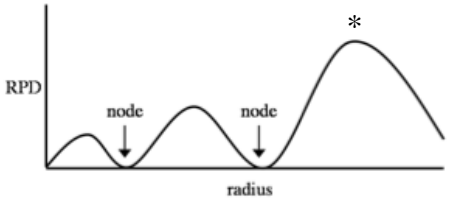
LECTURE 7

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 *.

(a) radial nodes: 2



(b) see * on rpd

2. Provide the ground state electron configuration expected for:
(a) Ca **(c)** Cu **(e)** Fe^{2+}
(b) V **(d)** Br^{1-} **(f)** Hf
Note that you may always use the shorthand (noble gas) configuration unless specifically asked otherwise.

Also correct if all of the core electrons are explicitly written out (correctly).
(a) [Ar]$4s^2$ **(c) [Ar]$4s^1 3d^{10}$** **(e) [Ar]$3d^6$**
(b) [Ar]$4s^2 3d^3$ **(d) [Kr]** **(f) [Xe]$6s^2 4f^{14} 5d^2$**

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.

(a) Z_{eff} = 26.8
(b) -1140 eV

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