

1 Ryden 10.1

2 Ryden 10.2

3 CMB to the Rescue Part 1. Once again the CMB plays a dramatic role as “the Great Synthesizer” of Cosmic information. What major characteristic of the CMB (spectrum, anisotropy, or polarization) informs our knowledge of BBN? Given the WMAP 5-year data-set value for the baryon density, Ω_B , and your knowledge that $T_{CMB} = 2.725$ K what does WMAP predict for η ? Using this η , what would you predict for the abundance of Helium ${}^4\text{He}$? Use WMAP’s “LAMBDA Data Archive” on-line to get Ω_B .

<http://lambda.gsfc.nasa.gov/product/map/dr3/parameters.cfm>

Click the top left “green dot” and read off the value of Ω_B . Use it and T_{CMB} to compute η . See Ryden Ch 9 for helpful equations.

4 CMB to the Rescue Part 2. Next, given T_{CMB} , use the value of η from question 3 and the plots of abundances vs. η , predict the abundance of deuterium...don’t forget the uncertainty! How much would the predicted abundance of Helium ${}^4\text{He}$ change if the CMB were measured incorrectly (due to some systematic error) and found to have the incorrect value: $T_{CMB} = 2.700K$?