Question Types for Electrochemistry

1. balancing a chemical reaction in acid or base

been there done that on quiz

medium

Change of oxidation problem

1. ox #
2. least common multiple = use ⟸ !!!!
3. assign coefficients
4. add $H^+ + H_2O$ in acid $OH^- + H_2O$ in base

in acid ⟸ Hint

2. assigning cell convention in electrochemical cell

medium

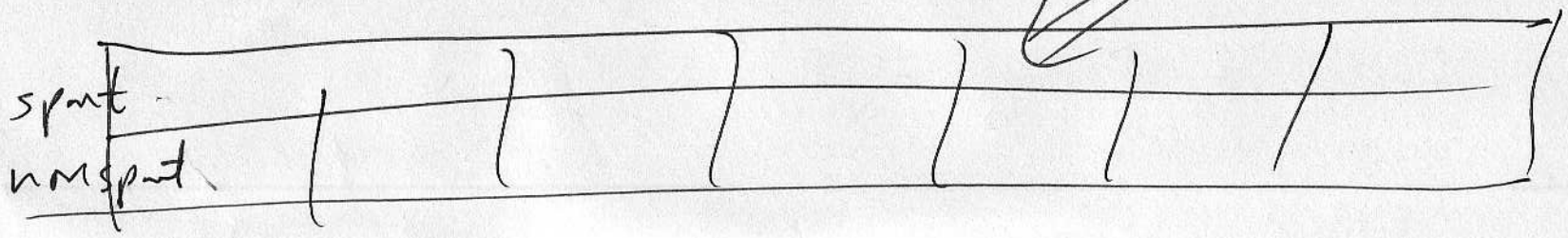
know the rules in the table of cell conventions.

(There are a lot of words)

In particular, you will be given a couple of 1/2 cell reactions & will need to know things like

anode vs cathode + vs −

that table ⟸



3. understanding the table of standard half cells — like on the quiz easy

know the typical std concepts for ½ reaction tbl

- SHE ← H_2 electrode = 0 V
- ±3 V range of ½ reactions
- reductions
- ½ reactions to make EC. cells
- 1 M, @ 1 atm

4. Nernst equation calculation — a pretty easy for a Nernst simple math

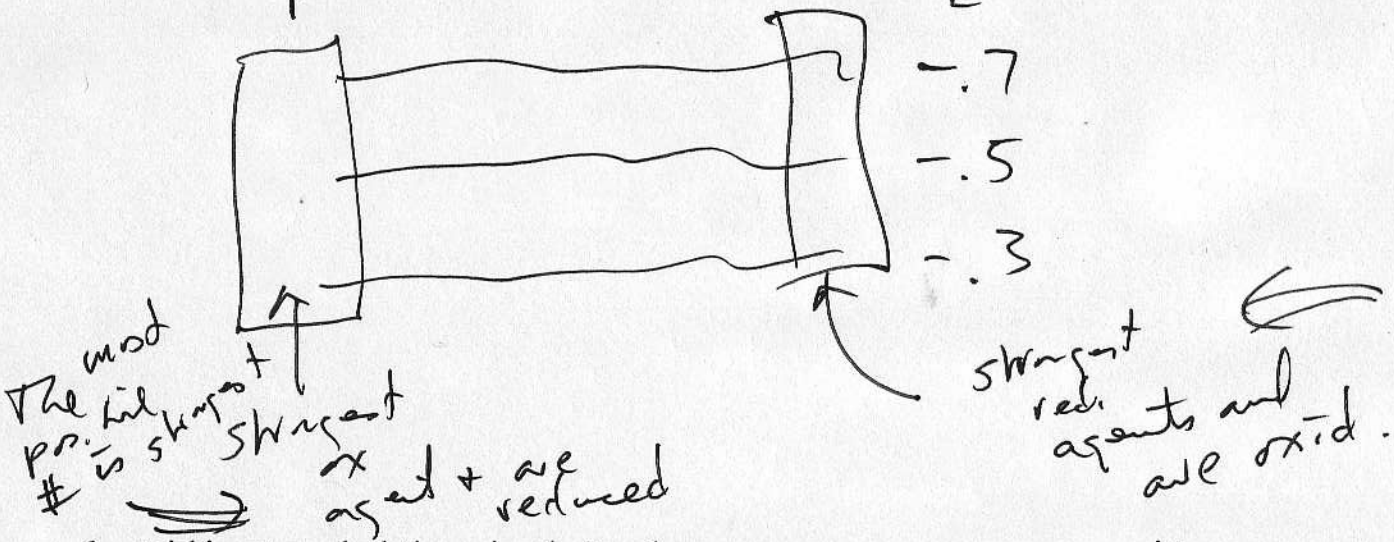
make sure you can do things like $\log \frac{[10^{-5}]}{[10^{-2}]}$

4 steps

hard
- calculate E° easy
- balance E.C. cell to get n (see #1) easy
- set up Q (hard because you have to think what is on top and below)
- solve easy

5. ranking oxidizing and reducing agents

annoyingly hard because you have to think. It looks like the one on my practice suite in partel.



The most neg E° is strongest because you have to flip the rxn.

6. stoichiometry calculation using the Faraday

Easy don't!!

$$\text{amount of substance} = \left(\text{tell you a \# of Coulombs}\right)\left(\text{Faraday!!}\right)\left(\frac{\text{stoichiometric 1 mole of substance}}{3 \text{ moles of } e^-}\right)\left(\text{moles} \rightarrow \text{grams}\right)$$

grams # of atoms

example $Al^{+3} \rightarrow Al$

7. current calculation

harder than 6
This is #6 per unit time.

$$i = \frac{C}{t}$$

This is the start of problem #6
so if you can get it from
i + t, you can solve the
problem as on #6

Hint:
Time has eqn
some silly
he puts on the
exam so you
can plug +
chug.

8. calculation involving E, K and ΔG

- you hope a this goes up that goes down

E + K > 1 ΔG ⊖

E − K < 1 ΔG ⊕

- a relatively simple plug + chug

$$-nFE = \Delta G = -RT \ln K$$

9. famous battery discuss on Thursday in lecture. But here are the famous batteries you should know

- $PbSO_4$ - Pb acid storage battery in cars
- Ni Cd battery rechargeable
- Li ion battery

} know the basics as to utility + operation

Question Types for Kinetics

10. calculating reaction rates a little tricky but easy

here is the rate law

$$\text{rate} = k[A]^x[B]^y$$

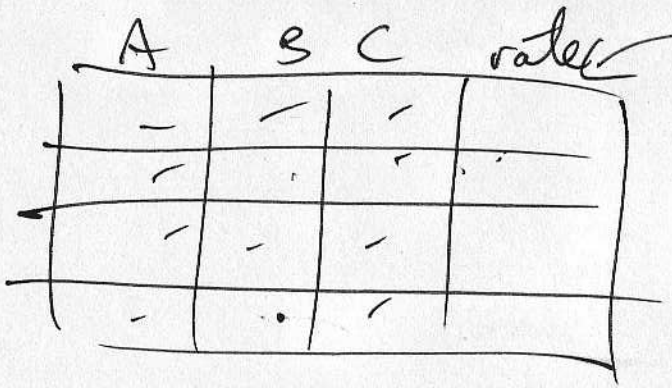
you need to understand how x and y impact rate

example. if x is second order and A triples

Then the rate increases by 9-fold

11. method of initial rates

seen this a million times.



use it to solve for rate law.

typical 0, 1, 2 order examples.

hint. you may have to work backwards

12. integrated rate law calculation

pretty easy plug + chug

- find the order of reaction from k

0th 1st 2nd

$A = A_0 - akt$ $\ln A = \ln A_0 - akt$ $\frac{1}{A} = \frac{1}{A_0} + akt$

13. integrated rate law calculation (half life) These are fun because you get to easy divide by 2 a lot

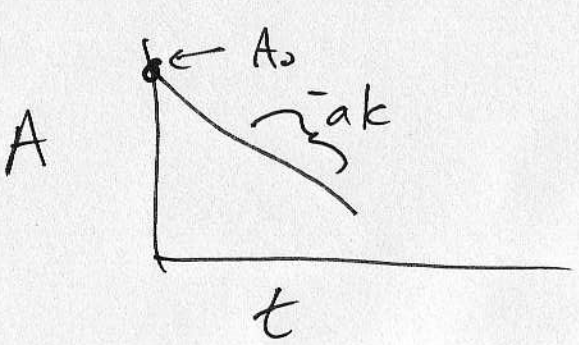
I'll give you an amount and a t and a 1/2, use this to tell me how much of is goes away.

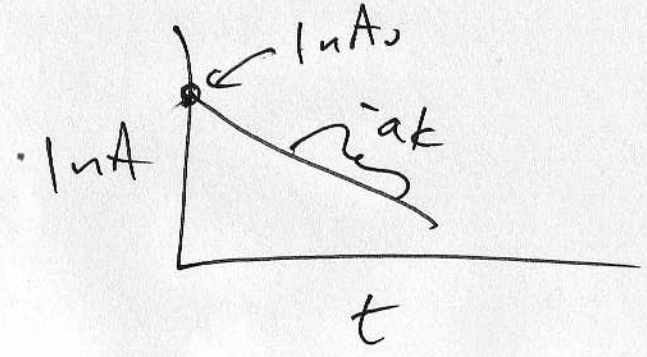
Just like quiz

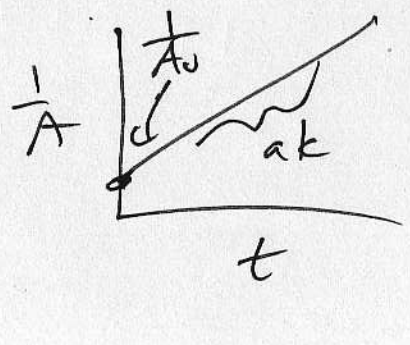
14. extracting information from straight line plots easy (not like the one on my practice exam)

- identify order of reaction

$A = A_0 - akt$ $\ln A = \ln A_0 - akt$ $\frac{1}{A} = \frac{1}{A_0} + akt$







15. kinetic theory—collision

easy usual bunch of words - see sviz

16 inetic theory—transition state

easy usual bunch of words - see sviz

17 combined Arrhenius calculation

this will be a simple math plug + chug using ratios

$$\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

Hint

really useful in finding the answer ⟹ as the T increases by 10°, the rate goes up 2 to 3 times

18 reaction mechanisms

pretty standard

step 1 $A + B \rightarrow 2C$ fast

step 2 ~~$C + D \rightarrow E$~~ slow

step 3 ——— fast

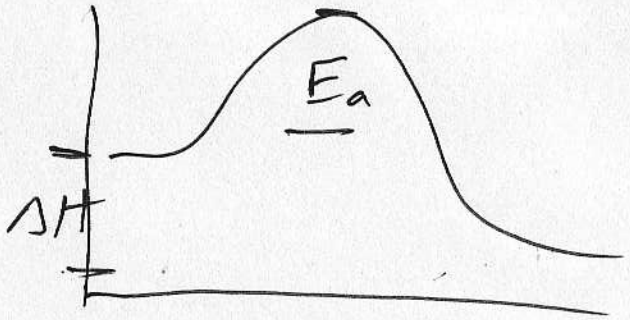
Hint ← a little tricky, but Think pure bonds have activ. of 1

find the r.d.s., eliminate everything after slow step. create ratio of stuff on left / stuff on right

rate = $k \frac{[A][B][D]}{[C]}$

19 E_a and energy profiles

really easy.



This is a simple calculation on ΔH or Ea for exo + endo Thermic processes

Hint: no numbers are used. take the simple variables from meth eqn

20 famous catalysts

last day lecture. But it is either

Ozone

or

catalytic converter

Descriptive Chemistry

21 ~~properties and~~ reactivity of alkali metals

know the most famous rxn done by alkali metals.

H.t. I did it 5000 times in class this year.

22 properties and reactivity of alkali earths

know everything about one of the elements.

Ca

23. properties and reactivity of the B family

know everything about one element.

Al

24. properties and reactivity of the N family

know everything about one element.

Ht. wt ≡ not P

25. properties and reactivity of the C family

know everything about one element

H.wt: not Ge

26 properties and reactivity of the O family

know everything about one compound

H.wt not S, its H_2SO_4

27. properties and reactivity of the halogen family

Know everything about one element.

not Cl

yes ⇒ F

28. famous chemical manufacturing processes

This one is really easy

know the stuff each of these makes

Haber
Bayer

Claus
Hall

Ostwald
contact

29. identifying famous gemstones

no help

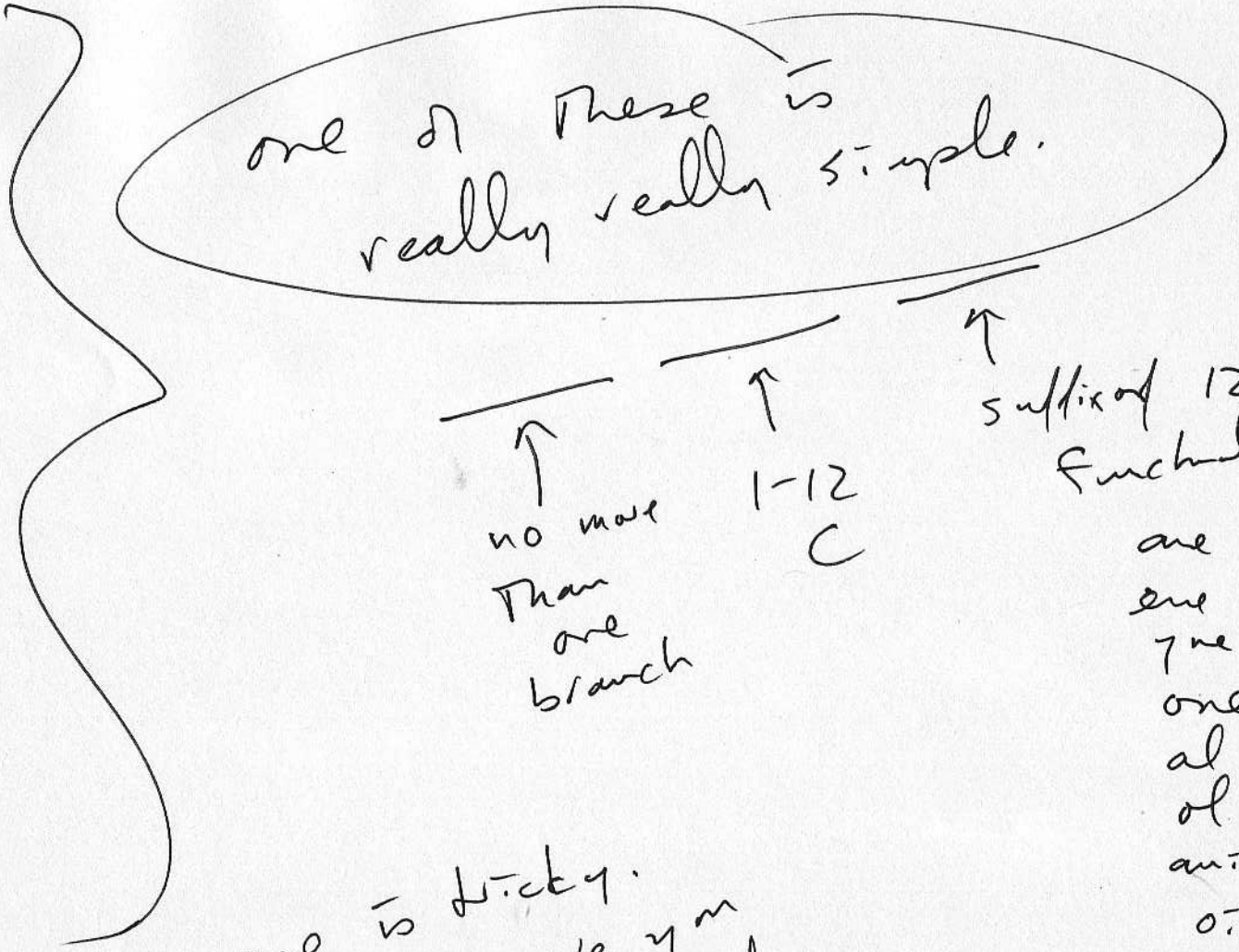
know the famous gems + the
in the notes + the
oxide they come from

Organic Molecules
30. hydrocarbon isomers

I will give you a hydrocarbon
+ you tell me the # of structural isomers
that is has.

31. naming organic molecules

32. naming organic molecules



33. organic polymer chemistry

In class tomorrow I will show you the table of addition polymers and hydrolyzed polymers. Be able to tell them apart.

34 biomolecule structure

There are very famous reactions that produce

sugars
fatty acids
proteins
nucleic acids

} eliminate of water
amidization
esterification
glycolysis

35. biomolecule structure

you will look at the product of a hydrolysis reaction and tell me the correct structure