solutions for quiz: Feb12:

Gr II:

1. The uncertainty in the position of a proton is Δx;

the uncertainty in its momentum$> \frac{\hbar}{2.\Delta x}$

the uncertainty in its kinetic energy $> \frac{\left(\frac{\hbar}{2.\Delta x}\right)^2}{2.m_p} = \frac{\hbar^2}{8.m_p.(\Delta x)^2}$

2. The antisymmetrized wavefunction for the H_2 molecule in its ground state is $\frac{1}{\sqrt{2}}\sigma(1).\sigma(2)\,[\alpha(1)\beta(2) - \alpha(2)\beta(1)]$,

where $\sigma(i) = N(\phi_{1s_A} + \phi_{1s_B})$; ϕ_{1s_X} =the normalized hydrogen $1s$ wavefunction with coordinates referring to nucleus X as the origin (C.M.);

$\alpha(1)\beta(2)$ implies that the electron 1 is in spin state α, (say, $s = \frac{1}{2}$; $m_s = \frac{1}{2}$) and the electron 2 is in spin state β, **(**$s = \frac{1}{2}$; $m_s = -\frac{1}{2}$**).**

Gr I :

1. The uncertainty in the position of a proton at time $t = 0$ is Δx_0.

(a) the uncertainty in its momentum at time $t = 0$; $> \frac{\hbar}{2\Delta x_0}$

(b) the uncertainty in its velocity at time $t = 0$; $> \frac{\hbar}{2.m_p.\Delta x_0}$

(c) the uncertainty in its position at time $t > 0$; $> \frac{\hbar.t}{2.m_p.\Delta x_0}$

2. The antisymmetrized wavefunction for the He atom in its ground state is: $\frac{1}{\sqrt{2}}\phi_{1s}(1).\phi_{1s}(2)\,[\alpha(1)\beta(2) - \alpha(2)\beta(1)]$

where ϕ_{1s} is the $1s$ wavefunction.