Answer on the question #68056, Chemistry / Physical Chemistry

Question:
b) Explain why He2 does not exist under ordinary condition? Calculate bond order
of He2+.

Answer:
Let's consider electronic configuration of He_2 : $(\sigma_{1s})^2(\sigma_{1s}^*)^2$. There are two electrons on bonding orbital and two electrons on antibonding orbital.

Bond order of He_2 is the number of bonding electrons minus number of the antibonding electrons, divided by two:

$$\frac{N_b - N_a}{2} = \frac{2-2}{2} = 0$$

He_2 molecule doesn't exist due to zero bond order.

Now, if we take He_2^+ ion, we can see in its electronic configuration that there are two electrons on bonding orbital and one electron on antibonding orbital : $(\sigma_{1s})^2(\sigma_{1s}^*)^1$.
The bond order of He_2^+ ion is :

$$\frac{N_b - N_a}{2} = \frac{2-1}{2} = 0.5$$