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# Deliberative Democracy: Cocaine Detection

## Alignment with Course Content

This module can be used to reinforce redox chemistry i.e., standard reduction potentials and spontaneity of redox reactions

## Necessary Background Knowledge

- Standard reduction potentials
  - Spontaneous vs non-spontaneous reactions
  - Analysis method characteristics (accuracy, precision, limit of detection)
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## Policy Question

The color changing method for detection of cocaine mentioned in the two assigned articles is called the Scott test. Usage of this common roadside cocaine test is controversial due to consequences from false positives. Based on your research and understanding of the Scott test and other available methods, which roadside method would you recommend? Using credible sources, please justify your response by discussing the accuracy, precision, and limit of detection of **two** different methods.

## Module Goals

### Students should be able to:

- Search and utilize published scientific data to construct an argument
- Compare analysis methods in terms of accuracy, precision, and limit of detection
- Describe a standard reduction potential
- Describe the criteria for a spontaneous redox reaction
- Describe how to force a nonspontaneous redox reaction
- Provide an example of an electrochemistry application
- Address a problem with consideration of multiple variables - both scientific and socioeconomic factors

## Deliberation Scaffolding

### Students should consider

- Why do compounds other than cocaine produce false positives in the Scott test?
- Why do police still use these field tests if they have false-positives and false-negatives?
- Are there ways to make the current method more selective?
- What types of equipment would be needed to carry out other types of cocaine roadside tests?
- What is the limit of detection of the current and proposed roadside tests?

## Instructor Notes

### Implementation Suggestions

- Describe the electrochemical method to students before they read the peer-reviewed article e.g., how the method is used to force the non-spontaneous oxidation of cocaine which occurs at the characteristic reduction potential and is detected as a flow of electrons.

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## Articles

### Media:

<https://www.nytimes.com/2016/07/10/magazine/how-a-2-roadside-drug-test-sends-innocent-people-to-jail.html>

### Peer reviewed:

<http://pubs.rsc.org/en/content/articlelanding/2016/sc/c5sc04309c#!divAbstract>

DOI: 10.1039/C5SC04309C

## Informative Articles Students Might Find

<https://www.propublica.org/article/no-field-test-is-fail-safe-meet-the-chemist-behind-houston-police-drug-kits>

<https://www.theguardian.com/science/2016/nov/21/cocaine-roadside-test-developed-in-effort-to-reduce-drug-driving>

<https://pubs.acs.org/doi/abs/10.1021/ac60050a027>

<https://www.ncbi.nlm.nih.gov/pubmed/16226152>

<https://www.unodc.org/pdf/scientific/SCITEC6.pdf>

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## Media Paper (Multiple-Choice Assignment Ideas)

<https://www.nytimes.com/2016/07/10/magazine/how-a-2-roadside-drug-test-sends-innocent-people-to-jail.html>

*How a \$2 Roadside Drug Test Sends Innocent People to Jail* by Ryan Gabrielson and Topher Sanders, The New York Times Magazine

Example question topics:

- What compound causes the color change in the Scott test?
- What variables can affect the outcome of the Scott test?
- Why were there a high percentage of false positive Scott tests in a county in Florida?
- What types of labels are required on the Scott test?
- Are false positive tests required to be reported back to police by a crime lab?

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## Peer Reviewed Paper (Multiple-Choice Assignment Ideas)

<http://pubs.rsc.org/en/content/articlelanding/2016/sc/c5sc04309c#!divAbstract>

DOI: 10.1039/C5SC04309C

*Electrochemical fingerprint of street samples for fast on-site screening of cocaine in seized drug powders* by Mats de Jong, Nick Slegers, Jayoung Kim, Filip Van Durme, Nele Samyn, Joseph Wang, and Karolien De Wael.

Example question topics:

- Identifying limits of detection
- Identifying any compounds, and their characteristics, that could provide a false negative for cocaine in this method
- Describe the process needed to force a nonspontaneous reaction
- Describing the information a peak in a voltammogram provides
- Identifying the reduction potentials of species based on voltammograms
- Identifying compounds on a voltammogram based on given standard reduction potentials

# Deliberative Democracy: Cocaine Detection

Leader First & Last Name		Facilitator/Spokesperson First & Last Name	
Recorder First & Last Name		Devil's Advocate/Summarizer First & Last Name	

**Question to scientists: The color changing method for detection of cocaine discussed in the two assigned articles is called the Scott test. Usage of this common roadside cocaine test is controversial due to consequences from false positives. Based on your research and understanding of the Scott test and other proposed methods, which roadside method would you recommend? Using credible sources, please justify your response by discussing the accuracy, precision, and limit of detection of two different methods.**

What do you need to know before you can make an informed recommendation?	Why does this missing piece of information matter? (include social and science rationales)	Who will find 2-3 articles about this concept (at least one per box must be peer-reviewed)?
A.		1.  2.  3.
B.		1.  2.  3.

## Deliberative Democracy: Cocaine Detection

What do you need to know before you can make an informed recommendation?	Why does this missing piece of information matter? (include social and science rationales)	Who will find 2-3 articles about this concept (at least one per box must be peer-reviewed)?
C.		1.  2.  3.
D.		1.  2.  3.

Before doing background research, what is your group's initial stance?

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**Question to scientists: The color changing method for detection of cocaine discussed in the two assigned articles is called the Scott test. Usage of this common roadside cocaine test is controversial due to consequences from false positives. Based on your research and understanding of the Scott test and other proposed methods, which roadside method would you recommend? Using credible sources, please justify your response by discussing the accuracy, precision, and limit of detection of two different methods.**

Evidence to support your science advisory statement:	Source title and journal (or media outlet) AND initials of who found the article	Which lecture topics or textbook chapters cover this material?
A.		
B.		

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Evidence to support your science advisory statement:	Source title and journal (or media outlet) AND initials of who found the article	Which lecture topics or textbook chapters cover this material?
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D.		

## Deliberative Democracy: Cocaine Detection

Science Advisory Statement (Deliberate consensus):

End of Day 2. Thank you for investing your time and energy on this activity!