

Department: Chemical Engineering  
Level: Second  
Semester: First (Midterm)  
Subject: Inorganic Chemistry  
Subject code: CHE203



Ministry of Higher Education  
Higher Institute for eng. and tech

Date: 11/11/2017  
Time allowed: 90 min.  
Full marks: 10  
Page numbers: One

### Model answer

1- a- Cs<sub>55</sub>      b- Cu<sub>29</sub>      c- Cd<sub>48</sub>      d- Pb<sub>82</sub>

a-Cs<sub>55</sub> [Xe], 6s<sup>1</sup>      period (6)

b- Cu<sub>29</sub> [Ar], 4s<sup>1</sup>, 3d<sup>10</sup>      period (4)

c- Cd<sub>48</sub> [Kr] 5s<sup>2</sup>, 4d<sup>10</sup>      period (5)

d- Pb<sub>82</sub> [Xe] 4f<sup>14</sup>, 5d<sup>10</sup>, 6s<sup>2</sup>, 6p<sup>2</sup>      period (6)

**Q.1 -b) Give the reason(s) for the following: \_\_\_\_\_ (3marks)**

1- Electronegativity is differ from electron affinity.

2- The atomic radius of Cr<sup>3+</sup> is larger than Cr<sup>6+</sup>.

3- No two electrons can have the same electronic quantum numbers

1- Electronegativity gained an electron for bonded atom but electron affinity for single atom.

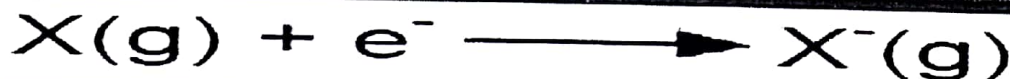
2- The decrease in positive charge in Cr<sup>3+</sup> causes the increase in atomic radius.

3- Any two electron must be different in spin quantum number.

**Questions (2) a- Explain the following terms: \_\_\_\_\_ (2 marks)**

1-Second ionization energy: Is the energy required to remove the second electron from outer shell (second ionization energy is higher than first.

2-Electron affinity; Is the energy change when an electron is added to the neutral species to form a negative ion.



3- Hund's rule; every orbital in a sublevel is singly occupied before any orbital is doubly occupied.

4- Purpose of electron configuration:

1-Soon you will learn that when atoms come into contact with one another, it is the outermost electrons of these atoms, or valence shell that will interact first

2-Electron configurations can also predict stability. An atom is at its most stable (and therefore unreactive) when all its orbitals are full

Electron configurations can help you to make predictions about the ways in which certain elements will react, and the chemical "compounds" or "molecules" that different elements will form

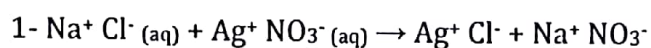
**b- Write down the following symbols: (1 mark)**

1-  $n-1$                       2-  $2n^2$                       3-  $m$                       4-  $n^2$

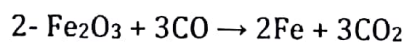
1- Azimuthal (angular) quantum number      2- Number of electrons in energy level

3- Magnetic quantum number                      4- number of orbitals in energy level

**c- By using the oxidation numbers, determine the oxidation and reduction reactions from the following: (2marks)**



No change in oxidation states for all species, thus no oxidation and no reduction.



Fe in  $\text{Fe}_2\text{O}_3 = +3$  and Fe in product = zero

The positive charge decrease, reduction process

C in CO = +2 and C in  $\text{CO}_2 = +4$

The positive charge increase, oxidation process.

**Best regards**

**Dr./ Ramadan elkateb**