

CHEM 321 - 1<sup>st</sup> Hourly Exam

Key  
NAME /

1. Which subshell has the following set of quantum numbers:  $N = 3, \ell = 2$ ? [5 pts]

3d

2. What are the maximum number of electrons allowed for a g type subshell? [5 pts]

18

3. How many angular nodes would be expected for a g type orbital? [5 pts]

4

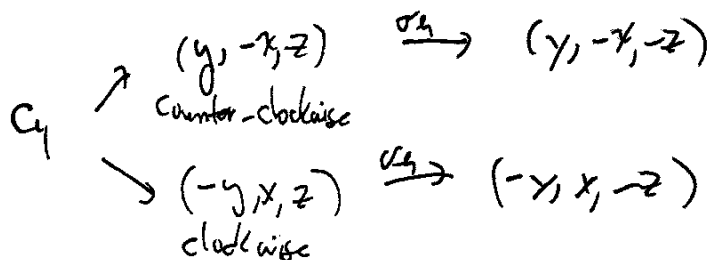
4. For the following atoms and ions, determine the correct ground state electron configuration and the number of unpaired electrons. [20 pts]

	Electron configuration	Unpaired electrons
B	$[\text{He}] 2s^2 2p^1$	1
$\text{Li}^+$	$[\text{He}]$	0
Sc	$[\text{Ar}] 4s^2 3d^1$	1
As	$[\text{Ar}] 4s^2 3d^{10} 4p^3$	3
Ne	$[\text{He}] 2s^2 2p^6$	0
$\text{Mn}^{2+}$	$[\text{Ar}] 3d^5$	5
K	$[\text{Ar}] 4s^1$	1
$\text{Au}^-$	$[\text{Xe}] 4f^{14} 5d^{10} 6s^1$	1

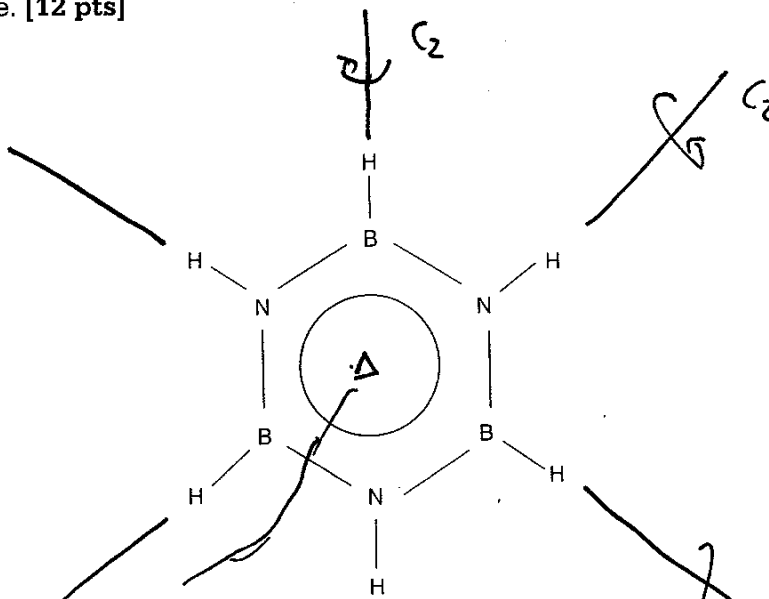
5. For the following atomic properties, state how these properties vary (increase or decrease) as one goes from left to right across a period and as one descends a given group. [8 pts]

	Left to right across period	down a group
atomic radius	decrease	increase
electronegativity	increase	decrease
electron affinity	increase	decrease
ionization energy	increase	decrease

6. How does a  $S_4^1(z)$  operation transform the point  $x, y, z$ ? (i.e. what are its new coordinates?) [7 pts]



7. Identify all symmetry elements and operations for the following planar aromatic molecule. [12 pts]



8. Determine the symmetry point group for the following molecules and/or ions. [30 pts]

