3. A sample of ore containing the mineral tellurite, TeO_2, was dissolved in acid. The resulting solution was then reacted with a solution of $K_2Cr_2O_7$ to form telluric acid, H_2TeO_4. The unbalanced chemical equation for the reaction is given below.

$$\ldots TeO_2(s) + \ldots Cr_2O_7^{2-}(aq) + \ldots H^+(aq) \rightarrow \ldots H_2TeO_4(aq) + \ldots Cr^{3+}(aq) + \ldots H_2O(l)$$

(a) Identify the molecule or ion that is being oxidized in the reaction.

(b) Give the oxidation number of Cr in the $Cr_2O_7^{2-}(aq)$ ion.

(c) Balance the chemical equation given above by writing the correct lowest whole-number coefficients on the dotted lines.

In the procedure described above, 46.00 mL of $0.03109\ M$ $K_2Cr_2O_7$ was added to the ore sample after it was dissolved in acid. When the chemical reaction had progressed as completely as possible, the amount of unreacted (excess) $Cr_2O_7^{2-}(aq)$ was determined by titrating the solution with $0.110\ M$ $Fe(NO_3)_2$. The reaction that occurred during the titration is represented by the following balanced equation.

$$6\ Fe^{2+}(aq) + Cr_2O_7^{2-}(aq) + 14\ H^+(aq) \rightarrow 2\ Cr^{3+}(aq) + 6\ Fe^{3+}(aq) + 7\ H_2O(l)$$

A volume of 9.85 mL of $0.110\ M$ $Fe(NO_3)_2$ was required to reach the equivalence point.

(d) Calculate the number of moles of excess $Cr_2O_7^{2-}(aq)$ that was titrated.

(e) Calculate the number of moles of $Cr_2O_7^{2-}(aq)$ that reacted with the tellurite.

(f) Calculate the mass, in grams, of tellurite that was in the ore sample.

S T O P

If you finish before time is called, you may check your work on this part only.
Do not turn to the other part of the test until you are told to do so.