Valence Electrons and Periodic Groups

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

For the main-group elements used here, count valence electrons in the highest occupied energy level. Use the periodic table as needed.

1 Which element is in the same group as magnesium?

(1) Na

(2) Al

(3) Ca

(4) Cl

2 A neutral chlorine atom has electrons in its first three energy levels in the arrangement 2, 8, 7. Determine the total number of electrons and the number of valence electrons. [1]

Answer and work

3 Explain how sodium and potassium can have similar chemical behavior even though they have different total numbers of electrons. [1]

Answer and work

4 Which arrangement represents an atom with a full outer energy level in a simple shell model?

(1) 2, 4

(2) 2, 6

(3) 2, 7

(4) 2, 8

Sorting Atom Cards

Use the information below to answer the questions.

A class sorts neutral main-group atom cards by the number of occupied energy levels and electrons in each level. Each card uses a shell model.

Card	Electrons in successive levels
P	2, 8, 1
Q	2, 8, 7
R	2, 8, 8, 1
S	2, 6

5 Which cards represent elements in the same periodic group?

(1) P and Q

(2) P and R

(3) Q and S

(4) R and S

6 Use occupied energy levels to explain which period contains the elements represented by P and Q. [1]

Answer and work

7 What charge results if the atom on card R loses its outermost electron?

(1) −2

(2) −1

(3) +1

(4) +2

8 Identify the element on card S using the total number of electrons and the periodic table. Explain the connection. [1]

Answer and work