

CHEM 8M, Experiment 6 – Colorful Chemistry

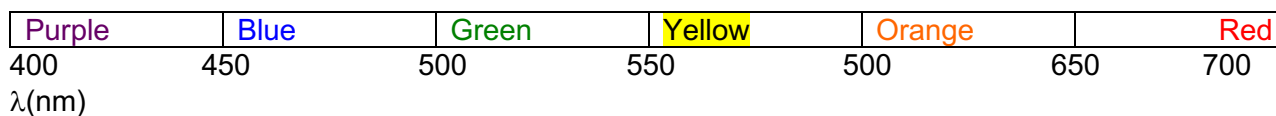
Synthesis & Application of Azo Dyes

- Nature of color

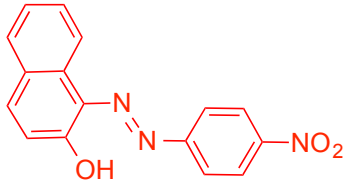
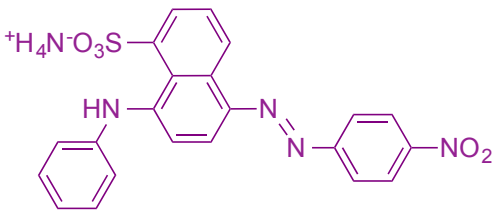
- Dye to Fabric Interactions

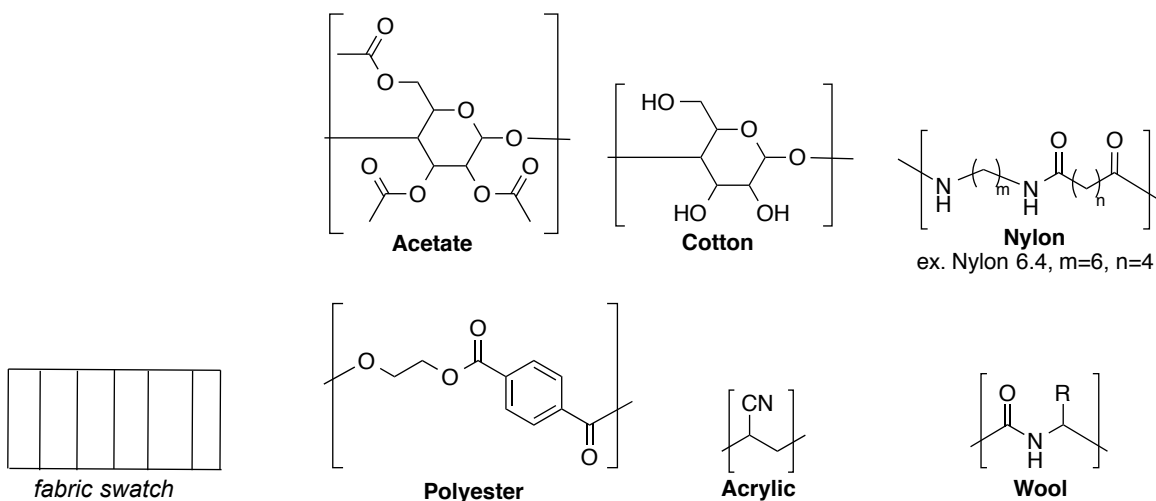
- Diazonium Coupling

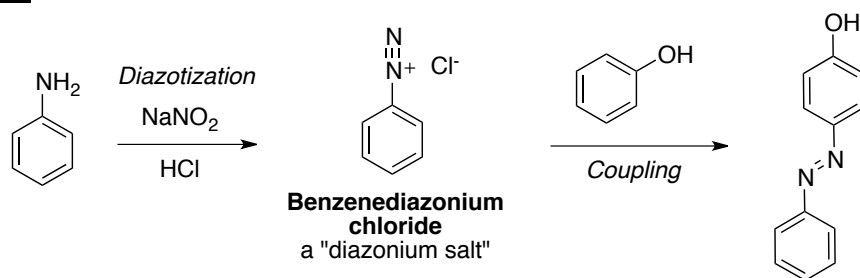
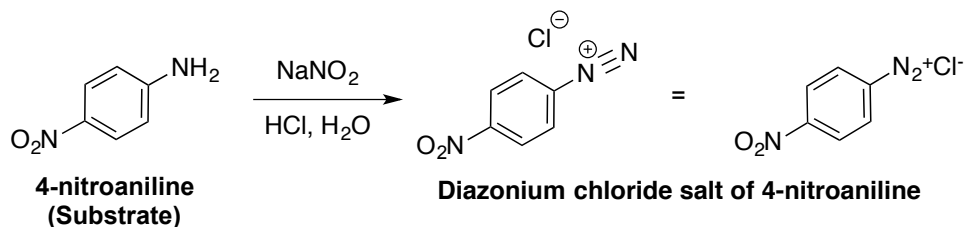
Outcomes: Observe effects of dye structure, fibers, and metals (mordants) on appearance

UV-Visible Spectrum

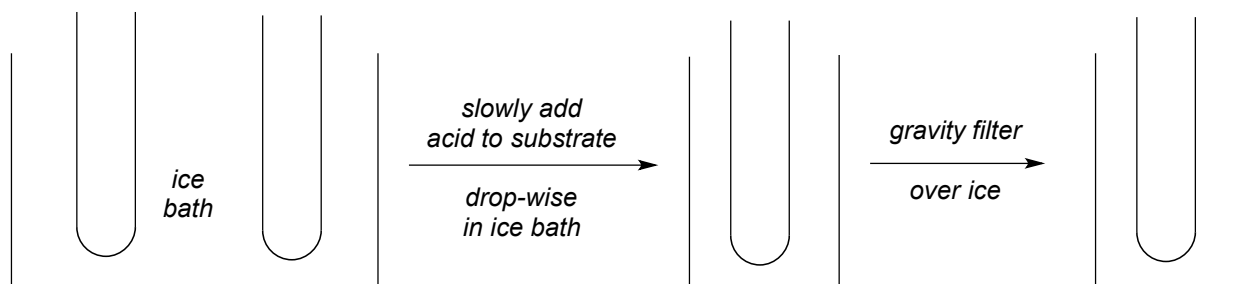
What is it about the structure of the dye that causes it to appear (emit) a specific color?

Dye Structure	Pi System
 <p>American Flag Red Emission ~700 nm</p>	
 <p>Easter Purple Emission ~400 nm</p>	

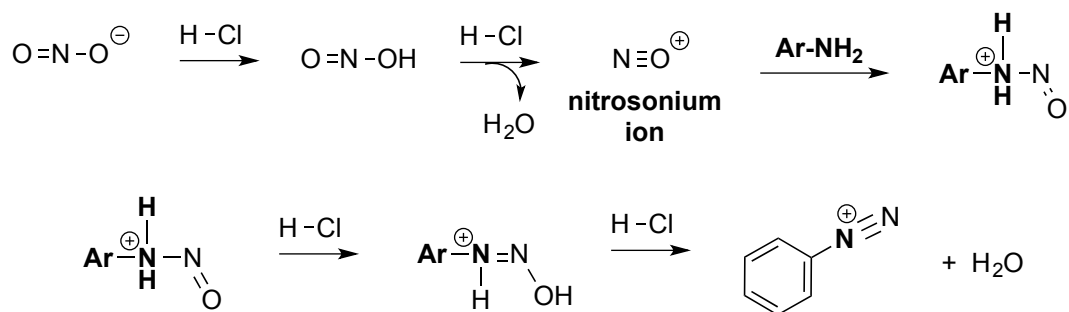
Fabric Fibers – Polymers with repeating units of...

Synthesis of Azo Dyes**Part A Diazotization**

Make & cool two solutions in two test tubes before mixing... then... Gravity filtration

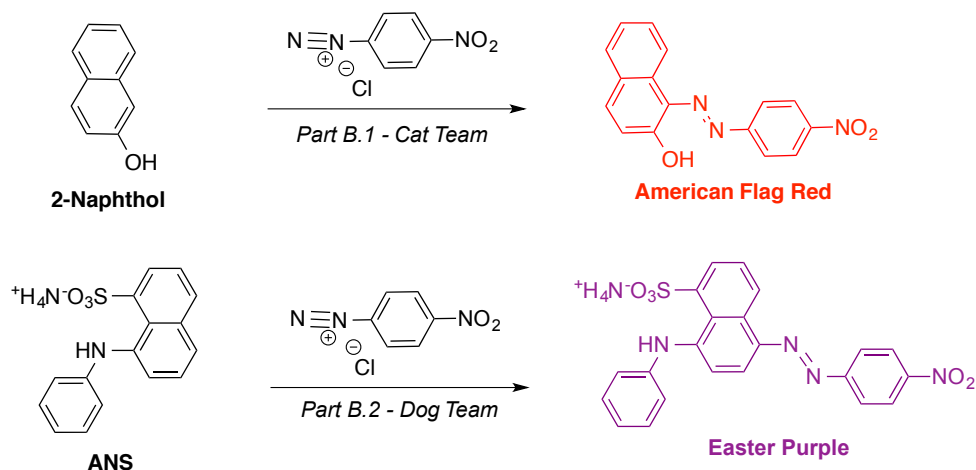
**Diazotization Mechanism – what's happening??!!**

Fill in the arrows at each step.



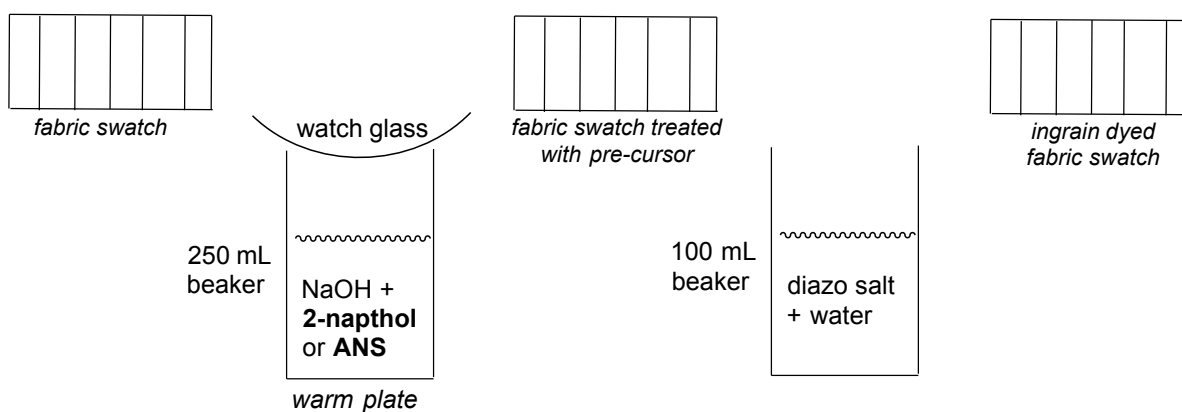
Part B Diazo Coupling *via* Ingrain Dyeing

- Diazo coupling is a type of Electrophilic Aromatic Substitution (EArS) reaction (McM Ch 16)
- *Propose arrow-pushing mechanisms for the synthesis of American flag red (1 intermediate)*



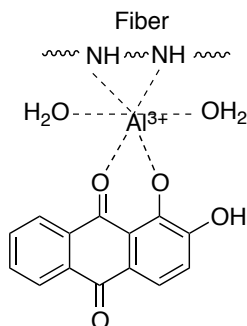
Apply EArS mechanism to easter purple...

Ingrain Dyeing = The reaction takes place on the fabric swatch!

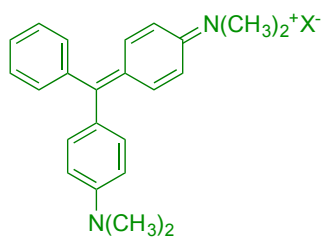


Mordant Dyeing

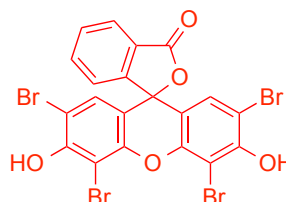
- Fabric strip is pre-treated with coordinating metal: Cu^{2+} , Al^{3+} , or Fe^{2+}
- Pre-made swatches with copper (II) sulfate, aluminum potassium sulfate, or iron (II) sulfate
- Use same ingrain dye procedure above with 'mordant fabrics'
- *How does this effect dye – fiber interactions?*



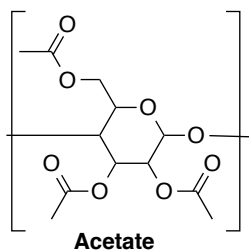
Direct Dyeing



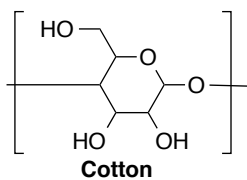
Malachite Green



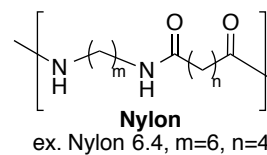
Eosin Y



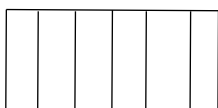
Acetate



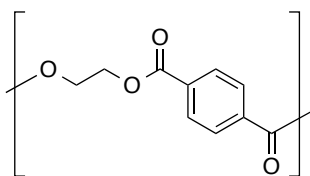
Cotton



Nylon



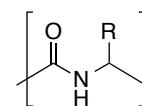
fabric swatch



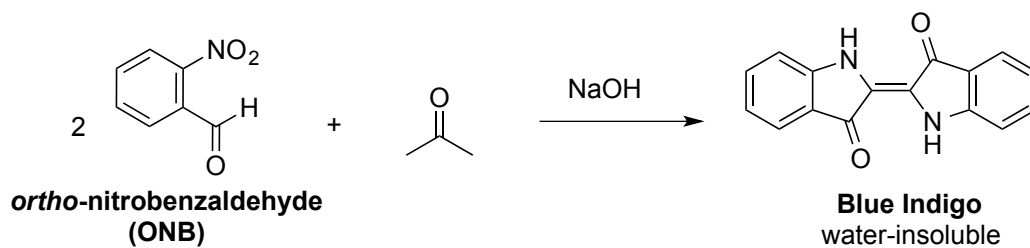
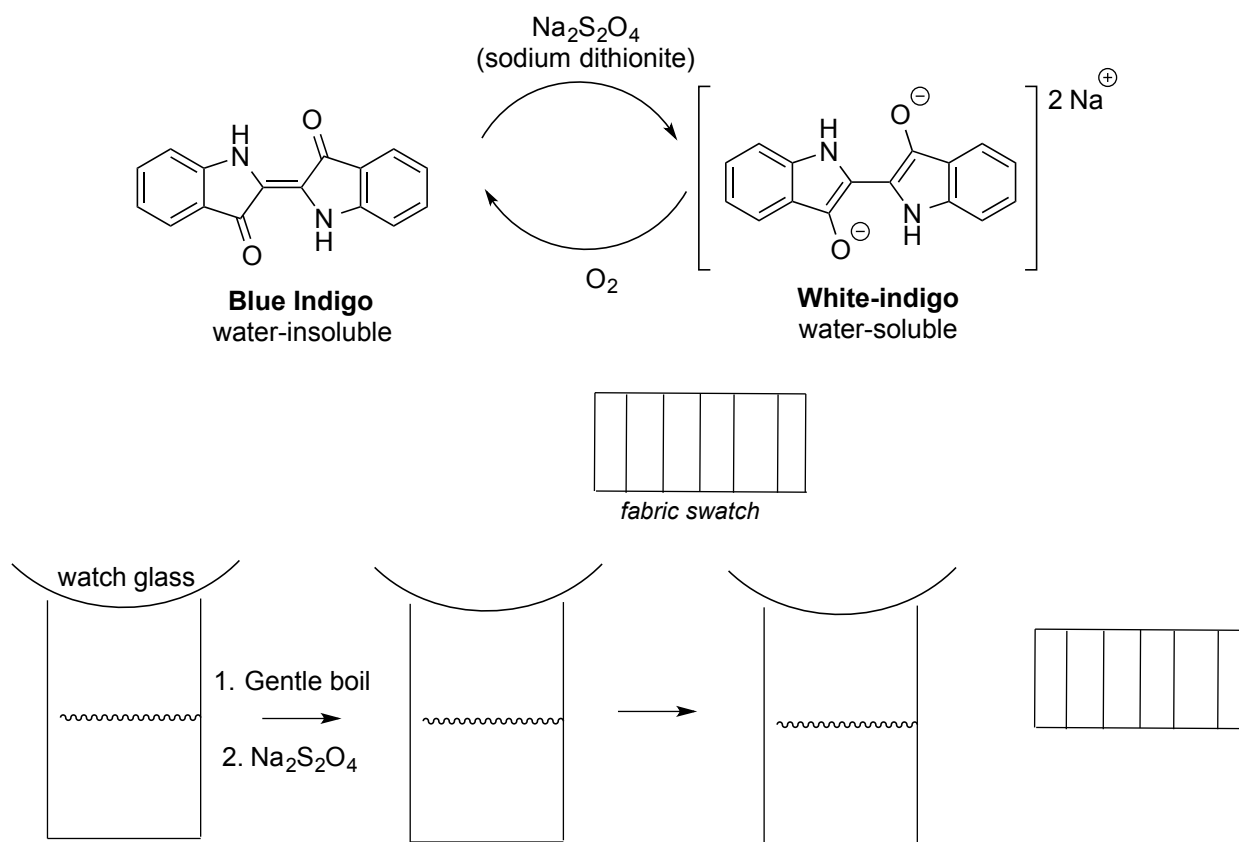
Polyester



Acrylic



Wool

INDIGO SYNTHESIS & VAT DYEING**Part D.1. Synthesis****Part D.2. Vat Dyeing with Indigo**

All reagents were commercially available.

- Draw the reaction scheme

- | | |
|-----------------------------------|---------------------------------|
| - Product name | - Chemical names (# mg, # mmol) |
| - Order of addition | - Temperature, time |
| - Filtration, washes, drying time | - No characterization |

Last sentence: "*Indigo was isolated as a blue solid (xx mg, xx mmol).*"

- Column Chromatography
- Thin-Layer Chromatography
- Acid-Base Extraction
- IR Spectroscopy
- ^1H NMR Spectroscopy
- Phase Transfer Catalysis
- Reflux
- Synthesis: oxidation, Fischer esterification, aspirin synthesis, azo coupling

Please fill out separate evals for me and your TA.

- What did you think about these lecture templates?
- Reflect: what do you remember most about this class?
- How did the instructors play their part in engaging you with the material?
- What did we do well and what could we improve upon?