and 'inert' of the coordination compounds. Compare these aspects with stability of compounds with appropriate examples. 2+3=5
- (d) Discuss the theory of colorimetric determination of metals. 5
5. (a) Write briefly about photosynthesis in the chloroplast membrane, clearly describing the role played by PS-I and PS-II. 5
- (b) What is biological nitrogen fixation? Compare it with the Haber's process of synthesis of ammonia. 1+4=5
6. (a) A radioactive substance with initial concentration N_0 disintegrates with time t . How can you establish that the radioactivity of the substance will cease to exist only at infinite time? Show that change of radioactivity with time is a straight line with amplitude and intercept. 3+2=5
- (b) Give a brief description of the chemistry of uranium. 5

Or

- (c) (i) How would you account for stability of He nucleus? 2
- (ii) What are radioactive tracers? Give one application of it with description. 1+2=3
- (iii) What is the expected electronic configuration of gadolinium? It shows only one oxidation state of +3. Give reasons. 1+1=2
- (iv) A remarkable characteristic of the spectra of the tripositive lanthanide and actinide ions is the sharpness of individual colour bands. Explain this observation. 3
