**Play-Doh Molecular Orbitals**

**Materials**

At least two different colors of Play-Doh

**Instructions**

Work in groups of 3-4 to investigate the following orbital interactions.

1. On a piece of paper, draw an (*x, y, z*) coordinate system with a vertical *z* axis, a horizontal *y* axis and an *x* axis perpendicular to the plane of the page.
2. Use Play-Doh to construct three-dimensional representations of each of the atomic orbitals listed below. Use the different colors of Play-Doh to show lobes of opposite signs.
3. Assume the energies of the atomic orbitals and distance between the atoms are suitable for bonding. Using your coordinate system and atomic orbitals, determine whether overlap of each pair of atomic orbitals will result in formation of a σ, π, or δ molecular orbital or no net interaction.
4. Sketch the resulting bonding molecular orbital if it exists and label the interaction as σ, π, or δ. If there is no net interaction, illustrate why the symmetries of the atomic orbitals prohibits bonding.
5. If there is a net interaction, model and sketch the corresponding destructive (antibonding) interactions between orbitals and label them as σ\*, π\*, δ\* or no interaction

*s* and *dz2* approaching along the *z* axis

*pz* and *dz2* approaching along the *z* axis

*dxz* and *px* approaching along the *x* axis

*dxz* and *px* approaching along the *z* axis

*dxz* and *dyz* approaching along the *z* axis

*dxz* and *dxz* approaching along the *y* axis