

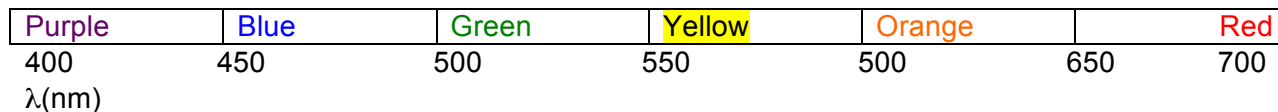
CHEM 8M, Lecture 5

Exp 4, Week 1 – Synthesis & Application of Azo Dyes

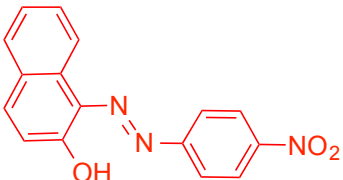
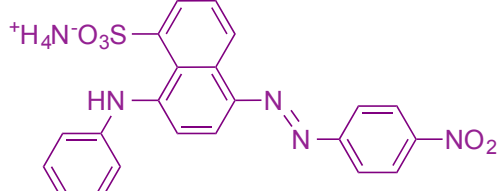
- Nature of color

- Dye to Fabric Interactions

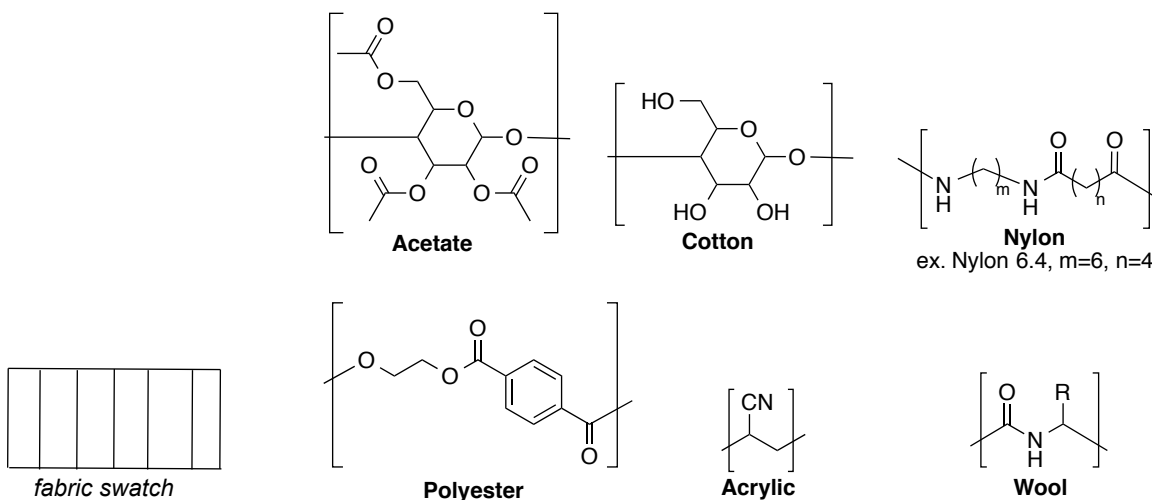
- Diazonium Coupling

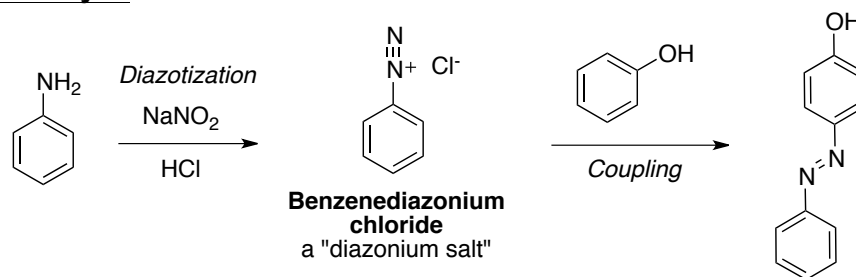
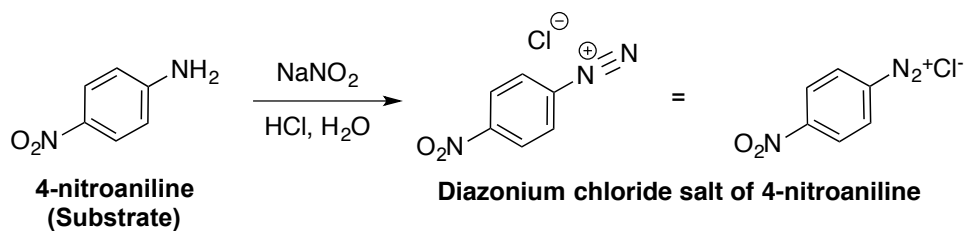
*Outcomes: Observe effects of dye structure, fibers, and metals (mordants) on appearance***UV-Visible Spectrum**

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

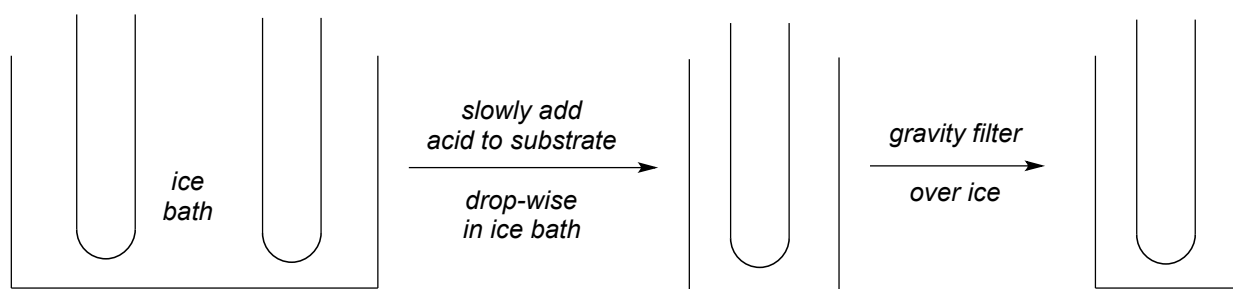
Dye Structure	Pi System
 <p>American Flag Red Emission ~700 nm</p>	
 <p>Easter Purple Emission ~400 nm</p>	

Fabric Fibers – Polymers with repeating units of...



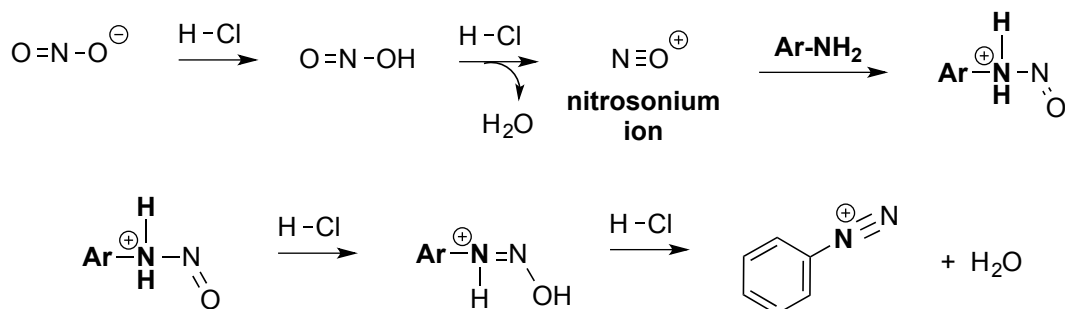
Synthesis of Azo Dyes**Part A Diazotization**

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



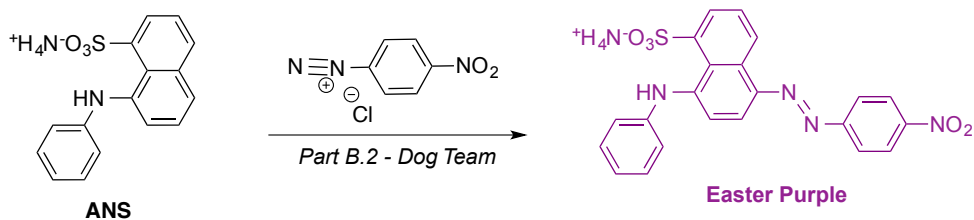
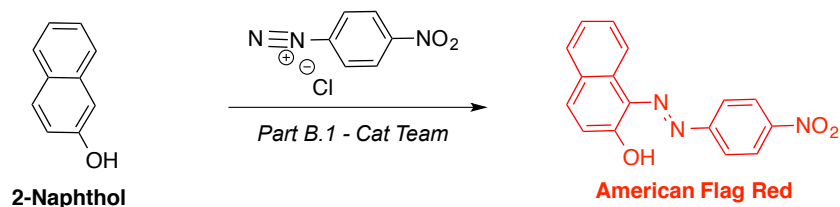
Diazotization Mechanism – what's happening??!

Fill in the arrows at each step.



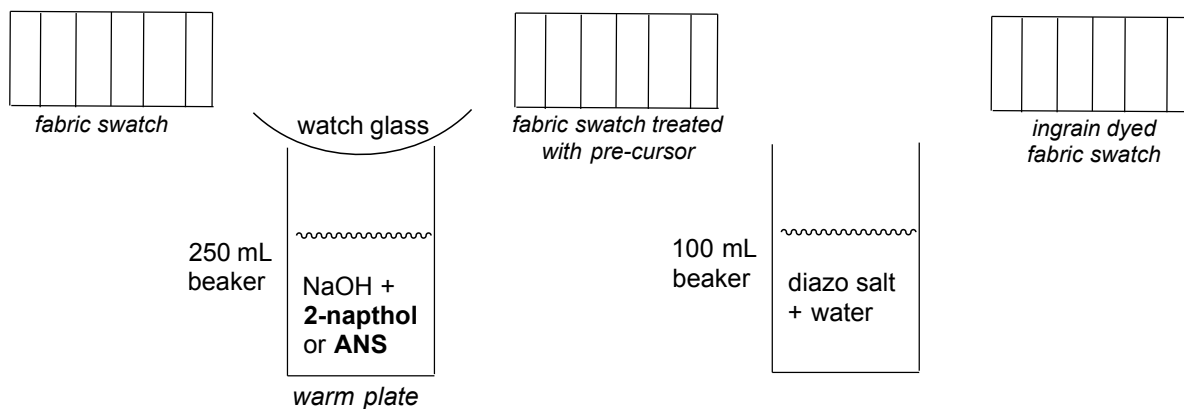
Part B Diazo Coupling via Ingrain Dyeing

- 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...

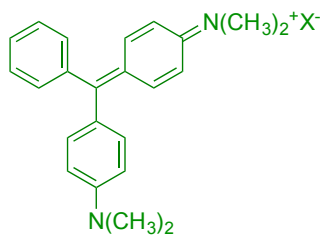
Ingrain Dyeing = The reaction takes place on the fabric swatch!



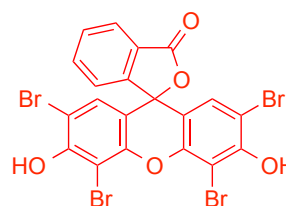
Mordant Dyeing

- 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

Exp 4, Day 1 Overview

- Part A – Make diazo salt
- Part B – Ingrain Dyeing Fabric with & without mordants

Logistics: Exp 4, page 5 includes...

	 <p>Team Cat Pair closer to the chalkboard</p>	 <p>Team Dog Pair farther from the chalkboard</p>
Day 1	<p>*Part A *American Flag Red *B.1 (ingrain & mordant dyeing)</p>	<p>*Part A *Easter Purple *B.2 (ingrain & mordant dyeing)</p>
Print Table 3 (page 12) and bring with you to lab both days.		
Day 2	<p>*Part D *Part C (Malachite green)</p>	<p>*Part D *Part C (Eosin Y)</p>