

Welcome

Chemistry Laboratory I

Chem 151

Fall 2009

Instructor: Dr. Kit Mao (Office: LabSci 101F)
[email: mao@wustl.edu](mailto:mao@wustl.edu)

Office Hours: TWThF 12-1 pm

Help Sessions (Workshops): M 5-6 pm, in LS 250

TA Office Hours will be posted on course web

151/152 Lab Manual and lab gears are for sale
in Rettner Gallery today from 1 pm to 3:30 pm

Course Introduction

Chem 151 and Chem 111A are two separated courses that compliment each other.

In Chem 151 you will learn:

- Hands-on experience of inorganic reactions
- Stoichiometric relation of reactants and products in reactions
- Implementation of quantum concept in lab
- General laboratory techniques and Scientific method
- Understand and appreciate chemistry in real world through web-base tutorials

Course Materials

Safety goggles

Lab Manual

Lab notebook

Calculator Same model as those permitted
in Chem 111A

**You must have all
these items when you
come to lab !!**

Proper Lab Attire: covered legs, torso and shoulders,
cover toes (no sandals, no ballet flats),
long hair tied back,
goggles **(must be wore at ALL times in lab)**

**You will be sent
home to change!!**

Goggles can be kept in your lab drawer.

You may keep a set of proper lab attire in a hallway locker.

DO NOT wear contact lens in lab !!

Your TA is the highest authority in lab

No lab this week!! Lab starts in the week of 9/15 – 9/20

Course Structure

1 lab lecture on Mondays at 12 pm or 2 pm

9 experiments (one can be dropped. **No make-up labs**)

5 Tutorial Assignments (access on web)

2 Exams (midterm exam and final exam)

Optional Help Sessions on Mondays 5-6 pm in LS250

Read Course Architecture carefully in Lab Manual !!!

Lab Assignment (80 points) includes:

- **Prelab Assignment in lab manual includes procedure outlines**
and prelab questions (10 pts. submit to TA before lab presentation.)
- **Lab notebook pages** (10 pts. submit to TA before leaving lab.)
- **Lab report** (60 pts. submit into red locker before end of period.)

Tutorial Assignments (20 pts. submit into the green locker before due time)

Help is available

Optional Help Sessions on Mondays 5-6 pm in LS250

Today's Help Session is Mole Concept and Molarity

Prelab Practices w/ answers (posted on Lab Info page)

Drilling Questions w/ answers (posted on Lecture page)

Gen Chem texts in Reserve Section in chemistry library (L549)

Course Homepage: <http://www.chemistry.wustl.edu>



Click on **COURSE PAGES** and choose Chem151



Click on *General Course Website* to access chem 151 web

Visit chem151 Course Web frequently

Access computers in LS460: User Name:

(Printers are in LS102) Password:

Academic Integrity:

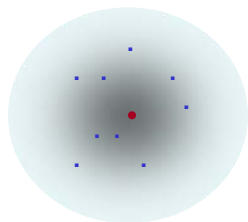
Students may discuss and help each other to understand concepts/calculations, but

DO NOT

- Share data/results
- Copy calculations or answers
- Copy tutorial assignments
- Make up data/results
- Cheat on exams

Violation of academic integrity will lead to a "F" grade in the course.

Structure of an Atom



Nucleus: protons + neutrons

The mass of an atom depends on the number of protons and neutrons (**mass number, A**) in its nucleus.

The chemical properties of an element depends on the number of protons (**atomic number, Z**) in the nucleus of an atom.

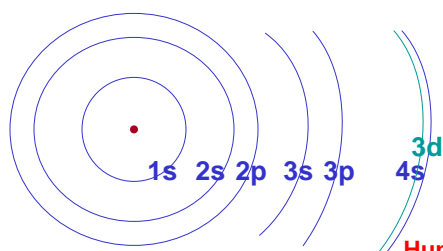


Outside the Nucleus: electrons (in orbitals) **NOT an orbit**

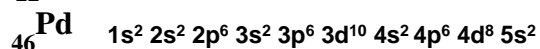
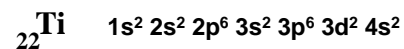
An orbital describes the energy of an electron and the probability of finding the electron in a given location. The **electron configuration** tells us the orbital of each electron in an atom. e.g., $1s^2 2s^2 2p^4$

Ground State Electron Configuration

The electron configuration in which all electrons are in the lowest possible energy levels.



Hund's Rule



— — — — — — — — — —	4f
— — — — — — — — — —	6s
— — — — — — — — — —	5p
— — — — — — — — — —	4d
— — — — — — — — — —	5s
— — — — — — — — — —	4p
— — — — — — — — — —	3d
— — — — — — — — — —	4s
— — — — — — — — — —	3p
— — — — — — — — — —	3s
— — — — — — — — — —	2p
— — — — — — — — — —	2s
— — — — — — — — — —	1s

Pauli's Exclusion Principle

1	1 H											2 He						
2	3 Li	4 Be	P: $3p^3$ Ar: $1s^2 2s^2 2p^6 3s^2 3p^6$ Ni: $[Ar] 3d^8 4s^2$ But NOT: $[Ca] 3d^8$										5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg	I: $5p^5$										13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86

Valence electrons --- The electrons in the outermost shell of an atom.

Stable electron configuration --- An atom is more stable when its p, d, or f orbitals are completely filled or half-filled. It is most stable when the configuration of the outermost shell is $ns^2 np^6$, the configuration of noble gases.

The gr. state e configuration of Cr is: $[Ar] 3d^5 4s^1$, **NOT** $[Ar] 3d^4 4s^2$

The gr. state e configuration of Cu is: $[Ar] 3d^{10} 4s^1$, **NOT** $[Ar] 3d^9 4s^2$

In Summary:

Ground state electron configurations

The periodic chart is arranged according to the ground state electron configurations of the elements. Learn how to recognize the ground state electron configuration of an element from its position in the periodic chart.

Valence electrons and stable electron configurations → bonding

Today's Reminders:

Memorize the names of the shaded elements in the periodic chart on next slide and do Tutorial 1 ASAP (due by 9/14/09).

Do Prelab Practice 1A to practice on writing ground state electron configurations.

No lab this week; lab begins on the week of 9/15 – 9/20.

Lab room assignment and ChemID will be posted by 9/12.

*Memorize the names and symbols
of all elements shaded in blue*

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	113 Uut	114 Uuq		116 Uuh		118 Uuo

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No