

1. A born skeptic, you plan to confirm for yourself the results of a classic experiment originally performed in the 1960s by Meselson and Stahl. They concluded that each daughter cell inherits only one strand of its mother's DNA. To check their results, you 'synchronize' a culture of growing cells, so that virtually all cells begin and then complete DNA synthesis at the same time. You first grow the cells in a medium that contains nutrients highly enriched in heavy isotopes of nitrogen and carbon ( $^{15}\text{N}$  and  $^{13}\text{C}$  in place of the naturally abundant  $^{14}\text{N}$  and  $^{12}\text{C}$ ). Cells growing in this 'heavy' medium use the heavy isotopes to build all of their macromolecules, including nucleotides and nucleic acids. You then transfer the cells to a normal, 'light' medium containing  $^{14}\text{N}$  and  $^{12}\text{C}$  nutrients. Finally, you isolate DNA from cells that have grown for different numbers of generations in the light medium and determine the density of their DNA by density-gradient centrifugation. Your data, plotting the amount of DNA isolated versus its density, are shown in Figure 1. Are these results in agreement with your expectations? Explain the results.

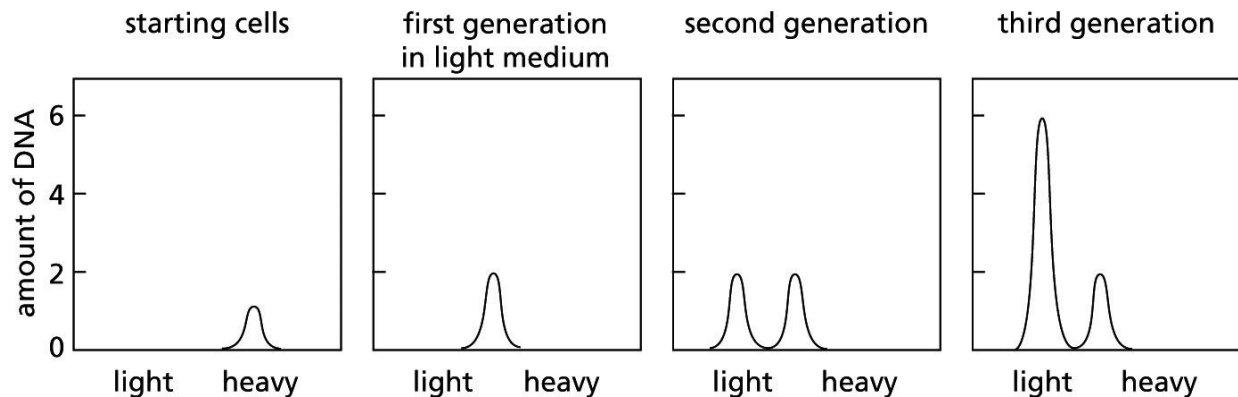


Figure 1 Density of DNAs isolated from cells that were grown for different times in 'light' medium after initial growth in medium enriched for heavy isotopes of nitrogen and carbon. Equal culture volumes were analyzed for each time point. Amount of DNA is in arbitrary units, with the peak amount of DNA in the sample containing starting cells set equal to 1.