

(b) $H_{9/2} \Rightarrow l=5 \quad j=\frac{9}{2} \quad s=\frac{1}{2} \quad (j=l-s)$

$\cos \theta = -0.632 \Rightarrow \theta = 129.20^\circ$

$H_{11/2} \Rightarrow l=5 \quad j=\frac{11}{2} \quad s=\frac{1}{2} \quad (j=l+s)$

$\cos \theta = 0.527 \Rightarrow \theta = 58.20^\circ$

Pb # 22.

According to Hund's rule $[\text{Ar}]3d^5 4s^1$ has lower energy than $[\text{Ar}]3d^4 4s^2$ and therefore $[\text{Ar}]3d^5 4s^1$ should be more stable atom. It is Chromium. $[\text{Ar}]3d^4 4s^2$ does not exist.

Pb # 24.

Atom	3s	3p	4s	Config.
Na	$\boxed{\uparrow}$	$\boxed{\quad} \boxed{\quad} \boxed{\quad}$	$\boxed{\quad}$	$[\text{Ne}] 3s^1$
Mg	$\boxed{\uparrow\downarrow}$	$\boxed{\quad} \boxed{\quad} \boxed{\quad}$	$\boxed{\quad}$	$[\text{Ne}] 3s^2$
Al	$\boxed{\uparrow\downarrow}$	$\boxed{\uparrow} \boxed{\quad} \boxed{\quad}$	$\boxed{\quad}$	$[\text{Ne}] 3s^2 2p^1$
Si	$\boxed{\uparrow\downarrow}$	$\boxed{\uparrow} \boxed{\uparrow} \boxed{\quad}$	$\boxed{\quad}$	$[\text{Ne}] 3s^2 2p^2$
P	$\boxed{\uparrow\downarrow}$	$\boxed{\uparrow} \boxed{\uparrow} \boxed{\uparrow}$	$\boxed{\quad}$	$[\text{Ne}] 3s^2 2p^3$
S	$\boxed{\uparrow\downarrow}$	$\boxed{\uparrow\downarrow} \boxed{\uparrow} \boxed{\uparrow}$	$\boxed{\quad}$	$[\text{Ne}] 3s^2 2p^4$
...				
...				
K	$\boxed{\uparrow\downarrow}$	$\boxed{\uparrow\downarrow} \boxed{\uparrow\downarrow} \boxed{\uparrow\downarrow}$	$\boxed{\uparrow}$	$[\text{Ar}]$ $[\text{Ne}] 3s^2 2p^6 4s^1$