

2. (10 points total) Some of the demonstrations we have seen since October 12 have involved (i) methanol mixed with a variety of chloride salts; (ii) sodium, potassium, and magnesium with water; and (iii) alkaline earth oxides with water. For two of these demonstrations,

- (a) briefly describe what we observed in class, and  
 (b) briefly discuss the physical or chemical concept that was illustrated.

- (ii) -1 switching K & Na observations  
 -1 not differentiating Na + K explanation  
 -1 " " " Group 1 and Group 2  
 -2 not noting any difference in reactivity of the 3 metals  
 -2 merely stating rxns were exothermic  
 -1 or -2 vague explanation  
 -2 just restating the problem.

- (i) -1 vague explanation

- (iii) -1 no differentiation of MgO and CaO reactions  
 -1 no mention of lattice energy (but saying that reactivity increases as you go down a group) -3 discussed only  
 -2 no discussion of trend in reactivity basicity

3. Experiments indicate that in its ground state, an atom of W has four unpaired electrons.

- (a) (4 points) Write down the abbreviated electron configuration consistent with this observation. You need not justify your answer here.

- (b) (8 points) The other two (non-radioactive) elements in Group 6, Cr and Mo, each have six unpaired electrons in their ground state. Identify the two energetic factors that control the electron configuration of Group 6, and explain how they lead to two different electron configurations.

- 2 no mention of pairing penalty (or effect of Lanthanides in the 4f subshell)  
 -2 no discussion of W  
 -1 vague discussion of the effect of 4f  
 -3 no mention of either the difference in E between 4s + 3d orbitals or the special stability of half-filled d subshells  
 -4 some specific statement  
 -5 significant misconceptions