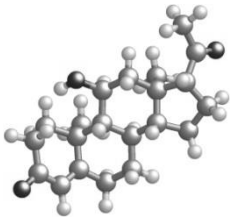

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Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

First Ionization Energy

First ionization energy is defined as *the energy required to convert 1 mole (6×10^{23}) of gaseous atoms into one mole of unipositive gaseous ions*. It can be represented by the following general equation where E represents the symbol of any chemical element and e^- is the symbol used to represent an electron:

$$E(g) \rightarrow E^+(g) + e^- \quad \textit{e.g.} \quad Cl(g) \rightarrow Cl^+(g) + e^-$$

In more simplistic terms, first ionization energy is a measure of how easily a single valence electron can be removed from an atom of a particular element.

Group

Period	**1**	**17**
2	Lithium (Li)	Fluorine (F)
4	Potassium (K)	

Question 1:

a) In the spaces provided, give the electron configurations and nuclear charges for lithium, potassium and fluorine.

b) Identify factors that will affect the electrostatic force of attraction between an electron in the valence shell and the protons in the nucleus of the atom.

c) By comparing the atomic structures of lithium and fluorine, state how you would expect the value of 1st ionization energy to change *across a Period*. Support your answer using sound scientific reasoning.

d) By comparing the atomic structures of lithium and potassium, state how you would expect the value of 1st ionization energy to change *down a Group*. Support your answer using sound scientific reasoning.

Space to answer **Question 1 b)**:

……

……

……

Space to answer **Question 1 c)**:

……

……

……

Space to answer **Question 1 d)**:

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……

Question 2:

a) Explain how the radius of an atom (*atomic radius*) changes *across a Period*:

……

……

……

b) Explain how the radius of an atom (*atomic radius*) changes *down a Group*:

……

……

……

Question 3:

Compare the radius of a potassium *atom* with the radius of a potassium *ion*. Which one is larger? Explain your answer:

……

……

Question 4:

What do you think is meant by the term *first electron affinity*? Write a general balanced chemical equation to describe *first electron affinity*:

……

……

Question 5:

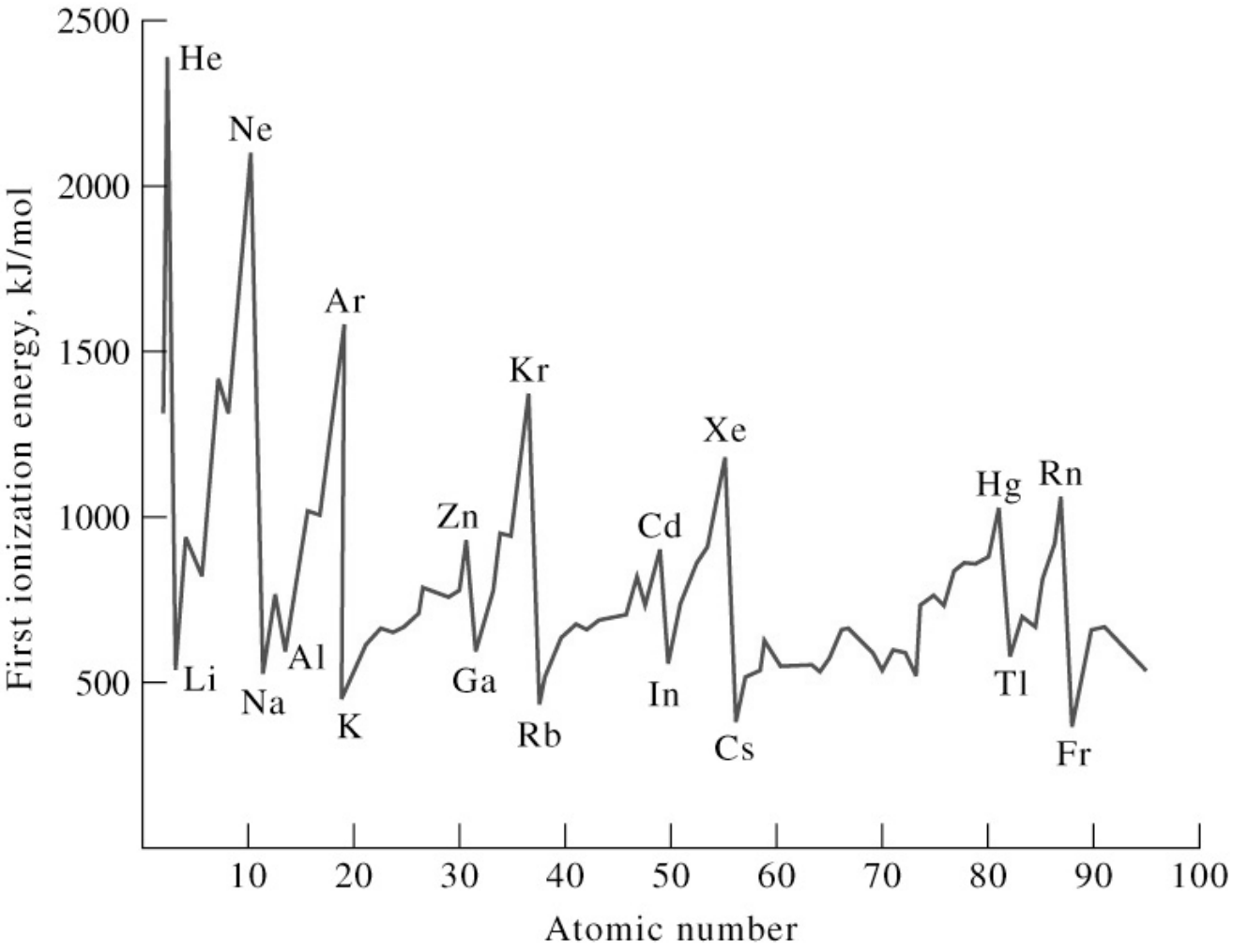
Compare the radius of a fluorine *atom* with the radius of a fluoride *ion*. Which one is larger? Explain your answer:

……

……

Reference Materials

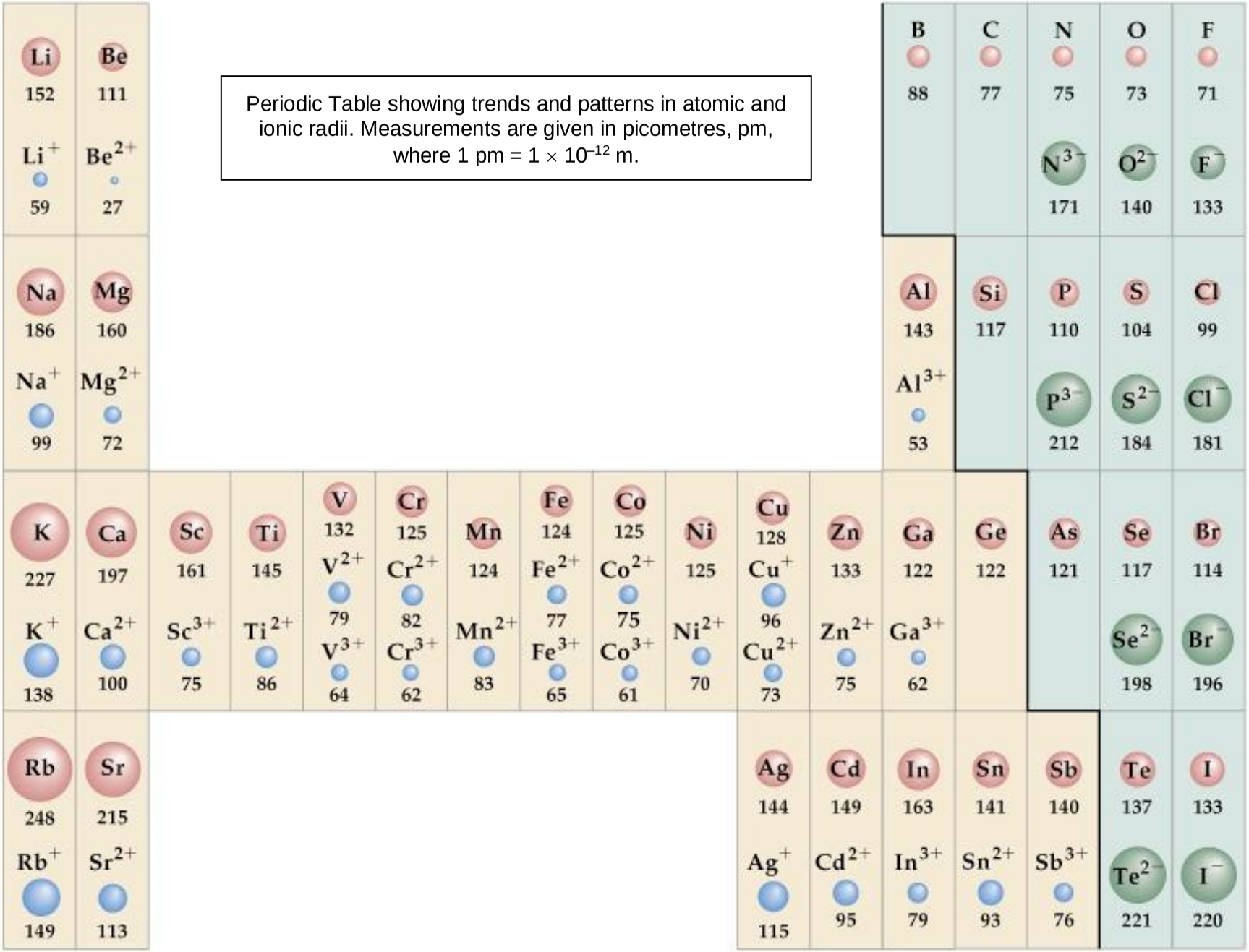
- Graph showing trends and patterns in first ionization energy for the chemical elements, hydrogen to thorium:



- *Coulomb's Law* states that the force of attraction (**F**) between two particles of charge $\mathbf{Q_1}$ and $\mathbf{Q_2}$ separated by a distance **r** is given by the equation:

$$F = \frac{1}{4 \times \pi \times \varepsilon_0} \times \frac{Q_1 \times Q_2}{r^2}$$

where $\boldsymbol{\varepsilon_0}$ = the relative permittivity of free space = 8.854×10^{-12} F m^{-1}.



Periodic Table showing trends and patterns in atomic and ionic radii. Measurements are given in picometres, pm, where 1 pm = 1×10^{-12} m.

- Scan the QR code given below to view the answers to this assignment.

http://www.chemist.sg/chemical_bonding/notes_atomic_structure/first_ionisation_energy_ans.pdf