



Professional 1-1 Chemistry Tuition

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Dr Simon Orchard

Hybridisation and Bonding in Carbon Dioxide

These slides may be downloaded at <https://www.chemistrytuition.net/>

Oxygen A



One pi
bond, one
sigma bond
and two
lone pairs

Carbon



Two pi
bonds and
two sigma
bonds

Oxygen B



One pi
bond, one
sigma bond
and two
lone pairs



Oxygen A

sp^2 hybrid orbitals

One pi bond, one sigma bond and two lone pairs

Carbon

sp hybrid orbitals

Two pi bonds and two sigma bonds

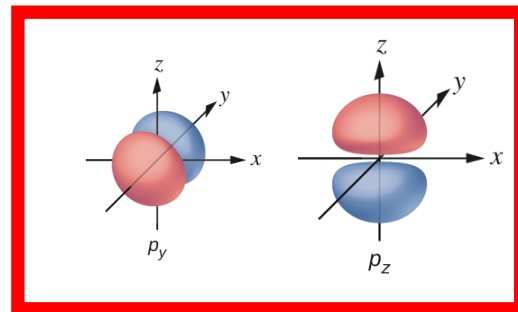
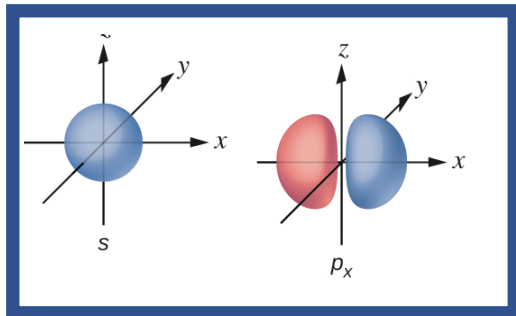
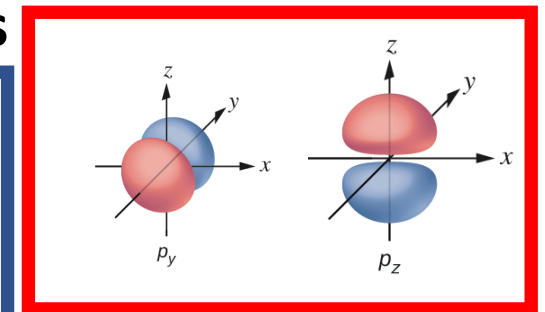
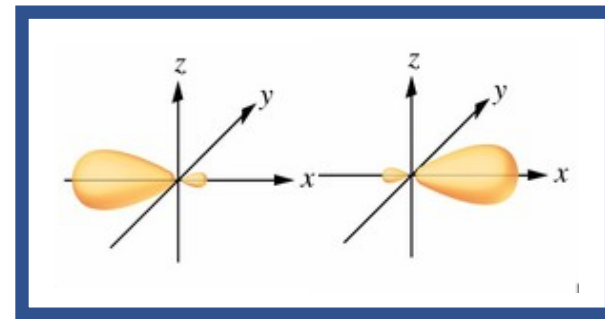
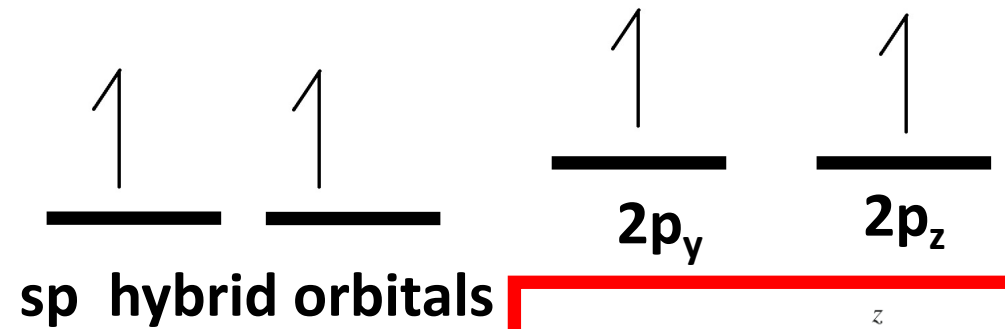
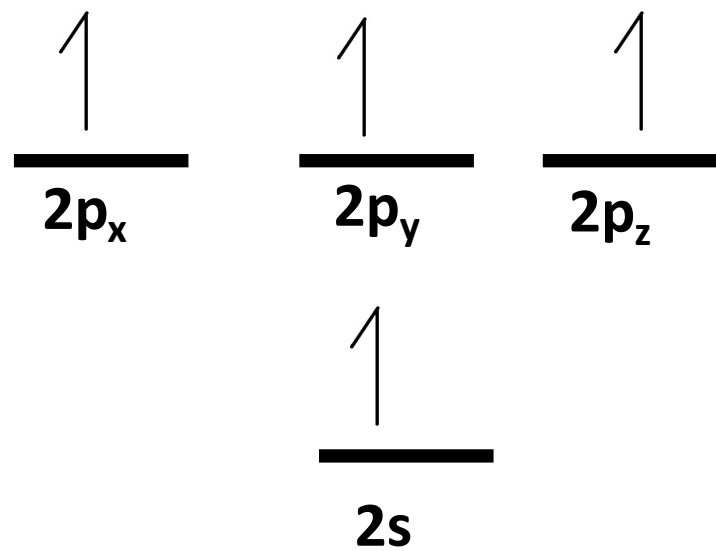
Oxygen B

sp^2 hybrid orbitals

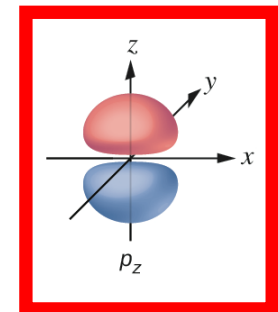
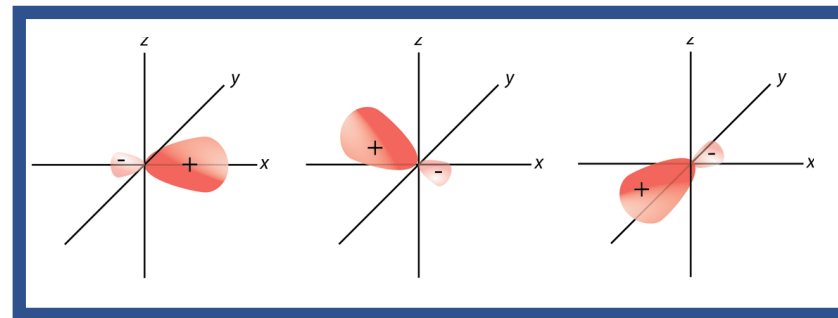
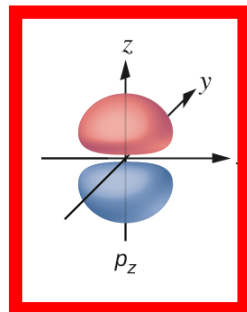
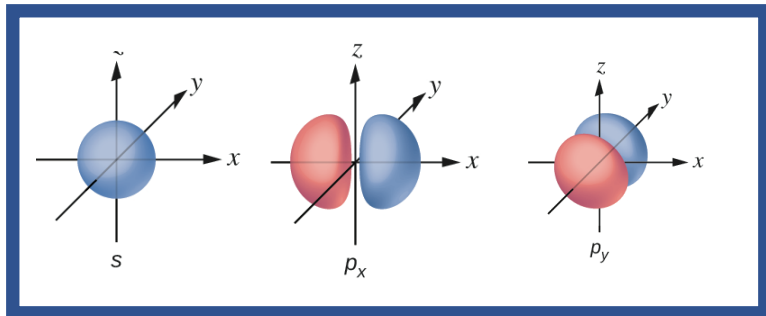
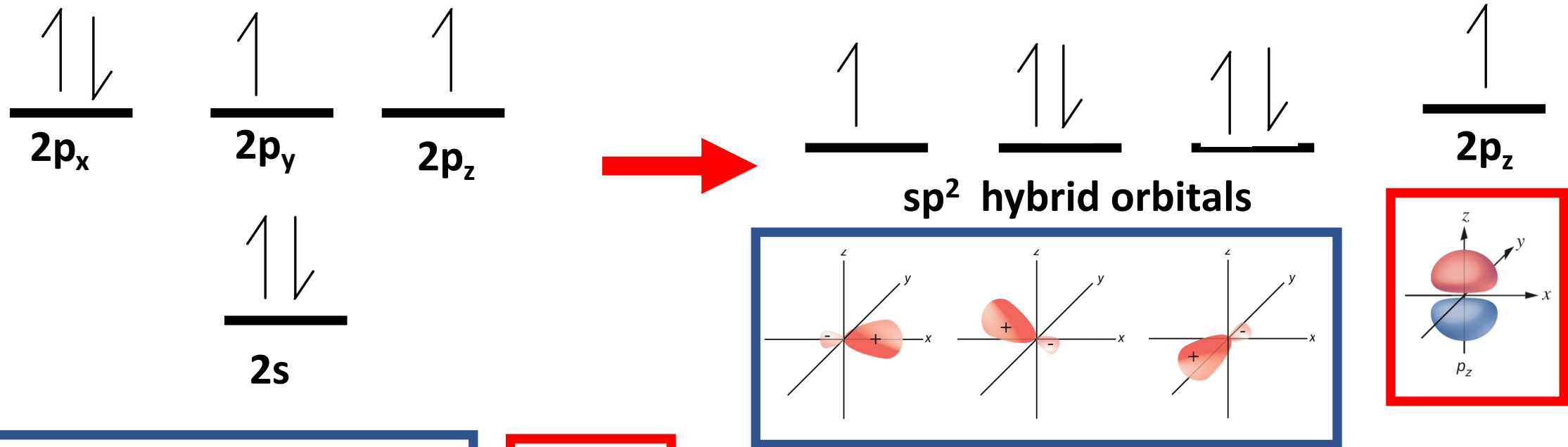
One pi bond, one sigma bond and two lone pairs



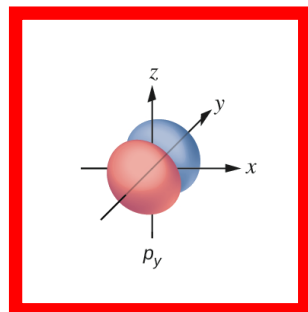
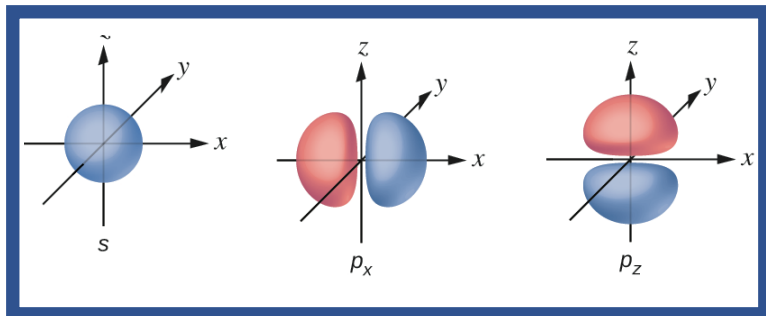
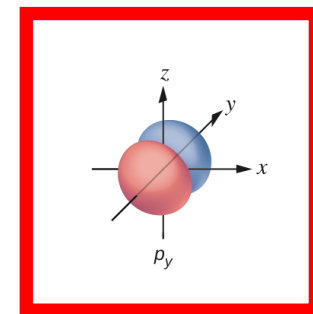
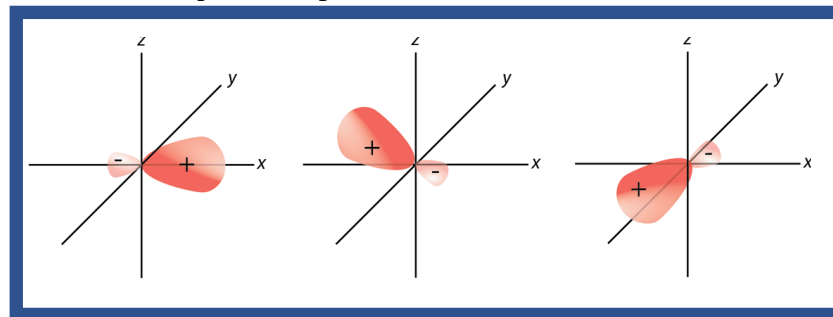
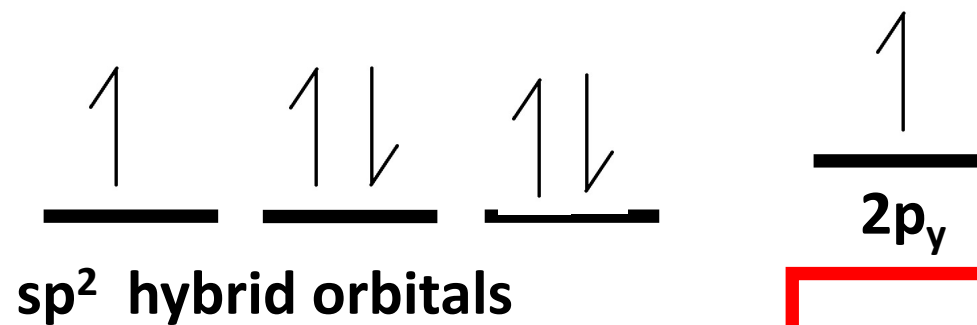
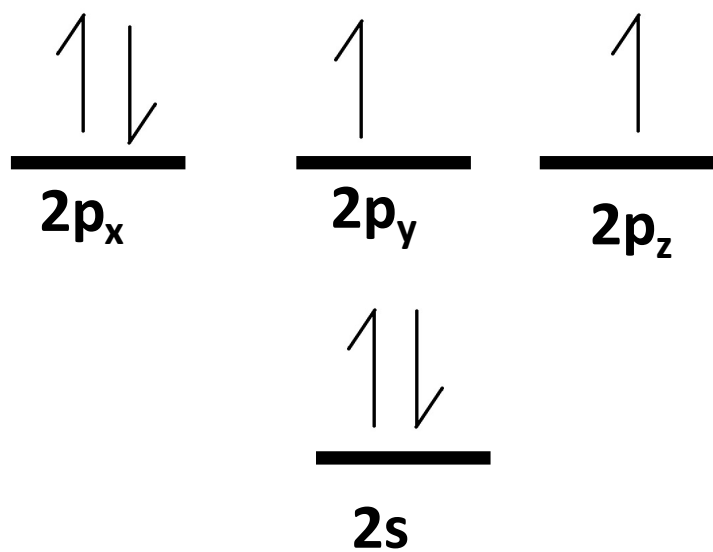
Carbon – 2s and 2p_x form sp hybrid orbitals
2p_y and 2p_z form pi bonds



Oxygen A – $2s$, $2p_x$ and $2p_y$ form sp^2 hybrid orbitals $2p_z$ forms a pi bond

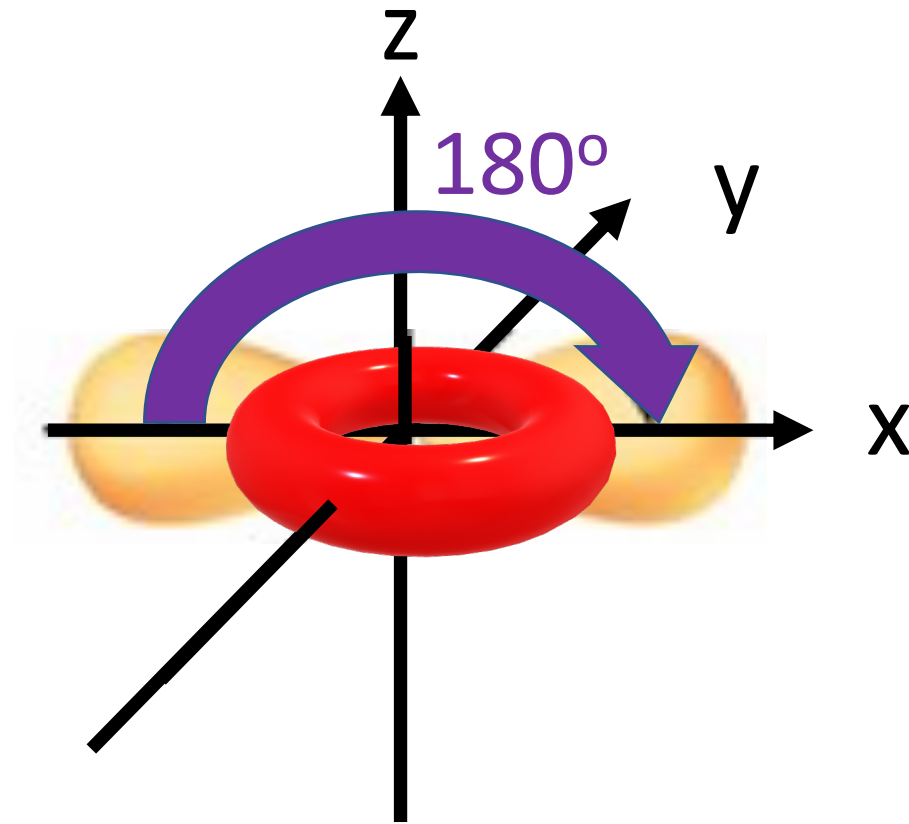


Oxygen B – $2s$, $2p_x$ and $2p_z$ form sp^2 hybrid orbitals $2p_y$ forms a pi bond



Sigma Bonding

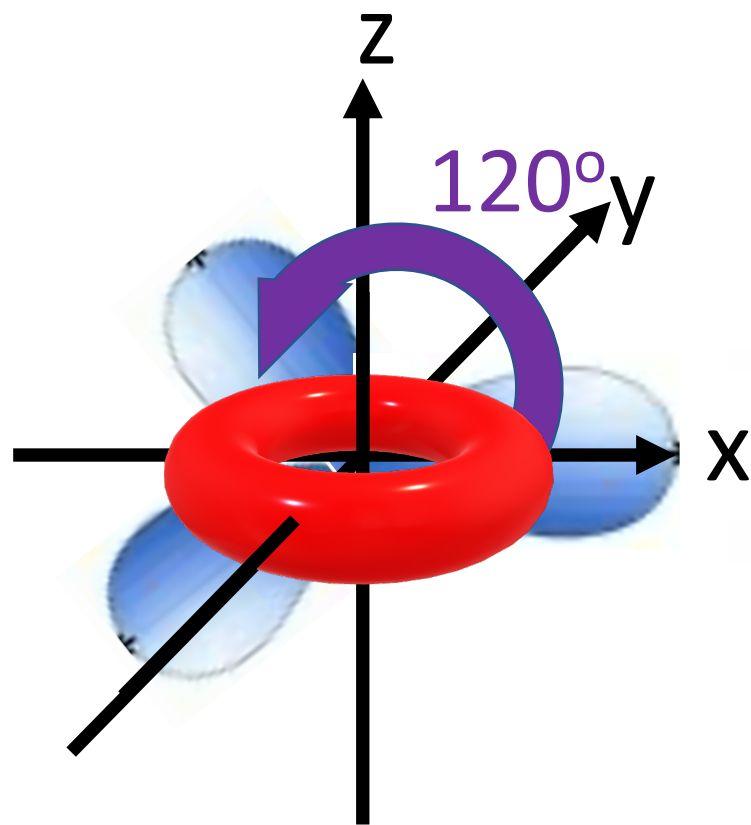
Carbon



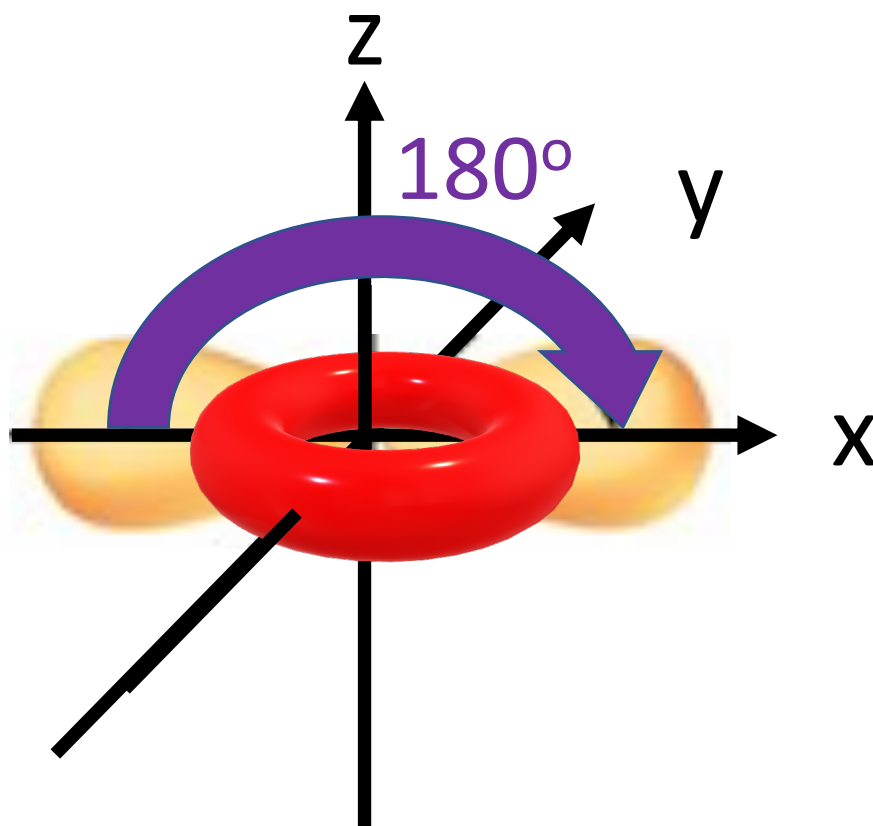
sp hybrid orbitals

2s, 2p_x

Oxygen A



Carbon



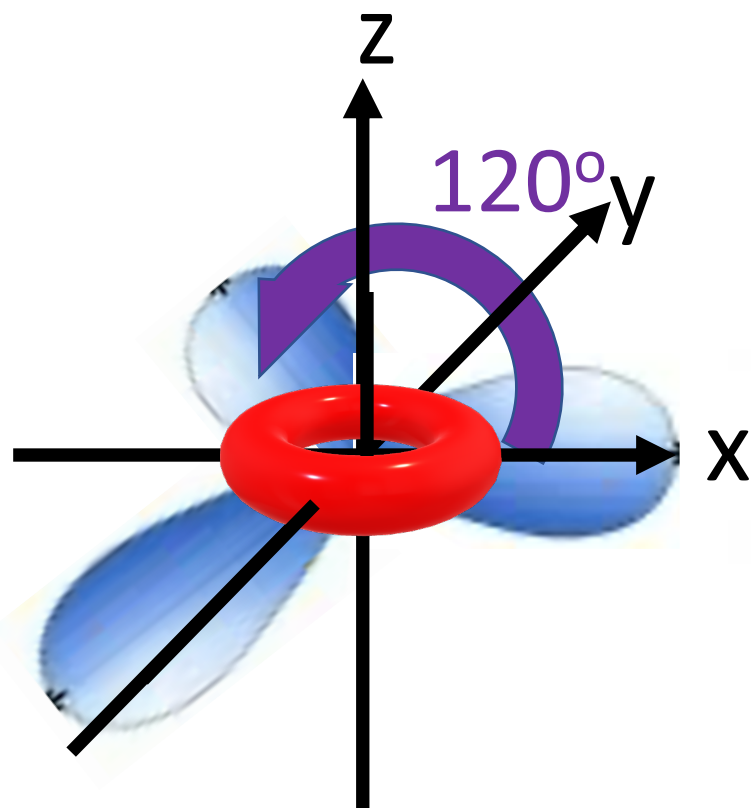
sp^2 hybrid orbitals

$2s, 2p_x, 2p_y$

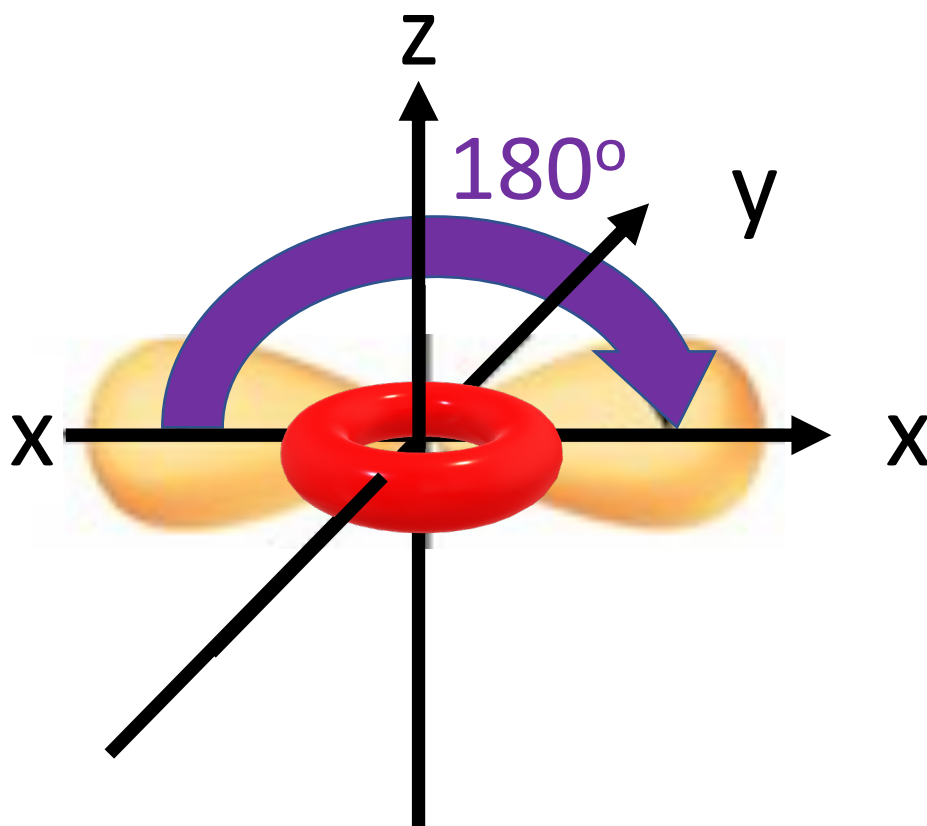
sp hybrid orbitals

$2s, 2p_x$

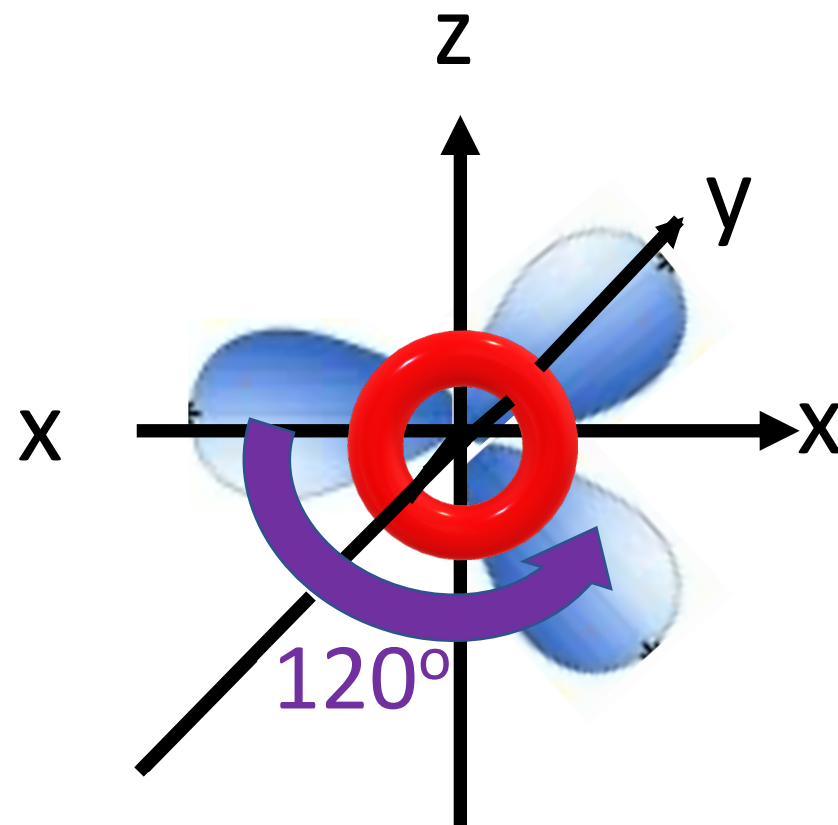
Oxygen A



Carbon



Oxygen B



sp^2 hybrid orbitals

$2s, 2p_x, 2p_y$

sp hybrid orbitals

$2s, 2p_x$

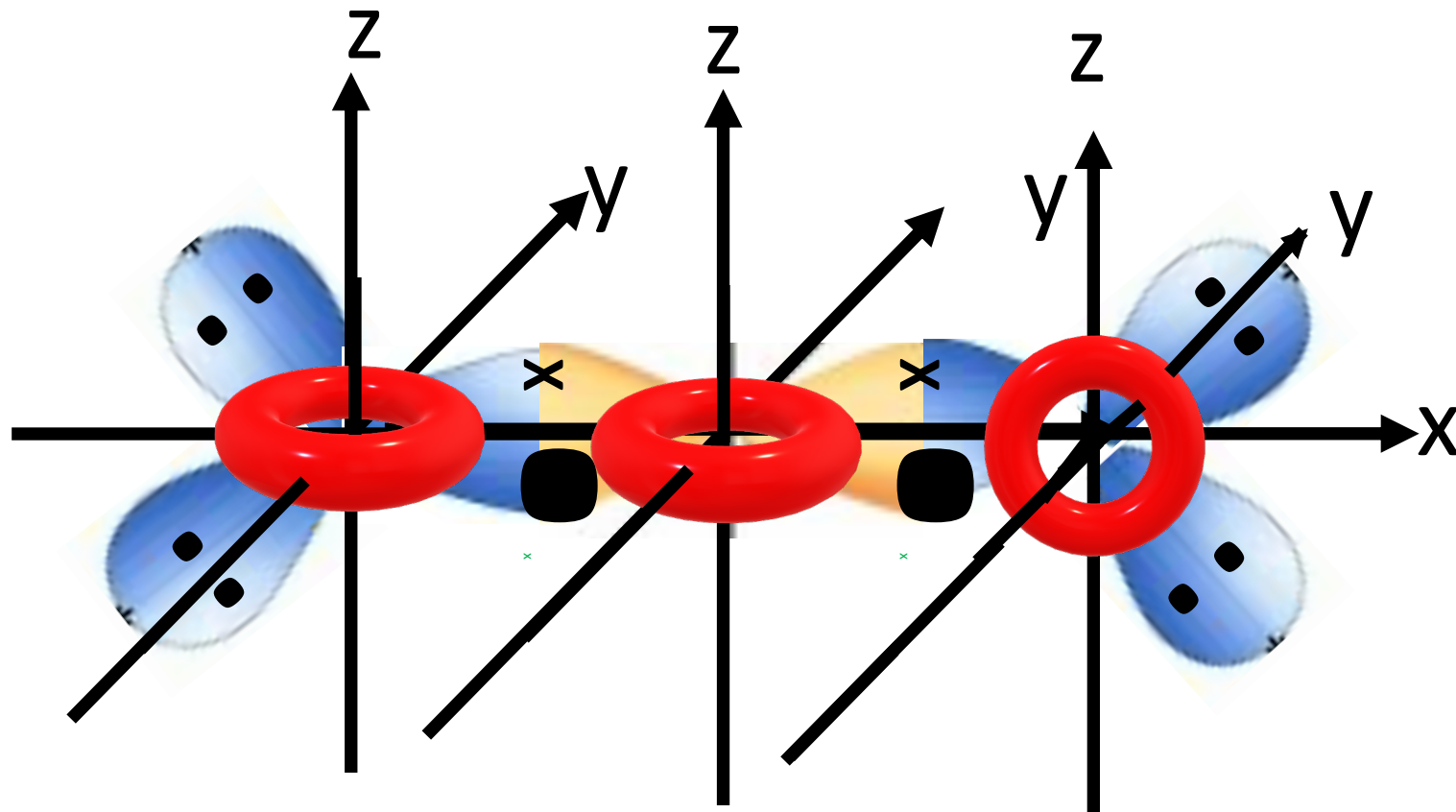
sp^2 hybrid orbitals

$2s, 2p_x, 2p_z$

Oxygen A

Carbon

Oxygen B



sp^2 hybrid orbitals

$2s, 2p_x, 2p_y$

sp hybrid orbitals

$2s, 2p_x$

sp^2 hybrid orbitals

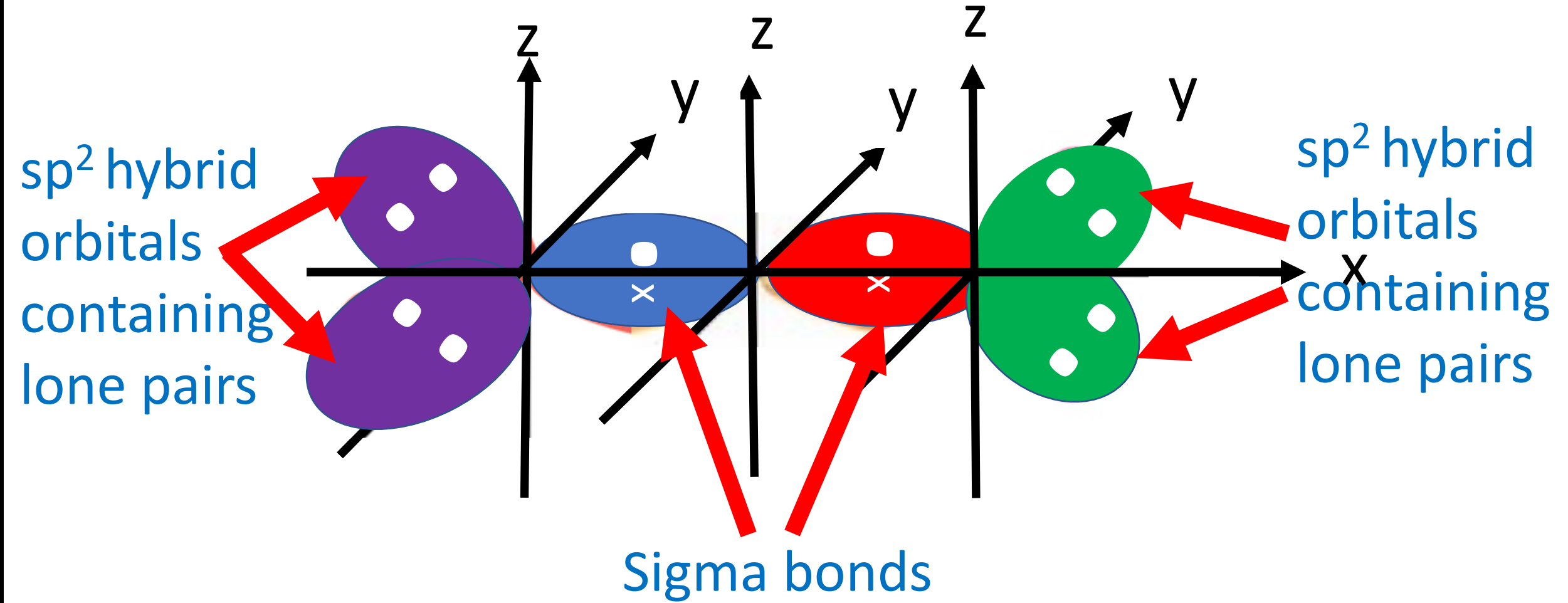
$2s, 2p_x, 2p_z$

Sigma Framework

Oxygen A

Carbon

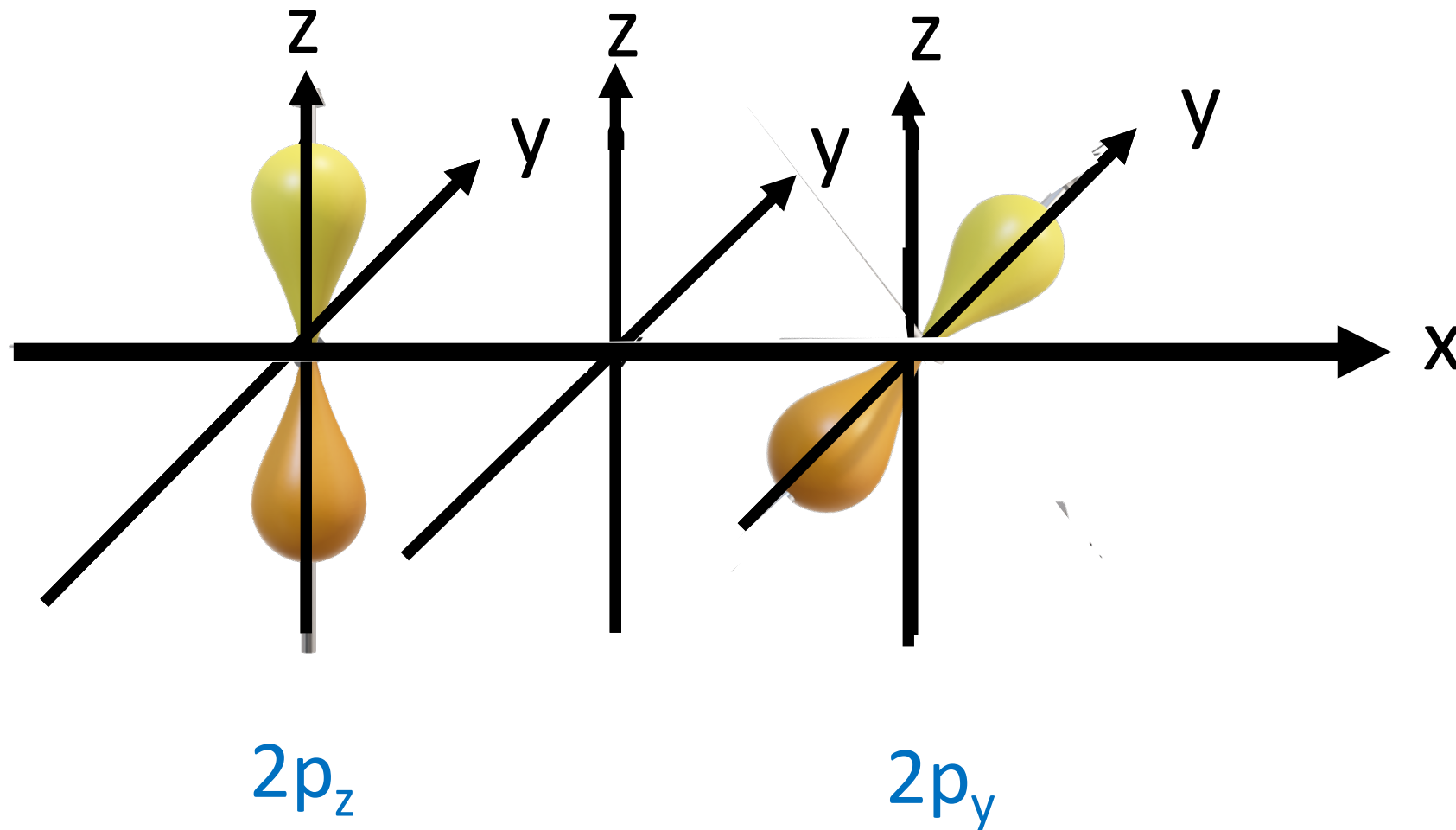
Oxygen B



Pi Bonding

Oxygen A

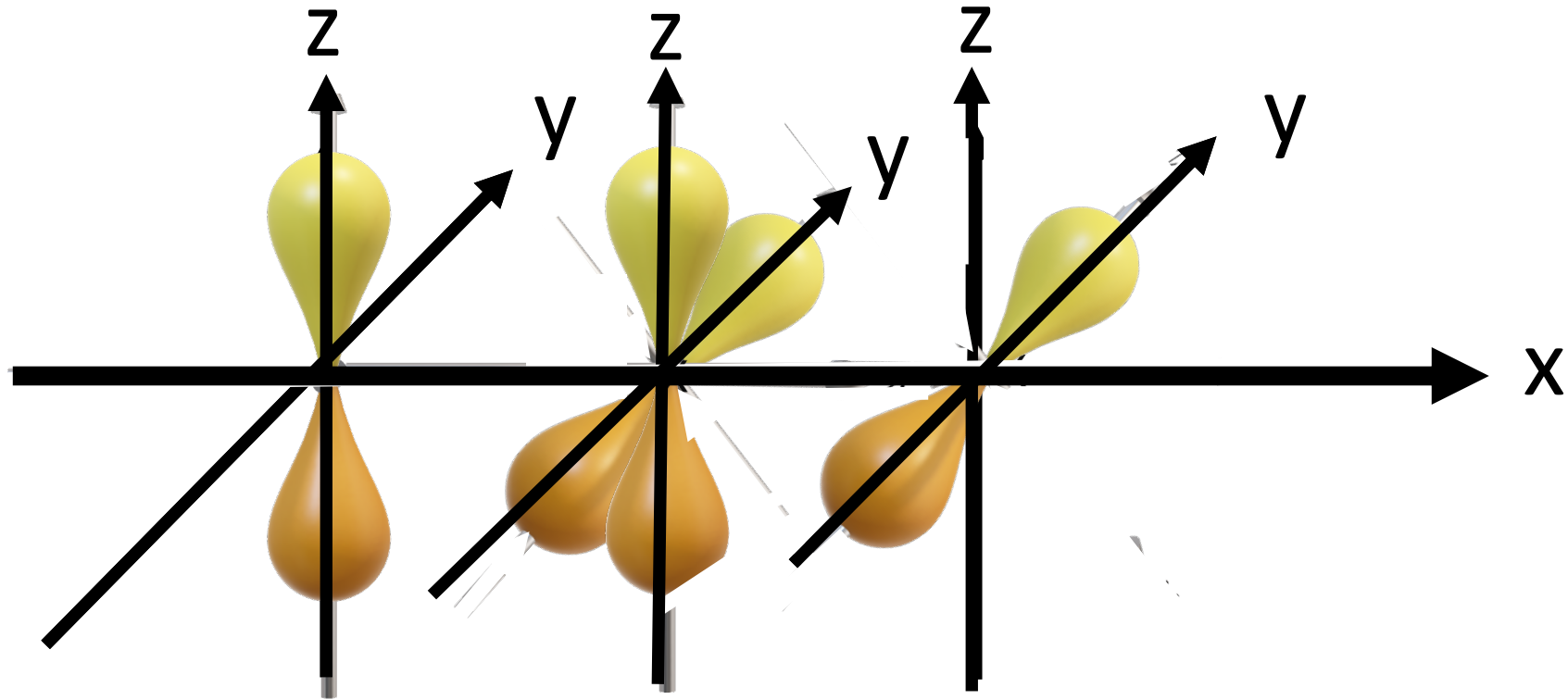
Oxygen B



Oxygen A

Carbon

Oxygen B



$2p_z$

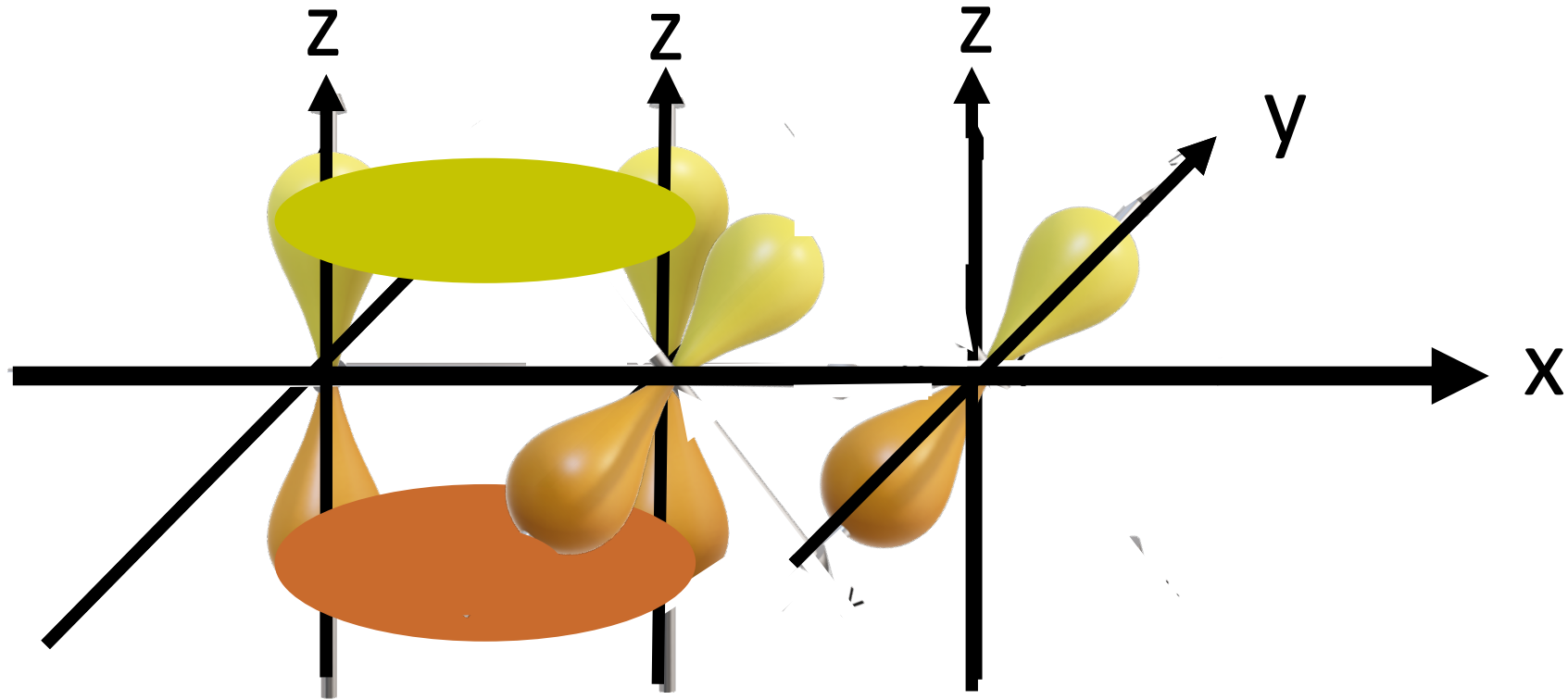
$2p_z, 2p_y$

$2p_y$

Oxygen A

Carbon

Oxygen B



$2p_z$

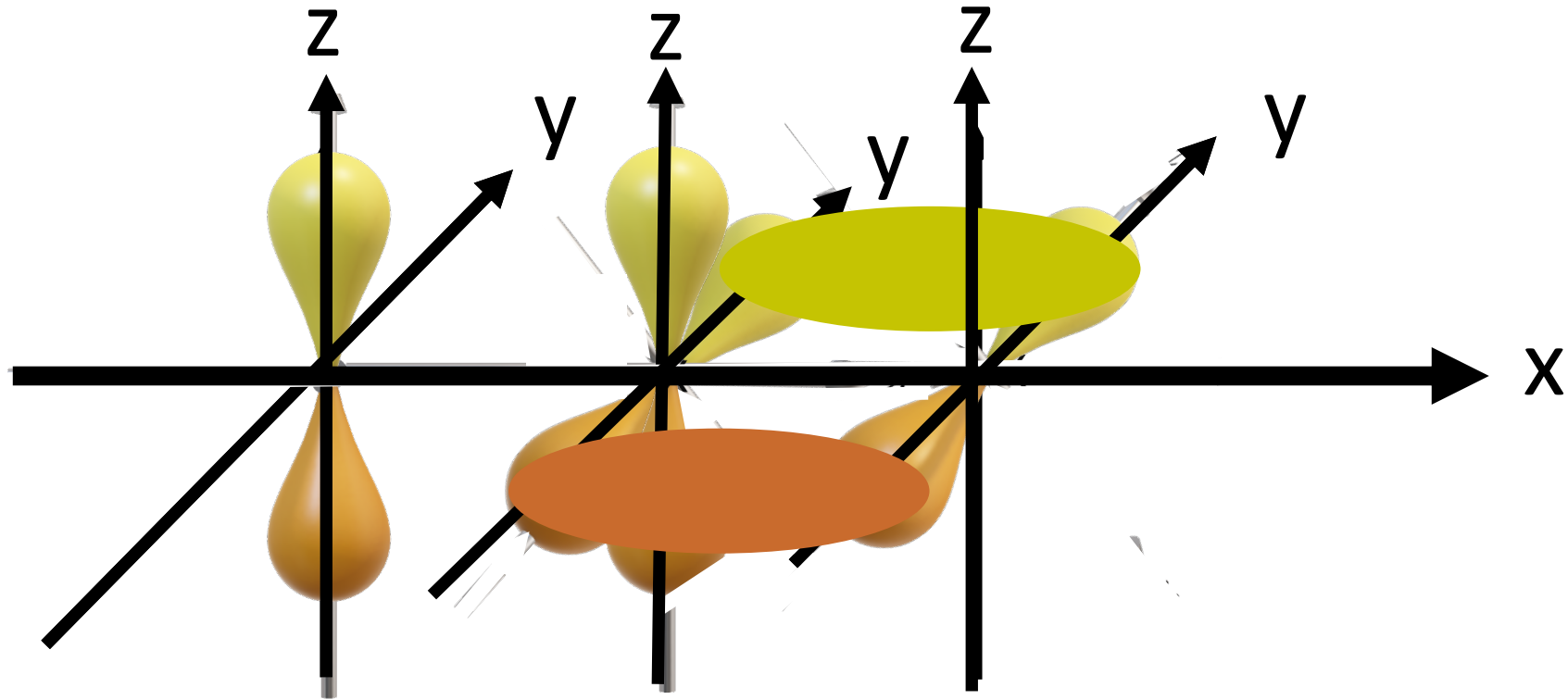
$2p_z, 2p_y$

$2p_y$

Oxygen A

Carbon

Oxygen B



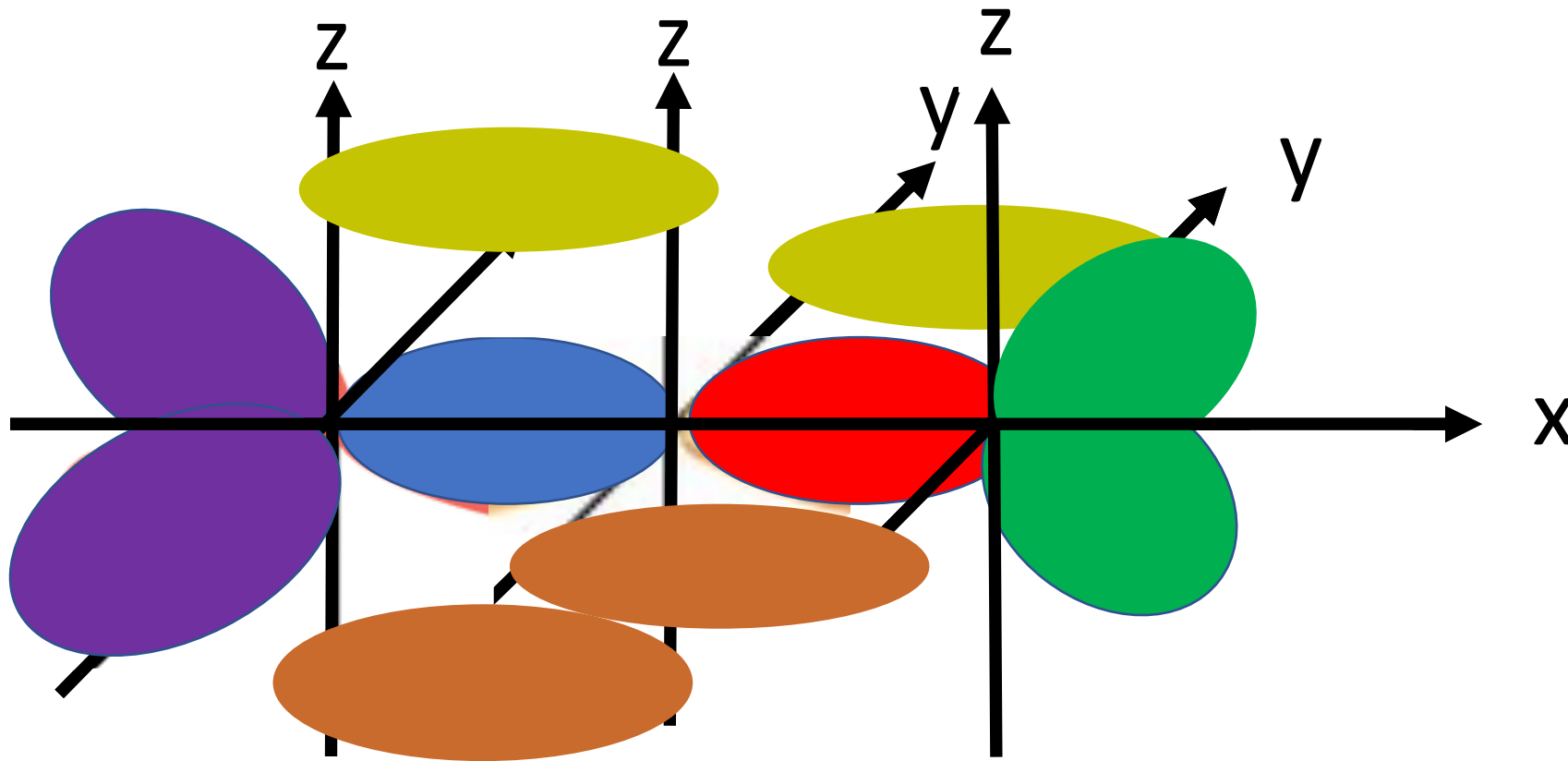
$2p_z$

$2p_z, 2p_y$

$2p_y$

Overview

Oxygen A Carbon Oxygen B



sp^2 hybrid orbitals

$2s, 2p_x, 2p_y$

sp hybrid orbitals

$2s, 2p_x$

$2s, 2p_x, 2p_z$

A ball-and-stick molecular model is shown in the background, rendered in a dark, semi-transparent style. It features a central blue sphere, several black spheres, and several white spheres, all connected by grey rods representing chemical bonds. The model is positioned behind the text, creating a layered effect.

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