Quiz 7
CHEM 3PA3; Fall 2019

1-7.   Evaluate the following commutators.

$$\left[\hat{H},\hat{L}_x\right] =$$

$$\left[\hat{S}_y,\hat{S}_z\right] =$$

$$\left[\hat{S}^2,\hat{S}_y\right] =$$

$$\left[\hat{J}^2,\hat{L}^2\right] =$$

$$\left[\hat{L}_y,\hat{L}_x\right] =$$

$$\left[\hat{L}_x,\hat{S}_y\right] =$$

$$\left[\hat{J}_x,\hat{S}_y\right] =$$

8.   The term symbols for the $1s^22s^22p^13p^1$ excited state of the Carbon atom are $^1D, ^1P, ^1S, ^3P, ^3P, ^3S$. **What is the predicted order of the states according to Hund's rules.**

9.   **What are the term symbols for the [Ar]$4s^23d^14p^1$ excited state (Titanium)?**

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1-7.   Evaluate the following commutators.

$$\left[\hat{H},\hat{L}_x\right]=0$$

$$\left[\hat{S}_y,\hat{S}_z\right]=i\hbar\hat{S}_x$$

$$\left[\hat{S}^2,\hat{S}_y\right]=0$$

$$\left[\hat{J}^2,\hat{L}^2\right]=0$$

$$\left[\hat{L}_y,\hat{L}_x\right]=-\left[\hat{L}_x,\hat{L}_y\right]=-i\hbar\hat{L}_z$$

$$\left[\hat{L}_x,\hat{S}_y\right]=0$$

$$\left[\hat{J}_x,\hat{S}_y\right]=\left[\hat{L}_x+\hat{S}_x,\hat{S}_y\right]=\left[\hat{L}_x,\hat{S}_y\right]+\left[\hat{S}_x,\hat{S}_y\right]=0+i\hbar\hat{S}_z=i\hbar\hat{S}_z$$

8.   The term symbols for the $1s^2 2s^2 2p^1 3p^1$ excited state of the Carbon atom are $^1D,^1P,^1S,^3P,^3P,^3S$. **What is the predicted order of the states according to Hund's rules.**

$^3D,^3P,^3S,\ ^1D,^1P,^1S$
Really we should add J indices. Then
$^3D_1,\ ^3D_2,\ ^3D_3,^3P_0,\ ^3P_1,^3P_2,^3S_1,\ ^1D_2,^1P_1,^1S_0$

9.   What are the term symbols for the $[Ar]4s^2 3d^1 4p^1$ excited state (Titanium)?
$^3P,^3D,^3F,^1P,^1D,^1F$