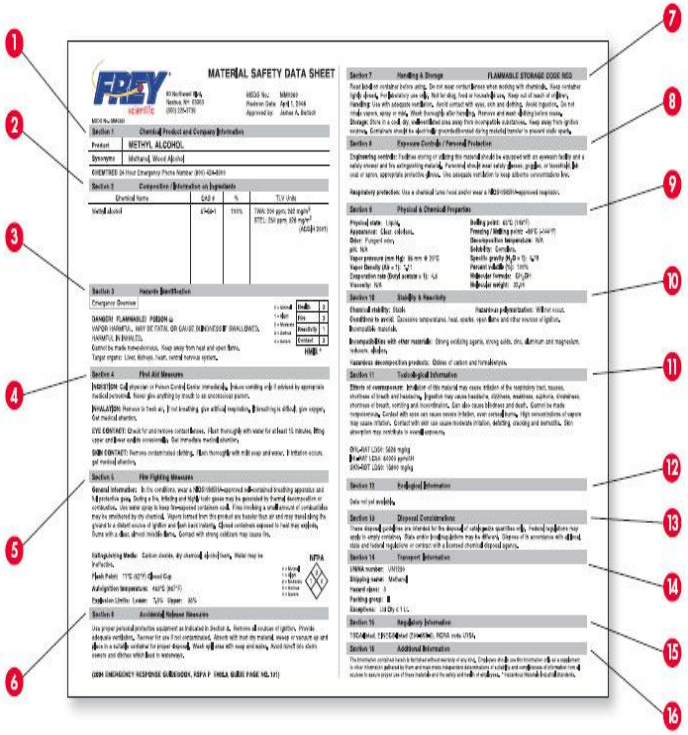
Module 1B

Material Safety Data Sheets

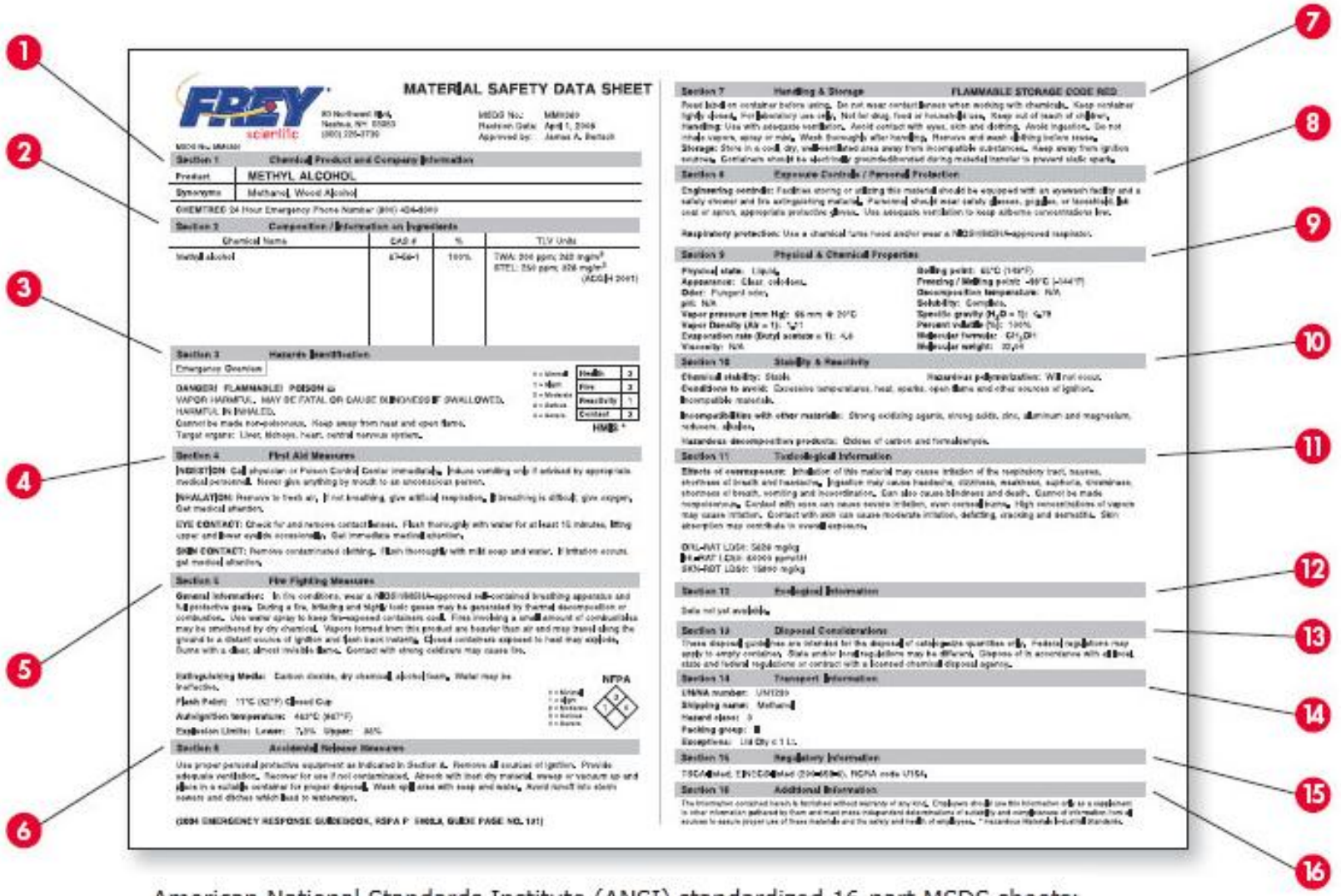
Forensic Science Teacher Professional Development

Unit 6: Material Safety Data Sheet (MSDS)

Module 1
Safety and
Scientific Methods



1. Chemical Product Information
2. Composition/Ingredients
3. Hazards Identification
4. First Aid Measures
5. Fire Fighting Measures
6. Accidental Release Measures
7. Handling and Storage
8. Exposure Controls/Personal Protection
9. Physical and Chemical Properties
10. Stability and Reactivity
11. Toxicological Information
12. Ecological Information
13. Disposal Considerations
14. Transport Information
15. Regulatory Information
16. Additional Information



American National Standards Institute (ANSI) standardized 16-part MSDS sheets:

1. Chemical Product Information
2. Composition/Ingredients
3. Hazards Identification
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Unit 6: MSDS/SDS – Section by Section

Module 1
Safety and
Scientific Methods

Section 1
Chemical and Company Identification:

Usually, the first section is Chemical and Company Identification.

- Product name, chemical formula, and its other names are listed.
- The chemical name is required to appear exactly the same as it does on the container.
- The Chemical Abstract Service (CAS) number is also listed. This number is similar to a social security number for a person. Each chemical has it own number.
- This section also includes the name, address, phone number, website, and other contact information for the company that supplied the chemical.

Unit 6: MSDS/SDS – Section by Section

Section 2
Composition and Information on Ingredients:

- Some products will contain more than one chemical. This section contains information on all of the ingredients that are present in the chemical.
- Legally, all ingredients that are hazardous according to OSHA's Hazard Communication standard criteria are required to be in the section. The non-hazardous materials may not be included.
- The percentage of each ingredient should be listed.
  - In some instances, the company can list the ingredients as a "trade secret," but they must still provide necessary safety information on the MSDS/SDS.

Unit 6: MSDS/SDS – Section by Section

Section 3
Hazards Information:

- The Hazards Information section includes information on the product's acute (short term) and chronic (long term) hazardous or adverse health effects.
- Targeted organs and body functions of these adverse effects are listed.
- Routes of entry into the body such as eye contact, inhalation, skin contact, or ingestion are listed.
- Chemicals can be characterized as carcinogens, teratogens, and/or mutagens:
  - Carcinogen – a chemical that tends to lead to cancer
  - Teratogen – a chemical capable of interfering with the development of a fetus, causing birth defects
  - Mutagen – a chemical capable of intensifying or causing a genetic mutation

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Section 4
First Aid Measures:

- This section states what to do in the case of eye contact, skin contact, serious skin contact, inhalation, serious inhalation, ingestion, and serious ingestion.
- Some of these first aid measures are standard (e.g., rinsing out the eyes or skin in case of contact for 15 minutes, or going outside in accidental inhalation of a chemical).
  - The measures for ingestion vary on the chemical, including some that seem counter-intuitive (i.e., not to induce vomiting in case of ingestion, but instead acquiring an antidote).

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Section 5
Firefighting Measures and Explosion Data:

- This section includes the fire and explosive properties (including whether or not the product is considered flammable, the flash point, and the flammable limits) of the product and the proper extinguishing materials and methods.
- Fire hazards in the presence of various substances are listed.
- Explosion hazards in the presence of various substances are listed.
- Special remarks on both the fire hazards and the explosion hazards may also be stated in this section.

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Section 6

Accidental Release/Spill Measures:

- This section describes the proper measures to clean up both a small spill and a large spill, including both the proper media to use and the correct method to employ.
  - Proper authorities should be contacted and informed of any spill, large or small. For many of the more dangerous chemicals, the room may need to be evacuated and a HAZMAT team may need to be called.

Unit 6: MSDS/SDS – Section by Section

Section 7
Handling and Storage:

- This section describes the safety measures that need to be taken when properly storing and handling the chemical.
- These are stated to ensure that the accidental release of dangerous chemicals into the environment and overexposure to the chemical are prevented.
- The storage of the chemical depends on the reactivity and flammability of the product.

Precautions that should be taken are also noted.

Unit 6: MSDS/SDS – Section by Section

Section 8
Exposure Control/Personal Protection:

- The Exposure Control/Personal Protection section is intended to keep the exposure of the user of the chemical at a minimum.
- This section includes engineering controls, the necessity of items such as a fume hood or proper ventilation, and personal protective equipment (PPE) including gloves, safety goggles, aprons, boots, etc.
- The PPE in case of a large spill may also be stated. Exposure limits (e.g., OSHA Permissible Exposure Limits (PEL) or ACGIH Threshold Limit Values (TLVs)) are also listed here.
  - Proper ventilation is a crucial part of lab work, as continued exposure throughout the day could be dangerous.

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Section 9
Physical and Chemical Properties:

- This section includes information about the chemical including physical state and appearance such as the odor, the taste, the molecular weight, the color, the pH, the boiling point, the melting point, the critical temperature, the vapor pressure, the vapor density, the viscosity, the specific gravity, the evaporation rate, the volatility, the odor threshold, the dispersion properties, and the solubility in water and other mediums.
- This can be very useful when trying to determine the proper measures needed to complete any given experiment and gives the employee/student a better idea of the properties of the chemical.

Unit 6: MSDS/SDS – Section by Section

Section 10
Stability and Reactivity Data:

- This section lists
  - whether the chemical is stable,
  - the instability temperature (if available),
  - the conditions of instability,
  - the incompatibility with various substances,
  - if polymerization will occur, and
  - if there are any special remarks on the reactivity and corrosivity of the chemical.
- By describing the conditions of instability, the MSDS/SDS tells the user conditions, including storage conditions, that should be avoided when using the chemical.

Unit 6: MSDS/SDS – Section by Section

Section 11
Toxicological Information:

- Toxicological information is included in this section of the MSDS/SDS. This information may also be mentioned in other sections of the MSDS/SDS as well.
- Although some of the information about the chemical is explained in everyday terms, this section is mainly intended for medical professionals, occupational health and safety professionals, and toxicologists.
- Possible information includes
  - the routes of entry into the body,
  - the toxicity of the chemical to animals,
  - the chronic effects on humans, and
  - other toxic effects on humans and any special remarks on toxicity to animals.

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Section 12
Ecological Information:

The ecological information is not included on all MSDS/SDSs.

- When ecological information is included, it contains ecotoxicity information that may help the HAZMAT team determine the effect of a chemical that is released into the environment.
- This section may also contain biodegradation information, such as
  - both acute and long-term toxicity to fish, invertebrates, plants, microorganisms;
  - effects on animals that drink from contaminated drinking water; and
  - special remarks on the products of biodegradation.
- This is all important when evaluating the effects of a major spill and when determining if a chemical can be disposed of in a landfill.

Unit 6: MSDS/SDS – Section by Section

Section 13

Disposal Considerations:

Every person using a chemical should be aware of the proper disposal methods required for that chemical.

- This section includes any special instructions required for disposal of the chemical in use.

Unit 6: MSDS/SDS – Section by Section

Section 14
Transport Information:

- In this section, the procedure for shipping hazardous materials is provided.
- Shipping criteria are regulated by the Department of Transportation (DOT).
- This could include the DOT shipping name, the DOT ID number, hazard class, and labels that are required to be on the shipping container.
  - Before shipping, the container must be properly labeled so in the event of an accident, the HAZMAT team can use the hazard class numbers to decide how to properly deal with the situation.

Unit 6: MSDS/SDS – Section by Section

Section 15

Other Regulatory Information:

- This section states the federal and state regulations associated with the chemical, as well as international, OSHA, TSCS, SARA, CERCLA, and CWA regulations.
- Hazardous ratings such as the NFPA codes, the HMIS codes, and PPE may be listed in the section.

Unit 6: MSDS/SDS – Section by Section

Section 16

Other Information:

- This section may include references, keys or legends, and the creation and revision dates of the MSDS/SDS.
- A disclaimer is often also located in this portion of the MSDS/SDS.

End of Module 1B

Forensic Science Teacher Professional Development