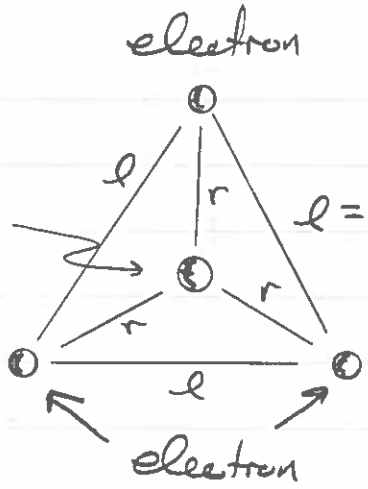
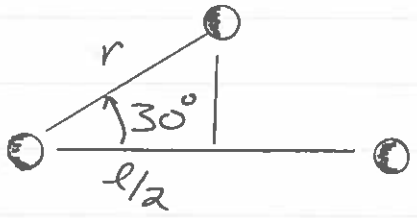


for electrons
$q = -e$

From geometry:



$$\cos 30° = \frac{\ell/2}{r} \Rightarrow r = \frac{\ell}{2\cos 30°} = 0.577 \text{ nm}$$

Now, for each charge pair:

$$U = 3 \cdot \underbrace{\frac{K(-e)(-e)}{\ell}}_{\text{electron-electron}} + 3 \cdot \underbrace{\frac{K(-e)(e)}{r}}_{\text{electron-proton}}$$

$$= 3Ke^2 \left\{ \frac{1}{\ell} - \frac{1}{r} \right\}$$

$$U = -5.062 \times 10^{-19} \text{ J}$$