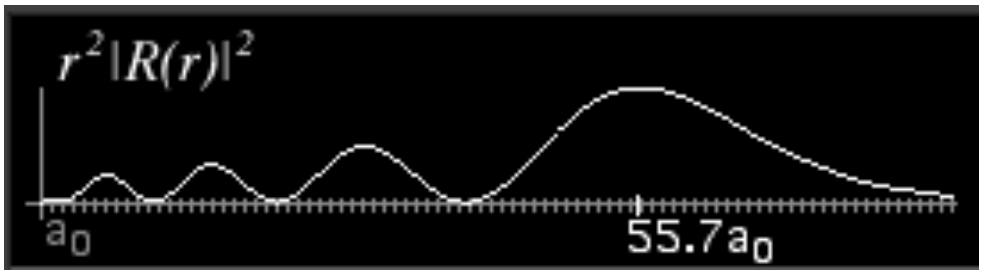
Hydrogenic Atomic Orbitals Activity

Go to the http://www.falstad.com/mathphysics.html
Scroll down to the quantum simulation section and select the hydrogen atom applet, which will work on most browsers.

In your own words, what do orbitals represent? What is the difference between the probability density and the radial probability density? What do nodes represent? Distinguish between radial and angular nodes.

Is there a relationship between quantum numbers and radial nodes? Start with ℓ = 0and increase n from 1-4; record the number of nodes. Then repeat with ℓ = 1, 2, 3. As well, test m_ℓ and note whether the number of radial nodes is also a function of m_ℓ. Derive an equation to express the number of nodes as a function of n and ℓ. Also, what is the relationship between angular nodes and Q.N. s?

Now that you are comfortable with radial and angular nodes, you should be ready to answer questions such as: What is the principle Q.N. (n) for the following radial probability function for an orbital with ℓ = 0 ?

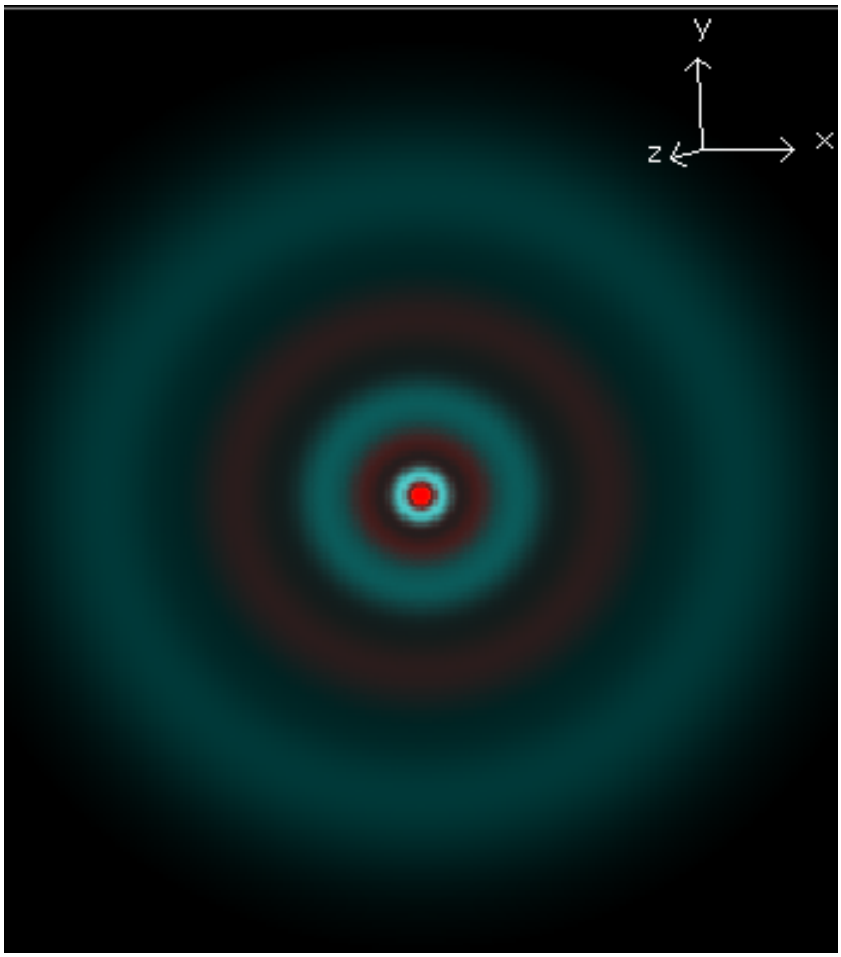


n =

In the following problems:

Use the pictures to determine the radial and angular nodes. Then use these values to specify n, ℓ, and the orbital name (including component for real or "chemical" orbitals). Check your result and answer the additional questions by displaying the orbital in the orbital viewer.

1.

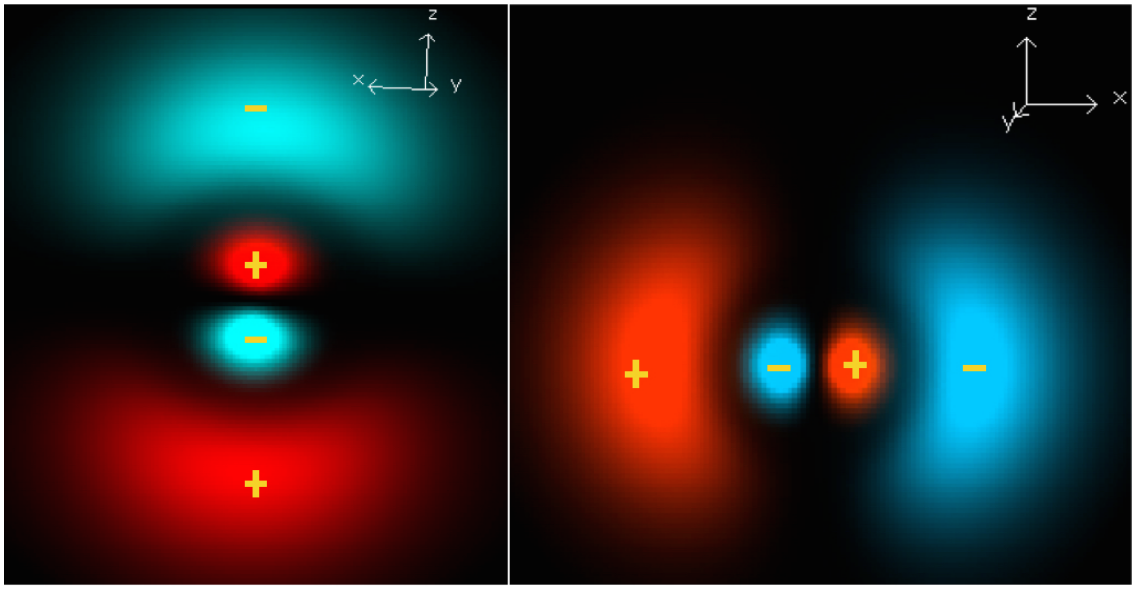


Nodes- radial:_____ and angular:_____ _____

n:_____ ℓ:_____Orbital: _____

What do you think the orbitals in this image look like from different orientations in space? Write down your prediction, and then move the orbitals around to see if your prediction and observations match.

2. a. **b.**



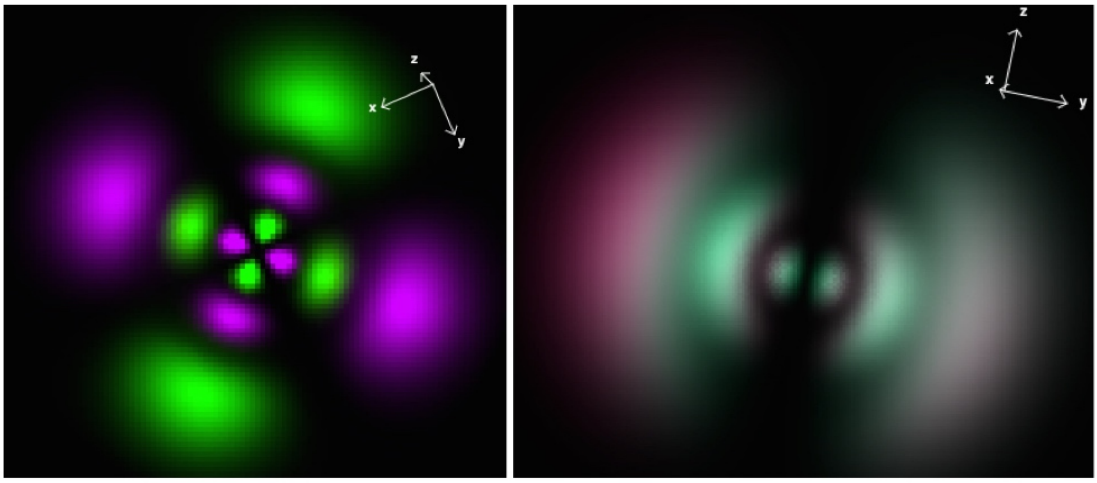
Nodes- radial:_____and angular:____ Nodes- radial:_____and angular:____

n:_____ ℓ:_____ n:_____ ℓ:_____

Orbital: _____ Orbital: _____

What do the positive and negative signs indicate on the previous orbitals?

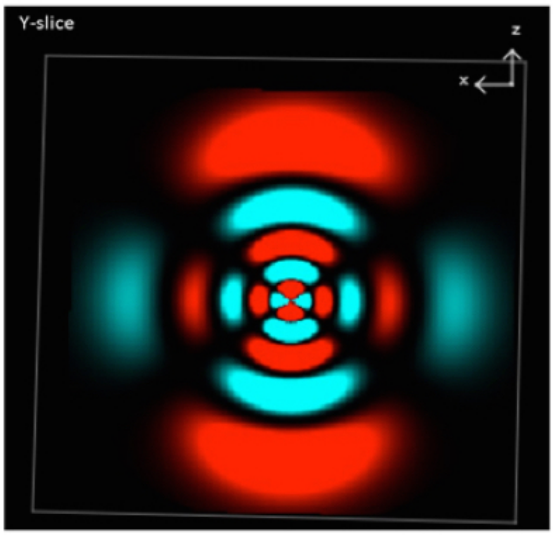
3.

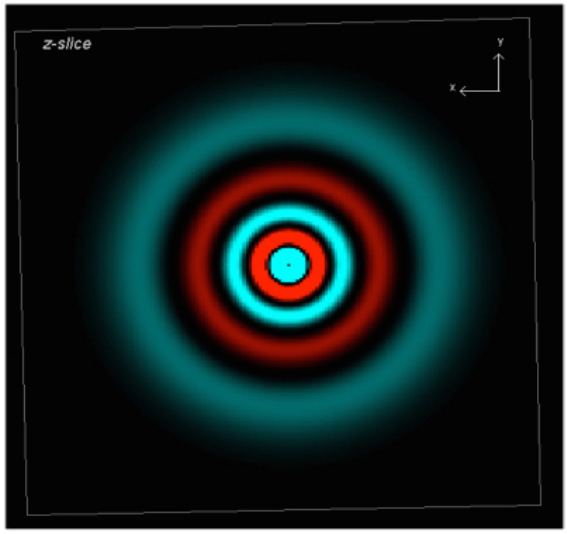


Nodes- radial:_____ and angular:_____

n:_____ ℓ:_____ Orbital: _____

4.

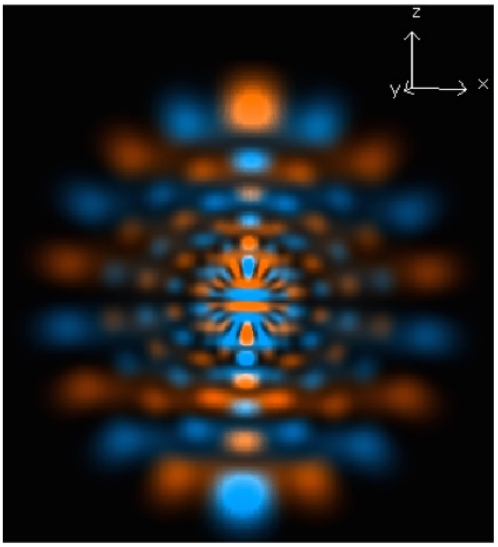


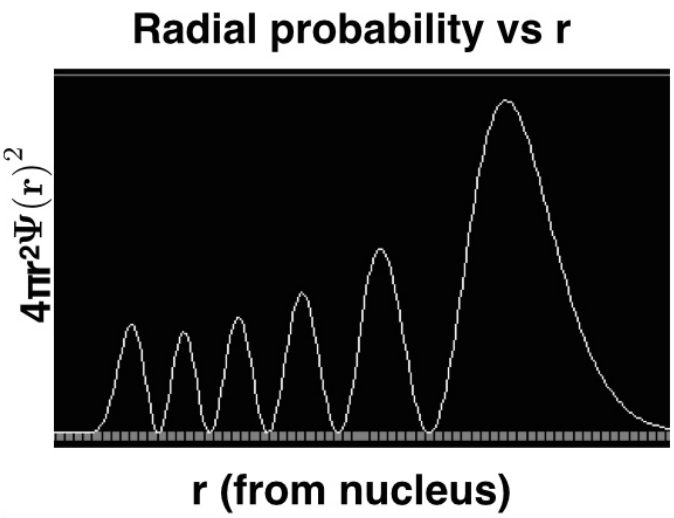


Nodes- radial:_____ and angular:_____

n:_____ ℓ:_____ Orbital: _____

5.





Nodes- radial:_____ and angular:_____

n:_____ ℓ:_____

Orbital : _*too many angular nodes; time to surrender on angular name !!*