

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

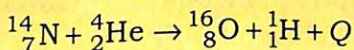
- (a) For an atom with configuration  $d^2$ , write the possible values of  $L$  and  $S$ .
- (b) Identify the ground state term in  
 $1p \quad 3p \quad 3f \quad 1g$
- (c) Which two metals are responsible for stabilization of DNA?
- (d) What is Wilson disease?
- (e) Mention one example where an actinide element is used for the identification of a soluble metal ion.
- (f) In which oxidation state Ac and Th are diamagnetic?
- (g) How many  $\alpha$  and  $\beta$  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  $^{235}\text{U}$  and  $^{238}\text{U}$ . 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  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  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

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