

UNIVERSITY EXAMINATIONS FOR THE AWARD OF THE DEGREE OF
BACHELOR OF EDUCATION
2021/2022 ACADEMIC YEAR
MAY SEMESTER 2022

UNIT CODE: LSCH 4101

UNIT TITLE: CHEMISTRY OF TRANSITION ELEMENTS

DATE: AUGUST 2022

TIME: 2 HOURS

INSTRUCTIONS

1. Answer **question one** and **any other two** questions
2. Do **not** write anything on this question paper
3. Do **not** write in the page margins of the answer booklet
4. Begin each question answer on a new page

QUESTION ONE COMPULSORY (30 MARKS)

- a) Explain the following:
 - i. Chromium is a typical metal while mercury is a liquid metal. (2 marks)
 - ii. Zinc readily liberates H_2 from cold dil. H_2SO_4 but not from cold conc. H_2SO_4 . (2 marks)
- b) Describe the d-block elements. (2 marks)
- c) Give the general electronic configuration of four series of d-block elements. (4 marks)
- d) Explain the way in which the electronic configuration of transition elements differ from that of the non-transition elements. (2 marks)
- e) State why chromium has electronic configuration $3d^5 4s^1$ and not $3d^4 4s^2$. (3 marks)
- f) Differentiate between hard d-block elements and soft d-block elements. (4 marks)

g) Outline the general characteristics of transition elements. (4 marks)

h) The chemistry of Actinoid elements is not so smooth as lanthanoid. Justify this statement. (2 marks)

i) Write the different oxidation states of manganese and state why +2 oxidation state of manganese is more stable. (2 marks)

j) Give the position of iron ($Z = 26$) in periodic table. Explain why Fe^{3+} is more stable than Fe^{2+} . (3 marks)

QUESTION TWO (20 MARKS)

a) Describe the characteristics of interstitial compounds. (4 marks)

b) Describe how transition elements act as catalyst and give examples. (6 marks)

c) Explain the metallic characters of the d-block elements of the first-row transition elements. (6 marks)

d) Discuss the trends in melting and boiling points of first row transition metals. (4 marks)

QUESTION THREE (20 MARKS)

a) Differentiate between diamagnetic and paramagnetic properties of transition elements. (4 marks)

b) Explain the trends observed in the ionization enthalpies of the d-block elements (4 marks)

c) Describe the three main oxides that 3d- elements give when they react with oxygen at high temperatures. (6 marks)

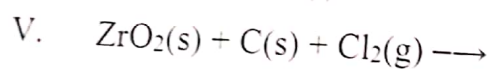
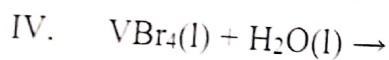
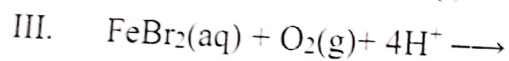
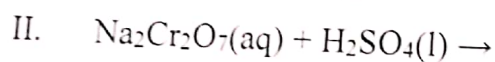
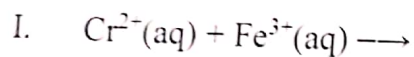
d) Give reasons why iron, cobalt and nickel do not show the expected highest oxidation states of +8, +9 and +10 respectively. (6 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the trend in atomic size of first row elements of transition series. (6 marks)
- b) Describe the splitting of d-orbitals in transition elements. (4 marks)
- c) Explain giving reasons: the transition metals generally form colored compounds. (4 marks)
- d) Predict which of the following will be coloured in aqueous solution? Ti^{3+} , V^{3+} , Cu^+ , Sc^{3+} , Mn^{2+} , Fe^{3+} and Co^{2+} . Give reasons for each. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Discuss five key industrial and biological roles of transition elements. (10 marks)
- b) Predict the products of each reactions and then balance each chemical equation.



(2 marks each = 10 marks)