

SCH 400 Dsvol-Home Assignment-2021

Education Arts (Kenyatta University)

Kenyatta University

Department of Chemistry

SCH 400 COMPARATIVE STUDY OF TRANSIT ELEMENTS *Home Assignment*

Attempt ALL Questions in the provided spaces

Question 1

Distinguish between transition and main group elements with reference to the following:

- Electronic configuration (use the first transition series to illustrate)
- Variable oxidation states
- Complex compound formation

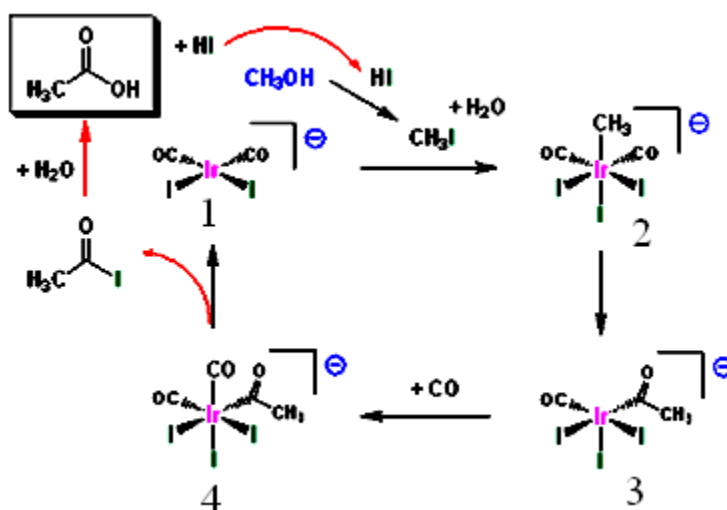
(12 marks)

Question 2

- Identify important properties of transition metals that make them or their compounds useful in industrial and biological catalysis.

(4 marks)

- Below is the catalytic cycle for a process produces acetic acid from methanol through carbonylation. Study it carefully and answer the questions that follow:



- Identify the properties of metal iridium that are varying throughout the cycle to facilitate carbonylation of methanol.
- Identify the types of reactions that the metal is involved in within the cycle.
- Work out the effective atomic number of metal in each stage of the cycle.

(10 marks)

Question 3

Explain the following giving reasons for your answers

- (i) At room temperature, TiF_4 is a white insoluble solid that melts at 284°C while TiCl_4 is a colourless liquid that readily hydrolyzes in water. (6 marks)
- (ii) Some elements of the second and third transition series have higher tendency to form compounds with metal–metal bonds than elements of the first transition series. (3 marks)
- (iii) Atomic radii of the elements decrease very gradually from scandium to copper then rise to zinc. (3 marks)
- (iv) Across the first row of transition elements from left to right, the +2 oxidation state becomes more stable in comparison with the +3 state. (4 marks)
- (v) Zr and Hf are used for different purposes in water cooled nuclear reactors, but they cannot be used together i.e. Zr and Hf must be separated. (8 marks)

Question 4

- (a) Write balanced net ionic equations for the following reactions:
 - (i) KMnO_4 oxidizes Fe^{2+} to Fe^{3+} in acidic medium. (2 marks)
 - (ii) FeCl_2 reacts with excess aqueous NaCN to give a deep blue solution. (2 marks)
 - (iii) Solid AgCl dissolves in conc. HCl when shaken for a prolonged period. When the clear solution is diluted with water the precipitate reappears. (4 marks)
 - (iv) When the yellow solution of CuCl_2 in HCl is further diluted with water it changes colour to green then to blue. (4 marks)
- b) Explain how the reaction of KMnO_4 oxidizing Fe^{2+} to Fe^{3+} in acidic medium be utilized in a chemistry lab? (3 marks)
- c) Write a critical account of the various ways in which the nine elements in the iron, Cobalt, and nickel groups have been grouped together for comparison purposes. (6 marks)