Chemistry Standards Alignment

INTRO: The TOPS experiments are designed for students to align to the California State Science Standards. The labs employ modern technology including computer driven instruments and commercially available data analysis software.

**Caffeine Extraction**
Extraction of biologically active compound from tea followed by purification to isolate caffeine.
Uses analytical balance, hot plates.
Standards 10b, 10d*
Investigation and Experimentation Standards: 1a, 1b*, 1c, 1d, 1e, 1f*, 1j, 1m, 1l


**Acid-Base Titration of Amino Acid & Spectroscopic Study of an Indicator**
Study of the basic titration of a biologically important amino acid and determination of its molecular weight. Quantitative study of the color of indicator at different pH, using spectrophotometer.
Uses analytical balance, pH meter, diode array scanning spectrophotometer.
Standards 3a*, 3c*, 3d*, 5a*, 5b, 5c*, 5d*, 10a*, 10c*
Investigation and Experimentation Standards: 1a*, 1b*, 1c, 1d, 1e, 1f*, 1j, 1m, 1l


**Esterification**
Synthesis of isopentyl acetate (banana oil) and study of the product by gas chromatography. Comparison to natural product isolated by extraction from bananas.
Uses analytical balance, microscale glassware kits, hot plates, gas chromatograph.
Standards 2a*, 2b*, 3a*, 10b
Investigation and Experimentation Standards: 1a*, 1b*, 1c, 1d, 1e, 1f*, 1j, 1m, 1l


**Greenhouse Effect**
Measurement of CO2 absorption by Elodea under varying light conditions.
Uses diode array scanning spectrophotometer
Standards 2b*, 4b
Investigation and Experimentation Standards: 1a*, 1b*, 1c, 1d, 1e, 1f*, 1j, 1m, 1l

**Kinetics/Catalysts**
Study of the decomposition of hydrogen peroxide as affected by pH, temperature, and catalysis.
Uses gas buret, micropipettor.
Standards 4c*, 4d*, 6d*, 8a, 8b, 8c*
Investigation and Experimentation Standards: 1a*, 1b*, 1c, 1d, 1e, 1f*, 1j, 1m, 1l


**Stoichiometry/Limiting Reagent**
Study of stoichiometric relationship which governs the reaction in nature.
Uses analytical balance.
Standards 1b*, 1c*, 2a*, 3a*, 3c*, 3e*, 6d
Investigation and Experimentation Standards: 1a*, 1b*, 1c, 1d, 1e, 1f*, 1j, 1m, 1l


**Water Quality Analysis**
Study of oxygen content of water samples, and changes caused by biological demands. Study of coliform content of water samples.
Uses BOD meters, Millipore filtration apparatus.
Standards 6b*, 6d*
Investigation and Experimentation Standards: 1a*, 1b*, 1c, 1d, 1e, 1j, 1l