# UNIVERSITY OF EMBU

**2017/2018 ACADEMIC YEAR**

**SECOND SEMESTER EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN CHEMISTRY**

**SCH 509: CURRENT TOPICS IN INORGANIC CHEMISTRY**

**DATE: APRIL 6, 2018** **TIME: 2:00-5:00PM**

**INSTRUCTIONS:**

**Answer question ONE and any other TWO questions**

**QUESTION ONE (30 MARKS)**

a) Explain the meaning of the following terms:- (8 marks)

i) Nanoscience

ii) Nanotechnology

iii) Self-assembly

iv) Heavy metal

b) Describe the three basic steps in nanoparticle formation from solution. (6 marks)

c) Cisplatin is perhaps the best known example of a clinically used small molecule metal-containing cancer chemotherapeutic agent. Draw the structure of cisplatin and discuss its limitations. (6 marks)

d) Discuss briefly any two features common to self-assembly processes. (4 marks)

e) Briefly explain three conditions that an element must satisfy in order to be categorized as an essential an element. (6 marks)

**QUESTION TWO (20 MARKS)**

a) Explain with examples the bottom-up and top-down techniques. What are their merits and demerits? (10 marks)

b) Explain five major areas of technology where nanotechnology can play important roles. (10 marks)

**QUESTION THREE (20 MARKS)**

a) Discuss the hazards of heavy metal contamination. (10 marks)

b) Chelation therapy has the intent of scavenging toxic metal ions from the organism, or of attenuating their toxicity by converting them in less toxic compounds, or of transferring them from the site where they exert their toxic action to a compartment where this cannot be executed. Briefly, discuss five essential properties of a chelating agent, based on chemical and biomedical considerations. (10 marks)

**QUESTION FOUR (20 MARKS)**

a) Describe the chemical and physical vapor deposition (CVD and PVD) methods for synthesis of nanomaterials. (10 marks)

b) Discuss the benefits, drawbacks and newer strategies of chelation therapy. (10 marks)

**QUESTION FIVE (20 MARKS)**

a) Describe the principles and processes of Scanning tunneling microscopy (STM) and atomic force microscopy (AFM) methods for characterization of nanomaterials. (10 marks)

b) Distinguish between scanning electron microscopy (SEM) and (transmission electron microscopy) TEM. What is the principal difference in sample preparation and detection? (10 marks)

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