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SCH4U	Assignment
Structure and Properties of Matter	/30

1. **Consider the element scandium.**
   a. **Complete the table below by providing a set of quantum numbers for the last two electrons in a scandium atom.** **[4]**

e^-	Principle quantum number	Orbital-shape quantum number	Magnetic quantum number	Spin quantum number
1	3	2	−2	$+\frac{1}{2}$
2	4	∅	∅	$-\frac{1}{2}$

   b. **Provide an orbital diagram of the scandium atom.** **[2]**

   c. **Provide an orbital diagram of the scandium ion.** **[2]**

2. **Consider the element iodine.**
   a. **Complete the table below by providing a set of quantum numbers for the last three electrons in an iodine atom.** **[6]**

e^-	Principle quantum number	Orbital-shape quantum number	Magnetic quantum number	Spin quantum number
1				
2				
3				

b. Provide an orbital diagram of the iodine atom. **[2]**

c. Provide an orbital diagram of the iodine ion. **[2]**

3. For each of the following, draw the correct Lewis structure and provide the hybridization of the central atom. **[8]**

a) $CHCl_3$ *Hybridization:* _____	b) H_2CO *Hybridization:* _____
c) PF_5 *Hybridization:* _____	d) XeF_4 *Hybridization:* _____

4. **A new element is discovered years in the future on a distant planet. Scientists choose to name it Akirium (Ak). Upon initial study of akirium, some preliminary data indicates the following:**
   - **Akirium has five valence electrons**
   - **Akirium is located below period 2 on the periodic table (in other words, it is NOT in period 1 or 2)**
   - **Akirium bonds with three oxygen atoms to form a polyatomic ion with a 1- charge, AkO_3^-**

   Draw the correct Lewis structure for the akirium polyatomic ion AkO_3^- and include ALL resonance structures. [4]