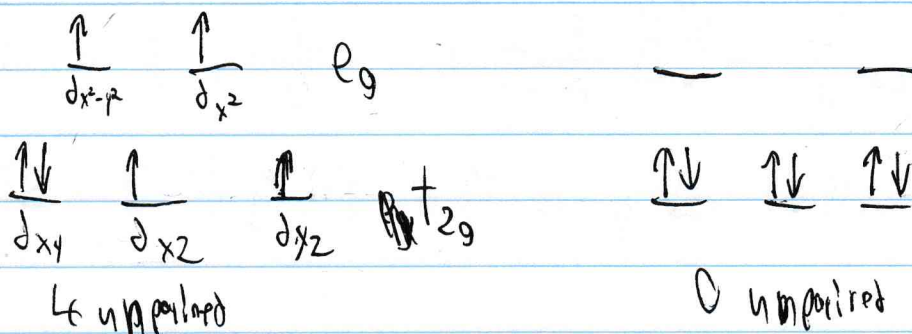


Lecture 28 Problems

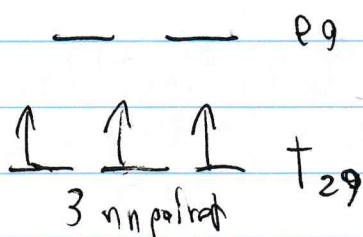
Problem 1

(a): Octahedral Weak Field d^6 Strong



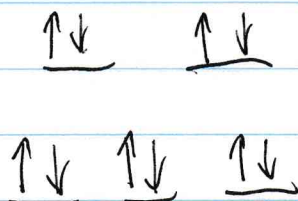
(b):

Octahedral Weak & Strong



(c): d^4 , 0 unpaired

Octahedral weak & strong



Problem 2

(a) For Fe_3 , weak has $(t_{2g})^4 (e_g)^2$
 strong has $(t_{2g})^6$

$$CFSE = 4 \cdot \frac{-2}{5} \Delta_0 + 2 \cdot \frac{3}{5} \Delta_0 \overset{+1PE}{=} \frac{-2}{5} \Delta_0 + 1PE \text{ for weak}$$

$$CFSE = 6 \cdot \frac{-2}{5} \Delta_0 + 3PE = \frac{-12}{5} \Delta_0 + 3PE \text{ for strong}$$

(b) Weak structure: $(t_{2g})^3$

$$\text{Strong } CFSE : 3 \cdot \frac{-2}{5} \Delta_0 = \frac{-6}{5} \Delta_0$$

(c) Weak & strong structure: $(t_{2g})^6 (e_g)^4$

$$CFSE = 6 \cdot \frac{-2}{5} \Delta_0 + 4 \cdot \frac{3}{5} \Delta_0 + 5PE \\ = 5PE$$

Problem 3

(a): ~~7~~ 6

(b): +3

(c): ~~High freq~~ Cl^- is a weak ligand

(d): Recall

$$E = h\nu \text{ and } c = \nu \lambda, \text{ thus } E = \frac{hc}{7.4 \cdot 10^{-7} \text{ m}}$$

and thus

$$A_0 = \frac{1.612 \cdot 10^5 \text{ J}}{\text{mol}}$$

Problem 4

(a): ~~paramagnetic~~ diamagnetic

(b): d^3 d^6

Problem 5

(a) For d_{z^2} :



For $d_{x^2-y^2}$ above:



(b) Less stable

(c) Less stable

(d) (i) Same

(ii) d_{z^2} should be more stable i.e. lower energy