Public Review

It is a unique and an excellent lab manual with well thought out experiments written for STEM students in General Chemistry 1. The experiments are directly related to what is being covered in the lecture and include learning important lab techniques and application. The experiments will increase the interest in the subject matter and the procedures are clear and easy to follow, and explanations are thorough and logical. They are written in a manner to encourage students to plan and design the experiments and help the instructor to facilitate interaction and discussion among students to solve relevant 'real world' problems involved and to promote critical thinking. It gives the instructors the flexibility to either provide the data table or by assigning the data table as a prelab to help them organize and plan ahead. It introduces a new approach by learning the techniques first and then apply the knowledge and skills in a following exploratory lab. Look forward to using it in my general chemistry 1 lab.

Brief Bio of Reviewer

Dr. Edward Rajaseelan is a Professor of Inorganic Chemistry and former Chair of the Chemistry Department at Millersville University where he routinely teaches Introductory Chemistry and Inorganic Chemistry courses. Dr. Rajaseelan is recognized for his excellence in teaching and mentorship of undergraduate students. He was named an outstanding Teaching Assistant three separate years during his PhD work at the University of Arizona. At Millersville University, Dr. Rajaseelan was the recipient of the Excellence in Teaching Award in 1995 and was named the Educator of the Year in 2013.

Separating Substances, measuring mass, and analyzing data - technique laboratory

Excellent experiment to introduce them to the college level lab and for them to analyze the data by calculating the RAD and relative error and how they are related to precision and accuracy of their measurements.

Suggestions

1. Picture of a 'new' balance.
2. Helpful to indicate or number the steps involved in the procedure.
3. Indicate that during filtration they would be filtering into a filter flask (picture of a vacuum filtration set-up would be helpful), and they need to transfer all the solution back into the beaker.
4. In the prelab, it may be beneficial to ask.
    a. What physical property of the components is used to separate them? (Solubility in water)
    b. What physical methods of separation are involved? (Decantation, Filtration, Evaporation)
    c. Question # 3, could be rephrased as "What kind of the mixtures are the hot filtered solution and the cooled filtered solution and which and what phase of the three components are present in each of the solution?"

Measuring Volumes – technique laboratory

Well designed lab for students to learn how to use different volumetric devices, reading the measurements, which ones are more accurate, and for what purpose to use each one. The pictures are very useful.

Suggestions

1. Typo in the density of Actual Volume Delivered calculation (0.9980 NOT 0.99980)

Reaction Types and Qualitative Analysis – technique laboratory

Excellent lab to learn different types of reactions, writing ionic, net-ionic, balanced chemical equations, and balancing redox reactions. Could be a two-period lab.

Suggestions

1. It will be good to state the difference between a quantitative and qualitative analysis lab
2. It's better to number the 4 different observations. Under formation of Gases and smell it's better to put in smaller font for testing a gas with a lit wooden splint and wafting to smell a gas. Similarly for clear, cloudy, and colorless under Formation of a solid.
3. Under Oxidation-reduction reaction, it is better to label(number) the 3 reactions.
   The sentence in Red-Ox reaction with manganese, 'The reaction Mn^{2+} ' is incomplete.
   It will be more useful to ask them to write the oxidation half rection, reduction half reaction, and then the balance redox reaction.
   Zn + HCl and Zn + $CuCl_2$ reactions, include 'record your observations'. It would be good for them to also write the ionic and net-ionic equations.
4. Acid-base reactions – number the 3 reactions. Based on their observations, it's good to determine them as exo or endo thermic. It's best to ask them to write the ionic and net-ionic equations.
5. Precipitation reactions – number the 2 sets of reactions. Write balanced, ionic, and net-ionic equations for each reaction.
6. Post-lab. 4. … $Cu(NO_3)_2$, $CuCl_2$, or $Sr(NO_3)_2$.
7. Pre-lab. 1. K_2CrO_4

What is contaminating the water supply?

Very good exploration lab.

Suggestions

1. The ammonium compounds sublime (When heating the solution and drying the solid)

Titrations Technique laboratory

It gives the opportunity for students to learn how to use/read new volumetric glassware and solution stoichiometry. Sample data tables for part 2 and 3 are very helpful.

What is the Acidity of Vinegar? – Exploration Laboratory

Excellent Investigative Lab. It includes expressing concentrations of solutions in different units (Molarity and % by weight) and how to convert one unit to the other.

Absorption Spectroscopy Technique laboratory

A well thought out lab that helps them learn the relationship between energy, wavelength, colors, absorption spectrum, and complementary colors. It comprehensively covers Beer Law, relationship between absorbance and concentration, calibration curve, and the quantitative measurements using a spectrophotometer.

What is the Dye Composition of a Drink? – Exploration Laboratory

A very interesting investigative lab. A thorough understanding of the previous technique lab is needed to do the challenging calculations involved.