The de Broglie wavelength of a neutron at $927^\circ C$ is λ. Its wavelength at $27^\circ C$ is:

(A) $\dfrac{\lambda}{2}$　　　　(B) λ　　　　(C) 2λ　　　　(D) 4λ

Solution

de Broglie wavelength $\lambda = \dfrac{h}{p} = \dfrac{h}{\sqrt{2mE}}$

So, $\lambda \propto \dfrac{1}{\sqrt{E}}$

Or, $\lambda \propto \dfrac{1}{\sqrt{T}}$

$\therefore \dfrac{\lambda'}{\lambda} = \sqrt{\dfrac{T}{T'}}$

$\therefore \lambda' = \lambda\sqrt{\dfrac{927+273}{27+273}} = \lambda\sqrt{\dfrac{1200}{300}} = 2\lambda$

Hence, (C)