



Damietta University
Faculty of Science
Chemistry Department
General Chemistry Students
Level: Fourth year



Academic year: 2024-2025
Semester: First
Date: 16 / 1 / 2025
Time: 2 Hour



Course: Inorganic Chemistry
(Electronic spectra and Bio)
Course code: 420 Chem
Total Marks: 70
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Dr. Rana El Sadda

Final exam on Inorganic Chemistry (Electronic spectra and Bio)
Part I: Electronic spectra [35 Marks]:

(1) Illustrate:

- i- Orgel diagrams for electronic transition bands of the complexes $[\text{Ni}(\text{bipy})_3]^{2+}$ and $[\text{Ti}(\text{H}_2\text{O})_6]\text{Cl}_3$.
- ii- The complex $[\text{Fe}(\text{H}_2\text{O})_6]\text{Cl}_3$ shows very weak electronic spectral bands.
- iii- Zeeman effect – spin orbit coupling constant.
- iv- Examples for metal complexes showed MLCT and LMCT. (15 Marks)

(2) A- Predict the electronic transitions for the following complexes, whose bands are presented below (cm^{-1} or nm).

- i- $[\text{TiCl}_3(\text{MeCN})_3]$: 1470, 17100 cm^{-1}
- ii- $[\text{VCl}_4]^-$: 8900, 15000 cm^{-1}
- iii- $\text{K}_2[\text{Cr}_2\text{O}_7]$: 340, 440 nm (12 Marks)

B- Illustrate in diagrams the energy state splitting for $[\text{VCl}_4(\text{H}_2\text{O})_2]$ and $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ to explain the two overlapping bands in each. (8 Marks)

Ti=22, V=23, Cr=24, Fe=26, Ni=28, Cu= 29

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(1)

Part II: Bioinorganic Chemistry [35 Marks]:

Question 1: Choose the correct answer (15 marks)

1. Which mineral is a crucial component of hemoglobin?
a. Zinc b. Iron c. Calcium d. Potassium
2. What is a primary cause of decreased calcium absorption in postmenopausal women?
a. High phosphorus intake b. Low estrogen levels
c. Vitamin D deficiency d. Phytates in grains
3. Which mineral is necessary for proper thyroid gland functioning?
a. Iodine b. Selenium c. Copper d. Manganese
4. Calcium is essential for which bodily function?
a. Vision b. DNA synthesis c. Blood clotting d. Oxygen transport
5. Which mineral is primarily involved in maintaining osmotic balance and nerve function?
a. Sodium b. Phosphorus c. Chromium d. Cobalt
6. Zinc deficiency may directly cause:
a. Anemia b. Growth retardation c. Osteoporosis d. Hypertension
7. Selenium is vital for:
a. Antioxidant defense b. Muscle contraction c. Bone mineralization d. None of the above
8. Which mineral is most associated with bone and teeth health?
a. Fluoride b. Chromium c. Nickel d. Molybdenum
9. Copper plays a role in:
a. Lipid metabolism b. Connective tissue synthesis c. DNA replication d. Photosynthesis
10. Which mineral's absorption is enhanced by vitamin C?
a. Calcium b. Iron c. Magnesium d. Zinc
11. The presence of what ion is critical for muscle contraction?
a. Sodium b. Potassium c. Calcium d. Chloride
12. Iodine deficiency may lead to:
a. Anemia b. Goiter c. Hypertension d. Osteoporosis
13. Which mineral is part of vitamin B12?
a. Cobalt b. Zinc c. Both Copper and Zinc d. Fluoride
14. Which trace mineral is important in regulation of insulin level?
a. Chromium b. Selenium c. Nickel d. Molybdenum
15. Milk fever is due to deficiency of in lactating animals
a. Iron b. Magnesium c. Copper d. Calcium

Question 2: Put true (✓) or false (x) mark with correction for the following Sentences: (20 marks)

1. Iron is a crucial component of hemoglobin.
2. Magnesium's bioavailability influenced by calcium level in body.
3. Iodine deficiency directly causes scurvy.
4. Calcitriol regulates molybdenum in the body.
5. Selenium has a role in antioxidant defense.
6. Zinc is involved in the synthesis of DNA and RNA.
7. The best form of iron which can be absorbed is a ferric iron.
8. Copper is required for photosynthesis in humans.
9. Selenium is classified as a micromineral
10. Vitamin C improves calcium absorption in the body.

End of the exam

With my best wishes

Dr. Rana El Sadda

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