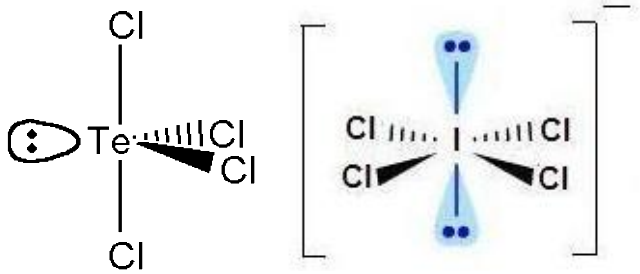
Answer on the question #68057, Chemistry / Physical Chemistry

Question:
a) Starting from Lewis structure, determine the hybridization types of the central atom of TeCl4 and ICl4- .

Answer:
Let's determine the whole number of valent electrons in molecules. Te has valence layer configuration $5s^25p^4$, so has 2+4=6 valence electrons.
Cl $3s^23p^5$; 2+5=7
I $5s^25p^5$; 2+5=7
Then, the total number of valence electrons in molecules are:
$TeCl_4$; 6+7*4 = 34
ICl_4^-; 7*5 +1= 35 + 1 = 36

Lewis structures of $TeCl_4$ and ICl_4^- are:



Thus, the steric number of $TeCl_4$ is 5 (4 bonds + 1 lone pair), so hybridization of tellurium is sp^3d (the exponents 1, 3 and 1 add up and give 5). Steric number of ICl_4^- is 6 (4 bonds + 2 lone pairs), hybrydization of iodine is d^2sp^3 or sp^3d^2 (1+3+2 = 6).