

Wednesday, May 22/13  
Science 122

Announcements
---------------

**\*\* Need an activity re a course topic before the end of May.**

---

1. Worksheet - Energy of Photons, Work Function, Etc.  
Worksheet - Energy Levels
  2. Test - Nuclear and Quantum Physics -> Thursday
  3. Redox Half-Reaction Tables - **HW for Friday**
- 



## Part I - Short Answer

- terms  
ie/ nucleon, nuclide etc.
- notation  
ie/ isotope  
ie/ decay particles.  
 $\alpha$  or  ${}^4_2\text{He}$   
 $\beta^-$  or  ${}^0_{-1}\text{e}$  etc.
- formation of  $e^-$  and  $e^+$
- write decay reactions  
ie/ parent nucleus  $\rightarrow$  daughter nucleus +  $\square$
- Planck, Einstein
- photoelectric effect.  
+ terminology  
+ graph
- energy level diagrams.

---

## Part II - Problems.

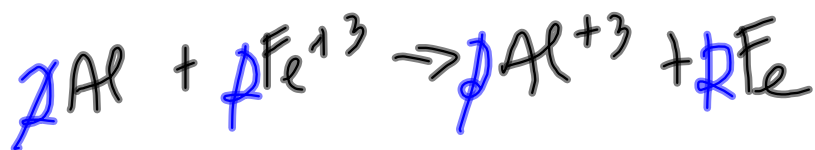
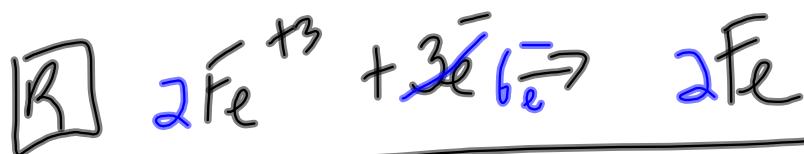
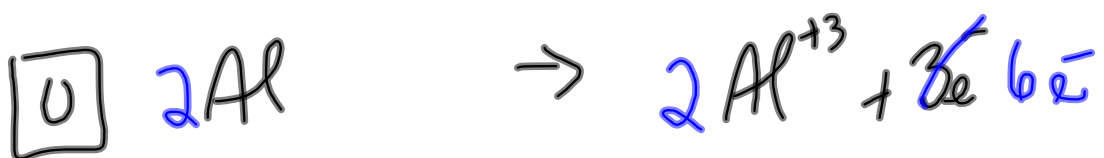
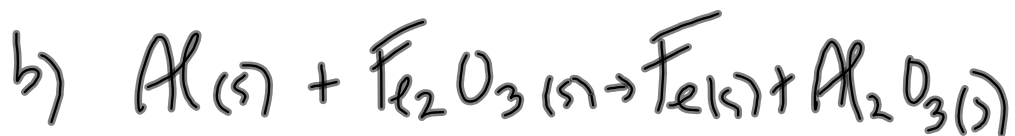
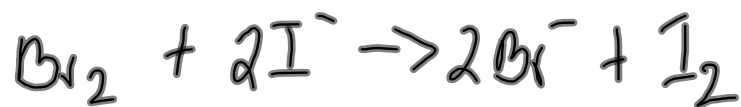
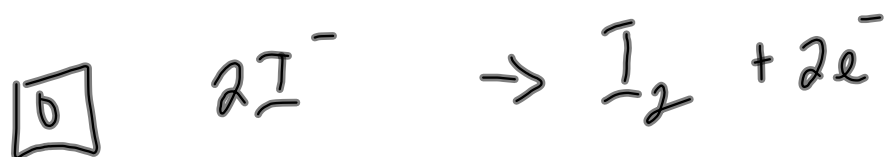
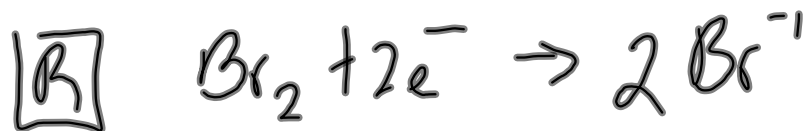
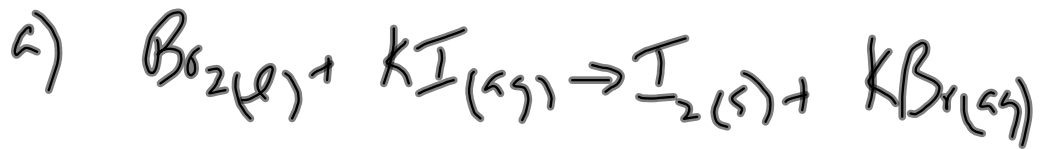
Formulas:

Nuclear Physics  $\Rightarrow A, \lambda, N, N_0, m, T_{1/2}$  etc.

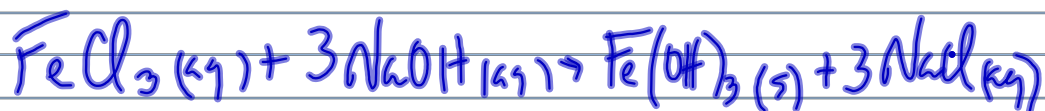
(2 worksheets)

Quantum Physics  $\Rightarrow E, \phi, f_c, E_n$  etc  
(2 worksheets)

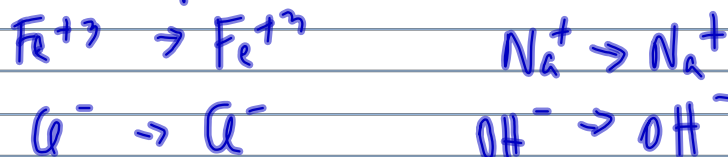




Question: Has a redox reaction taken place in the example below?



double replacement rxn.



→ No reduction/oxidation.

Usually it is assumed that chemical rxns are spontaneous; that is, they occur without a continuous addition of energy to the system.

### Are all single replacement reactions spontaneous?

Which combinations of copper, lead, silver and zinc metals and their aqueous metal ion solutions produce spontaneous reactions? (Nitrate solutions were used.)

ppt  $\rightarrow$  precipitate

	Cu <sub>(s)</sub>	Pb <sub>(s)</sub>	Ag <sub>(s)</sub>	Zn <sub>(s)</sub>
Cu <sup>+2</sup> <sub>(aq)</sub>	no change	red-brown ppt	no change	red-brown ppt
Pb <sup>+2</sup> <sub>(aq)</sub>	no change	no change	no change	black ppt
Ag <sup>+</sup> <sub>(aq)</sub>	silver crystals	silver crystals	no change	silver crystals
Zn <sup>+2</sup> <sub>(aq)</sub>	no change	no change	no change	no change

The reactivity of the four metal ions  
can be compared.

# of Rxns  
that occurred                      3        2        1        0

Ions                       $\text{Ag}^+(\text{aq})$      $\text{Cu}^{2+}(\text{aq})$      $\text{Pb}^{2+}(\text{aq})$      $\text{Zn}^{2+}(\text{aq})$

—————> decrease in reactivity  
of oxidizing agents

(ions)  $\rightarrow$  (oxidizing agents)

# Rxns  
occurring  
metals                      3        2        1        0

$\text{Zn}(\text{s})$      $\text{Pb}(\text{s})$      $\text{Cu}(\text{s})$      $\text{Ag}(\text{s})$

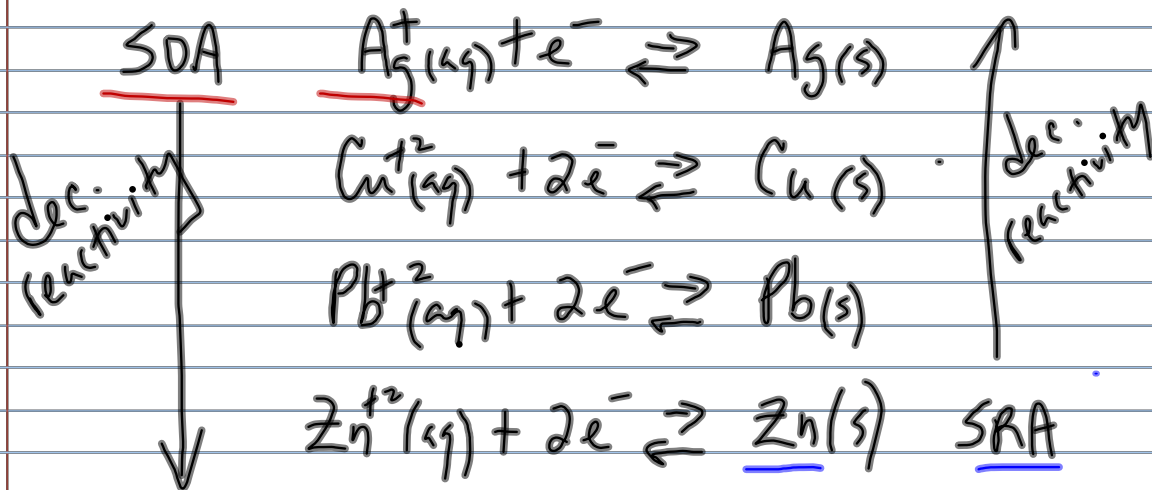
—————> decrease in reactivity  
of reducing agents.

(metals)  $\rightarrow$  (reducing agents)

SOA  $\rightarrow$  Strongest oxidizing agent  $\rightarrow \text{Ag}^+(\text{aq})$

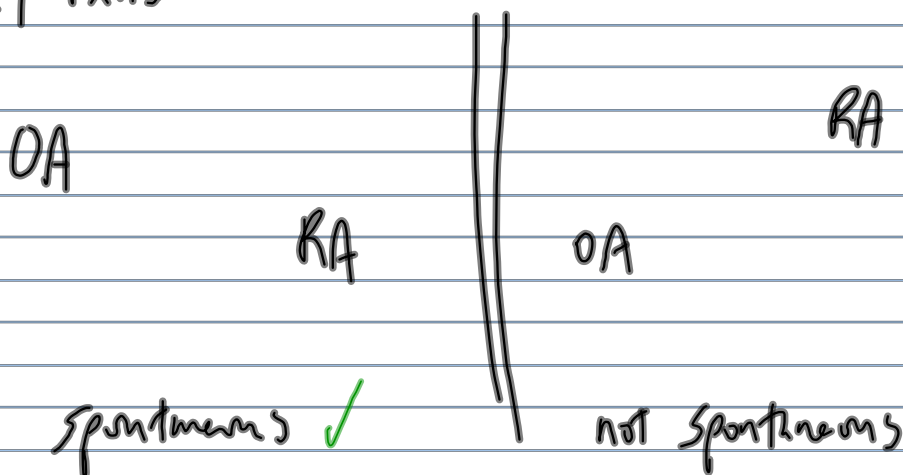
SRA  $\rightarrow$  " Reducing agent  $\rightarrow \text{Zn}(\text{s})$

## Table of Redox Half-Reactions $\rightleftharpoons$



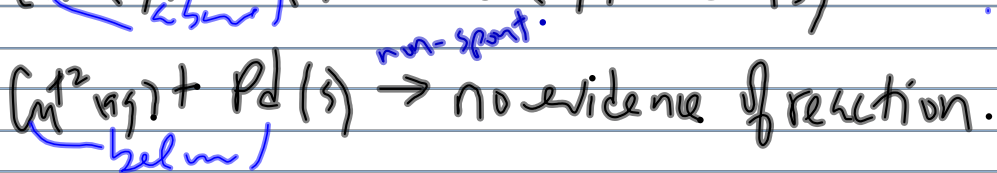
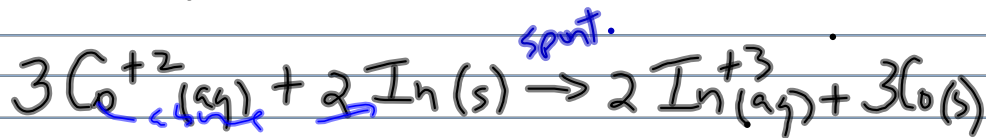
## Redox Spontaneity Rule

A spontaneous redox reaction occurs only if the oxidizing agent is above the reducing agent in the table of redox half rxns.

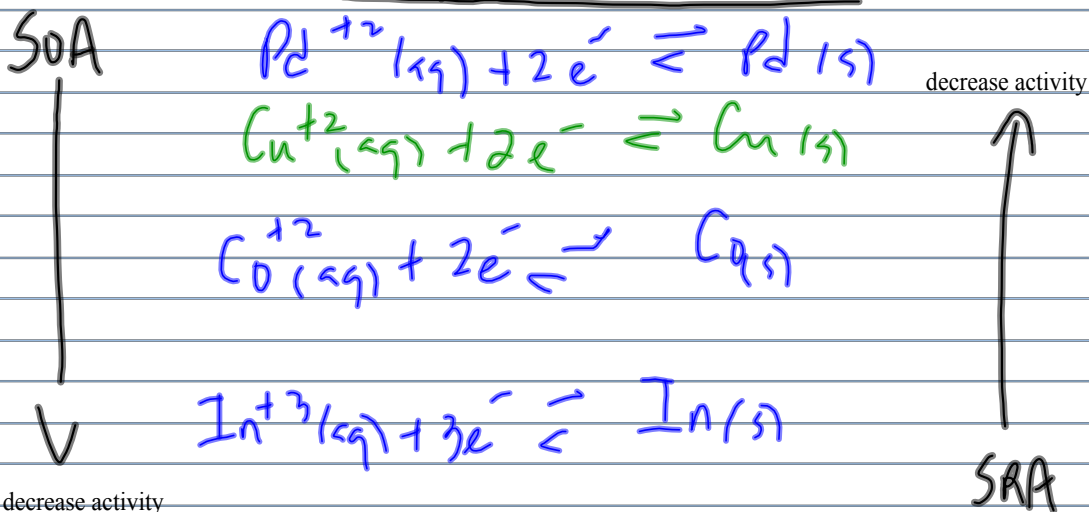




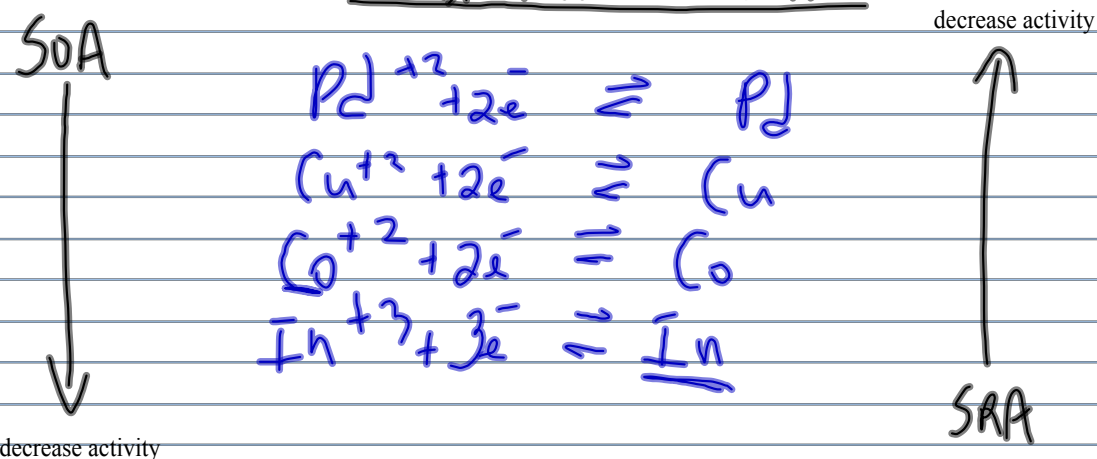
Redox tables can be built by analyzing net ionic equations and observations about Spontaneity.



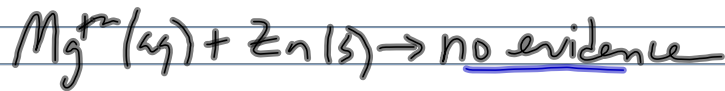
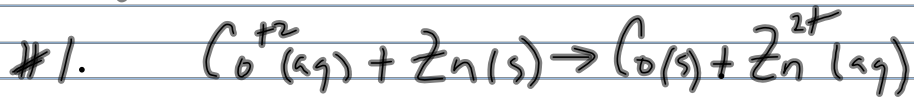
### Redox Half-Reactions



### Redox Half-Reactions

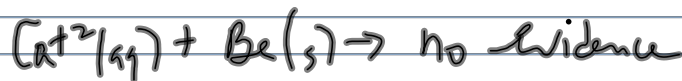
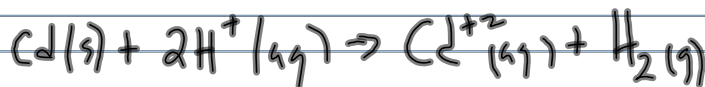
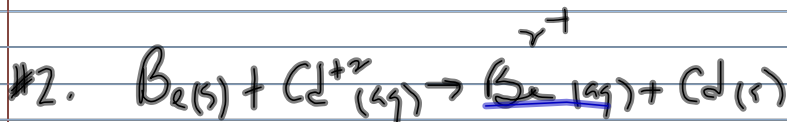


Try:



SoA  
act.  
dec. ↓

↑ act.  
dec.  
SRA



SoA  
act.  
dec. ↓

↑ act.  
dec.  
SRA

May 22/13

□