

Key

CH301H – Principles of Chemistry I: Honors
Fall 2017, Unique 50135

Quiz 4, 24 October 2017

a) Give the complete electron configuration of iron (Fe).

b) Which do you think has the largest first ionization energy, Mn, Fe, or Co? Justify your answer.

c) Which do you think has the largest electron affinity, Mn, Fe, or Co? Justify your answer.

d) Would a block of iron be a good sensor of a local magnetic field? Justify your answer.

The following constants may be useful:

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^{-2} \text{ J}^{-1} \text{ m}^{-1}$$

$$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$e = 1.602 \times 10^{-19} \text{ C}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

d) Yes, Fe is highly paramagnetic because it has 4 unpaired, like-spin e^- in the ground state.



this is an extremely favorable arrangement of unpaired e^- , and therefore it will take the most amount of energy to break this configuration.

c) Since all anionic species will not have Hund's Rule stability, we must go by effective nuclear charge (Z_{eff}). All three have the same # of shielding e^- , so Co has highest Z_{eff} . Adding an e^- to Co will be the most favorable, so its EA is highest.