Name: _____ Date: _____

Introduction: Chemistry is often used to help answer questions of how old or authentic objects are. Clever forgeries have fooled people into paying more money for an object than it is worth or believing something is true that is not. The following reading selection describes one incident.

Procedure:
1. Read the story through one time to get the overall idea.
2. Read it again and write chemical equations for the reactions described.
3. Draw an illustration that would help a non-scientist understand how the test worked.

Diaries: A modern day con game[1]

In the early 1980s, publishers of Stern, a leading West German weekly magazine, paid about four million dollars for what they believed were Adolf Hitler's diaries. Stern purchased the sixty-four volumes of diaries after first having handwriting experts analyze the documents for possible forgery. The forged diaries appeared so genuine, however, that they fooled those experts. Chemical analysis is another method that can be used to test for authenticity, and chemical tests showed that the diaries were fraudulent. Although some chemistry is very sophisticated, you would be surprised as to how much chemists discover with simple chemical tests. The chemical analysis of the diaries is an illustration of this. Chemists know that most chlorides (such as sodium chloride which is table salt) are soluble in water. There are three exceptions, one of which is silver chloride. Chemists used this simple solubility rule in one of the tests performed on the Hitler Diaries. The ink used in the Hitler Diaries contained chloride ions. When you apply such an ink to paper, the chloride ions migrate through the paper away from the original ink lines for about two years. The maximum migration distance is only about 3 mm from the original point of ink application. Chemists soaked pages of the Hitler Diaries in a silver nitrate solution to locate the chloride ions. Silver ions react with chloride ions to form insoluble silver chloride. Since silver chloride is insoluble, it doesn't wash off the paper when the paper is placed in the silver nitrate solution. When freshly made, silver chloride is white. When exposed to light, the white silver chloride turns black as it decomposes into silver atoms and chlorine molecules. We take advantage of this when we use silver salts in photographic film. Using a microscope, chemists carefully examined the lines of ink in the diaries that were treated with silver nitrate. They saw small black specks of silver surrounding the original ink lines. All black specks of silver were less than 3 mm away from the original ink lines. Since it takes two years for the chloride ions to migrate 3 mm away from the original ink lines, the diaries that the chemists examined had to

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be less than two years old. Hitler died in 1945, therefore the diaries should have been several decades old and the chloride ions in the ink would have migrated the 3 mm distance from the ink lines. Think what might have happened without those chemical tests. Historians would have accepted the diaries as historical documents, and researchers would have wasted untold numbers of man-hours studying them. Your history courses would contain incorrect information and interpretations.

[1] Reprinted with permission. Adopted from an article written by Ronald DeLorenzo appearing in General Chemistry by Kask and Rawn,1993, page 148, Wm. C. Brown Publishers.

Chemical equations:

Drawing: