Periodicity Trends short answers Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Suppose that a stable element with atomic number 119, symbol Q, has been discovered.

a. How many valence electrons does it have?

b. Would Q be a metal or a nonmetal? How do you know **based on its valence electrons?**

c. On the basis of periodic trends, would Q have the largest atomic radius in its group or would it have the smallest? How do you know?

|  |  |  |  |
| --- | --- | --- | --- |
| Element | first ionization energy (kJ/mol) | second ionization energy (kJ/mol) | third ionization energy (kJ/mol) |
| 1 | 1251 | 2300 | 3820 |
| 2 | 496 | 4560 | 6910 |
| 3 | 738 | 1450 | 7760 |
| 4 | 1000 | 2250 | 3360 |

The table above shows the first three ionization energies for atoms of four elements from the third period of the periodic table. The elements are numbered randomly. Use the information in the table to answer the following questions.

a. Which element is the most metallic? Why?

b. Identify element #3. How do you know?

c. Write the formula for the ion of element #2.

d. A neutral atom of which of the four elements has the smallest radius? How do you know?

In terms of atomic structure, explain why the first ionization energy of selenium is

a. less than that of bromine.

b. greater than that of tellurium.

Which is smaller, sodium or chlorine. Explain why it is smaller.

Why is the first ionization energy of potassium less than that of sodium?

Why is the second ionization energy of potassium greater than the second ionization energy of calcium?

The Ca2+ and Cl- ions are isoelectronic, but their radii are not the same. Which has the larger radius and why?

Although both are noble gases, krypton can actually form compounds, but helium cannot. Explain why.

The first ionization energy of beryllium is 900 kJ, but the first ionization energy for boron is 800 kJ. Explain why boron has a lower ionization energy.