



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 322: TRANSITION METALS CHEMISTRY

DATE: FRIDAY, 30TH MARCH 2012

TIME: 8.00 A.M. – 10.00 A.M.

INSTRUCTIONS: Answer ALL questions.

Question 1

- a) Distinguish between
 - i) A mineral and an ore
 - ii) pyrometallurgy and hydrometallurgy
- b) Explain why pretreatment of ores is an important step in metallurgy

(11 marks)

Question 2

- a) Explain the meaning of the term transition element. Describe three characteristic properties of transition elements and hence or otherwise justify the classification of ^{46}Pd , ^{78}Pt , ^{25}Mn and ^{72}Hf as transition elements.

(10 marks)
- b) Explain the origin of magnetism in transition metal compounds. Distinguish between paramagnetism and ferromagnetism citing relevant examples.

(6 marks)
- c) Explain what you understand by the term lanthanide contraction. What are its causes and effects on the properties of the elements of the third transition series?

(6 marks)
- d) Describe the two major applications of Ti either in elemental form or compounds or alloy form.

(5 marks)

Question 3

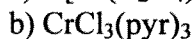
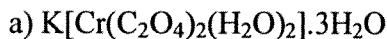
State and explain the general trend for the following properties across the first transition series of the Periodic Table.

- a) Atomic radius
- b) Density
- c) Melting points
- d) Formation of compounds in which the metal is in its group oxidation state.

(12 marks)

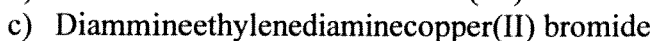
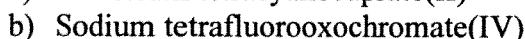
Question 4

- i) Write down the systematic name for each of the following complexes and indicate the oxidation state, electronic configuration, coordination number, geometry and magnetic moment of the central ion.



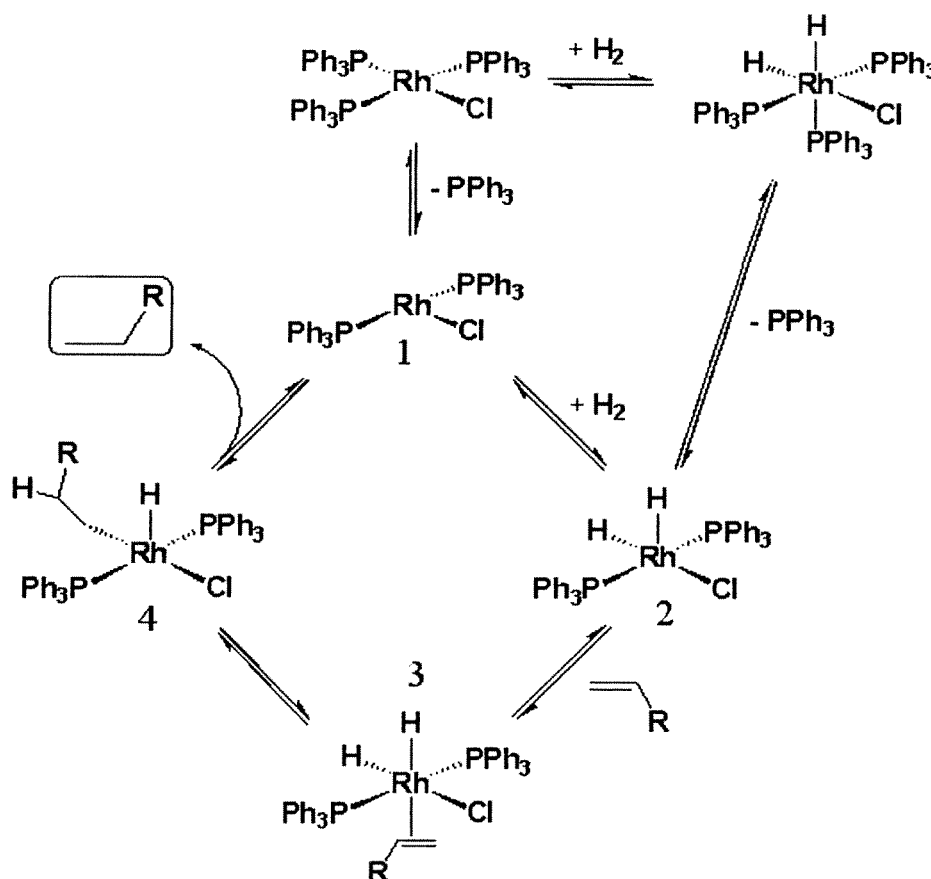
(8 marks)

- ii) Write the formulae of the following coordination compounds



(4 marks)

- iii) Industrial catalysis is a major application of transition metals. Study the catalytic hydrogenation cycle below and answer the questions that follow:



- a) Identify the substrates and the products
- b) Work out the oxidation states of the metal and the EAN of the metal in each of compounds 1 – 4
- c) Name the properties of the metal Rh that make it suitable for this purpose. Do you think Ca can be used instead? Explain your answer

(8 marks)