USE OF BALLOON MODELS IN VISUALIZATION AND PREDICTION OF MOLECULAR SHAPES[1]

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Simple "sausage" balloons can be twisted together in the middle to make very effective models for the demonstration of coordinations of from 2 to 8 ligands. This method of presentation allows the demonstration of vibrational phenomena such as the inherent vibrational instability of square planar coordination with respect to tetrahedral coordination. These phenomena are difficult, if not impossible, to demonstrate with more conventional molecular models.

Four balloons twisted together in the the center demonstrate the square biprismate structure characteristic of eight ligands, e.g. IF_8^-. Breaking of one lobe of the octacoordinate model will cause collapse of the model into the pentagonal bipyramid of heptacoordination forming a model which can be used to represent e.g. IF_7 or XeF_6. The use of these models predicts, correctly, that XeF_6 is not a regular octohedral structure.

By successive removal of "ligands" the same model can be used for demonstration of successively lower coordination numbers. Among the interesting patterns which appear are a general pattern for the development of the coordination number patterns for 2, 4, 6, and 8 ligands, and the fact that five coordinated groups split naturally into a set of two and a set of three. The same splitting of a group of five is seen in the splitting of "d" orbitals under the influence of a magnetic or electrical field. Additional correlations and uses will be obvious.

The writer has found that lectures based on this material can, with appropriate modification, be used with profit and enjoyment with groups from grade school to graduate school level.

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