$$\Rightarrow \langle U \rangle = -\frac{4ke^2}{a_0^3}\left(\frac{a_0}{2}\right)^2 \int_0^\infty z\, e^{-z}\, dz$$

but $\int_0^\infty z^n e^{-z} dz = n!$

$$\Rightarrow \langle U \rangle = -\frac{4ke^2}{a_0^3}\left(\frac{a_0}{2}\right)^2 = -\frac{ke^2}{a_0} = \boxed{-27.2\,eV}$$

$$\langle K \rangle + \langle U \rangle = \langle E \rangle$$

For the ground state $\langle E \rangle = -13.6\,eV$

and $\langle U \rangle = -27.2\,eV$

$$\Rightarrow \langle K \rangle = -13.6 + 27.2 = \boxed{13.6\,eV}$$