CHEMISTRY 101 **SPRING 2005** NAME

EXAM 2 S 501-511

Form A Signature

PART 2

Please read and sign: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam."

25. Consider the reaction: $\overset{+3\ -2}{As_2O_3} + 5\overset{+1\ -2}{H_2O} + 2\overset{0}{I_2} \rightarrow 2\overset{+1\ +5\ -2}{H_3AsO_4} + 4\overset{+1\ -1}{HI}$.

6/6

(2 pts) Which is the element being oxidized? As

(2 pts) The element changes in oxidation number from +3 to +5.

(2 pts) The oxidizing agent is I_2.

(6 pts) **26.** Write the formula unit, total ionic and net ionic equations for the neutralization reaction that would yield the salt, $Fe(ClO_4)_3$. (Note: there will be deductions if you forget to put the correct phase and charges for all species **for all equations**.)

4

acid + base → salt + H_2O

formula → $3HClO_4(aq) + Fe(OH)_3(s) \rightarrow Fe(ClO_4)_3(aq) + 3H_2O(l)$

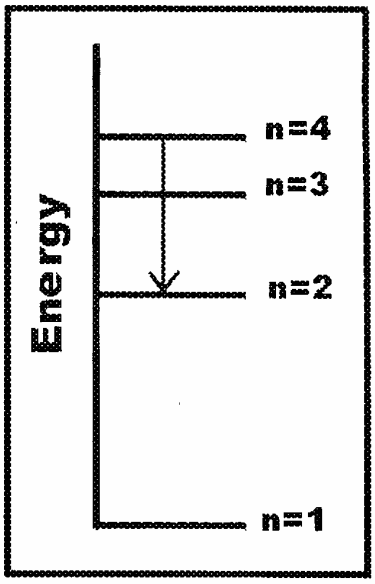
total ionic → $3H^+(aq) + 3ClO_4^-(aq) + Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe^{3+}(aq) + 3ClO_4^-(aq) + 3H_2O(l)$

net ionic → $3H^+(aq) + 3OH^-(aq) \rightarrow 3H_2O(l)$

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

OVER ⇒

(7 pts) **27.** In class we had a demonstration of the emission lines of hydrogen. In this experiment, 4.09×10^{-19} J of energy is released as blue-green light when one electrons falls from the n=4 to the n=2 principle energy level.



Calculate the wavelength of light emitted (in Å) when one excited electron went from the n=4 energy level to the n=2 energy level. (1 Å = 1×10^{-10} m)

$C = \lambda\nu$

$E = h\nu$

$E = h\nu \rightarrow \frac{E}{h} = \nu$

$\frac{4.09E-19\,J}{6.63E-34\,J/s}$

$\nu = 6.17E14\,s$

$C = \lambda\nu \rightarrow \lambda = \frac{C}{\nu}$

$= \frac{3E8\,m/s}{6.17E14\,s}$

$\lambda = 4.86E-7\,m \times \frac{1\,Å}{1E-10\,m}$ 2/2

$\boxed{\lambda = 4862.24\,Å}$

$E = h\nu$

$C = \lambda\nu \quad E = \frac{hc}{\lambda}$

$c/\lambda = \nu$

$\lambda = \frac{hc}{E} = 4.86E-7$

$NaCO_3 + Cu(NO_3)_2$

(6 pts) **28.** (a) Write the formula unit, total ionic and net ionic equations for the precipitation reaction between sodium carbonate and copper(II) nitrate. (Note: there will be deductions if you forget to put the correct phase and charges for all species **for all equations**.)

formula unit → $2NaCO_{3(aq)} + Cu(NO_3)_{2(aq)} \rightarrow 2NaNO_{3(aq)} + Cu(CO_3)_{(s)}$

total ionic → $2Na^+(aq) + 2CO_3^-(aq) + Cu^{2+}(aq) + 2NO_3^-(aq)$

$\rightarrow 2NaNO_3(aq) + Cu^{2+}(aq) + 2CO_3^-(s)$

net ionic → $2Na^+(aq) + 2NO_3^-(aq) \rightarrow 2NaNO_3(s)$

$Na^+(aq) + NO_3^-(aq) \rightarrow NaNO_3(s)$ 3

6

(4 pts) (b) Show all the major species present in the beaker before the reaction occurs and after the reaction is finished. You don't need to include water.

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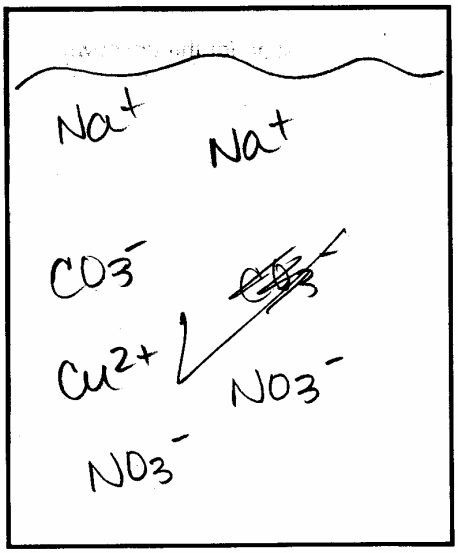
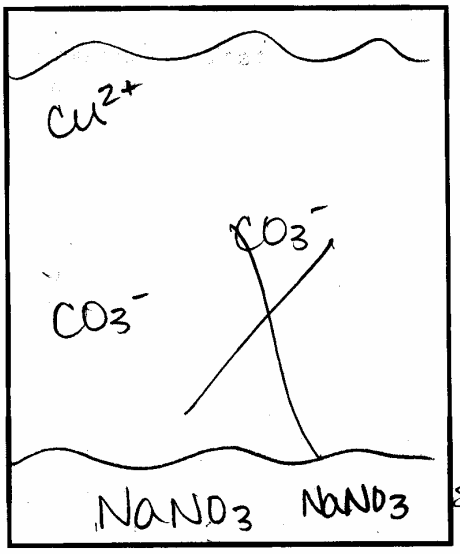
Cu^{2+}, CO_3^- spectator ions





solid

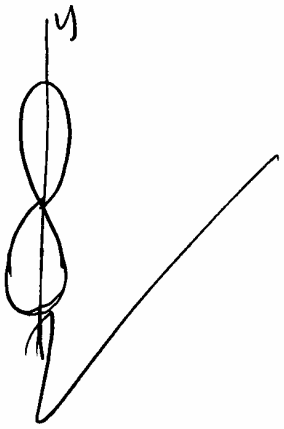
BEFORE OK according to above **AFTER**

35/ good

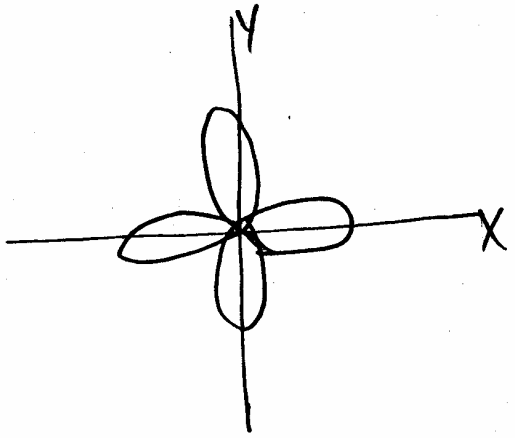
OVER ⇒

(6 pts) **29.** Sketch the following orbitals. Label the relevant axes.

(a) p_y orbital



(b) $d_{x^2-y^2}$ orbital



6/6

(5 pts) **30.** Write out an acceptable ground state electronic configuration for the unknown element with atomic number 115. Use the correct noble gas to abbreviate the configuration.

$[Rn]\,7s^2\,5f^{14}\,6d^{10}\,7p^3$

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