Name Date

Worksheet 10.1: The trends in the properties of elements down a group   
and across a period

**1** Complete the following sentences with the word *increases* or *decreases*:

1. Going down Group 1, the atomic radius \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Going across Period 2, the atomic radius \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Going down Group 1, the electronegativity \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Going across Period 2, the electronegativity \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2** Complete the following sentences with the word *exothermic* or *endothermic*:

1. Going down Group 1, the first ionisation energy becomes less

1. Going across Period 2, the first ionisation energy generally becomes more

1. For the same element, the successive ionisation energy becomes more

1. Going down Group 17, the first electron affinity generally becomes less

1. Going across Period 3 from Al to Cl, the first electron affinity generally becomes more

**3** Explain your answer to the following questions:

1. Which of the atoms Na, K and Rb would have the smallest radius?

1. Which of the ions F−, Cl− and Br− would have the smallest radius?

1. Which of F−, Ne and Na+ would have the smallest radius?

1. Which of P3−, S2− and Cl− would have the smallest radius?.



1. Which of Sc, Ti and V would have the smallest radius?

**4** Deduce the oxidation state of vanadium in VO3−, V3+, VO2+, and VO2+.

**5** This question is about the ionisation energies of sodium.

1. Write down the full electron configuration of a sodium atom.

1. Define the term first ionisation energy and write an equation to show the second ionisation energy of sodium.

1. Explain why the second ionisation energy of sodium is much higher than its first   
   ionisation energy.

1. Explain why the third ionisation energy of sodium is higher than its second ionisation energy.

1. Explain why magnesium has a higher first ionisation energy than sodium.

**6** This question is about the electron affinities of Group 17 elements.

1. Define the term first electron affinity and write an equation to show the second electron   
   affinity of chlorine.

1. Explain the signs for the first and second electron affinities of chlorine.

1. Explain the trend of first electron affinities for chlorine, bromine and iodine.

1. Explain why fluorine has a less exothermic first electron affinity than chlorine.