CH 301 Exam 1 Review

1. EMR rankings + calculation - easy
   just like quizzes

   either $E = h\nu$ or $\nu = \frac{c}{\lambda}$ calculation

   or need to rank EMR spectrum in terms of E, ν, λ

   X ray - UV - vis - IR - μ - radio

2. Theory behind failure of classical mechanics (hard)
   a multiple choice question with many words.
   some answers are correct, some are not.

   you must know the vocabulary behind explanation for
   - blackbody radiators
   - emission spectra
   - photo electric effect

   and be able to explain without saying
   "things" or "stuff" ... to your friends

3. Rydberg equation calculation (tricky)

a plug + chug for

$$\nu = R\left(\frac{1}{n_e^2} - \frac{1}{n_h^2}\right)$$

what makes this harder is that we will want to know trends for ν (boundary conditions) without actual calculations

4. particle in a box theory (so many words)

Be able to look at the equation for particle in a box including ψ equation and E equation, and explain, in words, how the ψ, E are a function of variables

5. uncertainty principle theory and calculation

This will be a theory question in which statements about the equation $\frac{h}{2} \leq \Delta x \Delta p$ are made.

6. deBroglie equation ~~theory and~~ calculation easy

simple plug + chug

$\lambda = \frac{h}{mv}$ just like the quiz

7. Schrodinger wave equations theory medium easy

I really like you understanding V(x) under various conditions, like particle in a box, H electron, multielectron

8. applying quantum number rules harder (tricky)

I will give you a certain set of quantum boundary conditions & you tell me how many e⁻s, orbitals, subshells there are.

9. applying quantum number rules hard

same as 8.

you really need to understand

$n = 1, \cdots \infty$

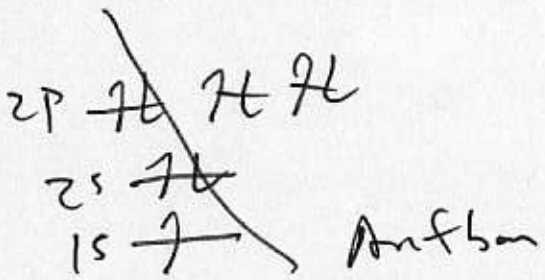
$\ell = 0, 1 \cdots n-1$

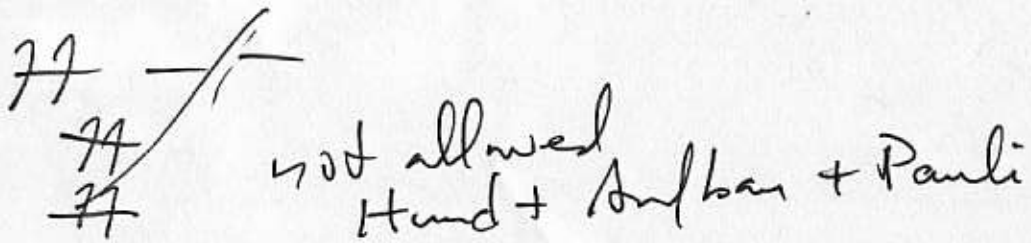
$m_\ell = -\ell, \cdots 0, \cdots +\ell$

$m_s = +\frac{1}{2}, -\frac{1}{2}$ very well

10. applying Aufbau, Pauli and Hund medium

I will show you various electronic configurations. you tell me what is allowed or not, and why.





11. assigning electronic configurations of atoms and ions hard for this type
count the e⁻s then fill the shells, make
sure you use [ ] noble gas nomenclature

[Ar] $4s^2$ $3d^3$ as example

Hint this is bigger than usual

12. assigning electronic configurations of atoms and ions (exceptions) easy
one kind of exception deals with d filled
+ half filled in the Cr + Cu families
remember s^1d^5 + s^1d^{10} exceptions

13. assigning electronic configurations of atoms and ions (exceptions) medium

exception in the p block metal ions

- The stuff like Tl^{+}, In^{+3}, $B:^{+5}$

kinds of ions. Be able to explain

how e^- are removed from first the

p then s then d

14. periodic table nomenclature easy I want to see that you

can describe the following parts of the table

group, family, main group, lanthanide, transition

shell, subshell, orbital

15. theory of periodic trends: ENC and shielding explain IE, EA, AR, IR, metals

p. d. easy

understand ENC + shielding concepts and how they define the trends

16. ranking periodic trends: IE, EA, AR, IR, metals easier

one question will be about size
+ one question will be about e⁻ energy

In both cases I want to see that you can look at a numerical value and assign it to an element or ion

Example A.R. 1 = 1.56 A.R 2 = 1.79
which belongs to Na and so Mg must be 1.56
which belongs to Mg

17. ranking periodic trends: IE, EA, AR, IR, metals ~~(exceptions)~~ easy

Just didn't feel like exceptions but lots of words

18. Lewis structures of ionic compounds really easy, drop the course if you get it wrong.

Example which of these is sodium chloride

Na^{+}, $:\ddot{\underset{\cdot\cdot}{\underset{\cdot\cdot}{Cl}}}:^{-}$ or Na^{+}, $:\ddot{Cl}:^{-}$

bingo

Hint: make sure you can handle AB, AB_2, A_2B, A_3B, AB_3, A_2B_3, A_3B_2

19. Lewis structures of covalent compounds, resonance easy

The next 7 quest.ons ask yo to draw a Lewis structre of a covalnt ion or molecule. I then ask questions to determine if yo have drawn it correctly

step 1 : add up the val. e's quickly
2 : find the central atom, spread the others symmetrically
3 : fill 2 or 8 around perimeter
4 : dump the rest in the middle. 5. Ask : is every body happy? if the octet rule isn't satisfied, "borrow" e's to make center happy

20. Lewis structures of covalent compounds, multiple bonds easy

At least once you will borrow to fill the middle and it won't be resonance

$O=C=O$ } multiple bonds
or
$N\equiv N$ }

Resonance

at least once, when you borrow it can come from more than one site meaning resonance

NO_2^-

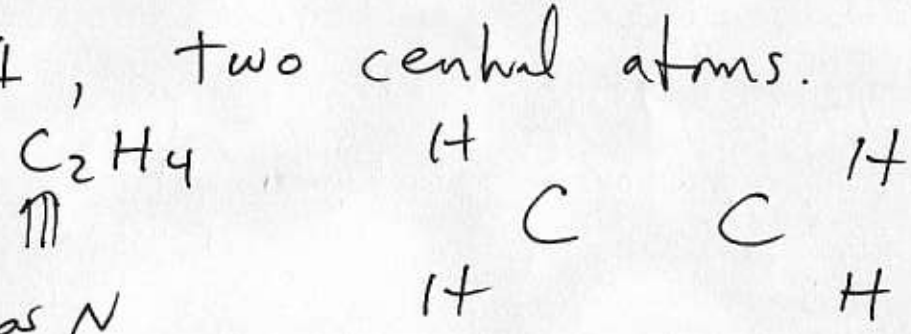
$O-\ddot{N}=O^-$ or $O=\ddot{N}-O^-$

21. Lewis structures of covalent compounds, multiple central atoms easy

Two different cases of organic molecules with more than one central atom.

Simple case 1, two central atoms.

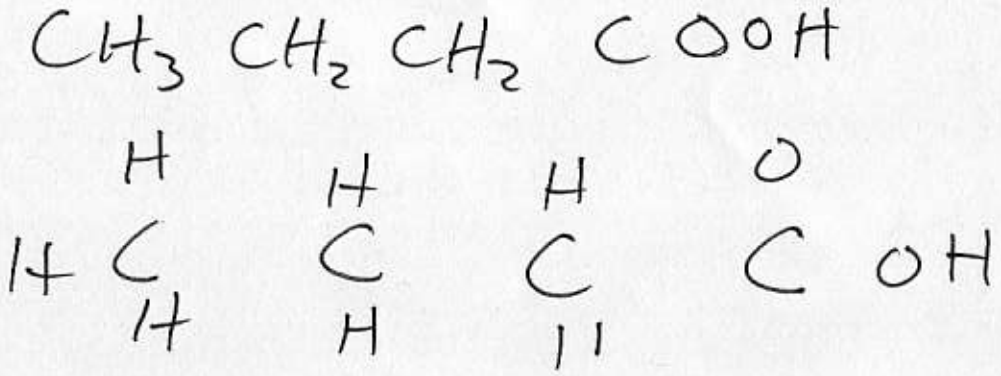
Example C_2H_4



Certain to be C as N

22. Lewis structures of covalent compounds, multiple central atoms harder

one case will have many central atoms. yuck. I will teach this on Tuesday



23. Lewis structures of covalent compounds, exceptions to octet (too large) easy

I will ask you to draw Lewis structures when on 3 occasion the octet rule (filled shell rule) doesn't work.

- expanded shell, happens all the time for n=3 row stuff like Si, S, P, Cl, I etc

have 5 or 6 e^- rich regions.

24. Lewis structures of covalent compounds, exceptions to octet (too small) easy

- you will be counting the # of valence e^-, and bing, bing, bing bing you get an ~~even~~ odd number.

This is going to be a radical.

Hint ⇒ Don't even bother, it is a radical waiting for it

25. Lewis structures of covalent compounds, exceptions to octet (too odd) easy

B ⇐ boron

BF_3, BCl_3, BH_2F

F–B(–F)–F

26. ranking crystal lattice energy medium

These are directly related to charge density

- The > The charge The > The c.l.e.

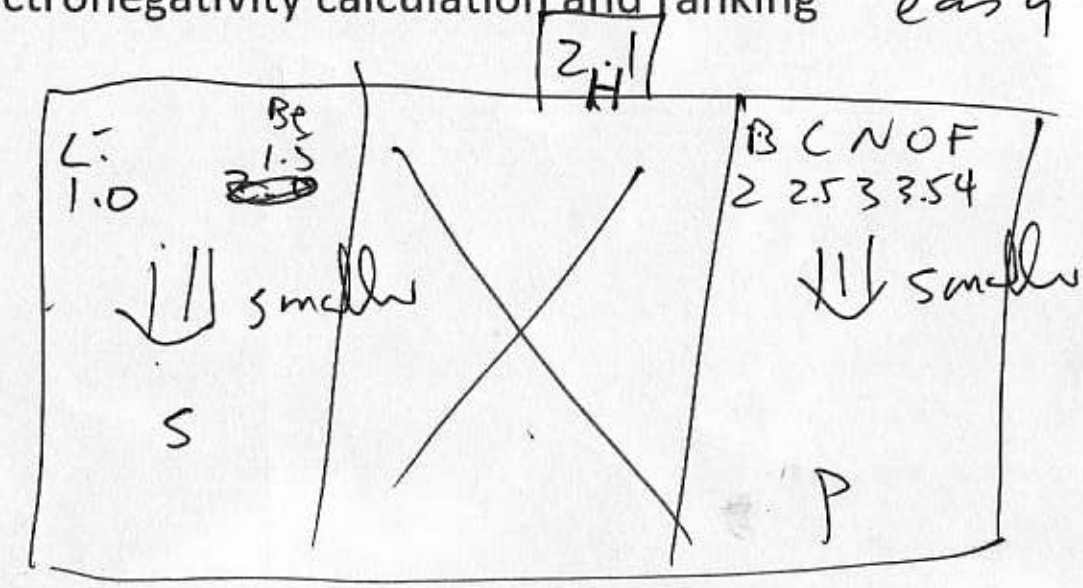
$Al^{+3} > Ca^{++} > Na^+$

- if same charge, then The smaller, The > c.l.e.

$Li^+ > Na^+ > K^+$

Hint: polyatomic ions are large (low charge density)

27. electronegativity calculation and ranking easy

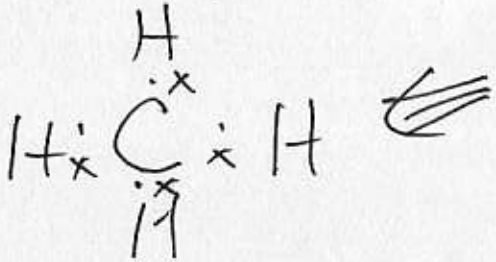


know this, you are good

28. assigning formal charge easy

I give you a simple molecule and ask the formal charge on the atoms in it.

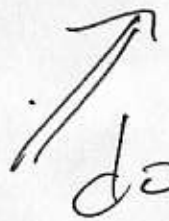
Example



all are formal charge of 0

29. formal charge and correct Lewis structures ~~pretty~~ really hard one

I give you a bucket load of comparison structures. Some are correct, some are not. you find which ones have the smallest overall formal charge, that is the "stable one



do last you get as many points as knowing NaCl is not Na^{+9} Cl^{-7}

30. ranking bonding trends: EN, bond energy, bond length

I teach this tuesday

But understand the following

- as bond order increases, bond length decreases + energy increases

$C \equiv C < C=C < C-C$ for length

$C \equiv C > C=C > C-C$ for energy

- polarizability increases down the table and makes bond energy decrease and bond length increase

larger energy → $CF > CCl > CBr > CI$