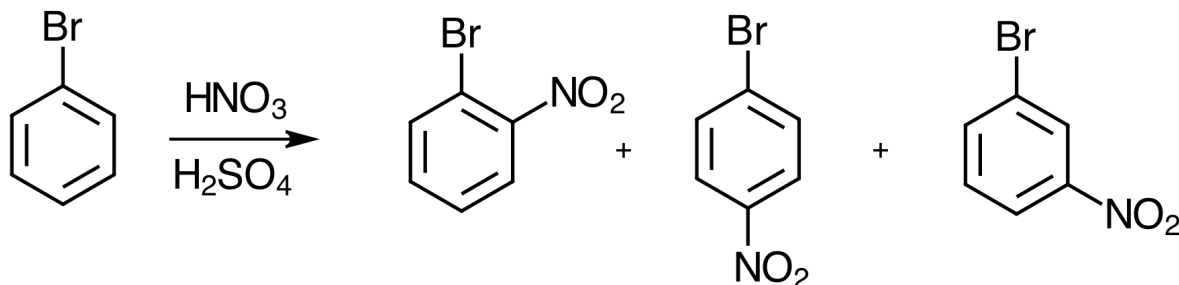


# Electrophilic Aromatic Substitution – Nitration of Bromobenzene

## Summary:

This reaction demonstrates the nitration of bromobenzene by electrophilic aromatic substitution and allows students to test the directing effects of a bromo substituent. The reaction is carried out using concentrated sulfuric and nitric acids.



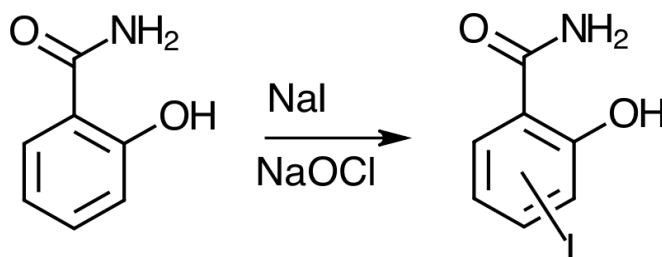
**Reference:** Nitration of Bromobenzene, Experimental Organic Chemistry, Gilbert and Martin, 5th Edition, p. 515

Chemical Name Aldrich Catalog #	Amount per 100 students (g or mL)	EH&S	Purchasing cost per 100 students (\$)
Bromobenzene B57702	800mL		\$17.49
Sulfuric acid, conc. 258105	305mL		\$6.28
Nitric acid, conc. 438073	200mL	*C	\$7.86
Ethanol, 95% 459836	1250mL		\$58.13

## Electrophilic Aromatic Substitution of Salicylamide – A Greener Approach

## Summary:

This reaction allows for students to study the directing effects of electron donating and electron withdrawing groups on the substitution of a benzene ring by using sodium iodide and household bleach (sodium hypochlorite).




**Reference:** A Green, Guided-Inquiry Based Electrophilic Aromatic Substitution for the Organic Chemistry Laboratory, Eby, E. and Deal, S. T., Green Chemistry, 2008, 85, 1426-1428

Chemical Name Aldrich Catalog #	Amount per 100 students (g or mL)	EH&S	Purchasing cost per 100 students (\$)
Salicylamide 860417	50 g	<div> <div></div> <div></div> <div></div> </div>	\$14.90
Ethanol, absolute 459836	1000 mL	<div> <div></div> <div></div> <div></div> </div>	\$77.50
Sodium iodide 383112	60 g	<div> <div></div> <div></div> <div>*</div> </div>	\$19.27
Sodium hypochlorite (6% w/v) 239305	10 mL	<div> <div></div> <div></div> <div>*</div> </div>	\$23.63
Hydrochloric acid, 10% 320331	250 mL	<div> <div></div> <div></div> <div></div> </div>	\$0.98
Ethanol, 95% 459836	500 mL	<div> <div></div> <div></div> <div></div> </div>	\$38.75

## Comparison: Electrophilic Aromatic Substitution

### Comparison of greener and traditional lab:




- Greener method eliminates the use of concentrated sulfuric and nitric acid and bromobenzene
- Greener method employs a guided-inquiry approach






	Purchasing costs	Waste (per 100 students)	"Greener" benefits
Greener method	\$175.03	1.9 L liquid waste	
Traditional method	\$89.76	2.5 L liquid waste	

Other greener lab options to explore:

- A simple and practical halogenation of activated arenes using potassium halide and oxone in water-acetonitrile medium, Synth. Comm. 2001, 31 (13), 2021-2027

EHS Key:

	Physical hazard
	Toxicity/Health hazard
	PBT

	Very high hazard
	High hazard
	Moderate hazard
	Low hazard
	No data