HW 3

3.1

3.1.1

$1s^2\,2s^2\,2p^6\,3s^2\,3p^5 = [Ne]\,3s^2\,3p^5$

$= \text{Chlorine, Cl}$

$[Ar]\,4s^2\,3d^6 = \text{Iron, Fe}$

3.1.2

looking at valence e^- only

Cl.

$3p$ ↑↓ ↑↓ ↑

$m_\ell = -1 \quad 0 \quad 1$

$\Rightarrow S = 1 \quad L = 1$

→ paramagnetic (weak)

Fe

$3d$ ↑↓ ↑ ↑ ↑ ↑

$m_\ell = -2 \quad -1 \quad 0 \quad 1 \quad 2$

$S = 2$

$L = 2$

→ paramagnetic (strong)

3.2

S: $1s^2 2s^2 2p^6 3s^2 3p^4$

shielding by $n < n_{valence}$: $n=1$ and $n=2$ shield

$$Z_{eff} = 16 - \underbrace{2}_{1s^2} - \underbrace{8}_{2s+2p} = 6$$

3.2.1

$$E_{1st} = -\frac{Z_{eff}^2}{n^2} R = -\frac{6^2}{3^2} R = -4R = -54\,eV$$

↑
(removing a 3p e^-)

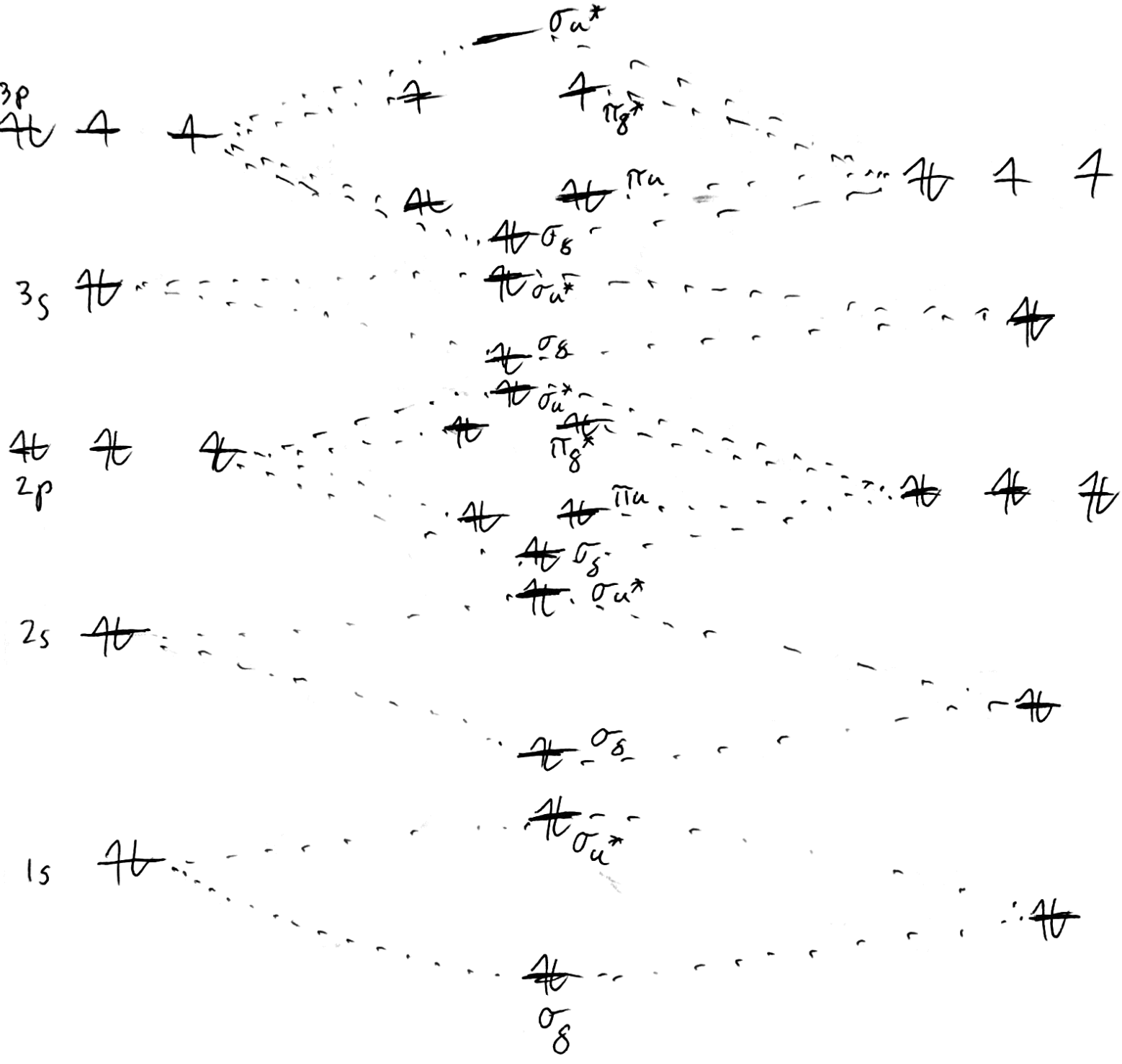
3.2.2

not realistic because:

- $3s^2$ and other 3p e^- have effect, too.
- 1s, 2s and 2p e^- will not shield completely as 3p wavefunctions extend towards nucleus.

3.3

3.3.1



3.3.2

$$B = \frac{18 - 14}{2} = 2 \rightarrow > 0 \rightarrow \text{stable}$$