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| **Online Pre-Lab and Hazard Analysis** | | | | | | | |
| *To be completed and submitted online by 1AM on the day of your lab; students MUST ALSO bring a printed copy to the lab as your procedure and to record observations or else be dismissed from that week’s lab and receive zeroes.* | | | | | | | |
| **Experiment name:** | | Seawater analysis part 2 | | | | | |
| **Student name:** | | **Aseem Awasthy** | | | | | |
| **Laboratory objective(s):** | | 1. Weigh the AgCl and BaSO4  2. Titrate both calcium and magnesium using Calcon and Calmagite indicators | | | | | |
| **Equipment Required:  (list or paragraph)** | | Weighing paper  Metal spatula  Scale  50 ml beaker  50 ml buret  Stir bar/stirrer  Graduated cylinder | | | | | |
| **Chemicals Required: (list or paragraph)** | | **AgCl,BaSO4(from last lab)**  **EDTA**  **NaOH**  **Calcon Indicator**  **NH3**  **NH4Cl**  **Calmagite** | | | | | |
| **Procedure:**  *Use your own words. Steps can be combined.* (Add rows as needed) | | **List hazards for each step**  *(See Table 1 for examples)* | | **Risk Level #**  **(Probability x Consequence)**  *Use Table 2* | | **Hazard Mitigation**  *(How can you avoid the hazards you listed?)* | |
| Place 20 mL .05M EDTA in buret(Close bottom before) | | Spilling hazard | | 2 | | Make sure bottoms closed before and use funnel to lessen risk | |
| Pipet 4 mL of seawater with volumetric pipet into 50mL glass beaker | | Spilling hazard handling glass ware | | 4 | | Handle the glass firmly and don’t squeeze pipet to hard. | |
| Add 10mL of .15 NaOH with graduate cylinder. Put stirring bar in beaker | | Spilling hazard handling glass ware | | 4 | | Handle glass firmly and don’t drop stirring bar in beaker place it. | |
| Add 5 drops of .4% Calcon | | Spilling hazard | | 2 | | Drop the indicator slowly | |
| Start stir plate and allow calcon to mix to bright pink | | N/A | | 0 | |  | |
| Record Volume in buret then titrate the seawater with .05 M EDTA in buret | | Spilling hazard | | 2 | | Titrate slowly | |
| Open stopcock and allow EDTA to drop steadily. Endpoint is blue control flow as to not overshoot it and record final volume in buret | | Spilling hazard | | 2 | | Make sure you open stopcock slowly | |
| Repeat above steps for 3 trials before moving on. | |  | |  | |  | |
| Add 20 mL .05 EDTA to buret with help of funnel | | Spilling hazard handling glass ware | | 4 | | Make sure funnel is sturdy | |
| Pipet 4mL of seawater into 50mL glass beaker | | Spilling hazard handling glass ware | | 4 | | Don’t squeeze pipet to hard | |
| Add 10mL 1.5M NH3/.3M NH4Cl buffer and mix gently | | Spilling hazard handling glass ware | | 4 | | Handle glass firmly | |
| Add 4 drops of Calmagite | | Spilling hazard | | 2 | | Don’t squeeze pipet to hard | |
| Titrate with EDTA solution to endpoint when it changes color  Open stopcock to drop steady, After sharp change from pink to purple close stopcock allow solution to stir and wait until reaction reaches equilibrium then open stopcock until color is blue | | Spilling hazard handling glass ware | | 4 | | Handle glass firmly  Make sure bottoms closed before  Titrate slowly | |
| Record final volume | | N/A | | 0 | |  | |
| Volume of EDTA = final volume – initial volume | | N/A | | 0 | |  | |
| **General Hazards Checklist: Rank each from 1 (low risk) to 5 (high risk)** | | | | | | | |
| On a scale of 0 to 5, what are the risks that someone can slip, trip, or fall? Explain. 3.  Many liquids around work area one could be spilled and someone could trip.. | | | | On a scale of 0 to 5, what are the risks that someone can injure someone else? Explain. 3. Many chemicals out and without proper communication one could mistake a chemical for another. | | | |
| On a scale of 0 to 5, what are the risks that someone can be caught or entangled in anything? Explain.  3. The buret is a long piece of equipment could get caught in it. | | | | On a scale of 0 to 5, what are the risks that someone can strike against or make contact with any physical hazards? Explain.  3. The buret and other instruments used are all going to coincide in the work station which could cause someone to strike against it | | | |
| **Complete the following table of reagents for this experiment (include units): (5 points)**  ***(MUST use CAMEO Chemicals database (***[***https://cameochemicals.noaa.gov/***](https://cameochemicals.noaa.gov/)***) to fill out table.)*** | | | | | | | |
| **Chemical name** | **Chemical formula** | **Molecular weight (g/mol)** | | **Concentration (M or mol/L)** | **State**  **(aq, l, s, g)** | | **NFPA Hazard safety rating (use words not numbers)** |
| Ex) Hydrofluoric acid | HF | 20.0063 g/mol | | 1.5M | Aqueous | | Reactive in water and air. Health hazards include toxic if inhaled, ingested, or upon contact. |
| Silver Chloride | AgCl | 143.32 | | N/A | S | | Can cause irritation of the eyes and skin or the digestive tract if ingested. |
| Barium sulfate | BaSO4 | 233.39 | | N/A | S | | No health hazards |
| Ethylenediaminetetraacetic acid | C10H16N2O8 | 292.244 | | 0.05 M | aq | | Can cause eye irritation, harmful if inhaled |
| Sodium Hydroxide | NaOH | 39.9971 | | 0.15 M | aq | | Can cause serious eye and skin damage, toxic to organs |
| Ammonia | NH3 | 17.031 | | 1.5 M | aq | | Serious eye damage, skin corrosion, toxic to inhale |
| Ammonium chloride | NH4Cl | 53.491 | | 0.3 M | aq | | Harmful if swallowed causes eye irritation |
| Laboratory TA feedback to be provided on electronic Canvas submission | | | | | | | |
| Student digital signature: Aseem Awasthy | | | Date: 4/3/2024 | | | | |

This file is excerpted and modified from “Identifying and Evaluating Hazards in Research Laboratories: Guidelines developed by the Hazard Identification and Evaluation Task Force of the American Chemical Society’s Committee on Chemical Safety”.

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| **Student observations and notes:** |
| Calculate the Ca2+ concentration from the titration using Calcon as the indicator and calculate the average, in units of mmols/L and mg/L. 2. The sum (total) of Mg2+ + Ca 2+ in units of mmol/L is to be obtained in the titration using Calmagite indicator. 3. Then the Mg2+ ion concentration can be obtained in units of mmol/L by difference: Mg 2+ mmol/L = (Mg2+ + Ca2+ ) mmol/L – (Ca2+ ) mmol/L  After obtaining the individual concentrations of Mg2+ and Ca 2+ in units of mmol/L, also calculate their concentrations in units of mg/L of Ca 2+ and mg/L of Mg2+ . Compare these values with the values for seawater given in the CRC Handbook of Chemistry and Physics. |

*Table 1. Examples of hazards commonly identified in a chemistry lab.*

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| **Example Hazard Types** | |
| * Carcinogenic * Teratogenic * Corrosive * Toxic * Mutagenic * Explosive * Flammable * Unstable * Potentially explosive * Water-reactive * Chemical asphyxiates * Spill hazard | * Electrical shock * Hot surfaces or steam burn * Clutter or crowded workspace * Chemical mixing * Tangling hazard * Handling waste * Transportation of hazardous materials * Handling glassware and other sharp objects * Heating of chemicals * Dermal contact * Centrifuging |

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| Numeric Designation | Risk Level | Probability of an incident occurring | Exposure to hazards | Consequence of an incident |
| **5** | Very High Risk | Almost Certain | Continuous | Emergency |
| **4** | High Risk | Quite possible | Frequent | Serious |
| **3** | Substantial Risk | Remotely possible | Occasional | Important |
| **2** | Moderate Risk | Very unlikely | Rare | Noticeable |
| **1** | Low Risk | Practically impossible | Very rare | Barely noticeable |

*Table 2. Chemistry lab hazards risk levels and definitions.*