

# Welcome Chem 30A

- Introductory Chemistry
- Laney College
- Spring 2016 Semester
  
- Scott Beaver, Ph.D. (a.k.a. Dr. Scott)
- [sbeaver@peralta.edu](mailto:sbeaver@peralta.edu)
  - I'm mostly away from email Fri, Sat, Sun...
  - otherwise I usually reply the following day.
  
- Add codes given next week. Please don't ask yet.

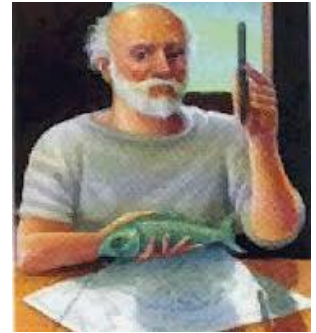
# Lecture 1 Goals

- Why are we in this classroom?
  - Historical perspective on science, chemistry, and technology (Ch 1.1)
- Do you belong in this class?
  - No previous chemistry experience is required.
  - Algebra prerequisite: Math 201 or 210D
    - If your math skills are lacking, make that your top priority.
  - Math self assessment
- Cover the syllabus
  - Policies, schedule, grading, study tips
  - Be familiar with this document!
  - Course materials
    - Textbook – McMurry 7<sup>th</sup> (or any) edition
    - Lab manual – from the bookstore
  - Follow lab attendance and dress code policies for a passing grade

# Where does science come from?

(Not on any exam.)

- Natural science is proposed by ancient Greeks (~600 BC)
  - Idea that the observable world (weather, heat, rocks) is explained exclusively in terms of the natural 'stuffs' of our world
    - as opposed to *supernatural* explanations
  - Scientific progress means improving on your teacher's methods
  - Mathematics enabling astronomy emerge around 150 BC
- Scientific method spreads after the dark ages
  - Roger Bacon (1214-1294) borrows from Muslims on repeating cycles of observation, hypothesis, experimentation, and verification
  - Galileo (1562-1642) is called the father of the (modern) scientific method
  - Descartes (1596-1650) fosters a scientific revolution with geometry and calculus
    - Science is contained in 3D mathematical models, not just abstract ideas
- Chemistry and physics split around 14<sup>th</sup> century Renaissance in Europe
  - Experimental chemistry gains from Venetian glass blowing
- Periodic table of Mendeleev (1869) organizes the elements
  - Chem 192 picks up from here...



# Every thing is composed of chemical “elements”

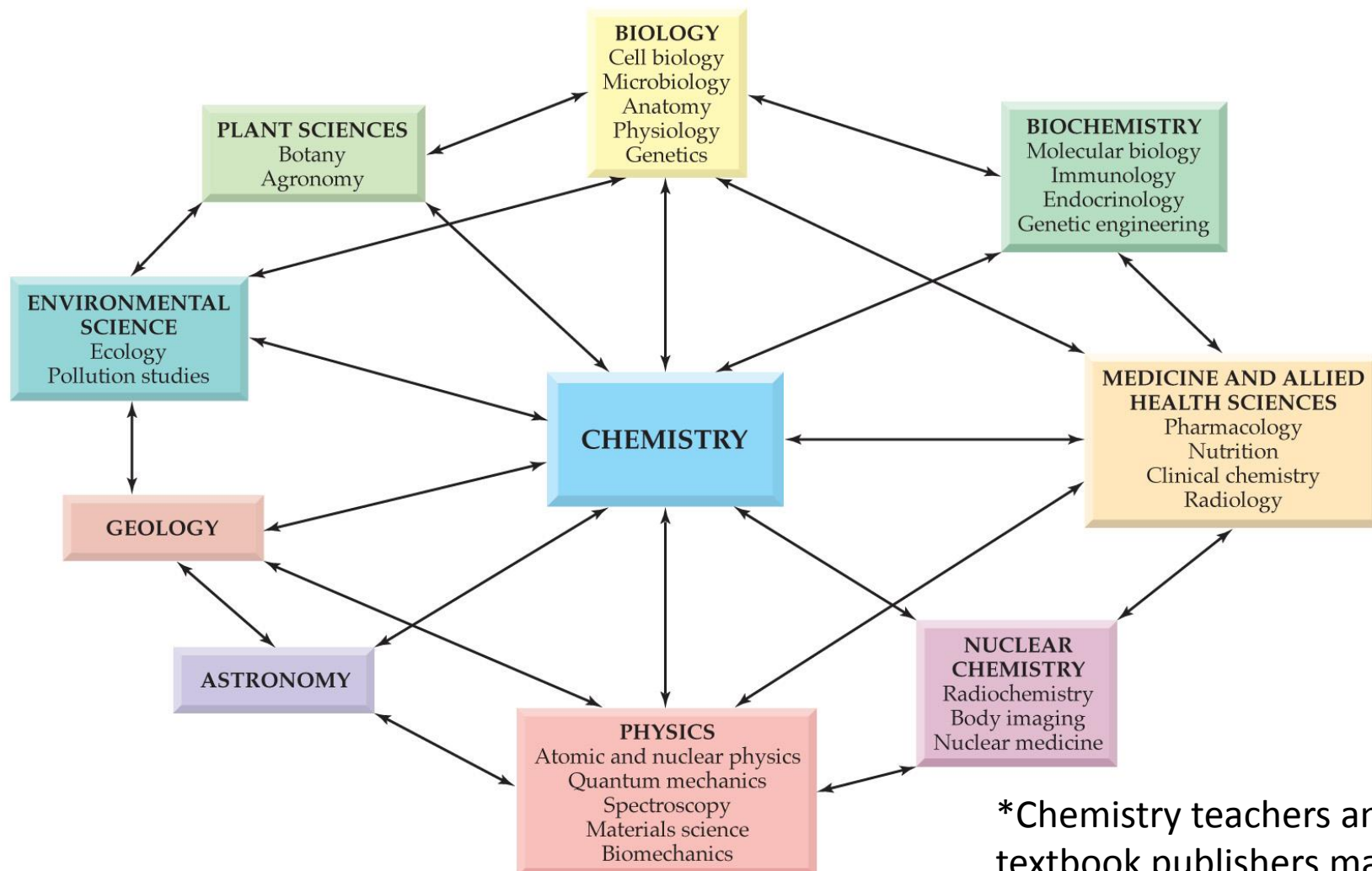
Computer chips before 90's  
Since the 90's  
Beyond 2006

hydrogen 1 <b>H</b> 1.0079																	helium 2 <b>He</b> 4.0026																					
lithium 3 <b>Li</b> 6.941	beryllium 4 <b>Be</b> 9.0122																	boron 5 <b>B</b> 10.811	carbon 6 <b>C</b> 12.011	nitrogen 7 <b>N</b> 14.007	oxygen 8 <b>O</b> 15.999	fluorine 9 <b>F</b> 18.998	neon 10 <b>Ne</b> 20.180															
sodium 11 <b>Na</b> 22.990	magnesium 12 <b>Mg</b> 24.305																	aluminum 13 <b>Al</b> 26.982	silicon 14 <b>Si</b> 28.086	phosphorus 15 <b>P</b> 30.974	sulfur 16 <b>S</b> 32.065	chlorine 17 <b>Cl</b> 35.453	argon 18 <b>Ar</b> 39.948															
potassium 19 <b>K</b> 39.098	calcium 20 <b>Ca</b> 40.078	scandium 21 <b>Sc</b> 44.956	titanium 22 <b>Ti</b> 47.867	vanadium 23 <b>V</b> 50.942	chromium 24 <b>Cr</b> 51.996	manganese 25 <b>Mn</b> 54.938	iron 26 <b>Fe</b> 55.845	cobalt 27 <b>Co</b> 58.933	nickel 28 <b>Ni</b> 58.693	copper 29 <b>Cu</b> 63.546	zinc 30 <b>Zn</b> 65.39	gallium 31 <b>Ga</b> 69.723	germanium 32 <b>Ge</b> 72.61	arsenic 33 <b>As</b> 74.922	selenium 34 <b>Se</b> 78.96	bromine 35 <b>Br</b> 79.904	krypton 36 <b>Kr</b> 83.80																					
rubidium 37 <b>Rb</b> 85.468	strontium 38 <b>Sr</b> 87.62	yttrium 39 <b>Y</b> 88.906	zirconium 40 <b>Zr</b> 91.224	niobium 41 <b>Nb</b> 92.906	molybdenum 42 <b>Mo</b> 95.94	technetium 43 <b>Tc</b> [98]	ruthenium 44 <b>Ru</b> 101.07	rhodium 45 <b>Rh</b> 102.91	palladium 46 <b>Pd</b> 106.42	silver 47 <b>Ag</b> 107.87	cadmium 48 <b>Cd</b> 112.41	indium 49 <b>In</b> 114.82	tin 50 <b>Sn</b> 118.71	antimony 51 <b>Sb</b> 121.76	tellurium 52 <b>Te</b> 127.60	iodine 53 <b>I</b> 126.90	xenon 54 <b>Xe</b> 131.29																					
caesium 55 <b>Cs</b> 132.91	barium 56 <b>Ba</b> 137.33	57-70 <b>*</b>	lutetium 71 <b>Lu</b> 174.97	hafnium 72 <b>Hf</b> 178.49	tantalum 73 <b>Ta</b> 180.95	tungsten 74 <b>W</b> 183.84	rhenium 75 <b>Re</b> 186.21	osmium 76 <b>Os</b> 190.23	iridium 77 <b>Ir</b> 192.22	platinum 78 <b>Pt</b> 195.08	gold 79 <b>Au</b> 196.97	mercury 80 <b>Hg</b> 200.59	thallium 81 <b>Tl</b> 204.38	lead 82 <b>Pb</b> 207.2	bismuth 83 <b>Bi</b> 208.98	polonium 84 <b>Po</b> [209]	astatine 85 <b>At</b> [210]	radon 86 <b>Rn</b> [222]																				
francium 87 <b>Fr</b> [223]	radium 88 <b>Ra</b> [226]	89-102 <b>**</b>	lawrencium 103 <b>Lr</b> [262]	rutherfordium 104 <b>Rf</b> [261]	dubnium 105 <b>Db</b> [262]	seaborgium 106 <b>Sg</b> [266]	bohrium 107 <b>Bh</b> [264]	hassium 108 <b>Hs</b> [269]	meitnerium 109 <b>Mt</b> [268]	unnilium 110 <b>Uun</b> [271]	ununium 111 <b>Uuu</b> [272]	ununbium 112 <b>Uub</b> [277]		ununquadium 114 <b>Uuq</b> [289]																								
																				lanthanum 57 <b>La</b> 138.91	cerium 58 <b>Ce</b> 140.12	praseodymium 59 <b>Pr</b> 140.91	neodymium 60 <b>Nd</b> 144.24	promethium 61 <b>Pm</b> [145]	samarium 62 <b>Sm</b> 150.36	europium 63 <b>Eu</b> 151.96	gadolinium 64 <b>Gd</b> 157.25	terbium 65 <b>Tb</b> 158.93	dysprosium 66 <b>Dy</b> 162.50	holmium 67 <b>Ho</b> 164.93	erbium 68 <b>Er</b> 167.26	thulium 69 <b>Tm</b> 168.93	ytterbium 70 <b>Yb</b> 173.04					
																				actinium 89 <b>Ac</b> [227]	thorium 90 <b>Th</b> 232.04	protactinium 91 <b>Pa</b> 231.04	uranium 92 <b>U</b> 238.03	neptunium 93 <b>Np</b> [237]	plutonium 94 <b>Pu</b> [244]	americium 95 <b>Am</b> [243]	curium 96 <b>Cm</b> [247]	berkelium 97 <b>Bk</b> [247]	californium 98 <b>Cf</b> [251]	einsteinium 99 <b>Es</b> [252]	fermium 100 <b>Fm</b> [257]	mendelevium 101 <b>Md</b> [258]	nobelium 102 <b>No</b> [259]					

\*lanthanoids  
\*\*actinoids

Slide taken from “Is there life after CMOS?” by Paul M. Soloman, IBM T. J. Watson Research Center.

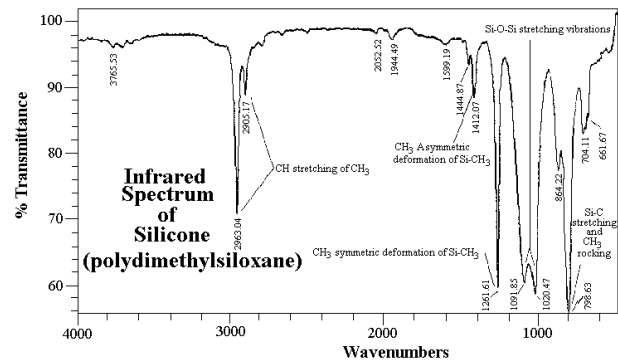
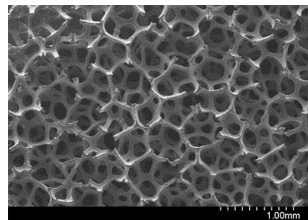
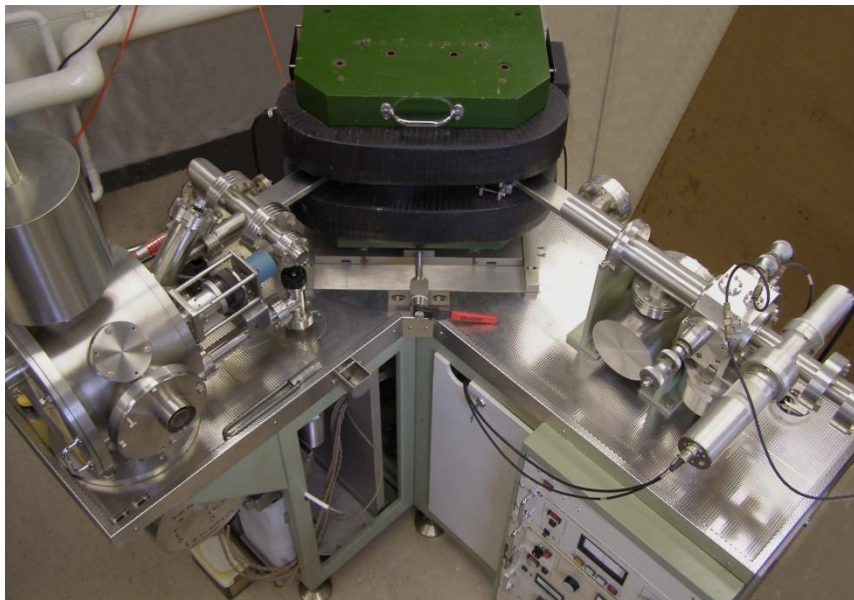
# 1.1 Modern chemistry is the central academic science\*



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\*Chemistry teachers and textbook publishers may like this slide. Other scientists might put their own story at the center!

# All branches of science rely on measurements based on chemistry

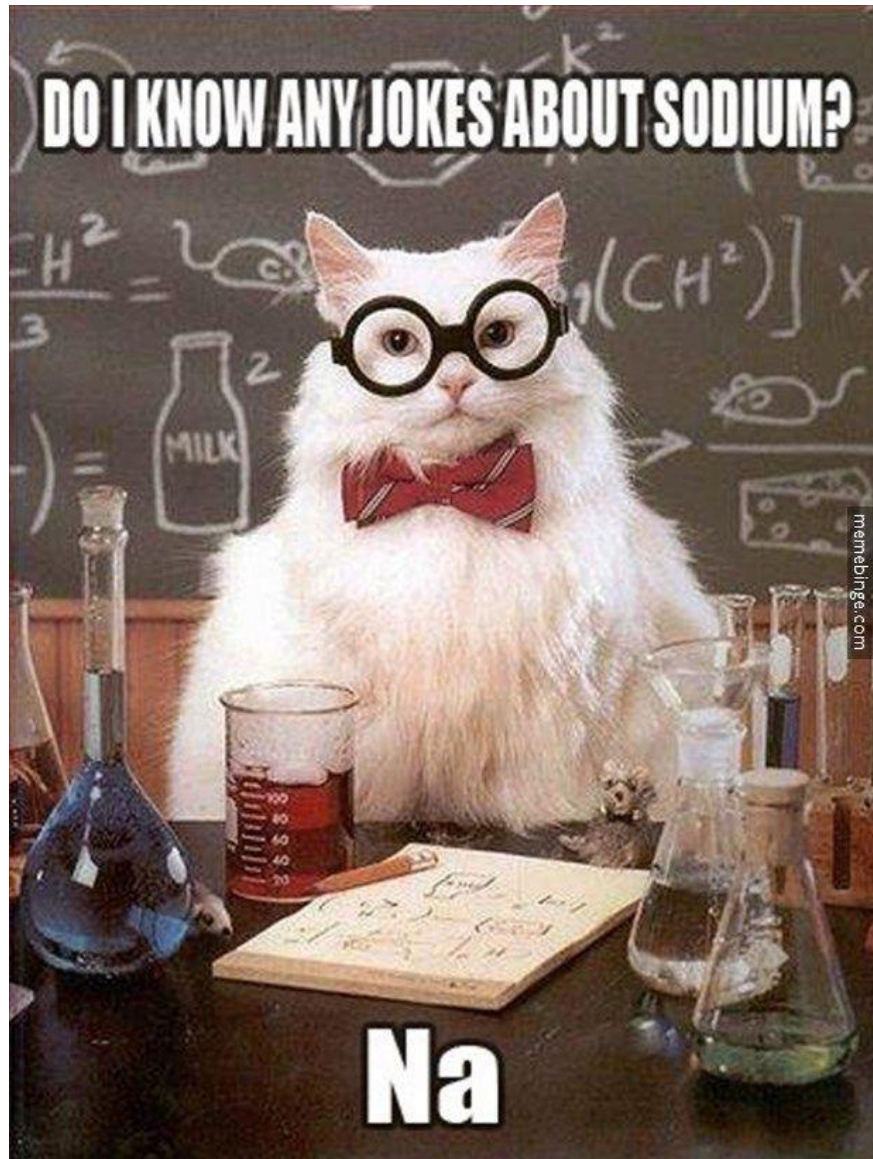


In Chem 30A, you will learn basic chemistry principles on which modern instrumentation and technology are based. You'll gain confidence in trusting your judgement over the analysis machine.

# Why are you here?

- Anonymously respond with short answers:
  - What are your educational/career objectives?
  - What grade do you want in Chem 30A?
  - How many hours per week do you plan to study, outside of class?
  - Describe any previous chemistry experience.
  - Rate your math skills on 1-10 scale
    - 10 = I'm really good at algebra

# Let's take a 5-minute break.



Have a pen/pencil and blank sheet of paper when we resume.



1. Solve for  $x$ :  $\frac{7}{10}x - 1 = 2$

2. Graph the equation:  $y = -2x + 4$

3. Simplify the following equations:

(a)  $8 - 4 \div 2 - 10 \div 2$

(b)  $\frac{5x^2y}{x^3}$

(c)  $-2x + 3(x + 2) + 1$

4. Convert to scientific notation: 650,000

5. The length of a rectangle is 2 ft more than its width. The perimeter of the rectangle is 20 ft. Find the length of the rectangle.

# Math self- assessment (neither collected nor graded)

6. Solve the Shrodinger equation... just kidding.

WHAT PART OF  
$$i\hbar \frac{\partial}{\partial t} \Psi(\vec{r}, t) = \left( -\frac{\hbar^2}{2m} \nabla^2 + V(\vec{r}, t) \right) \Psi(\vec{r}, t)$$
  
DON'T YOU UNDERSTAND?

# Worked solutions

If you can do this,  
you have a high  
probability of success  
in Chem30A!

If this is not  
happening, you need  
to improve your math  
skills to pass  
Chem30A.

$$\begin{aligned} \textcircled{1} \quad \frac{7}{10}x - 1 &= 2 \\ \frac{10}{7} \cdot \frac{7}{10}x &= 3 \cdot \frac{10}{7} \\ x &= 3 \cdot \frac{10}{7} \\ x &= \frac{30}{7} \end{aligned}$$

$$\textcircled{2} \quad y = -2x + 4$$

$\swarrow$  y int = 4

$\nearrow$  slope  $\frac{\Delta y}{\Delta x} = \frac{\text{rise}}{\text{run}} = -2$   
down 2, right 1

$$\textcircled{3} \quad \text{a) } 8 - 4 \div 2 - 10 \div 2 = 8 - \frac{4}{2} - \frac{10}{2} = 8 - 2 - 5 = 1$$

Test in your calculator!

$$\text{b) } \frac{5x^2}{x^3} = 5x^{(2-3)} = 5x^{-1} = \frac{5}{x}$$

exponents add/subtract

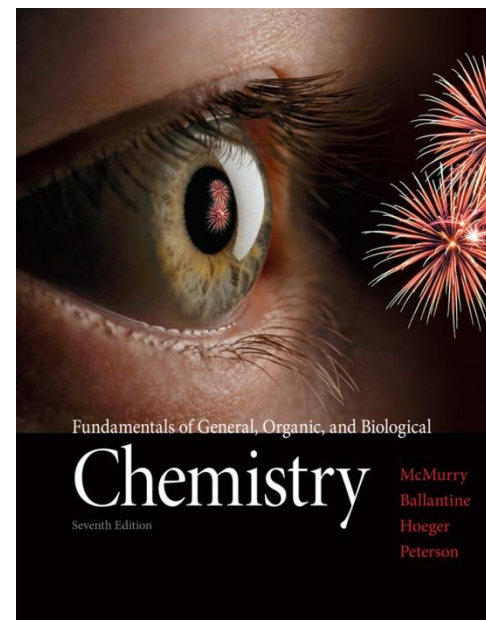
$$\text{c) } -2x + 3(x+2) + 1 = -2x + \underbrace{(3x+6)}_{\text{distribute}} + 1 = x + 7$$

$$\textcircled{4} \quad \underbrace{650,000}_{5 \times \text{decimal places}} = 6.5 \times 10^5$$

$$\textcircled{5} \quad \begin{array}{l} \text{rectangle with length } l \text{ and width } w \\ l = 2 + w \\ 2l + 2w = 20 \\ 2(2+w) + 2w = 20 \\ 4 + 2w + 2w = 20 \\ 4w = 16 \\ w = 4 \\ \boxed{\begin{array}{l} w=4 \\ l=6 \end{array}} \end{array}$$

# Let's cover the syllabus

- Policies
  - Strict lab policies for passing grade
  - You must withdraw if needed
    - I don't drop students, except for no-shows
- Materials
  - Textbook: McMurry 7<sup>th</sup> Ed.
  - Chem30A lab manual
  - Printer access to print lab sheets
  - Scientific calculator (no graphing calculators or cell phones)
  - Lab goggles
- Be prepared... know the schedule.
- Understand how your grade is computed.
- Apply the study tips for success!!



[syllabus is on the Moodle]