Electron Density Lab Exercise
Chemistry 221

You might find it helpful to work through the electron density tutorial at the website first: web.pdx.edu/~shusteq

For the molecules listed below:

- Draw a Lewis dot structure model
- Use the ball and stick models below and electronegativities to predict if the molecules are polar

A) CH₄

B) NH₃

C) CH₃CH₂OH

D) CH₃NH₂

E) CHClCHCl

F) CCl₂CH₂

Below are electron density models of the molecules you drew Lewis structures for. These are surfaces where the value of the electron density
is the same everywhere. The value of the electron density chosen to
generate these surfaces is that which can be interpreted as a “size” surface.
This is how big the molecule is.

Additional information is included in these graphical images. Regions where
the surface is most negative are colored red and regions where the surface
is most positive are colored blue. The rainbow of colors between red and
blue are used for intermediate charges. The charge on the surface is the
result of the combination of nuclear charge and the electron charge
distribution at that point. When the nuclear charge exceeds the electron
charge the result is a positive region of the surface, and vice versa for
negative.

Evaluate the electron density surfaces below and compare the
quantum mechanical predictions to your simpler Lewis model and
electronegativities.
Now that you are more familiar with the electron density models, which molecules below you would expect to be most soluble in water?

In addition, indicate the relative attraction you would expect between these molecules and a surface or column that was coated with a very polar material. Can you use this as a separation scheme to separate these compounds?

Water:

1) 

2) 

3) 

4)