Conservation Chemistry I and II
INF 393C.8, INF 393C.9

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Description

Introduction to physical and chemical properties of materials used in fabrication, identification and repair of books, photographs, manuscripts and related objects.

Adhesives:

Bonding, adhesion and cohesion, wetting, Tg, Young’s modulus, adhesive testing, deterioration pathways, Feller’s classifications, Animal glues, Polysaccharides, modified cellulose, synthetic adhesives, pressure sensitive adhesives
Lab: adhesive testing

Analytical techniques:

Stages in experimentation, electromagnetic spectrum, calculation of double bond equivalents, FTIR, ATR, Lasers, Raman, UV-Vis, Mass Spec, Elemental analysis, Chromatography, Microscopy, SEM, SEM/EDS
Labs: TLC, SEM, ATR, Confocal microscopy

Cellulose, Starch, Proteins:

Chemistry of polysaccharides, Amylose, amylopectin, deterioration, Paper testing, Arrhenius equation, deterioration, Feller classification of deterioration stages, ASTM paper ageing research program, Proteins, amino acids, deterioration

Color, Light and Chemistry:

Human color perception, color temperature, black body radiation, Color measurement systems, Munsell, CIE, L* a* b*, Chemiluminescence, fluorescence, electron spin numbers, phosphorescence, light absorption, resonance structures, pigments and dyes,
Lab: Colorimeter

Enzymes:

101, Lock and key explanation,
102 Proteins, primary secondary and tertiary structures, activity parameters, catalytic activity, homogenous and heterogeneous catalysts,
103 Co-factors, poisoning, immobilization methods

**Functional Groups**: (getting up to speed activity)

Functional group classification, Chemical nomenclature, oxidation numbers

**Modern paper making materials**

Chemistry of Paper deterioration (in more detail), processes from tree to paper, fibers from wood, lignin, hemicelluloses, mechanical wood, refiner mechanical wood, thermo mechanical wood, semi-chemical methods, bleaches, chemical wood processes, Kappa number, commercial paper classification, additives in paper making, internal sizes, fillers, neutral pH systems, surface sizes, wet strength additives, dry strength additives.

**Moles and molarity**

A short re-cap

**Polymers**:

Classification, synthesis, side group conformations, amorphous and crystalline areas, homopolymers, co-polymers, thermoplastic, thermo set, Tg (Sperling’s classifications) hysteresis, elastomers, optical properties, info on different polymers (ie., Nylons, epoxys, acrylics), polymer deterioration,

**Redox reactions**:

A short re-cap

**Skins, leather and parchment**:

Parts of the skin, collagen, ancient and modern leather making techniques, tanning, chrome tanning, alum tawed, oil tanned, smoke tanning, vegetable tannins, leather deterioration, parchment making, surface preparations, tannins, deterioration

**Solvents**:

Van der Waals forces, heat of vaporization, cohesive energy density, Hilderbrand solubility parameters, Hansen parameters, Teas chart, Feller’s chart of solvent mixtures Labs: TLC using PRISM parameters, removal of aged adhesives

**Statistics**:

Estimating errors in experiments, precision and accuracy, systematic and random errors, mean and standard deviation, Gaussian distribution, Null hypothesis
**Water:**
Chemical formula of water (no, it’s not H₂O), polarity of water, primary states of water, dynamic equilibrium, dissociation, dissociation constant, pH, Acids and Bases, Arrhenius, Bronsted and Lowry, Lewis, Usanovich, hard and soft acids/bases, strength of acids and bases, conjugate acids and bases, buffer solutions, wash water quality, hard water, water softeners, de-ionized water, reverse osmosis, Lab: Comparing pH testing methods, testing water for hardness.

**Photography:**
Silver chemistry, development, gelatin, Daguerreotype, Gallotype, salted out paper, Collodion, Ambrotype, other metals, Lab: pin hole photography