3.1	***3.2***	***3.3***	***3.4***	***3.5***	***Total***
1	2	3	2	6	14

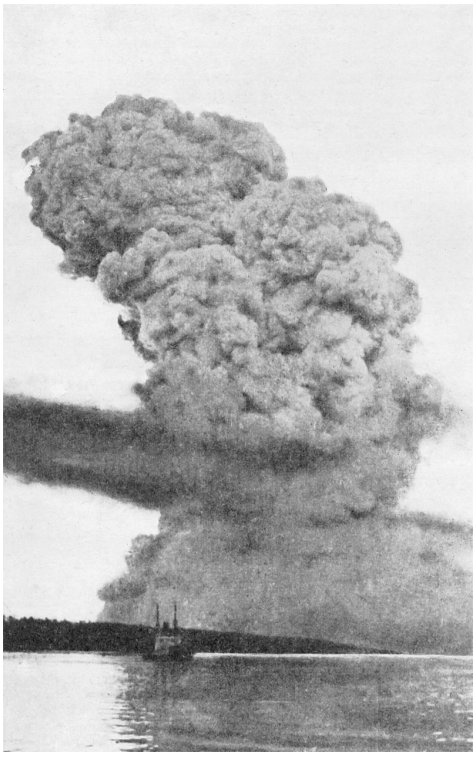
Problem 3. Electrochemical Reduction of Explosives, Hosted by 21st Camper "Drek Wang"

A hydroxy derivative of benzene is nitrated, installing -NO_2 groups on the ring. Drek dissolves 0.4596g of the nitrated compound in inert solvent, and then tries to reduce the nitro groups on the compound to NH_2 groups electrolytically, applying a current of 20 A for 3.63 minutes. However, the faradaic yield was only 80 % (that is, the yield of the reduced compound as a percentage of the maximum amount that could be formed by the passage of this amount of electricity).

3.1 Write the half reaction for the reduction of R-NO_2 to R-NH_2 in acid.
3.2 Determine the molecular mass of the compound.
3.3 Determine the molecular formula of the compound, and draw a reasonable structure.

The pK_a of the nitrated compound is .38, which is rather low for such an organic compound.

3.4 Why is the nitrated compound so acidic? (*Hint: Consider the resonance structures of the conjugate base)*
3.5 Drek spills some of the compound into deionized water (clumsy fool!) resulting in a solution with concentration $2.1 \cdot 10^{-7}$ M. Calculate the pH of the resulting solution.



Proposed by Anugrah C.