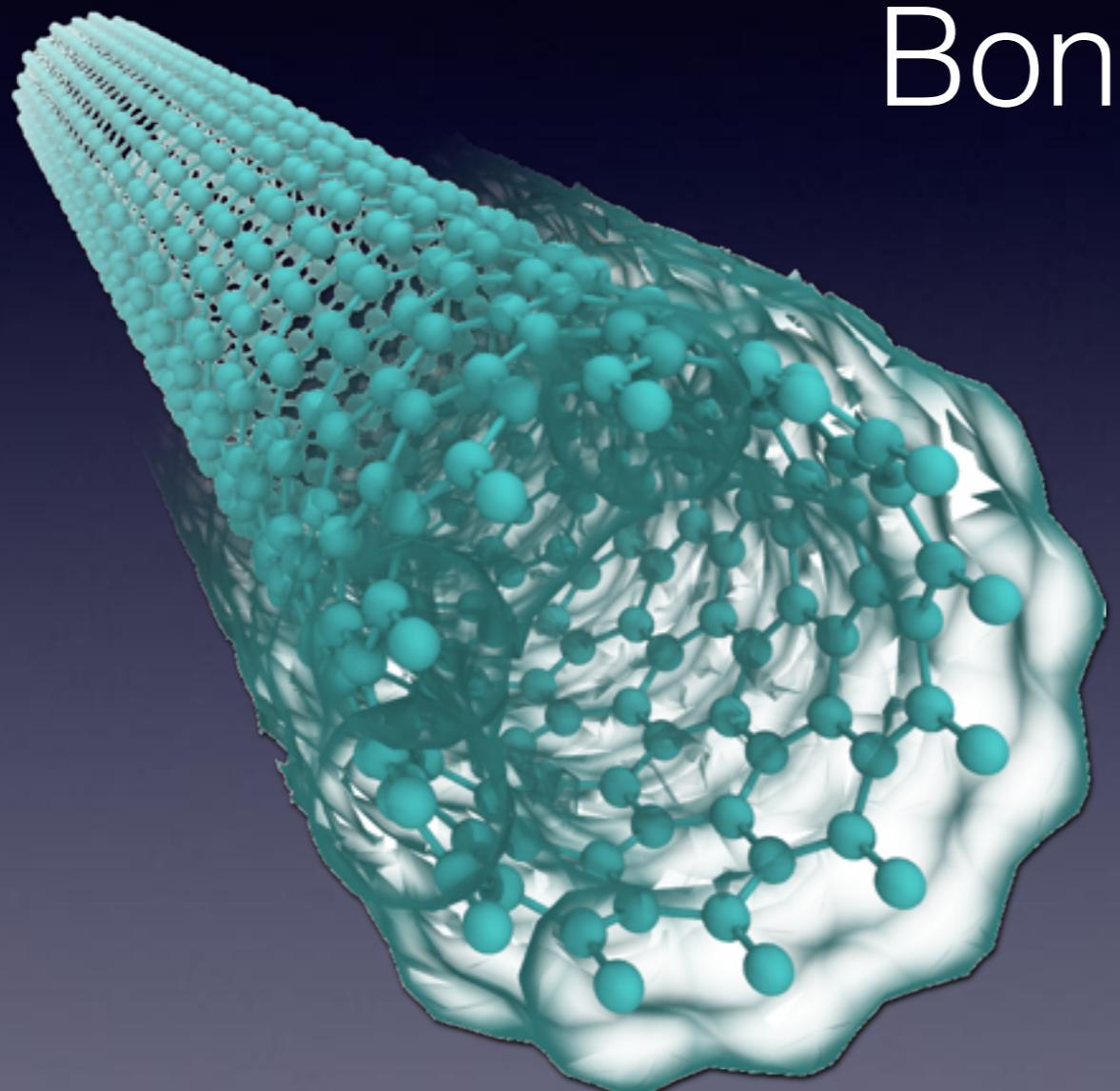


Ch1010: Chemical Properties, Bonding, and Forces



Worcester Polytechnic Institute
Department of Chemistry
and Biochemistry

Professor Ronald L. Grimm
Gateway Park 3027
60 Prescott Street
grimm@wpi.edu
508-831-4165



Where are we going today?

- Why properties, bonding, and forces?
- Course plumbing
- What are you responsible for that I'm not going to teach...



Why properties...?

Civil Engineering



- Physical and Chemical Treatment Processes
- Energy and Sustainability
- Water Resources



Bergendahl



Mathisen



Plumber

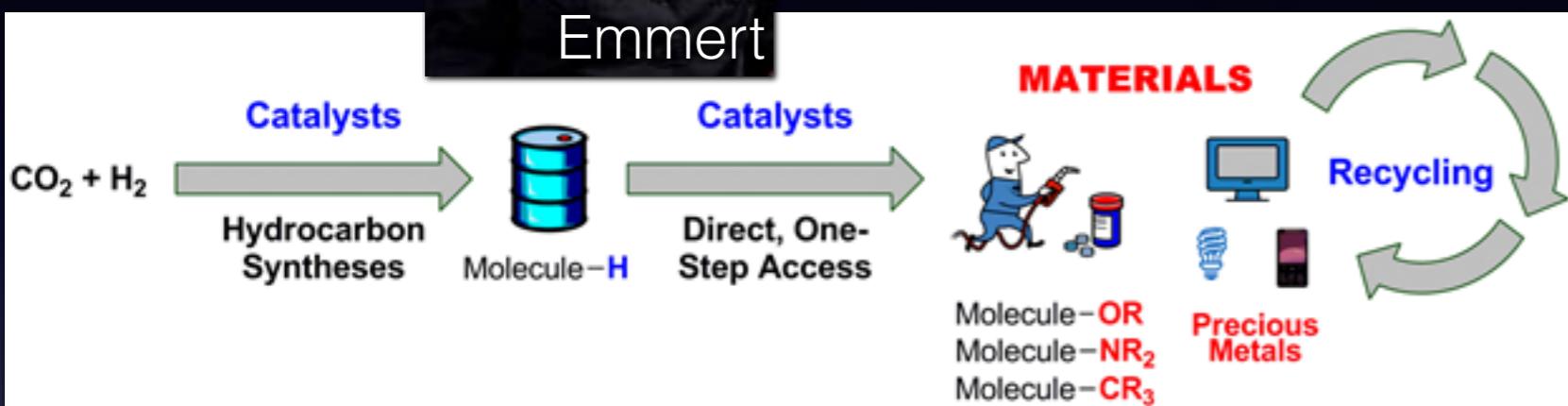


Hart

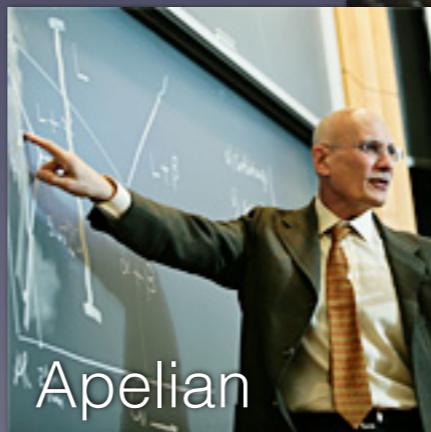


Why properties...?

Metals Processing Institute



- Solid solutions
 - Alloys
 - Intermetallics
- Phase diagrams
- Material properties
 - Strength
 - Recycling



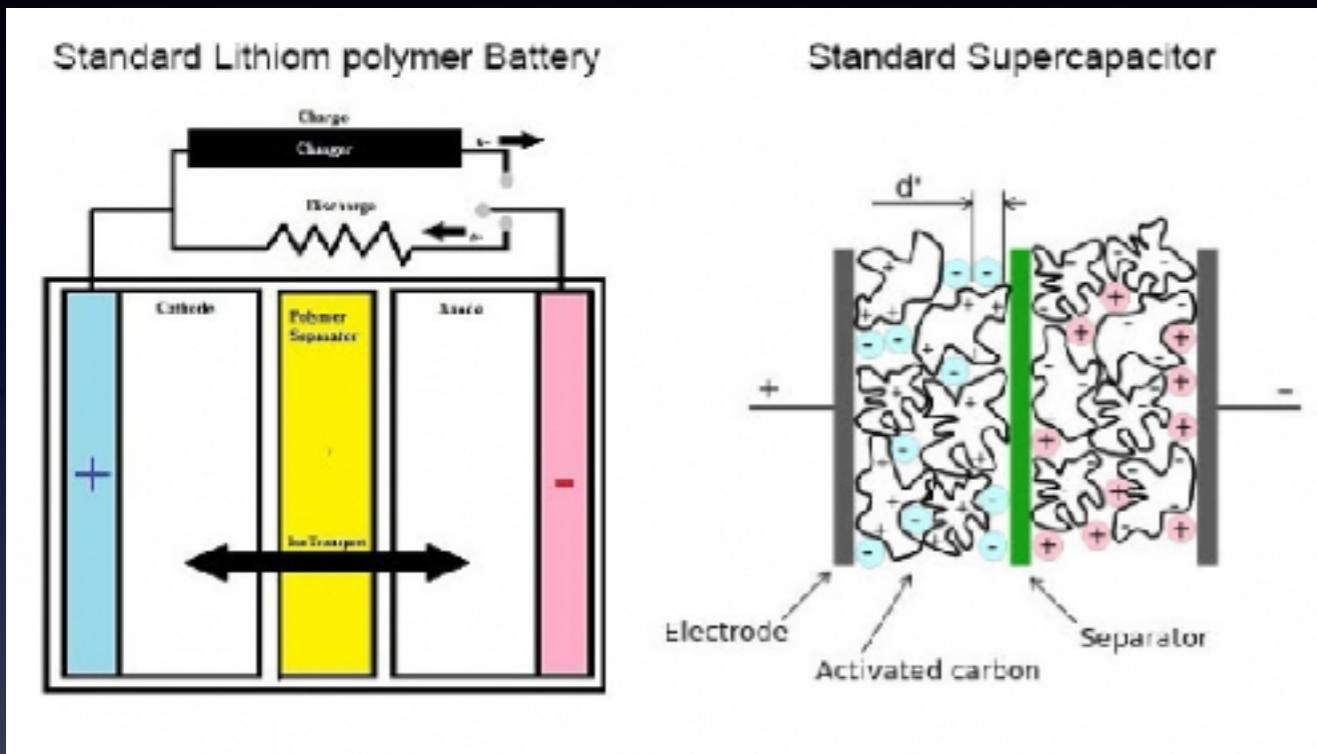
Apelian



Why properties...?

Mechanical Engineering

http://www.dvice.com/sites/dvice/files/styles/blog_post_embedded/public/photo1-battery-supercapacitor.jpg?itok=XOw8e48-



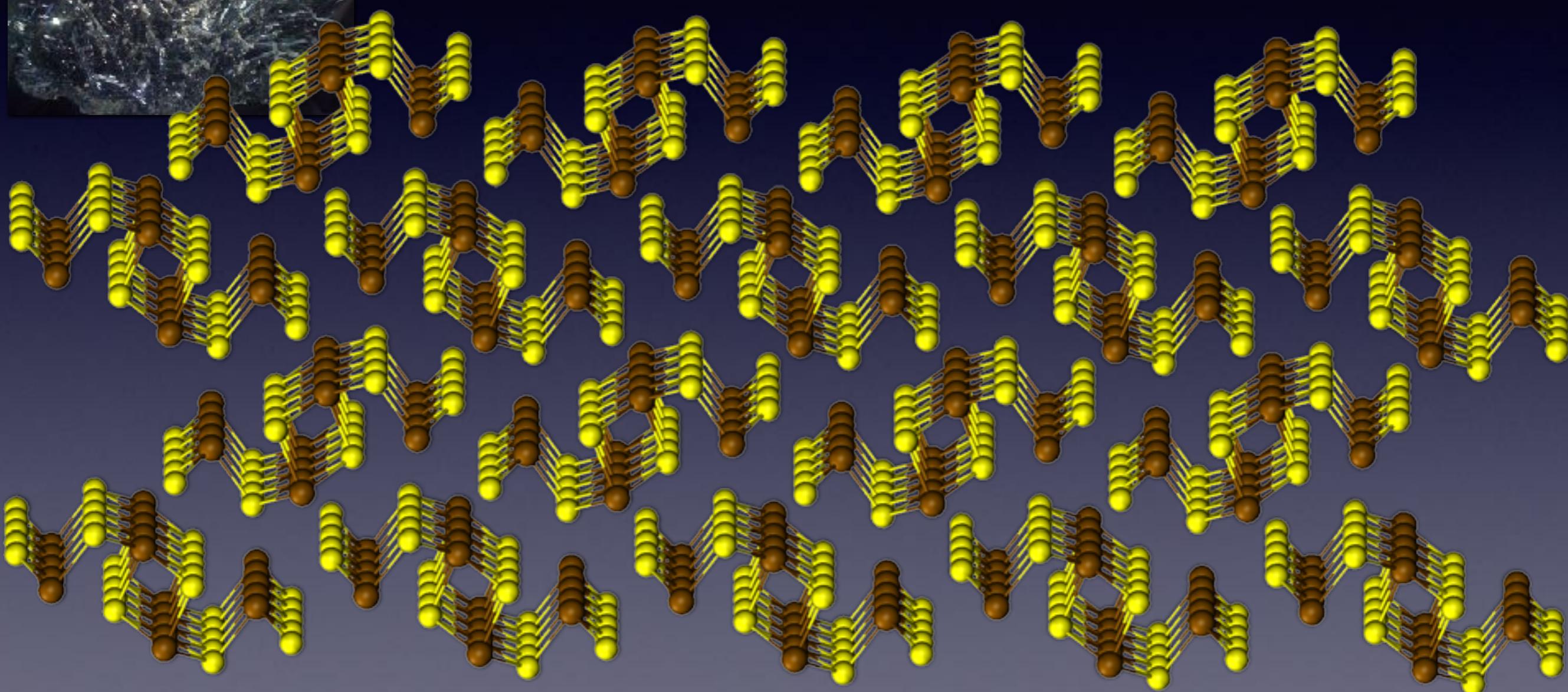
- Flow batteries
- Supercapacitors
- Lithium ion batteries
- Photoelectrochemistry





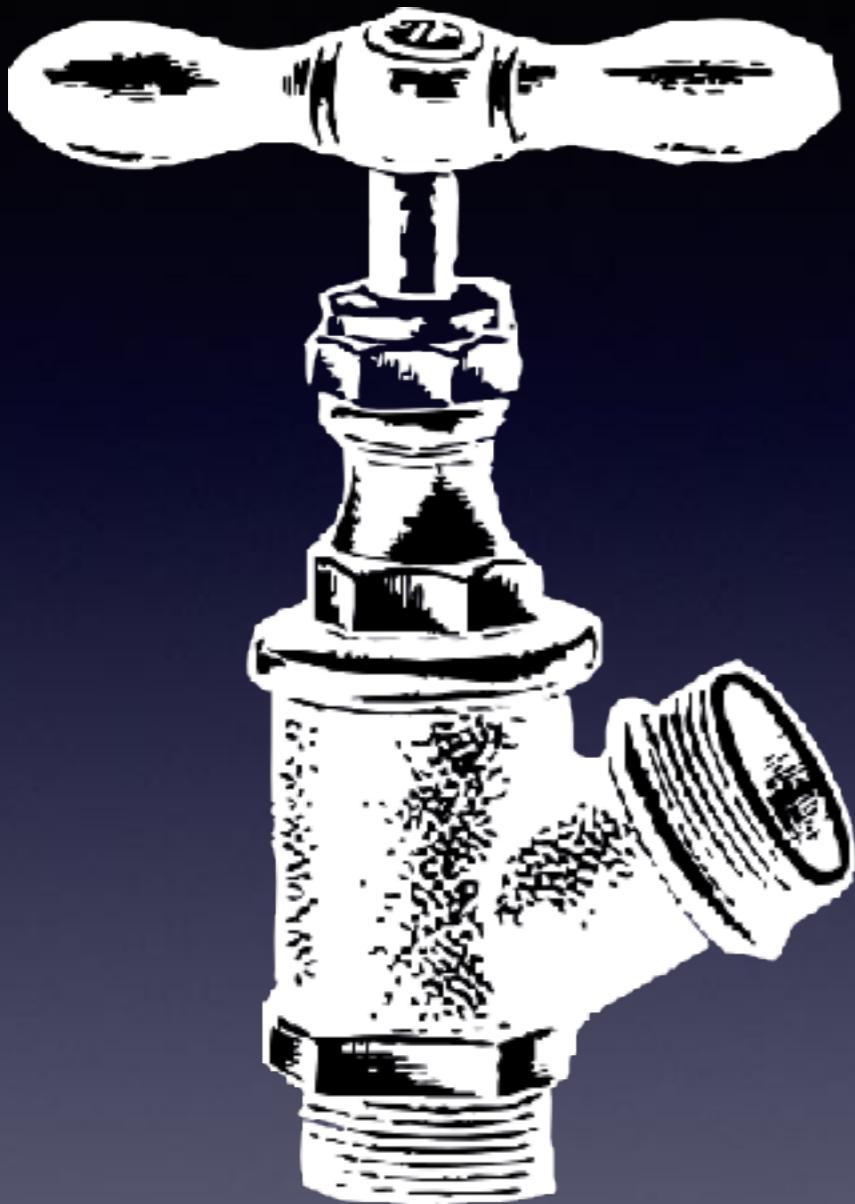
Why properties...?

Solar energy conversion



Mineralogical Sb_2S_3 is called Stibnite

Course plumbing...



Tro, responsibilities

Dailies

Recitations

Exams

Accommodations

Grades

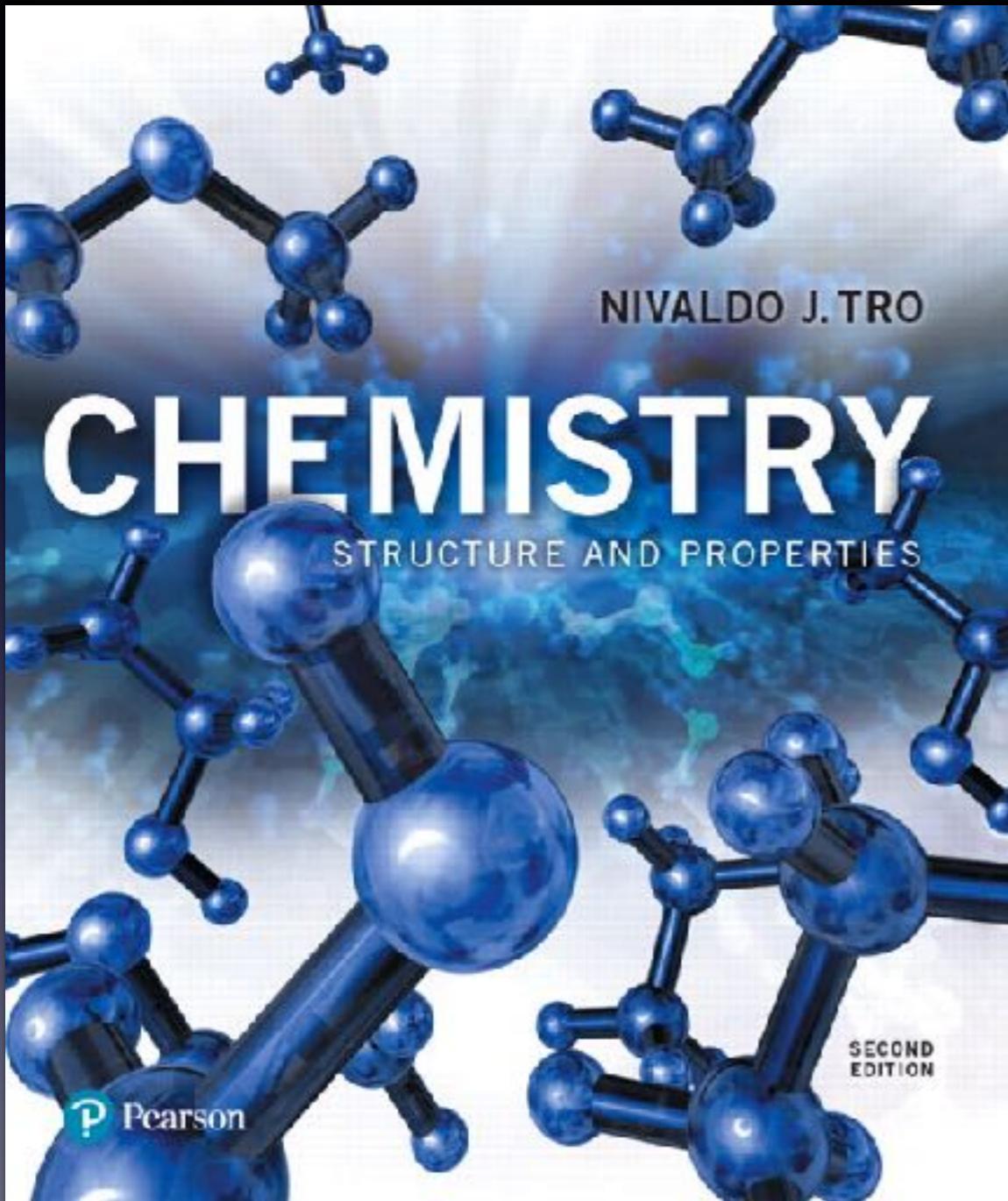
Chemtable and M*A*S*H

Laboratory

Schneetage!

www.clker.com

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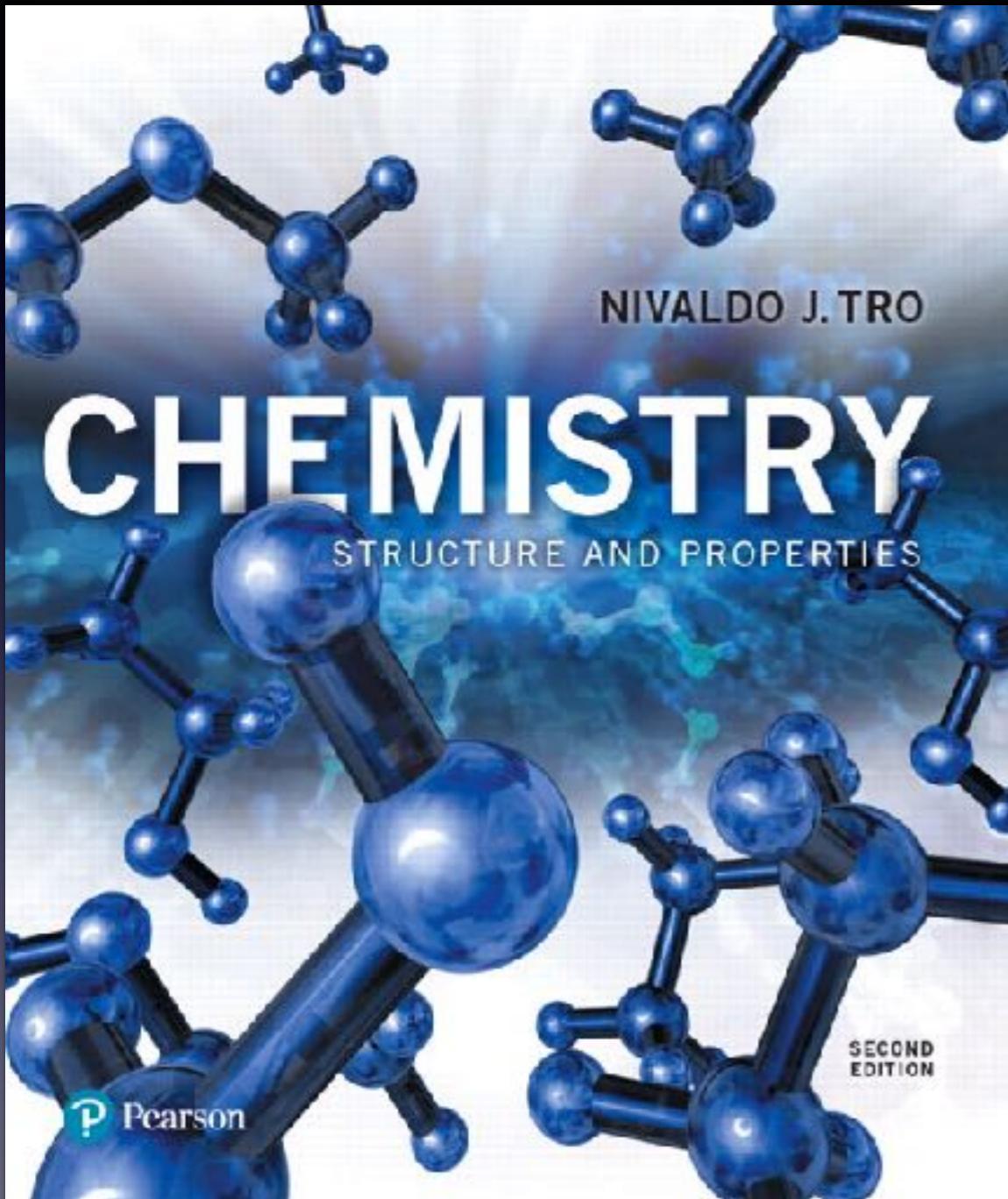


Chemistry Structure and Properties

Niva Tro, 2nd edition

\$66.65 e-text 6-month rental
from bookstore. This is
required for the online
homework.

2 hard copies are in GH 103
and never leave that room!

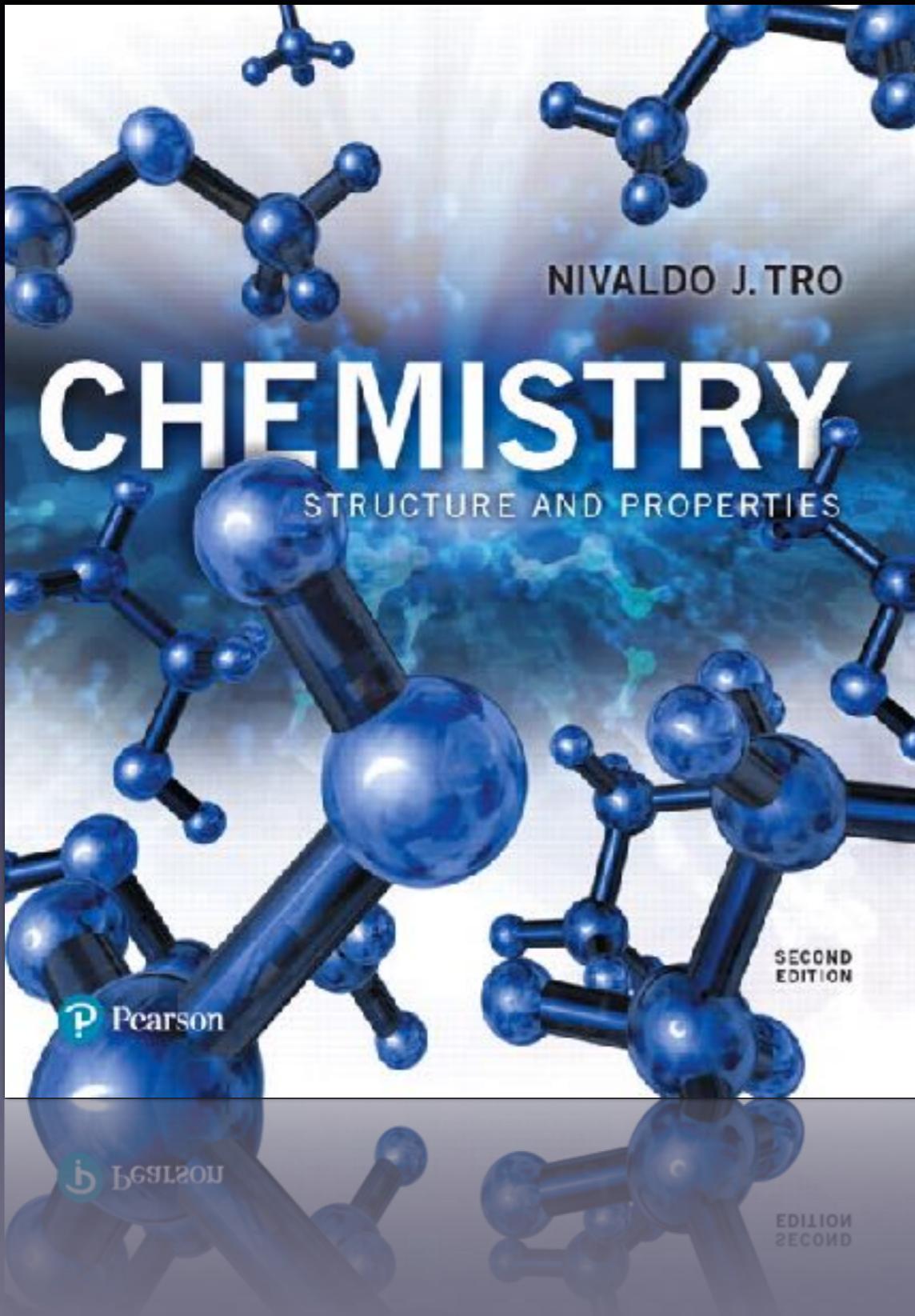


Chemistry Structure and Properties

Niva Tro, 2nd edition

Accessible through
“Modules” course menu
option in Canvas.

Link to “eText for Chemistry:
Structure and Properties,
Second Edition by Tro”



Ch E: Essentials: Units, Measurements, Problem Solving

Ch 1: Atoms

Ch 2: The Quantum-Mechanical Model of the Atom

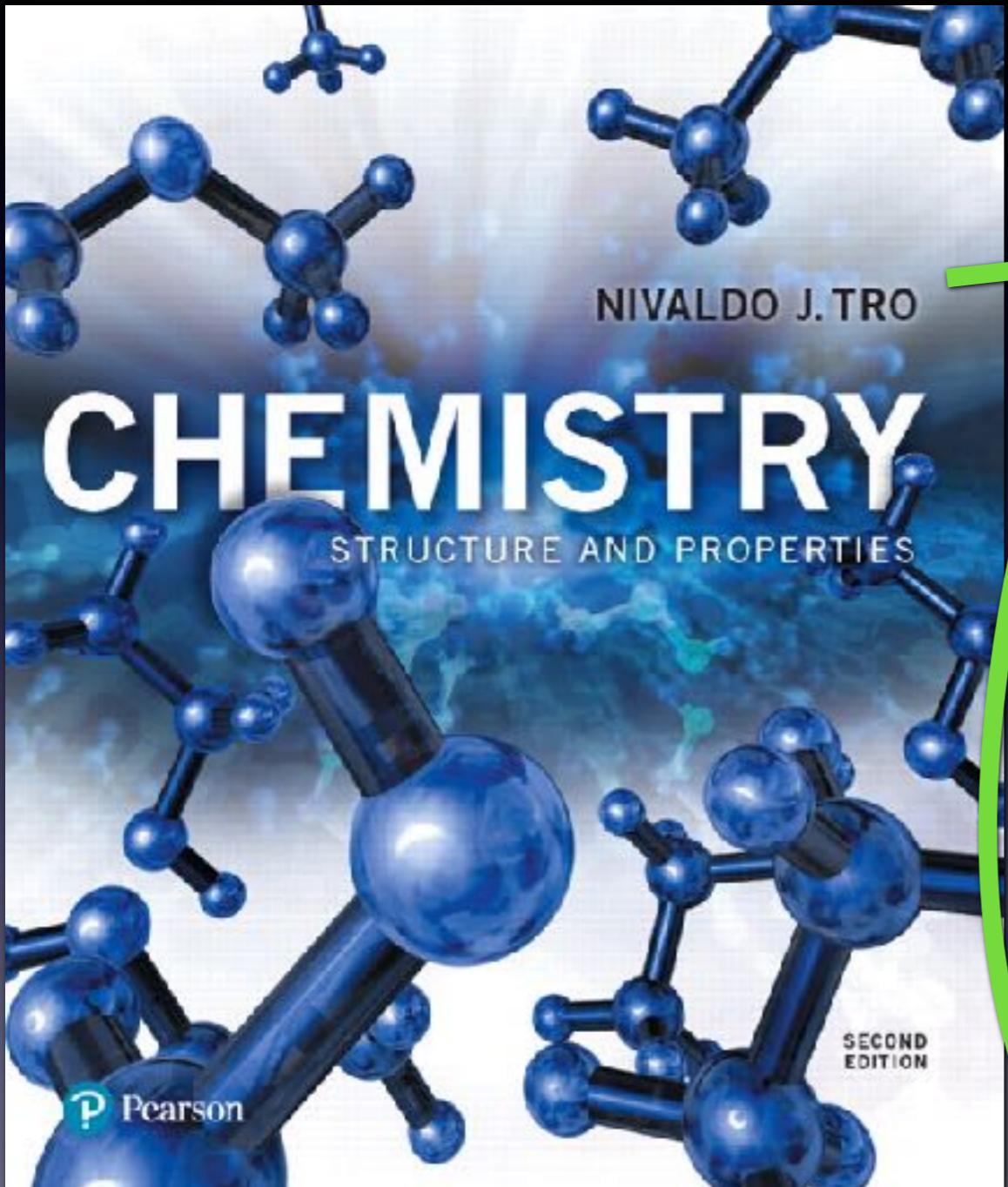
Ch 3: Periodic Properties of Elements

Ch 4: Molecules and Compounds

Ch 5: Chemical Bonding I

Ch 6: Chemical Bonding II

Ch 11: Liquids, Solids, and Intermolecular Forces



Ch E: Essentials: Units, Measurements, Problem Solving

Ch 1: Atoms

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Ch 3: Periodic Properties of Elements

Ch 4: Molecules and Compounds

Ch 5: Chemical Bonding I

Ch 6: Chemical Bonding II

Ch 11: Liquids, Solids, and Intermolecular Forces

You are responsible for... (but I'm not going to teach)

- The entirety of Chapter E!
- Parts of Chapter 1:
§1.1–1.5: Prechemistry
§1.6 The discovery of the electron
§1.7 The structure of the atom
(We'll cover the rest of Ch. 1 after quantum chemistry)
- Video lectures...

You are responsible for... (but I'm not going to teach)

- ...Video lectures
 - Ch1010 Nomenclature
https://video.wpi.edu/Watch/CH1010_Nomenclature_1
https://video.wpi.edu/Watch/Ch1010_Nomenclature_2
 - Isotopes, AMU, and Moles
https://video.wpi.edu/Watch/Ch1010_Isotopes_AMU_Moles_1
https://video.wpi.edu/Watch/Ch1010_Isotopes_AMU_Moles_2
 - Links will be available on the course *Canvas* site.

Monty Python trivia (5 points)

1. What is the airspeed velocity of an unladen swallow? Express your answer in furlongs per fortnight to 3 sig figs. (3 pts)

furlongs fortnight⁻¹

2. How long would it take that unladen swallow to travel the 3304 km from Worcester, MA to Oranjestad, Aruba in hours? (2 pts)

hours

Monty Python trivia (5 points)

- What is the airspeed velocity of an unladen swallow? Express your answer in furlongs per fortnight to 3 sig figs. (3 pts)

$$\frac{35.7 \text{ furlongs}}{0.0124 \text{ fortnights}} = 2,879.03 \text{ furs per forts}$$

2880

furlongs fortnight⁻¹

- How long would it take that unladen swallow to travel the 3304 km from Worcester, MA to Oranjestad, Aruba in hours? (2 pts)

2879.03 furlongs

...

fortnights

...

hours

Dailies



<http://thumbs.dreamstime.com/z/too-much-homework-vector-23920513.jpg>

- Thirty dailies, each with ~4 questions. Schedule is on the syllabus but generally out and due non-test days.
- Available following each class on *Canvas*; Due at 3pm the following lecture class day
- Collaboration discouraged but not forbidden
- 30% of the course (120 pts); **all** must be completed to receive a course grade
- Schneetag? Dailies are still due!

Dailies



<http://thumbs.dreamstime.com/z/too-much-homework-vector-23920513.jpg>

- Accessible through “MyLab and Mastering” in course menu in *Canvas*. Must link to Pearson account with wpi.edu email address.
- See “Reg info for Dailies.pdf” in “Files” section of *Canvas* site. (course is grimm97139)
- Dailies 1–2 will be due Monday, 28 August to accommodate this delay.

Recitations



<http://thumbs.dreamstime.com/z/too-much-homework-vector-23920513.jpg>

- Once a week. Generally Wednesdays during class period (different on exam weeks).
- Will post worksheets to “Recitation worksheets” in “Files” on *Canvas* the Sunday before a recitation.
- We will work through these worksheets during recitations, but maximal learning if you attempt problems beforehand.

Exams



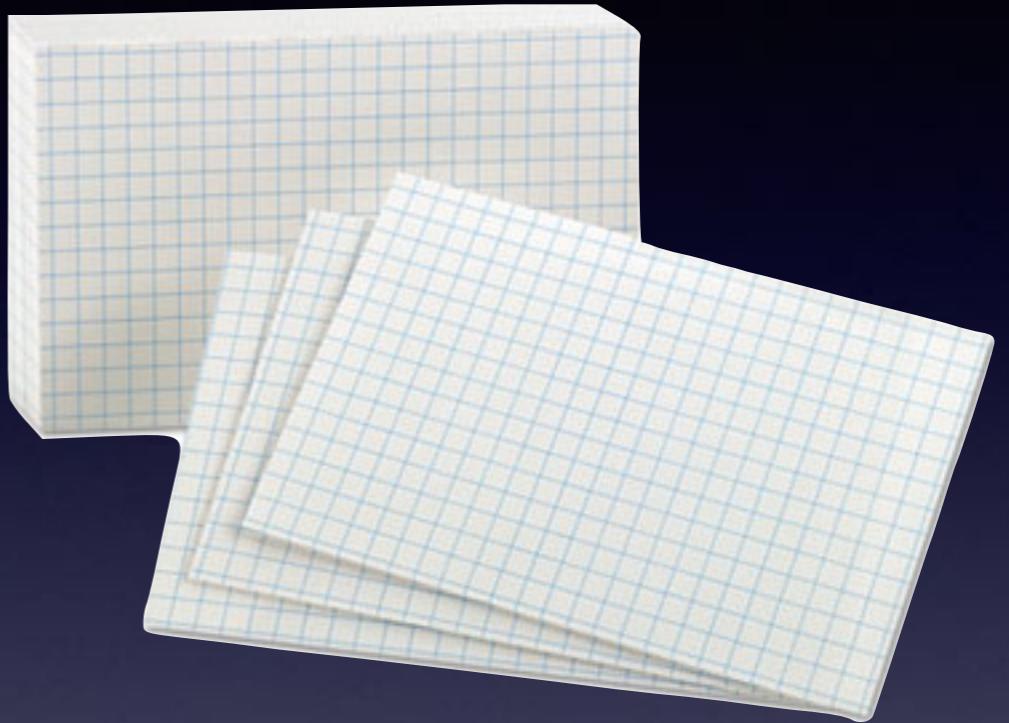
<http://thumbs.dreamstime.com/z/too-much-homework-vector-23920513.jpg>

- Three in-class exams
- Each 60-point exam will comprise 15% of the course.
- Index card, and front page
- Room assignments are AK 116 or FL-LWR based on last name. See syllabus. No points for attending the wrong room.
- Schneetag? Check *Canvas*!

Exams



<http://thumbs.dreamstime.com/z/too-much-homework-vector-23920513.jpg>



- ONE 3" x 5" index card
- all six sides allowed
 - must be HAND written

Front page of exam is yours

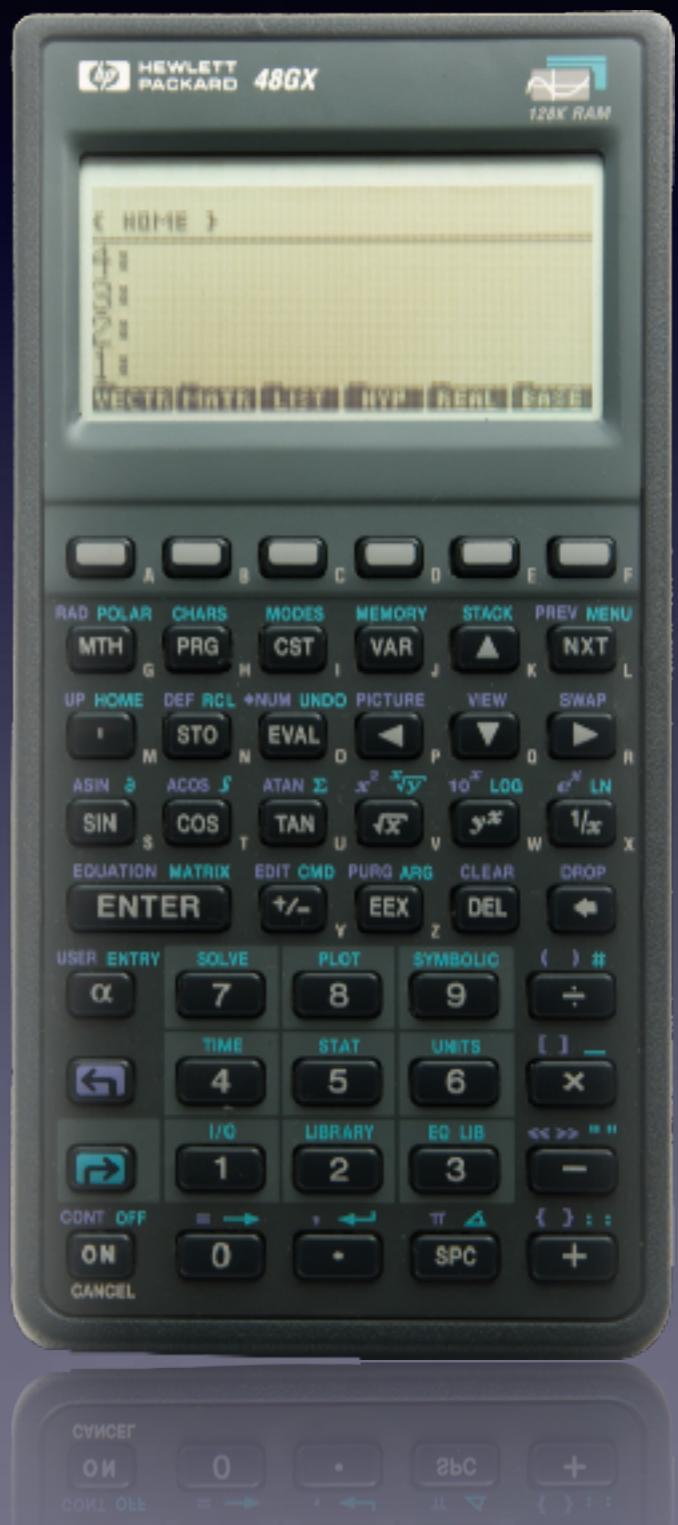
Exams



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In class...

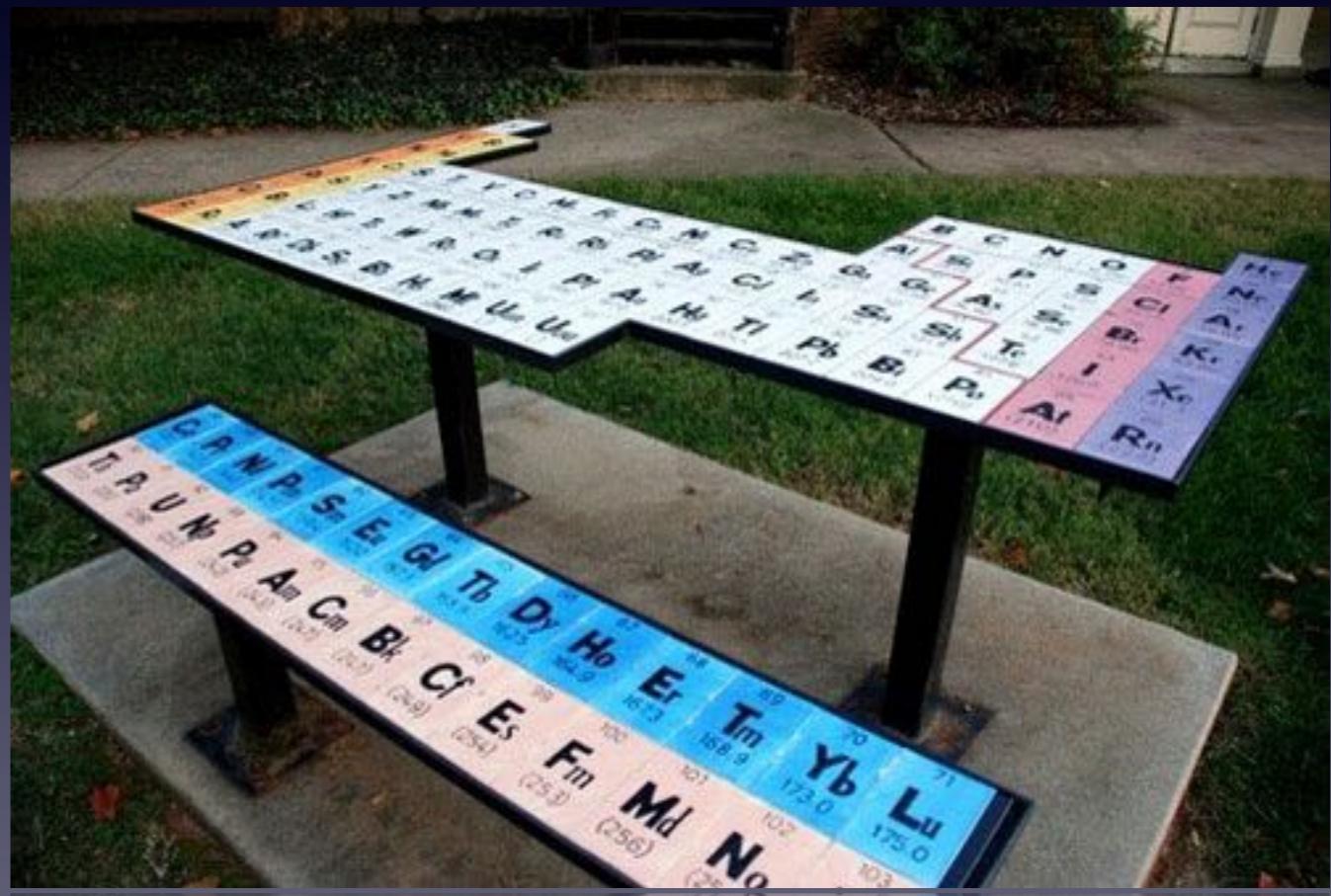


Accommodations

- No “upright” laptops, no recording devices without prior authorization by Grimm.
- Lecture PDFs and boardwork slides posted to “Lectures and boardwork” folder in “Files” menu option in *Canvas* course site.
- Class capture captured under “Echo360 Class Capture” menu option in *Canvas* course site.
- Office of Disability Services (ODS)
disabilityservices@wpi.edu
x4908, 137 Daniels Hall.
- Accommodations must be received by 5 September or will not be considered when scheduling exams.

Office hours

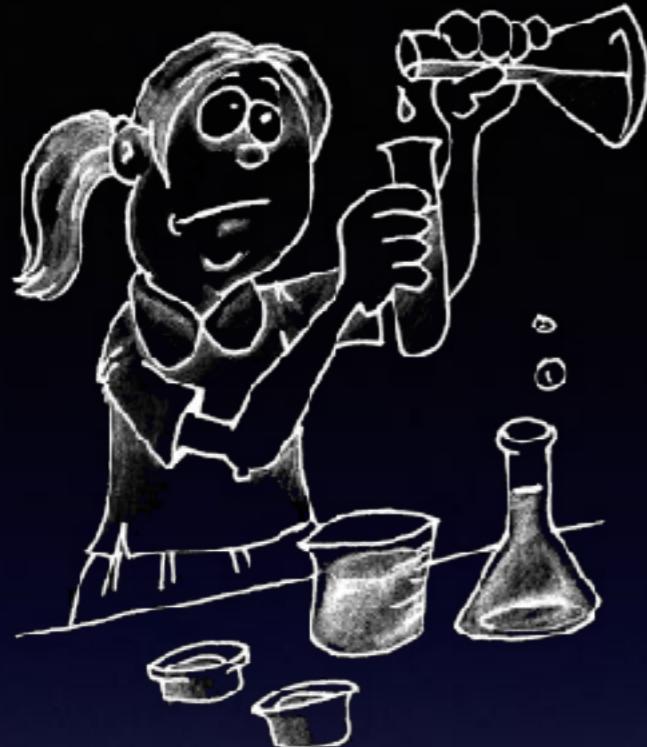
- After class MTWR at 4pm in GH 103.
- Over no earlier than 5, and no later than 6pm.
- Otherwise by appointment.
- No office hours today.



imgur.com/5FVE8

	Mon	Tues	Wed	Thurs	Fri
8 am					
9					
10					
11					
12 pm					MASH-ARC
1					
2					
3	Lecture	Lecture	Lecture*	Lecture	Lecture
4	MASH-ARC	Office	Office	Office	Office
5	Office				
6					
7		MASH-EPC			

- ARC: Academic resources center, Daniels Hall
- EPC: Exam Proctoring Center, near Dining Hall
- * Wednesdays are *usually* recitation days



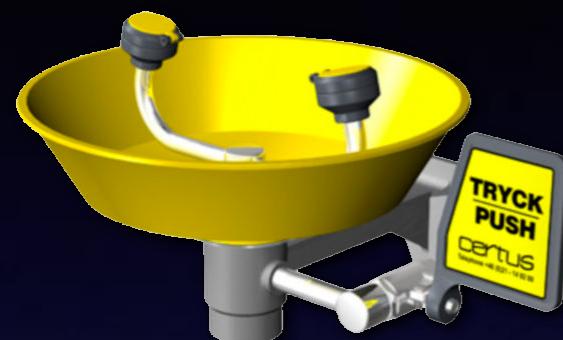
Laboratory Component

- Lab is decoupled from the lecture however you will only receive a singular grade from the Registrar. Weights are 75% lecture, 25% lab.
- Labs are running the first and second day of the term (unlike years past), and consist of two 2-hour lab periods and one 1-hour conference section. Conferences are not optional.
- Read the lab course syllabus (*Canvas* site), and understand course expectations.
- Watch “Lab Safety video.mp4” in the Lab Startup Assignments module on the lab *Canvas* site, and earn 100% on the Lab Safety Quiz by 27 August 2017 (that’s a Sunday).
- Come to each lab prepared. That includes prelabs due several days before *each* lab period!

	Mon	Tues	Wed	Thurs	Fri
8 am	AX01 (GH109) AX10 (GH110)	AX06 (GH109) AX15 (GH110)	AC01	AX01 (GH109) AX10 (GH110)	AX06 (GH109) AX15 (GH110)
9			AC01		
10	AX02 (GH109) AX11 (GH110)	AX07 (GH109) AX16 (GH110)	AC03	AX02 (GH109) AX11 (GH110)	AX07 (GH109) AX16 (GH110)
11			AC04		
12 pm	AX03 (GH109) AX12 (GH110)	AX08 (GH109) AX17 (GH110)	AC05	AX03 (GH109) AX12 (GH110)	AX08 (GH109) AX17 (GH110)
1			AC06		
2	AX04 (GH109) AX13 (GH110)	AX09 (GH109) AX18 (GH110)	AC07	AX04 (GH109) AX13 (GH110)	AX09 (GH109) AX18 (GH110)
3			AC08		
4	AX05 (GH109) AX14 (GH110)		AC09	AX05 (GH109) AX14 (GH110)	
5					
6					
7					

- Labs run twice a week with a mandatory Wednesday conference
- Open lab period all day Wednesday, and they must be scheduled in one-hour blocks in advance on *Canvas*

Lab safety...



[http://www.wallingfordsales.com/
prodimages/bradley/s19-310jj_highres.jpg](http://www.wallingfordsales.com/prodimages/bradley/s19-310jj_highres.jpg)



[http://jouielovesyou.files.wordpress.com/2010/11/
1194986420721173922red-telephone-
mimoo-01-svg-hi5b15d.png](http://jouielovesyou.files.wordpress.com/2010/11/1194986420721173922red-telephone-mimoo-01-svg-hi5b15d.png)



Do you
know how to call
emergency services?



Required



Forbidden

Coursework	Total points	Percentage
Dailies (30)	120	30%
Lecture exams (3)	180	45%
Laboratory	100	25%
Σ	400	100%

Scores are rounded to two places after the decimal

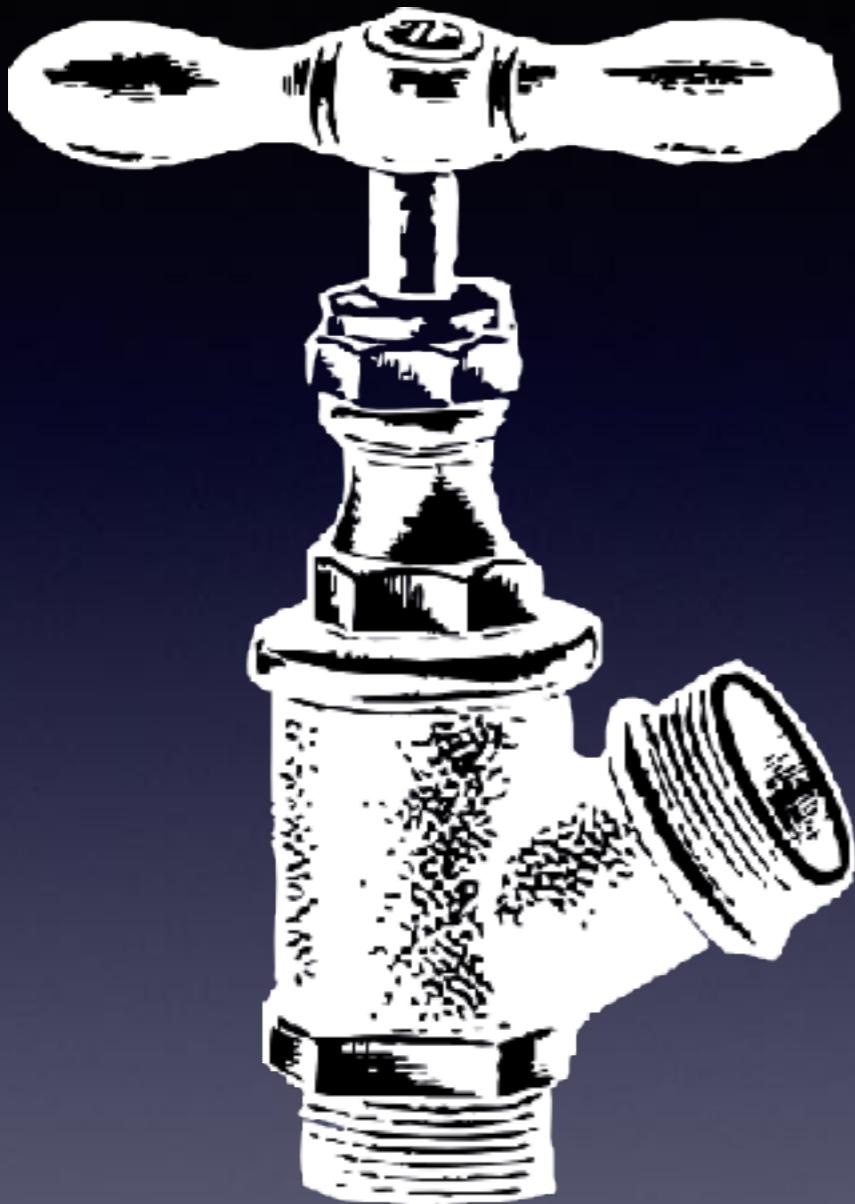
Grades

- A: $\geq 90.00\%$
- B: $\geq 80.00\%$
- C: $\geq 65.00\%$

You will only receive a grade if you...

- ...complete ALL of the Dailies
- ...pass the lecture (195 / 300 pts)
- ...pass the laboratory (65 / 100 pts)

Course plumbing...



Tro, responsibilities

Dailies

Recitations

Exams

Accommodations

Grades

Chemtable and M*A*S*H

Laboratory

Schneetage!

www.clker.com

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_faucet.svg.hi.png



Where are we going today?

- Why molecularity?
- Course plumbing
- What are you responsible for that I'm not going to teach...

Next time...

- § 2.2 The Nature of Light
- § 2.3 Atomic Spectroscopy, Bohr