

5.E: Exercises

1	Estimate the wavelength of the photon which is emitted when a 3p electron falls to a vacancy in the 1s orbital in a chlorine ion. The energies of the 1s and 3p orbitals in chlorine are -2.854×10^3 eV and -13.77 eV respectively.
2	In his investigation of the X-ray spectra of the elements, Moseley found that the frequencies of the lines of shortest wavelength could be expressed as a function of the atomic number Z as <div style="text-align: right;">$\sqrt{\nu} = a(Z - \sigma)$</div> where a and s are constants. Account for the general form of the relationship. What is the significance of the factor s ?
3	(a) On the basis of your knowledge of the electronic structure of the elements arrange the following substances in the order of their increasing ability to act as oxidizing agents. He^+ , Cl, P, Na, F^- (b) Arrange the following substances in the order of their increasing ability to act as reducing agents. Cs, Li, C, S, Cl
4	Rationalize the following observations on the basis of the electronic structures of the halogen atoms and their ions. Iodide ions can be oxidized to elemental iodine by molecular oxygen $4\text{HI} + \text{O}_2 \rightarrow 2\text{I}_2 + 2\text{H}_2\text{O}$ but the corresponding reaction does not occur with HCl $\text{HCl} + \text{O}_2 \rightarrow$ no reaction
5	Account for the fact that the second ionization potential for oxygen is greater than that for fluorine. (I_2 for O is 35.15 eV and I_2 for F is 34.98 eV.)
6	Which atom or ion in the following pairs has the highest ionization potential? (a) N, P (b) Mg, Sr (c) Ge, As (d) Ar, K^+
7	Of the following substances: F_2 , F^- , I_2 , I^- (a) Which is the best oxidizing agent? (b) Which is the best reducing agent? (c) Write one chemical equation for a reaction which will illustrate your answers to parts (a) and (b).

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