1. (a) Sketch the radial probability distribution for a 5d orbital in a carbon atom. You should label the axes, but do not need to include numbers. Use arrows to indicate the radial nodes.
   (b) Label the most probable radius, $r_{mp}$, on your 5d radial probability distribution with an *.

2. Provide the ground state electron configuration expected for:
   (a) Ca
   (b) V
   (c) Cu
   (d) Br$^-$
   (e) Fe$^{2+}$
   (f) Hf
   Note that you may always use the shorthand (noble gas) configuration unless specifically asked otherwise.

3. The binding energy for a 3s electron in technetium ($Z = 43$) is -1090 eV.
   (a) Calculate the effective nuclear charge, $Z_{eff}$, experienced by a 3s electron in technetium.
   (b) Identify the most likely binding energy for a 3s electron in ruthenium ($Z = 44$) from the following three options: -980 eV, -1090 eV, or -1140 eV. Explain your reasoning.
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