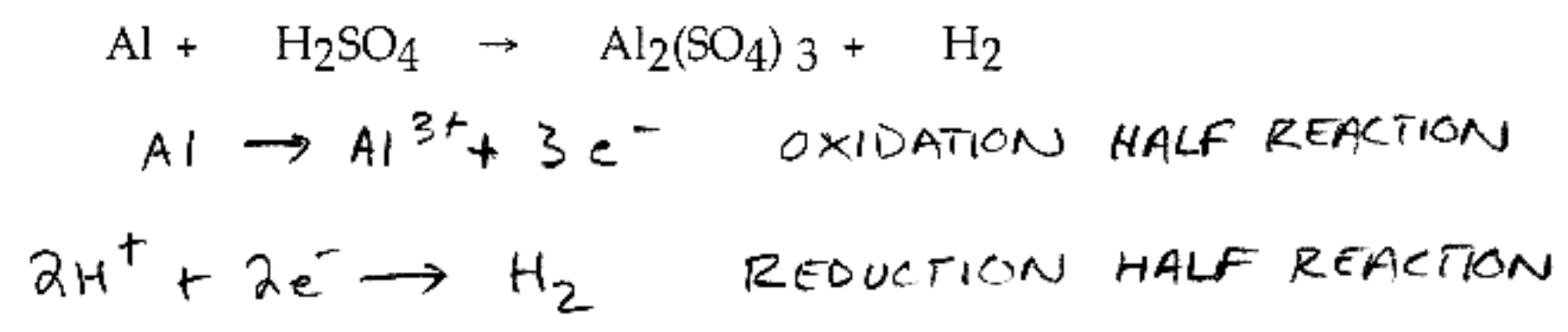


Rest of Redox Reactions Practice Problems

1) When balancing a redox reaction, extra "leftover" electrons should be placed on the product side. (True or False) 1) _____

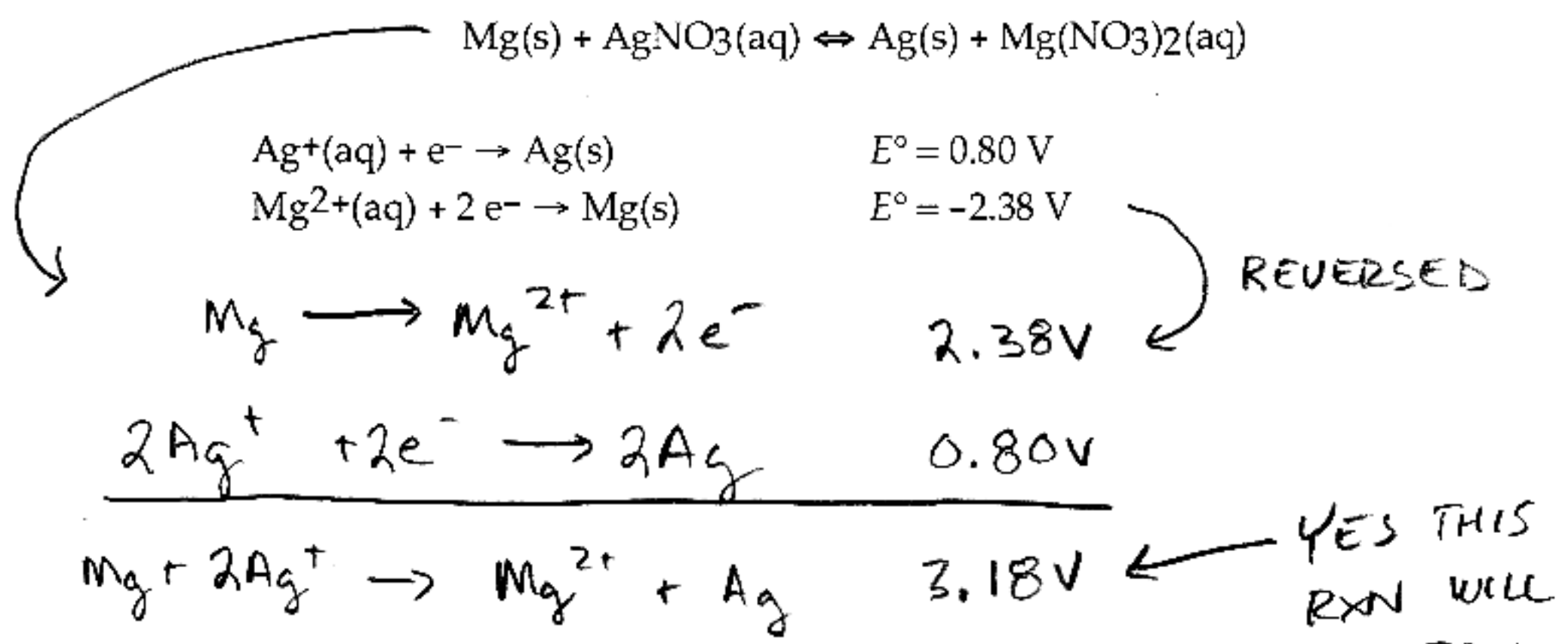
FALSE!

2) What are the balanced oxidation and reduction half reactions in the following unbalanced reaction. If aluminum metal is submersed in sulfuric acid, will this reaction take place? 2) _____



SO₄²⁻ IS SPECTATOR ION

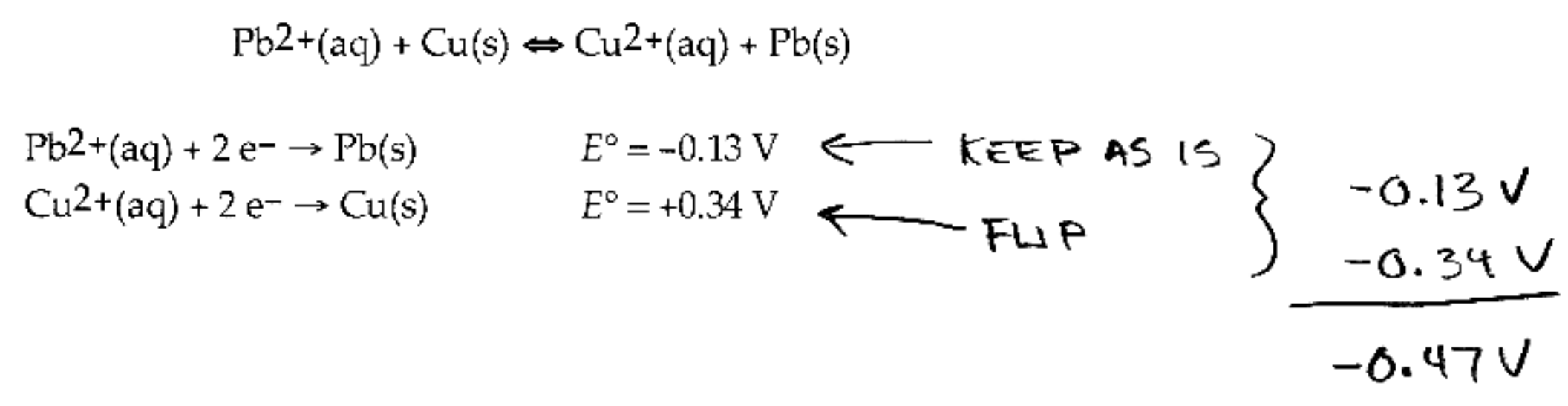
3) Is the following reaction spontaneous in the forward direction? 3) _____



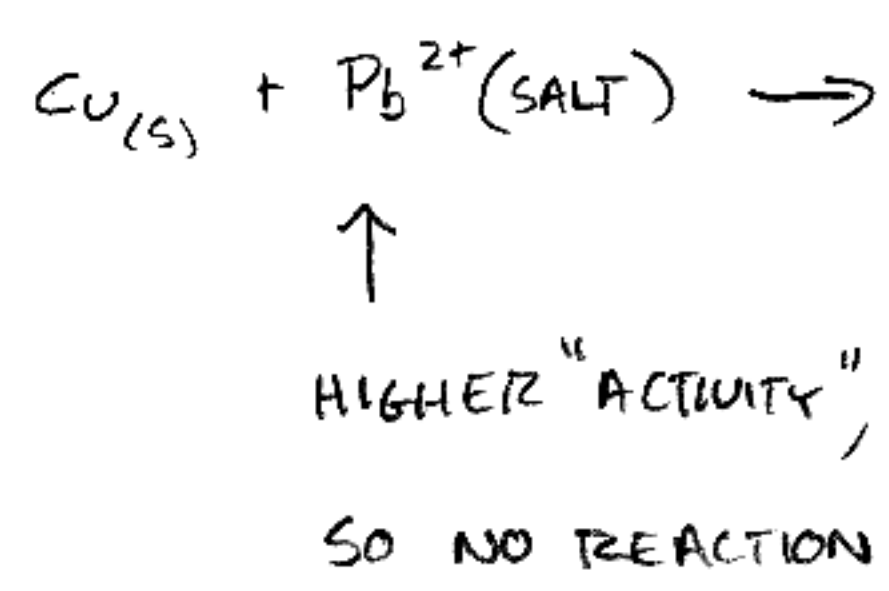
NO₃⁻ (SPECTATOR)

ALSO, YOU COULD LOOK AT THE ACTIVITY SERIES; Mg IS HIGHER THAN Ag, SO RXN WILL HAPPEN

4) Is the following reaction spontaneous in the forward direction? 4) _____

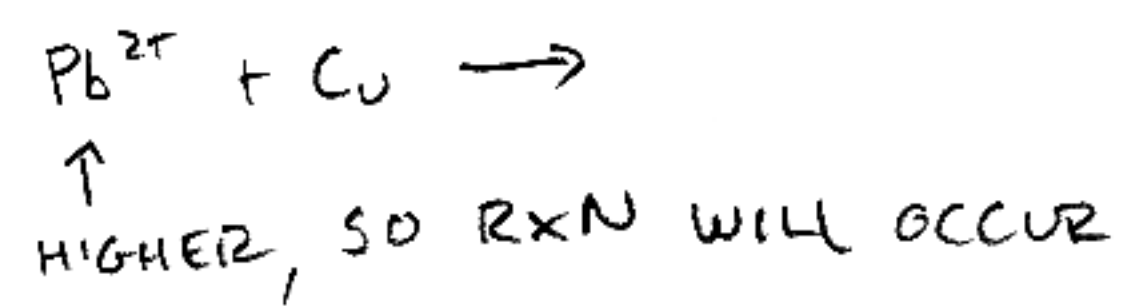


ACTIVITY SERIES:



NO, REACTION WILL NOT OCCUR (E° IS NEGATIVE)

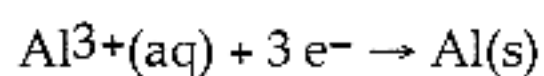
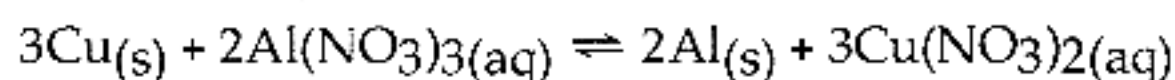
BE CAREFULL WHEN USING THE ACTIVITY SERIES! A COMMON MISTAKE IS



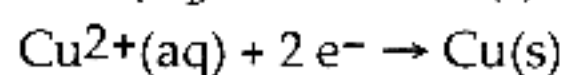
NO!

5) Is the following reaction spontaneous in the forward direction?

5) _____



$$E^\circ = -1.66\text{ V}$$



$$E^\circ = +0.337\text{ V} \leftarrow \text{FLIP}$$

ACTIVITY SERIES:

Al HIGHER, SO NO REACTION.

REDOX POTENTIALS:



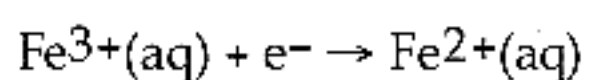
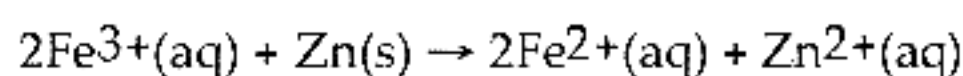
$$\left. \begin{array}{l} -1.66\text{ V} \\ -0.337\text{ V} \end{array} \right\} -2.00\text{ V}$$



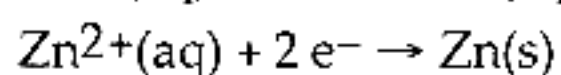
$$\uparrow$$

6) $\frac{E^\circ \text{ NEGATIVE, SO}}{\text{NO RXN}}$

6) Is the following reaction spontaneous in the forward direction?



$$E^\circ = 0.77\text{ V}$$



$$E^\circ = -0.76\text{ V} \leftarrow \text{FLIP}$$

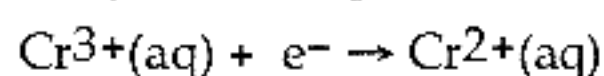
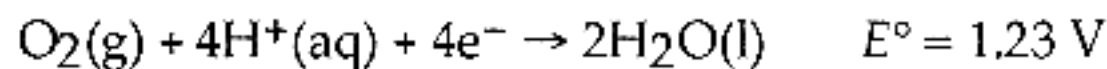
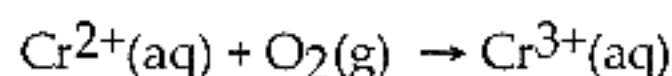
NOTICE, ACTIVITY SERIES WON'T WORK FOR THIS ONE....

$$\begin{array}{r} 0.77\text{ V} \\ +0.76\text{ V} \\ \hline \end{array}$$

$$1.53\text{ V} \leftarrow \text{YES, RXN WILL OCCUR (E}^\circ \text{ POSITIVE)}$$

7) Balance the following reaction that occurs in acidic solution. Is this reaction spontaneous in the forward direction?

7) _____



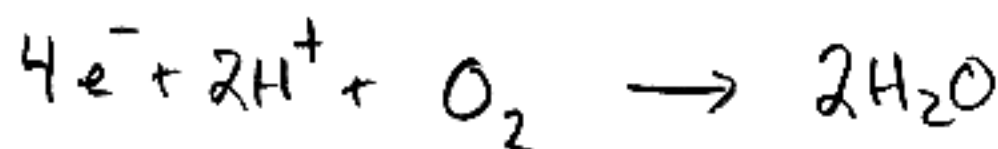
$$\leftarrow \text{FLIP} \rightarrow$$

$$1.23\text{ V}$$

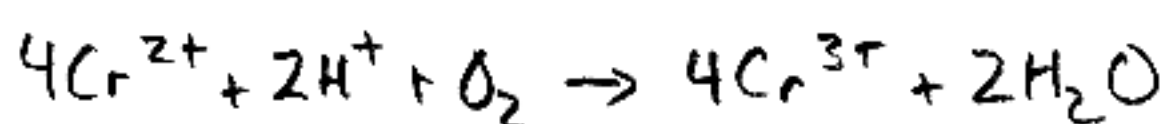
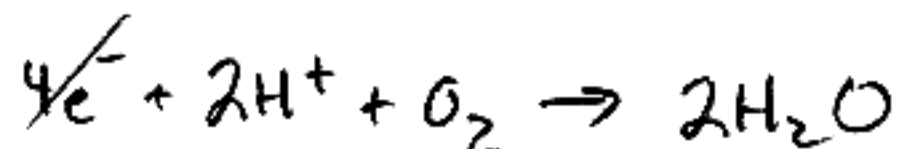
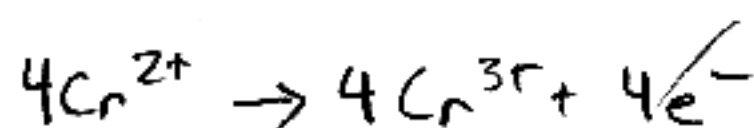
$$0.42\text{ V}$$

$$\hline 1.65\text{ V}$$

→ REACTION WILL OCCUR



↓



1) BALANCE ALL ATOMS EXCEPT H & O

2) BALANCE OXYGEN WITH H₂O

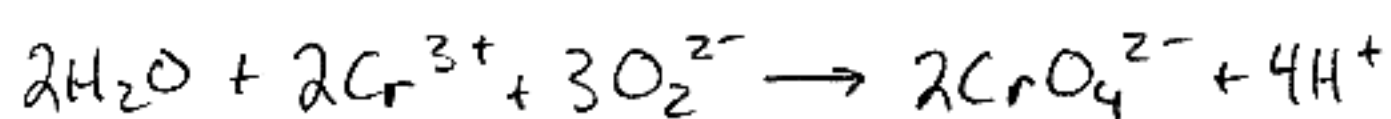
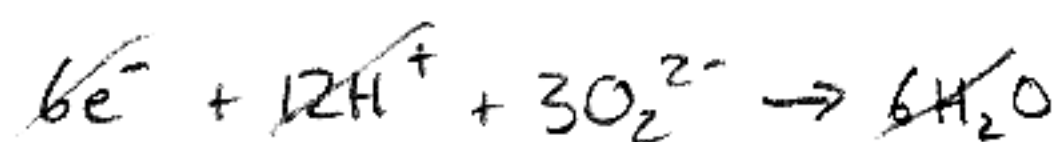
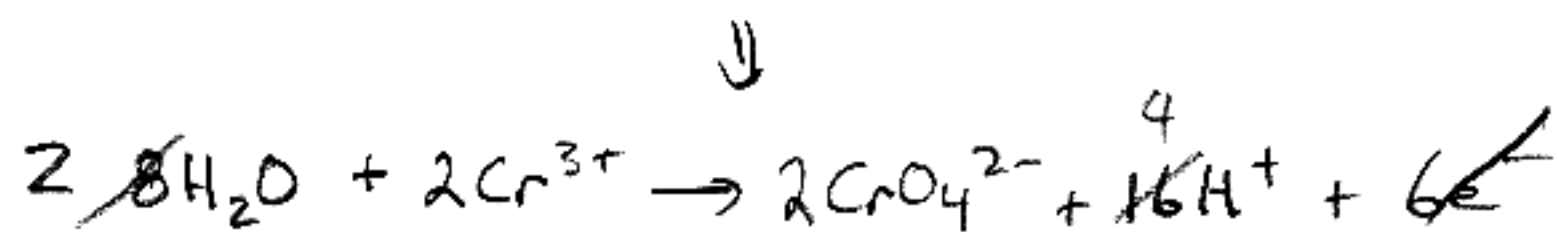
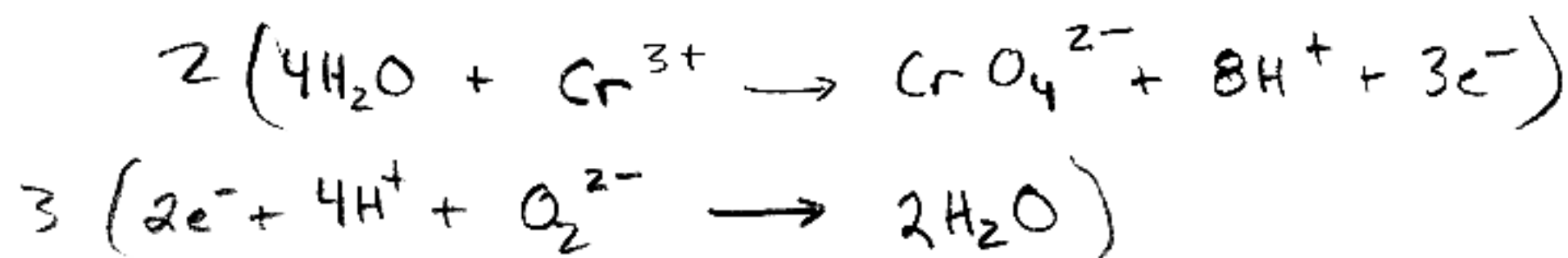
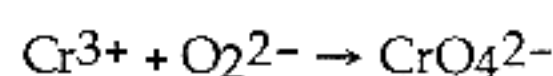
3) BALANCE HYDROGENS WITH H⁺

4) BALANCE CHARGE WITH e⁻

2 BALANCED RXN IS OKAY IN ACIDIC SOLN.

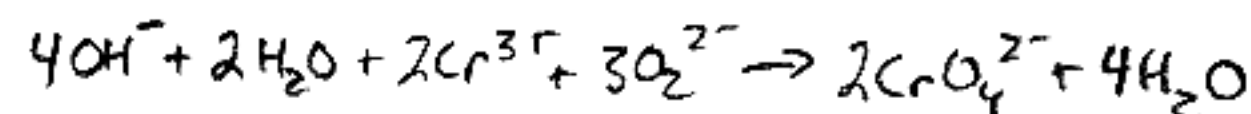
8) Balance the following reaction that occurs in basic solution?

8) _____

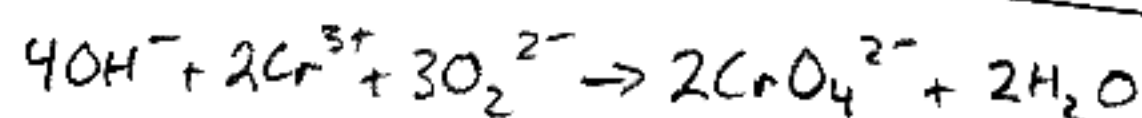


↑
BASIC
SOLUTION

ADD
4OH⁻ TO
BOTH SIDES

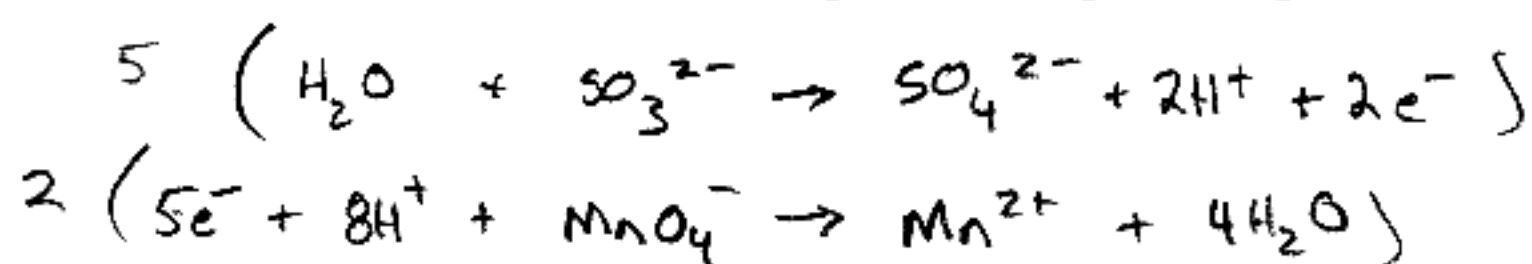
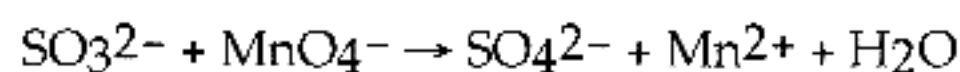


↓ CANCEL H₂O

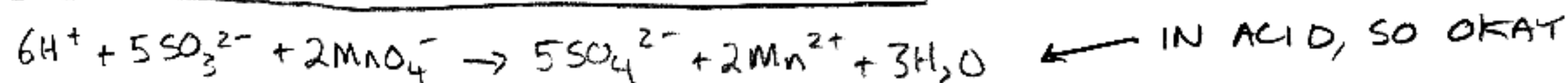
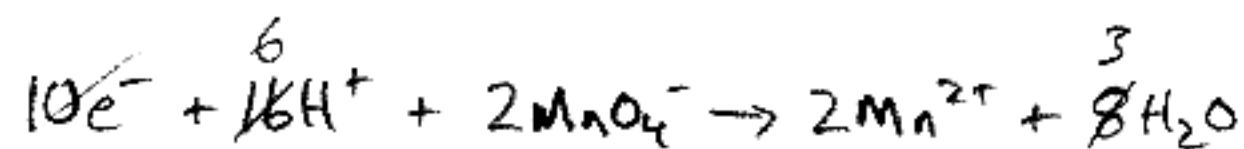
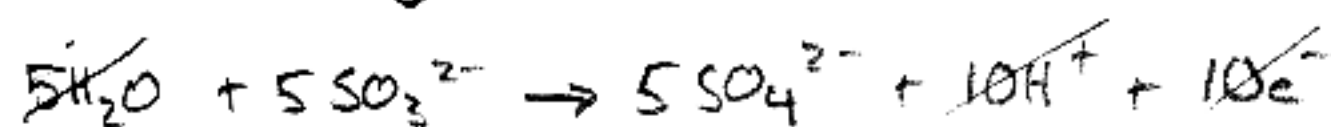


9) Balance the following reaction that occurs in acidic solution?

9) _____

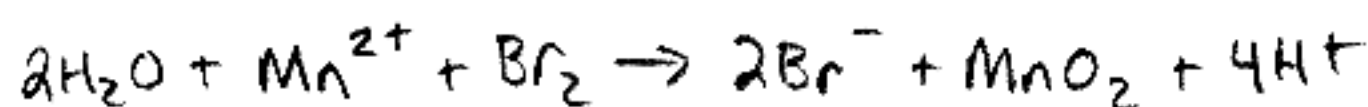
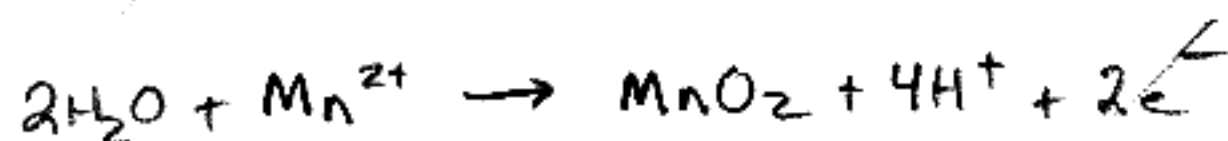
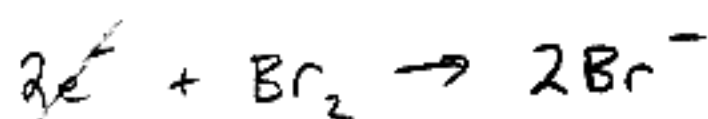
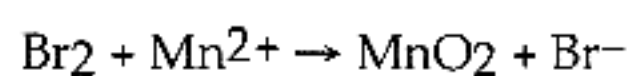


⇓

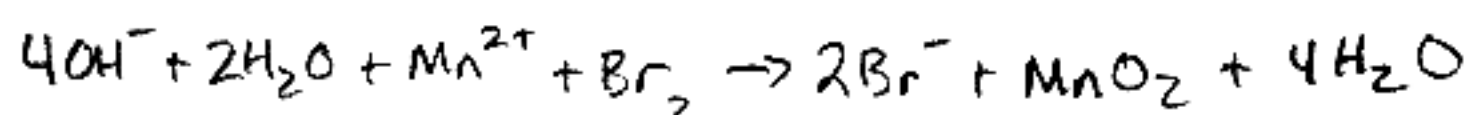


10) Balance the following reaction that occurs in basic solution?

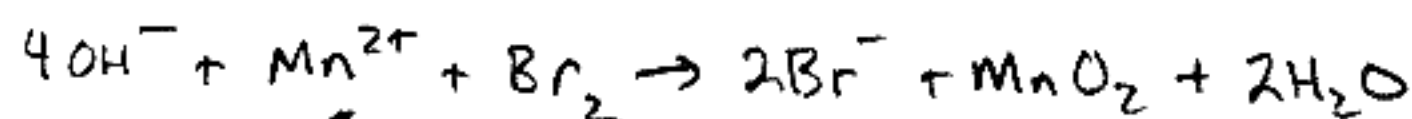
10) _____



⇓ BASIC, SO:

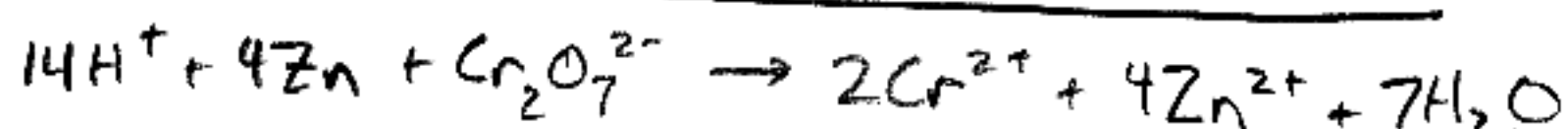
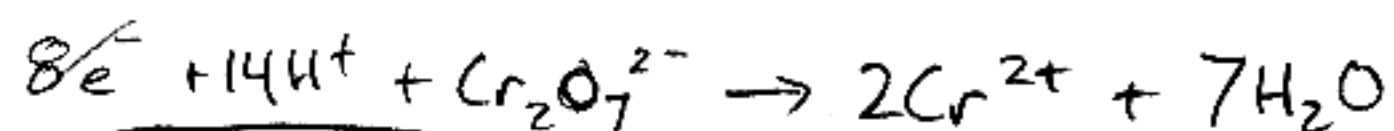
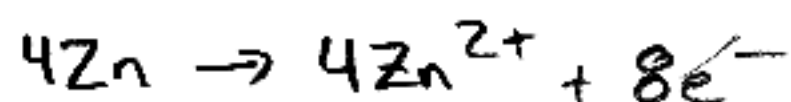
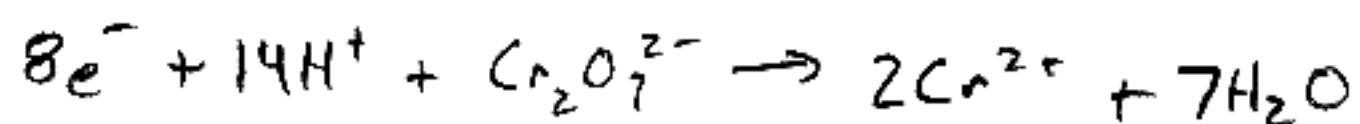
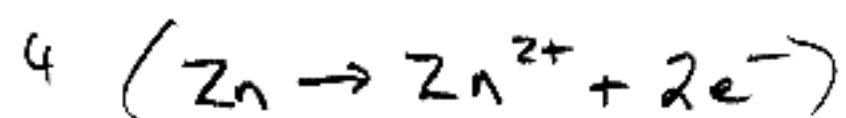
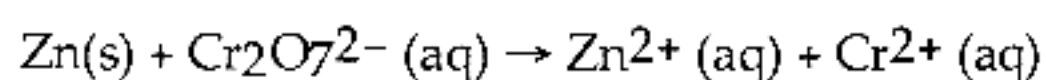


↓ CANCEL H₂O



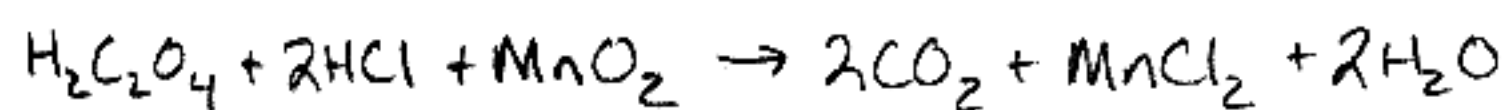
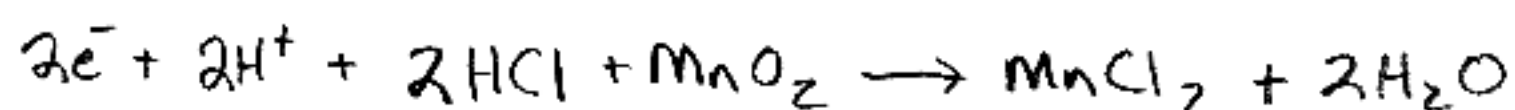
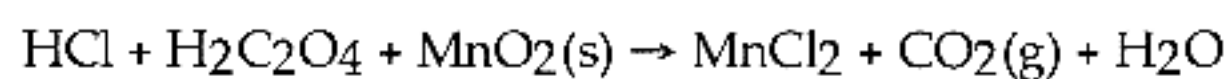
11) Balance the following reaction that occurs in acidic solution?

11) _____



12) Balance the following reaction that occurs in acidic solution?

12) _____



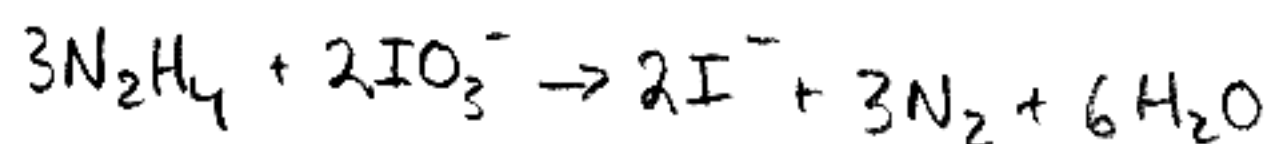
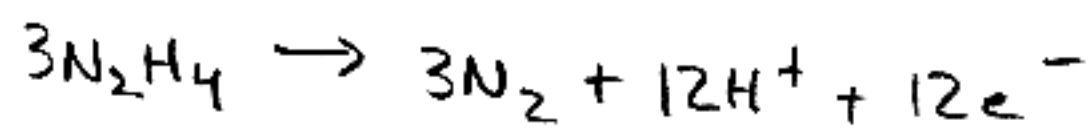
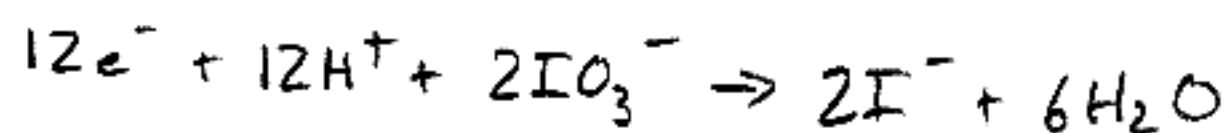
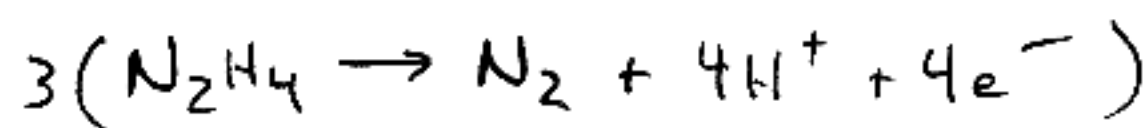
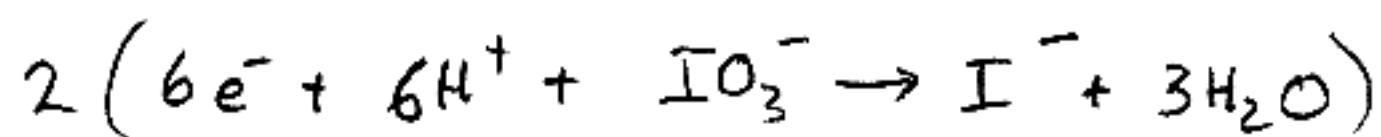
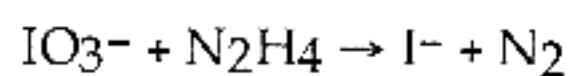
↑

REALLY SHOULD BE



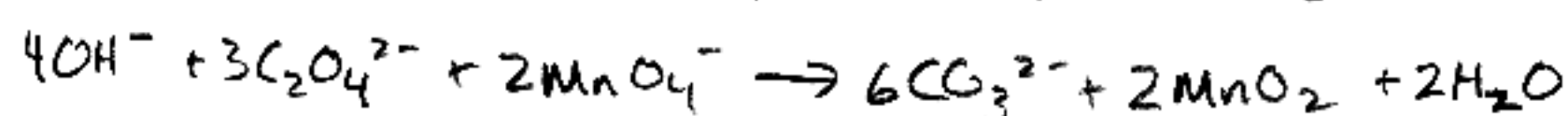
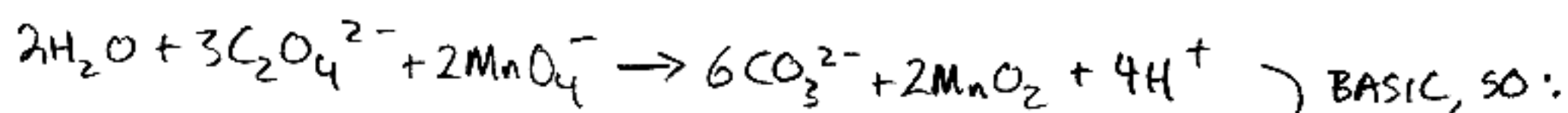
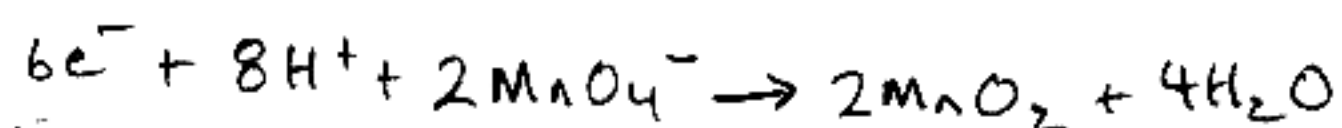
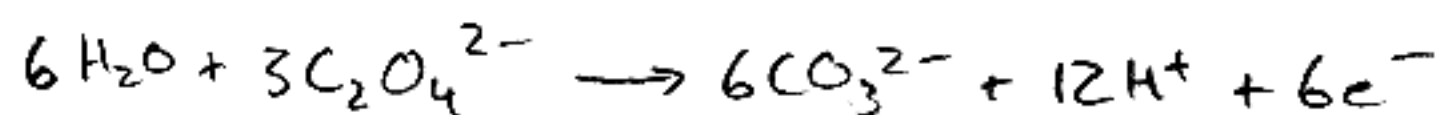
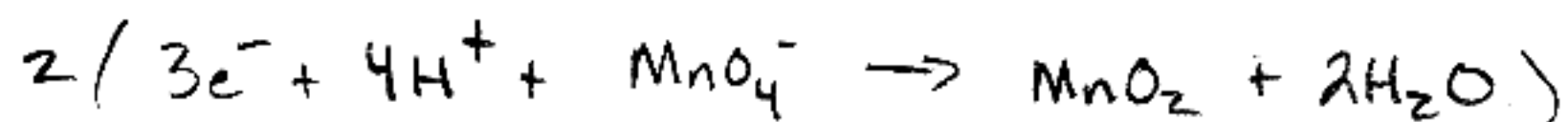
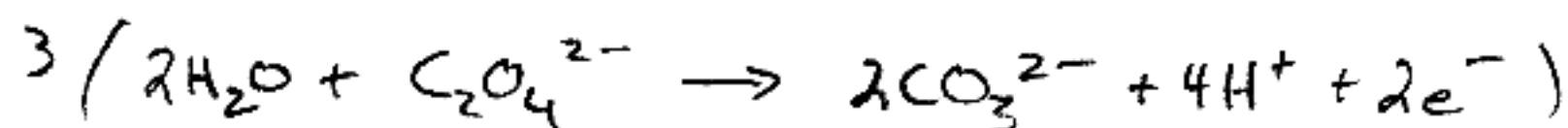
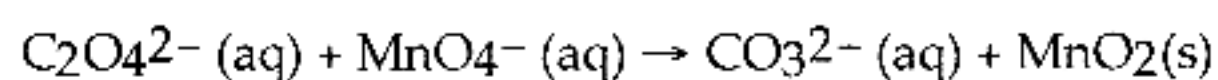
13) Balance the following reaction that occurs in acidic solution?

13) _____



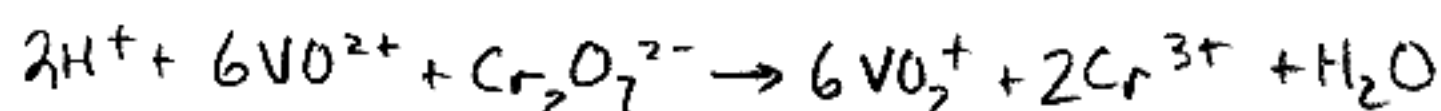
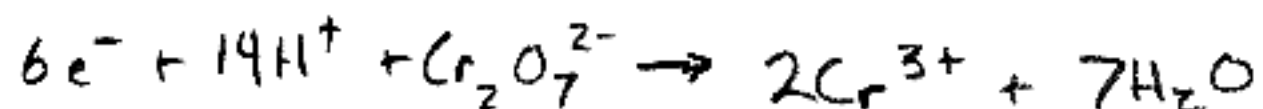
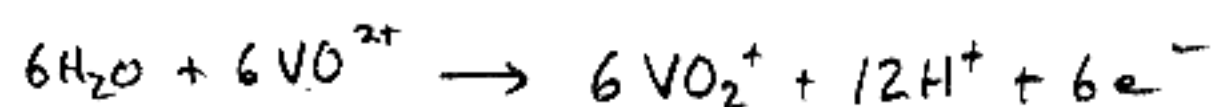
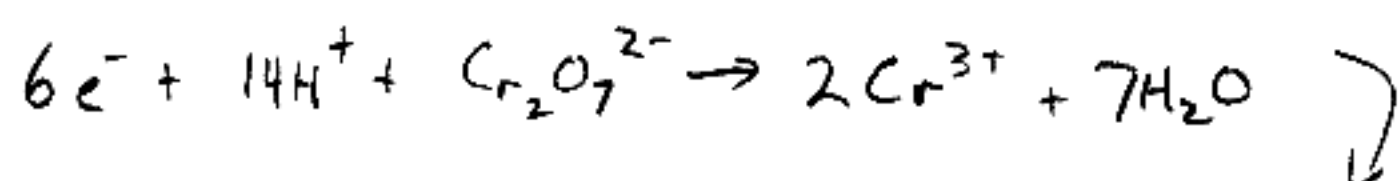
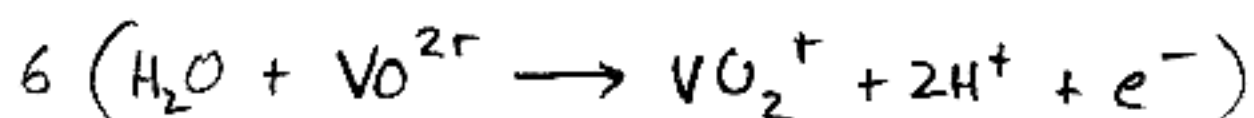
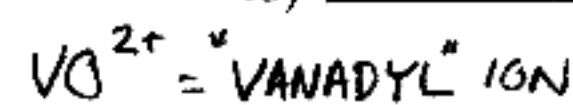
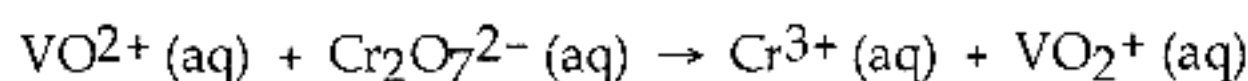
14) Balance the following reaction that occurs in basic solution?

14) _____



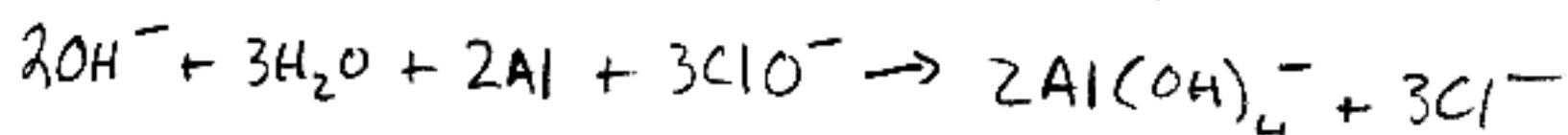
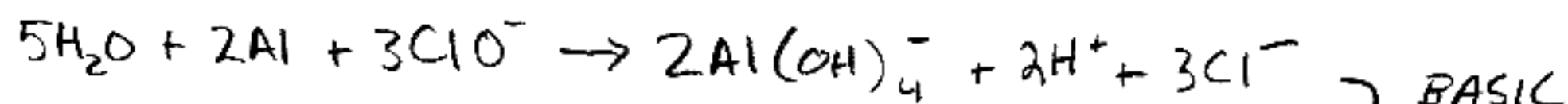
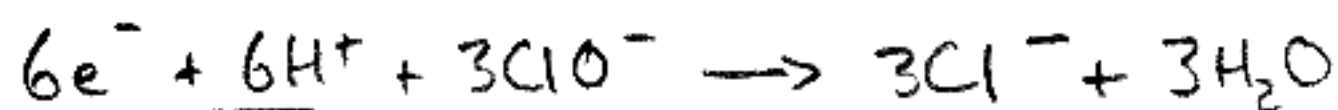
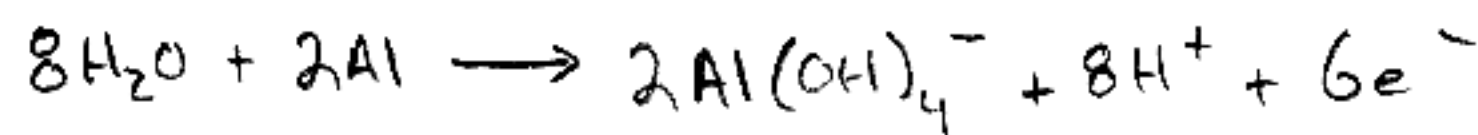
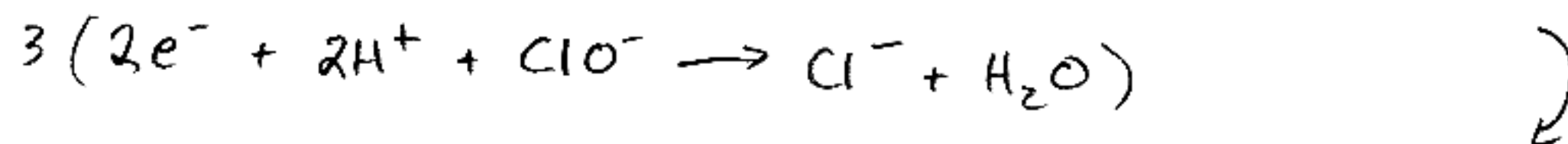
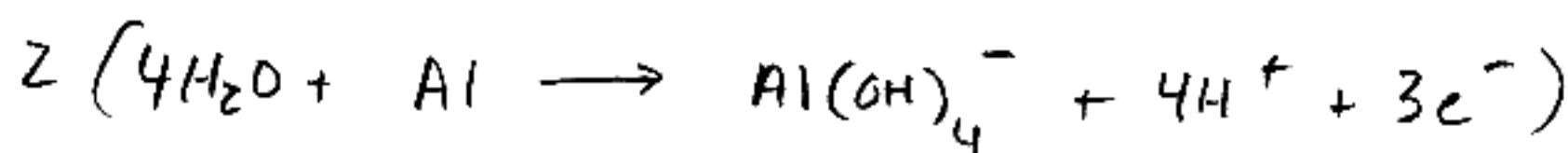
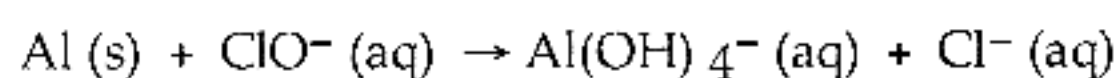
15) Balance the following reaction that occurs in acidic solution

15) _____

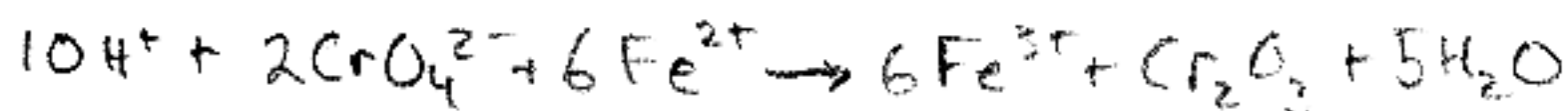
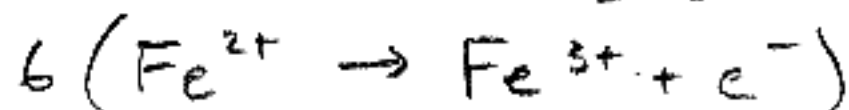
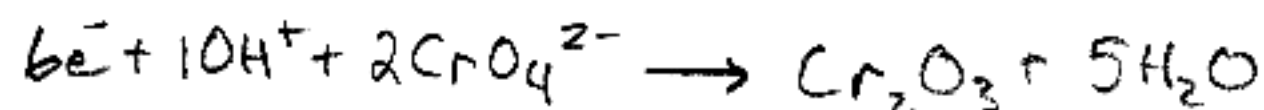
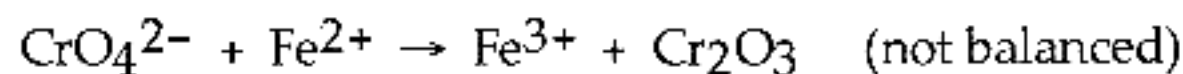


16) Balance the following reaction that occurs in basic solution?

16) _____



- 17) Balance the following equation that occurs in acidic solution. How many milliliters of a 3.85 M solution of Fe^{2+} are needed to titrate 250.0 mL of a 0.125 M CrO_4^{2-} solution? 17) _____



$$250.0 \text{ mL} \times \frac{10^{-3} \text{ L}}{\text{mL}} \times \frac{0.125 \text{ mol CrO}_4^{2-}}{\text{L}} \times \frac{\text{mol Fe}^{2+}}{2 \text{ mol CrO}_4^{2-}} \times \frac{\text{L}}{3.85 \text{ mol Fe}^{2+}} \times \frac{\text{mL}}{10^{-3} \text{ L}} = 4.06 \text{ mL}$$

The following are not redox related.

- 18) Calculate the molarity of Cl^- in 245.0 mL of a solution containing 23.4 g BaCl_2 . 18) _____

$$\frac{23.4 \text{ g}}{245.0 \text{ mL}} \times \frac{\text{mL}}{10^3 \text{ L}} \times \frac{\text{mol BaCl}_2}{208.24 \text{ g}} \times \frac{2 \text{ mol Cl}^-}{\text{mol BaCl}_2} = 0.917 \text{ M}$$

- 19) If the concentration of Na^+ in an aqueous solution of sodium sulfate is $3.2 \times 10^{-1} \text{ mol/L}$, how many moles of sodium sulfate must have been dissolved per liter to make the solution? 19) _____

A) 6.4×10^{-1} B) 1.1×10^{-1} C) 9.6×10^{-1} D) 1.6×10^{-1} E) 3.2×10^{-1}

EXACTLY → $1 \text{ L} \times \frac{0.32 \text{ mol Na}^+}{\text{L}} \times \frac{\text{mol Na}_2\text{SO}_4}{2 \text{ mol Na}^+} = 0.16 \text{ mol Na}_2\text{SO}_4$

- 20) Consider a 1.00-L solution containing 85.5 g $\text{Al}_2(\text{SO}_4)_3$ (FW = 342.15) and 21.3 g Na_2SO_4 (FW = 142.06). What are the molar concentrations of aluminum, sodium, and sulfate ions, respectively? 20) _____

[Al^{3+}], [Na^+], [SO_4^{2-}]

$$85.5 \text{ g} \times \frac{\text{mol Al}_2(\text{SO}_4)_3}{342.15 \text{ g}} \times \frac{2 \text{ mol Al}^{3+}}{\text{mol Al}_2(\text{SO}_4)_3} \times \frac{1}{1.00 \text{ L}} = \boxed{0.500 \text{ M Al}^{3+}}$$

A) 0.50 0.75 0.15

B) 0.25 0.30 0.15

C) 0.50 0.30 0.90

D) 0.25 0.15 0.40

E) 0.50 0.75 0.90

$$21.3 \text{ g} \times \frac{\text{mol Na}_2\text{SO}_4}{142.06 \text{ g}} \times \frac{2 \text{ mol Na}^+}{\text{mol Na}_2\text{SO}_4} \times \frac{1}{1.00 \text{ L}} = \boxed{0.300 \text{ M Na}^+}$$

SO_4^{2-} :

$$85.5 \text{ g} \times \frac{\text{mol Al}_2(\text{SO}_4)_3}{342.15 \text{ g}} \times \frac{3 \text{ mol SO}_4^{2-}}{\text{mol Al}_2(\text{SO}_4)_3} = 0.74967 \text{ mols SO}_4^{2-}$$

$$21.3 \text{ g} \times \frac{\text{mol Na}_2\text{SO}_4}{142.06 \text{ g}} \times \frac{\text{mol SO}_4^{2-}}{\text{mol Na}_2\text{SO}_4} = 0.14994 \text{ mols SO}_4^{2-}$$

ADD TOGETHER

$$0.900 \text{ mol SO}_4^{2-}$$

IN 1.00 L → $\boxed{0.900 \text{ M SO}_4^{2-}}$