

2008 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS

Answer Question 5 and Question 6. The Section II score weighting for these questions is 15 percent each.

Your responses to these questions will be graded on the basis of the accuracy and relevance of the information cited. Explanations should be clear and well organized. Examples and equations may be included in your responses where appropriate. Specific answers are preferable to broad, diffuse responses.

5. Using principles of atomic and molecular structure and the information in the table below, answer the following questions about atomic fluorine, oxygen, and xenon, as well as some of their compounds.

Atom	First Ionization Energy (kJ mol ⁻¹)
F	1,681.0
O	1,313.9
Xe	?

- (a) Write the equation for the ionization of atomic fluorine that requires 1,681.0 kJ mol⁻¹.
- (b) Account for the fact that the first ionization energy of atomic fluorine is greater than that of atomic oxygen. (You must discuss both atoms in your response.)
- (c) Predict whether the first ionization energy of atomic xenon is greater than, less than, or equal to the first ionization energy of atomic fluorine. Justify your prediction.

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- (d) Xenon can react with oxygen and fluorine to form compounds such as XeO_3 and XeF_4 . In the boxes provided, draw the complete Lewis electron-dot diagram for each of the molecules represented below.



- (e) On the basis of the Lewis electron-dot diagrams you drew for part (d), predict the following:
- (i) The geometric shape of the XeO_3 molecule
 - (ii) The hybridization of the valence orbitals of xenon in XeF_4
- (f) Predict whether the XeO_3 molecule is polar or nonpolar. Justify your prediction.