Unit 4: The Periodic Table

Free Response Review #2

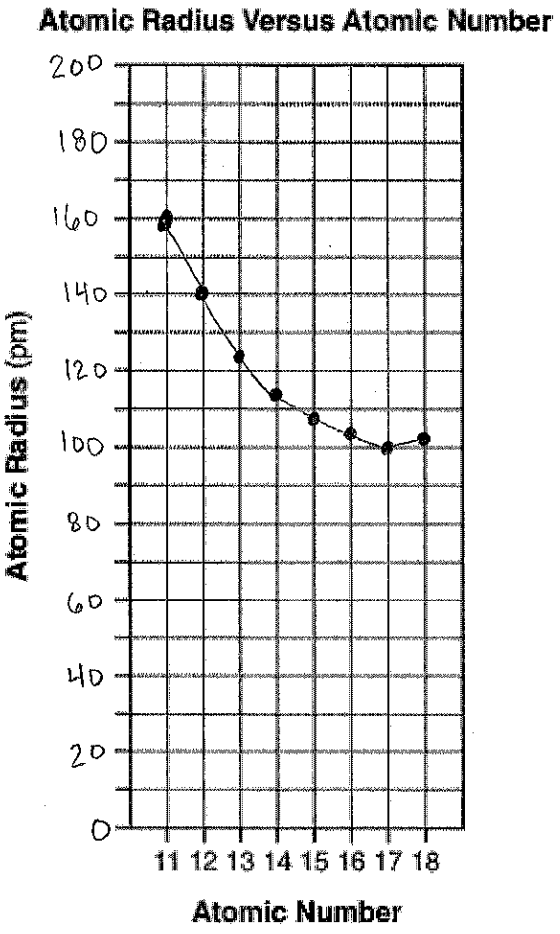
Directions: The suggested time is about 15 minutes for answering the constructed response section of the chemistry test. The parts within a question may not have equal weight. For calculations, show all your work in the spaces provided after each part. Pay particular attention to the proper use of units. Be sure your final answer is rounded to the correct number of significant figures. Make sure your work is legible. Illegible work will receive a grade of zero.

Question 1 [10 POINTS]

The atomic number and corresponding atomic radius of the Period 3 elements are shown in the data table below:

Data Table

Atomic Number	Atomic Radius (pm)
11	160.
12	140.
13	124
14	114
15	109
16	104
17	100.
18	101



A. On the grid above, mark an appropriate scale on the axis labeled "Atomic Radius (pm)." **[1 POINT]**

See above!

B. On the grid above, plot the data from the data table. ~~Circle and~~ Connect the points. **[1 POINT]**

The Periodic Table

C. Explain why the radius of sodium is larger than the radius of argon. **[2 POINTS]**

The radius of Na is larger than P b/c their valence e^- are found at the same principal energy level but Na has less p^+ than Ar, so its valence e^- are less attracted to the nucleus + thus further away.

D. Explain why the radius of sodium is larger than the radius of lithium. **[2 POINTS]**

Na's valence e^- are found at a higher principal energy level than those of Li, thus they are further from the nucleus (aka larger radius).

E. Explain the change in radius when a magnesium atom becomes a magnesium ion. **[2 POINTS]**

$Mg \rightarrow Mg^{2+}$

When Mg loses $2e^-$ to form an Mg^{2+} ion, the energy level of its valence e^- decreases from $n=3$ to $n=2$ (losing an energy level), so its radius decreases b/c its valence e^- are closer to the nucleus.

F. Explain the change in radius when a phosphorus atom becomes a phosphide ion. **[2 POINTS]**

$P \rightarrow P^{3-}$

When P gains $3e^-$ to become a P^{3-} ion, the # of energy levels doesn't change but e^-/e^- repulsion increases, so P^{3-}'s valence e^- are less attracted to and thus further away from the nucleus.