

10.5) THE GROUND STATE OF Na HAS 2 e^- IN 1s, 2 IN 2s, SIX IN 2p, AND ONE IN 3s. FOR THE OUTER e^- IN THE 3d,

a) WHAT $U(r)$ IS FELT BY THE 3d e^- ?

b) WHAT SHOULD BE THE ENERGY AND HOW DOES IT COMPARE WITH THE OBSERVED -1.52 eV?

a) FOR THE OUTER e^- , IF SHIELDING IS PERFECT, $Z_{\text{eff}} = 1$

$$U_{3d, \text{Na}}(r) = -Z_{\text{eff}} \frac{ke^2}{r} = -\frac{ke^2}{r_{3d}}$$

b) THE ENERGY WOULD THUS BE

$$E = -Z_{\text{eff}} \frac{R_{\infty}}{n^2} \quad (10.6)$$

$$E_{3d, \text{Na}} = -(1) \left(\frac{-13.6}{9} \right)$$

$$E_{3d, \text{Na}} = -1.51 \text{ eV}$$

THE OBSERVED ENERGY OF -1.52 eV IS SLIGHTLY LARGER BECAUSE THE SHIELDING IS NOT QUITE PERFECT.

IT'S CLOSE, THOUGH!