

TALENT6: HWK 4

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Let' try out mirror symmetry in $A = 7$. If one considers ${}^3\text{H} + \alpha$ elastic scattering, there is a $J^\pi = 7/2^-$ resonance observed at $E = 2.185$ (c.m. energy), with a width of $\Gamma = 69$ keV. This state exists in the ${}^7\text{Li}$ compound nucleus and has an analog in ${}^7\text{Be}$. Find this analog using the TUNL compilation (<http://www.tunl.duke.edu/nuclldata/>). What is the resonance energy for ${}^3\text{He} + \alpha$, according to the compilation? Using the Γ value from ${}^7\text{Li}$, predict the width of the analog state in ${}^7\text{Be}$. How well does this result agree with the value in the compilation? What orbital angular momentum did you use for your penetration factor?

For a more challenging application of mirror symmetry, see C.D. Nesaraja *et al.*, *Nuclear structure properties of astrophysical importance for ${}^{19}\text{Ne}$ above the proton threshold energy*, Phys. Rev. C **75**, 055809 (2007). <https://doi.org/10.1103/PhysRevC.75.055809>.