

Roll No. _____

B.Sc-M. Sc INTEGRATED PROGRAMME
SCHOOL OF CHEMICAL AND LIFE SCIENCES
SEMESTER III EXAMINATION 2019
PAPER TITLE: INORGANIC CHEMISTRY-II (COORDINATION CHEMISTRY)
PAPER CODE: BCH-CC08TH

(Write your roll no. at the top immediately after receipt of this question paper.)

Time: 3h

Max Marks: 75

Attempt all the questions. All parts of a question must be attempted in continuation.
Start answer of a fresh question on a new page.

Q1. Attempt ALL of following:

15 x 1 = 15

- A. Write the formulae of
- (i) achloridotris(triphenylphosphine)rhodium(I)
 - (ii) diamminetetra(isothiocyanato)chromate(III)
- B. Why is $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ stable and $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ unstable?
- C. Why are d5 systems generally of high spin?
- D. The CFSE of $[\text{Ru}(\text{H}_2\text{O})_6]^{3+}$ is _____ than CFSE of $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$; CFSE of $[\text{Rh}(\text{NH}_3)_6]^{3+}$ is _____ than CFSE of $[\text{Ir}(\text{NH}_3)_6]^{3+}$.
- E. How is titanium produced?
- F. List all platinum group metals.
- G. Transition metal complexes of _____ ligands are common for 3d series and complexes of _____ ligands are common for 4d and 5d series.
- H. What is a nerve impulse or action potential?
- I. What is auranofin?
- J. Nickel is carcinogenic in the form of _____ and chromium is most carcinogenic as _____.
- K. Acute lead poisoning can be treated by using _____ and chronic lead poisoning can be treated by using _____.
- L. The volatile, elemental form of mercury $\text{Hg}(0)$ is nontoxic, but its conversion to _____ compounds by anaerobic microorganisms utilizing a _____ biosynthetic pathway constitutes a serious health hazard.
- M. LaI_2 and CeI_2 can be formulated as _____.
- N. Despite the tendency to form stable +3 cations, the lanthanides do not closely resemble transition metals such as chromium or cobalt. Why?
- O. What is actinide hypothesis?

Q2. Attempt ANY THREE of the following:

3 x 5 = 15

- A. Discuss different types of back bonding.
- B. Describe Jahn-Teller theorem with the help of crystal field splitting diagram.
- C. Discuss the effect of nature of ligands on CFSE using electronic absorption spectra.
- D. Describe the valence bond pictures of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$.
- E. Draw the crystal field splitting and fill up the electrons in $[\text{NiCl}_4]^{2-}$.

Q3. Attempt ANY THREE of the following:

3 x 5 = 15

- A. Draw and explain the Frost diagram for the first series of d-block elements.
- B. Some of the transition metals are termed noble. What do you understand by the noble character of some transition metals? Explain with relevant examples.
- C. Describe the action of aqua regia on gold and platinum.
- D. List all of the d-block elements with their symbols, names and valence cell electronic configurations.
- E. Write short notes on sodium-potassium pump.

Q4. Attempt ANY THREE of the following:

3 x 5 = 15

- A. What is hematin? How is it formed?
- B. What are Picket fence porphyrins? In what way do they help us to understand the dioxygen binding by hemoglobin?
- C. Describe the mechanism of catalytic conversion of CO_2 to carbonic acid in biological systems.
- D. Write short notes on the use of chelating agents in medicine.
- E. Describe Perutz mechanism.

Q5. Attempt ANY THREE of the following:

3 x 5 = 15

- A. Describe the differences between 4f and 5f orbitals.
 - B. Explain the causes of the similarity in the physical and chemical properties of holmium(III) and yttrium(III) compounds.
 - C. Describe the trend in oxidation states of actinides.
 - D. Write short notes on the absorption spectra of lanthanides and actinides.
 - E. What is the symmetry of f-orbitals? Draw the f-orbitals and explain their symmetry. How do they split in an octahedral ligand field?
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