

Marks
3

- The periodic table lists elements in a systematic fashion. Briefly explain why the atomic radii decrease in period 3 (Na → Cl) from left to right.

Across a period, more electrons get added to the same electron shell and the number of protons in the nucleus increases. This leads to an increase in the effective nuclear charge.

The electrons therefore get attracted more strongly to the nucleus and the radius decreases.

What consequence does the shrinking atomic size have for the nature and reactivity of these elements?

As the electrons get held more strongly, there is a gradual change from metallic to non-metallic behaviour.

The smaller atoms attract additional electrons more strongly and have a higher electronegativity.

The increase in effective nuclear charge leads to an increase in the ionization energy across the period. This leads to decreasing reactivity across the first few groups. As the period is crossed, the elements become increasingly electronegative with increasing electron affinities. This leads to an increased reactivity from the middle of the period toward the end.

The full shell and high effective nuclear charge at the end of the period leads to very low reactivity for the last group.

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- Briefly explain why H_2S is a stronger Brønsted acid than H_2O .

Marks
2

S is much larger atom than O, so the H–S bond is much longer and weaker than H–O, so H_2O is weaker acid than H_2S .