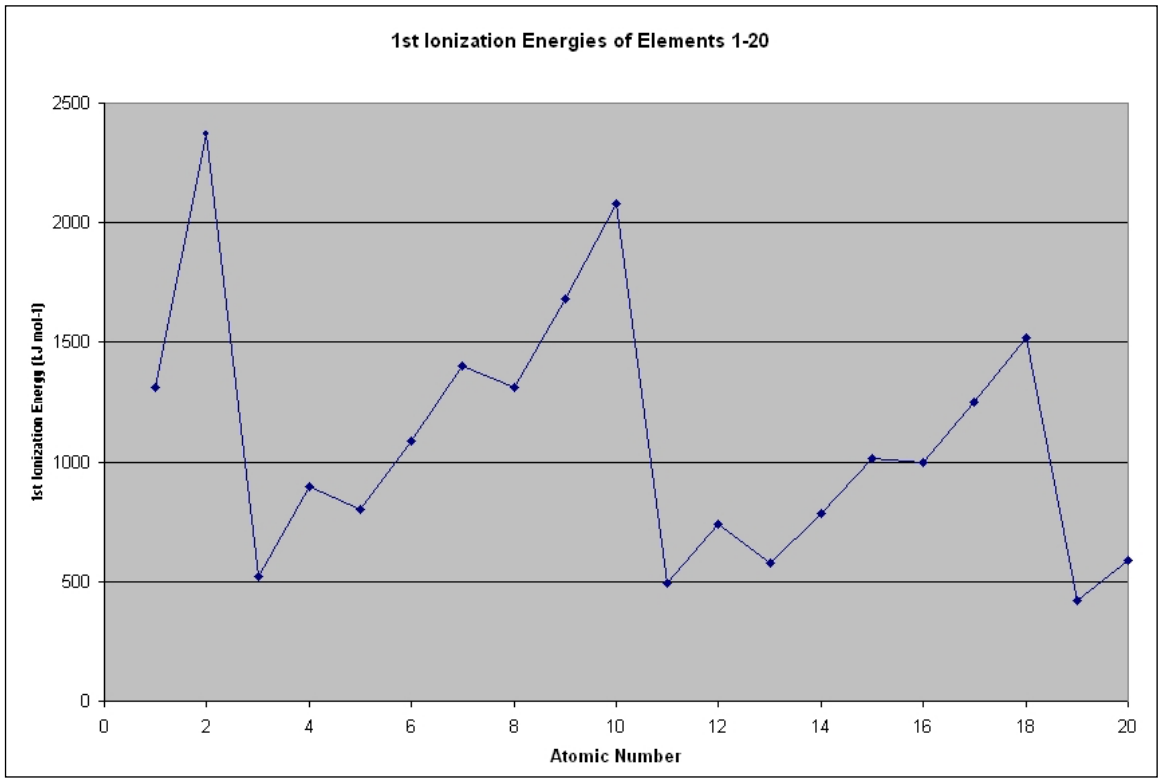
AP WORKSHEET 01GH: Ionization Energy

1. Explain each of the following observations.

   (a) Sodium has a lower first-ionization energy than lithium. (2)

   (b) Oxygen has a lower first-ionization energy than nitrogen. (2)

2. Consider the ionization energy plot shown below. Explain each of the following.



   (a) There is a general increase in the first ionization energy from sodium to argon. (2)

   (b) Boron has a lower first ionization energy than beryllium. (2)

(c) The first ionization energy of neon (atomic number 10) is significantly higher than that of argon (atomic number 18) but significantly lower than the first ionization energy of helium (atomic number 2), despite all three elements being in the same group. (2)

(d) Helium has the highest first ionization of all the elements shown. (2)

3. Consider the ionization energies of elements X and Y shown below in $kJmol^{-1}$. X and Y are in the same period of the periodic table and are adjacent to one another in the table.

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
X	1680	3375	6050	8409	11022	15165	17868	92038	106440
Y	2080	3950	6122	9370	12180	15239	20000	23068	115375

(a) In which group would one find element X? Explain. (2)

(b) Does element X lie to the right or the left of element Y in the periodic table? Explain. (2)

(c) Which is the first period on the periodic table that these elements could be in? Explain. (2)

(d) Why are the second ionization energies of both elements larger than their respective first ionization energies? (2)

(e) It is found that Y has the largest first ionization energy in the period that it is found. What does this tell us about Y? (2)

(f) It is found that element Q, which is in the same period as X and Y but lies to the left of element X in the periodic table, only has values for its first four ionization energies. Suggest a reason for this observation. (2)

4. (a) Define first ionization. (2)

(b) Write an equation to show the second ionization energy of calcium. (2)