

Invest 6.1A: Rate Dependant Factors

INTRODUCTION:

Thiosulfate ions react in acid solution to produce a precipitate of sulfur according to the equation:



The rate of the reaction can be followed by measuring the time taken for a fixed amount of sulfur to be produced. This practical first examines the effect on the rate of the reaction when the concentration of thiosulfate ions is altered at a fixed temperature. Then it examines how the rate varies with temperature for a fixed concentration of thiosulfate ions.

ENVIRONMENTAL CARE: Sodium thiosulfate is known as photographers 'hypo' for fixing developed films and prints. To minimize pollution the concentrations of thiosulfate ions have been kept low and only very small amounts of sulfur dioxide are evolved. The residues can be disposed of down the sink.

SAFETY: There are no particular hazards associated with this practical except that you should avoid breathing in any sulfur dioxide that is evolved while you are waiting for the cross to disappear.

PROCEDURE:

1. Concentration.

- Measure 50 cm³ of 0.20 mol dm⁻³ sodium thiosulfate solution into a conical flask.
- Place the flask onto a white piece of paper or note card marked with a black "X".
- Measure out 5 cm³ of 2.0 mol dm⁻³ hydrochloric acid into a measuring cylinder and then add the acid to the thiosulfate starting a stop-clock at the same time.
- Swirl the contents of the flask initially to mix and then allow the flask to remain still on the tile.
- Look down vertically through the solution and time how long it takes for the cross to "just" disappear.
- Rinse the flask out immediately but take care not to get the X on the paper wet.
- Then put 40 cm³ of the 0.20 mol dm⁻³ sodium thiosulfate solution into the flask and add 10 cm³ of water.
- Add 5 cm³ of the hydrochloric acid and time as before.
- Repeat the experiment four more times using 30, 20, 15 and 10 cm³ of the thiosulfate solution making the total volume up to 50 cm³ with water each time.

2. Temperature.

- Measure 10 cm³ of 0.20 mol dm⁻³ thiosulfate solution. Add distilled water to a total volume of 50 cm³ into the conical flask and warm until the temperature is one or two degrees above 30-35 °C on a hot plate.
- Place the flask on the tile marked with a cross and add 5 cm³ of 2.0 mol dm⁻³ hydrochloric acid, timing as before.
- Record the temperature of the mixture after the acid has been added.
- Repeat the experiment using fresh portions of the 0.20 mol dm⁻³ thiosulfate solution each time at temperatures of approximately 40, 50 and 60 °C.

Lab Investigation 33a

Smith College



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Manual of Mental and Physical Tests: Complex processes Guy Montrose Whipple, 1921 Manual of Mental and Physical Tests. A Book of Directions Compiled with Special Reference to the Experimental Study of School Children in the Laboratory Or Classroom Guy Montrose Whipple, 1915 Investigations in Ore Dressing and Metallurgy [Testing and Research Laboratories] Canada. Bureau of Mines, 1938 Investigations in Ore Dressing and Metallurgy (testing and Research Laboratories). Canada. Mines and Geology Branch, 1937 Earlier reports are found in the Summary *Manual of mental and physical tests v.2, 1915* Guy Montrose Whipple, 1915 *Design and Construction of Forest Service Dams for Use of Civilian Conservation Corps* United States. Forest Service, 1935 **Subject Index to Unclassified ASTIA Documents** Defense Documentation Center (U.S.), 1960 **Report of Investigations - Laboratory of Anthropology, Washington State University** Washington State University. Laboratory of Anthropology, 1957 *Test Reports* Michigan. Dept. of State Highways. Testing Laboratory Section, 2005 **A Study of Simian Retrovirus, Type 1 (SRV-1) Infection, and Genetically Engineered Envelope Polypeptides SRV-1-gp20 and -gp70** Hwei-Sing Kwang, 1987 *Nuclear Science Abstracts*, 1976-05 **Agricultural Appropriation Bill** United States. Congress. Senate. Committee on Appropriations, 1928 *Bulletin* Smith College, 1924 **General Register** University of Michigan, 1921 Announcements for the following year included in some vols The Annual Catalogue of Purdue University, Lafayette, Indiana ... with Announcements for ... Purdue University, 1921 *Announcements for the Year ...* Purdue University, 1920 **Catalogue and Register** University of Michigan, 1918 Announcements for the following year included in some vols **Official Circulars, Smith College** Smith College, 1927 *Investigations of Fuels and Fuel Testing* Canada. Mines Branch, 1927 **Catalogue of the College of Arts and Sciences and the College of Agriculture** Canton Christian College, Canton Lingnan University (China), 1924

Lab Investigation 33a: Bestsellers in 2023 The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous captivating novels enthralling the hearts of readers worldwide. Lets delve into the realm of bestselling books, exploring the fascinating narratives that have enthralled audiences this year. Lab Investigation 33a : Colleen Hoover's "It Ends with Us" This touching tale of love, loss, and resilience has gripped readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Lab Investigation 33a : Taylor Jenkins Reid's "The Seven Husbands of Evelyn Hugo" This captivating historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reid's absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Lab Investigation 33a : Delia Owens' "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These bestselling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and thrilling novel that will keep you guessing until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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