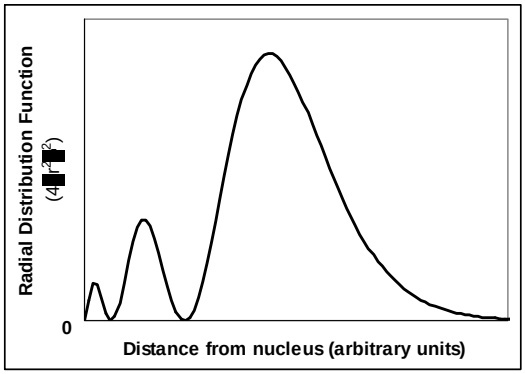
Chem 121 **Name** _____
Quiz 2 – Jan. 27, 2006

Complete the following problems. You must show your work for mathematical problems to receive full credit. Show your answers to the correct number of sig. figs. with the correct units.

1. Consider the following depictions of the same orbital. Which orbital do the pictures represent? Provide the values for n and ℓ for the orbital and *justify your reasoning*. Note that there are no angular nodes (nodal planes) for this orbital. (9 points)



90% Probability Density Plot

2. Consider the orbitals listed below. Determine if each orbital is valid (has an allowed combination of quantum numbers). If an orbital is not valid, explain why. If the orbital is valid, specify the number of radial nodes and number of angular nodes that the orbital possesses. (8 points)

   a. 3p

   b. 2d

   c. n = 4, ℓ = 2, m_ℓ = 1

   d. n = 3, ℓ = 2, m_ℓ = 3

3. Problem 12-32. What is the maximum wavelength of light capable of removing an electron from a hydrogen atom in the energy state characterized by n = 3? (8 points)

Possibly Useful Information

$h = 6.63 \times 10^{-34}$ Js	$c = 3.00 \times 10^{8}$ m/s	$N_A = 6.02 \times 10^{23}$ mol^{-1}
$E = h\nu$	$\nu\lambda = c$	$R = 1.097 \times 10^{-7}$ m^{-1}
$H\psi = E\psi$	$\Delta E \bullet \Delta(mv) > h$	$Rhc = 2.179 \times 10^{-18}$ J/atom
$E = -\frac{Rhc}{n^2}$	I'm not paranoid, the ARE out to get me!!	$\Delta E = -Rhc\left(\frac{1}{n_{final}^2} - \frac{1}{n_{initial}^2}\right)$

PERIODIC CHART OF THE ELEMENTS

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	INERT GASES
1 H 1.00797																1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122											5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312											13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	‡89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

Numbers in parenthesis are mass numbers of most stable or most common isotope.

Atomic weights corrected to conform to the 1963 values of the Commission on Atomic Weights.

The group designations used here are the former Chemical Abstract Service numbers.

*Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97

‡Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)