

Xenon Hexafluoride Oxidation State Analysis

<https://gemini.google.com/app/e2db431e47d864a2>

Response: Statement **(2)** is the **false** statement.

Detailed Analysis of Options:

1. **(1) True:** Going down Group 18 (He to Xe), atomic size and electron cloud polarizability increase, leading to stronger London dispersion forces. Therefore, Xe has the highest boiling point among He to Xe.
 2. **(2) False:** First ionization energy **decreases** down Group 18 due to increasing atomic radius and increased shielding effect. He has the highest first ionization energy in Group 18 (and the entire periodic table), whereas Xe has a significantly lower first ionization energy.
 3. **(3) True:** In XeF_4 and XeF_6 , fluorine has an oxidation state of -1 . Solving for Xe:
 - $\text{XeF}_4: x + 4(-1) = 0 \implies x = +4$
 - $\text{XeF}_6: x + 6(-1) = 0 \implies x = +6$
 4. **(4) True:** XeF_2 has 8 valence electrons from Xe + 2 bonding electrons from F = 10 valence electrons (5 electron pairs: 2 bond pairs and 3 lone pairs). 5 electron pairs correspond to a **trigonal bipyramidal** electron pair geometry (with a linear molecular geometry).
 5. **(5) True:** Atomic radius increases down a group due to the addition of electron shells. Thus, Xe has the largest atomic radius among the first five elements (He, Ne, Ar, Kr, Xe).
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