Explaining Two Exceptions in a Period Trend

Scoring guide · one credit per question · review written work against each rubric

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Question 1

Choice (2)

Mg to Al goes from 738 to 578 kJ/mol, and P to S goes from 1,012 to 1,000 kJ/mol. In both comparisons the later atom has more protons.

Question 2

The first electron removed from Al is in 3p. It is more shielded and less likely to be close to the nucleus than the 3s electron removed from Mg. In this comparison the electron’s region helps explain the lower energy despite Al’s extra proton.

Question 3

The P model has one electron in each of the three parts of 3p. The S model has two electrons in one part. Repulsion within the pair helps explain why removing one of those electrons takes less energy.

Question 4

The change from 3s to 3p applies to Mg and Al. P and S both lose a 3p electron, so that explanation cannot distinguish them. Their 3p occupancies differ, and the paired electrons in S supply the second model’s explanation.