

# A guideline for 3D printing of macromolecular models on the cheap

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The structure and function of biomolecules relationship is the hallmark of biochemistry, molecular biology and life sciences in general. Physical models of macromolecules give students the possibility to manipulate these structures in three dimensions, developing a sense of spatiality and a better understanding of key aspects such as atom size and shape, bond lengths and symmetry. Several molecular model systems were developed specifically to represent particular classes or groups of molecules and hence lack the flexibility of a universal solution. Three-dimensional (3D) printing could nevertheless provide such a universal solution, as it can be used to create physical models of biomolecular structures based on the teacher's or demonstrator's needs and requirements. Here, insulin was used as a model molecule and several depictions and printing parameters were tested in order to highlight the technical limitations of the approach. In the end, a set of settings that worked is provided which could serve as a starting point for anyone wishing to print its own custom macromolecular model on the cheap.