

## Answer on Question #54467 – Chemistry – General chemistry

### Question:

Using Coulomb's law, given Li 2+ and Be 3+ (Be 3+ having the lower energy). If the electron to nucleus distance is the same, by what factor do two energies differ? (Round two places after the decimal point)

### Solution:

The electrostatic potential energy,  $E_{\text{elec}}$ , is given by

$$E = \frac{1}{4\pi\epsilon_0} \frac{Ze^2}{r}$$

where

$\epsilon_0$  is the permittivity of the vacuum,

Z is the atomic number (number of protons in the nucleus),

e is the elementary charge (charge of an electron),

r is the distance of the electron from the nucleus.

For Li  $Z_{\text{Li}}=3$ , for Be  $Z_{\text{Be}} = 4$ .

Thus,

$$\frac{E_{\text{Li}}}{E_{\text{Be}}} = \frac{Z_{\text{Li}}}{Z_{\text{Be}}} = \frac{3}{4} = 0.75$$

$$\frac{E_{\text{Be}}}{E_{\text{Li}}} = \frac{Z_{\text{Be}}}{Z_{\text{Li}}} = \frac{4}{3} = 1.33$$

**Answer:** Energy for Be<sup>3+</sup> is larger than that of Li<sup>2+</sup> by a factor of 1.33