Topic Reminder Q4
Periodic Trends

| | 1st ionization kJ/mol | 2nd ionization kJ/mol | 3rd ionization kJ/mol |
|---|---|---|---|
| Sodium | 550 | 1400 | 1700 |
| Magnesium | 700 | 1100 | |

Ionization energy

Na Mg
3 3
11 12

1. Why is the 1st ionization of magnesium larger than the 1st ionization of sodium.
Both Na and Mg have the same number of energy levels. Mg has more proton/nuclear charge, giving a greater coulombic attraction and higher 1st ionization energy

2. Why is the 2nd ionization energy of sodium higher than the 2nd ionization of magnesium.

$Na^{+1}$ $Mg^{+1}$
2 3
When removing the second electron from Na, the e- is being removed from the 2 energy level, which is less of a distance (more coulombic attraction) than $Mg^{+1}$

3. Would you predict the 3rd ionization energy of magnesium to be (higher/lower) than the 3rd ionization of sodium? Explain.

$Na^{+2}$ $Mg^{+2}$
2 2
11p+ 12p+
The 3rd ionization energy would be greater for Mg due to its greater nuclear charge, giving a higher coulombic attraction

Radius

4. O (</>) then F? explain
O > F
2 2
8p+ 9p+
Both O and F have the same number of energy levels, F has more nuclear charge (9p+) and more coulombic attraction, making F smaller

5. $O^{-2}$ (</>) then Ne? explain
$O^{-2}$ > Ne
2 2
8p+ 10p+
Both $O^{-2}$ and Ne have 2 energy levels. Ne has greater nuclear charge (10p+) and more coulombic attraction, making Ne smaller

6. Na (</>) then Ne? explain
Na > Ne
3 2
Na has more energy levels, so Na is larger

7. $Na^{+1}$ exists in nature but $Na^{2+}$ does not. Hypothesis?
$Na^{+1}$ has many protons (11p+) and 2 energy levels. Due to its high charge and close distance (Coulomb's Law) it would take a lot of energy to pull the 2nd election off.