

## Question One

- a) Differentiate between the following terms:
- Main group elements and transition elements
  - Soft and hard ligands (4 marks)
- b) State why scandium is regarded as a transition element while zinc is not? (2 marks)
- c) Explain why transition elements exhibit higher enthalpies of atomisation? (2 marks)
- d) Give the electronic configuration of the following metals atoms/ions
- $\text{Rh}^{+1}$
  - Cr
  - $\text{La}^{2+}$  ( Rh = 45, Cr = 24, La = 57 ) (3 marks)
- e) State any **four** common properties among the transition metals. (4 marks)

## Question Two

- a) Consider the following atomic sizes for the first row transition metals and explain the following observations:

Element	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
Atomic size (pm)	144	132	122	118	117	117	116	115	117	125

- There is hardly any change in size from Cr to Cu. (3 marks)
  - There is an increase in size from Cu to Zn. (2 marks)
- b)  $\text{Cr}^{2+}$  is reducing and  $\text{Mn}^{3+}$  oxidising when both have  $d^4$  configuration. Explain. (2 marks)
- $4s^1 3d^4$                        $4s^0 3d^5$
- c) Calculate the magnetic moments expected for the following ions
- $\text{Ni}^{2+}$  (2 marks)
  - $\text{V}^{4+}$
- d) Explain why  $\text{Cu}^{2+}$  ion colored is and paramagnetic while  $\text{Zn}^{2+}$  ion is colorless and diamagnetic. (3 marks)
- e) Draw the structures of the following complexes and check whether each conforms with eighteen electrons rule;