Cold, Flu, or Allergy?

Teacher Information

science take-out
just add students™

Summary

Students conduct simulated flu tests to determine whether patients have the flu or not. Students then use product labels to select the medicines appropriate for patients with the flu, the common cold, or allergies.

Core Concepts

- Colds, the flu, and respiratory allergies have similar symptoms but they are treated with different drugs.
- The Drug Facts label on over-the-counter (OTC) drugs provides information essential for selecting and using drugs safely.
- A doctor or pharmacist can provide advice to help people select OTC drugs.

Time Required

2-3 forty-minute class periods

Kit Contains

- 3 Flu test swabs (simulated)
- Rapid Flu Test Strip
- Rapid Flu Test Solution (simulated)
- Dropper for Rapid Flu Test Solution
- 4 simulated medicine labels

Teacher Provides

- Safety goggles
- Paper towels for clean-up

Warning: Choking Hazard

This Science Take-Out kit contains small parts. Do not allow children under the age of seven to have access to any kit components.

Teacher Resources

- **CDC – Influenza (Flu)** provides a wide variety of resources related to influenza. http://www.cdc.gov/flu/

- **CDC – Common Cold and Runny Nose** provides information on the common cold. https://www.cdc.gov/antibiotic-use/community/for-patients/common-illnesses/colds.html

- **WebMD – Allergies Health Center** provides information on allergies. http://www.webmd.com/allergies/

- **WebMD – Cold, Flu, & Cough Health Center** provides information on colds and influenza. http://www.webmd.com/cold-and-flu/default.htm

- **WebMD – Allergy Medications** lists and describes OTC and prescription drugs to relieve allergy symptoms. http://www.webmd.com/allergies/guide/allergy-medications

Reusing the Kit

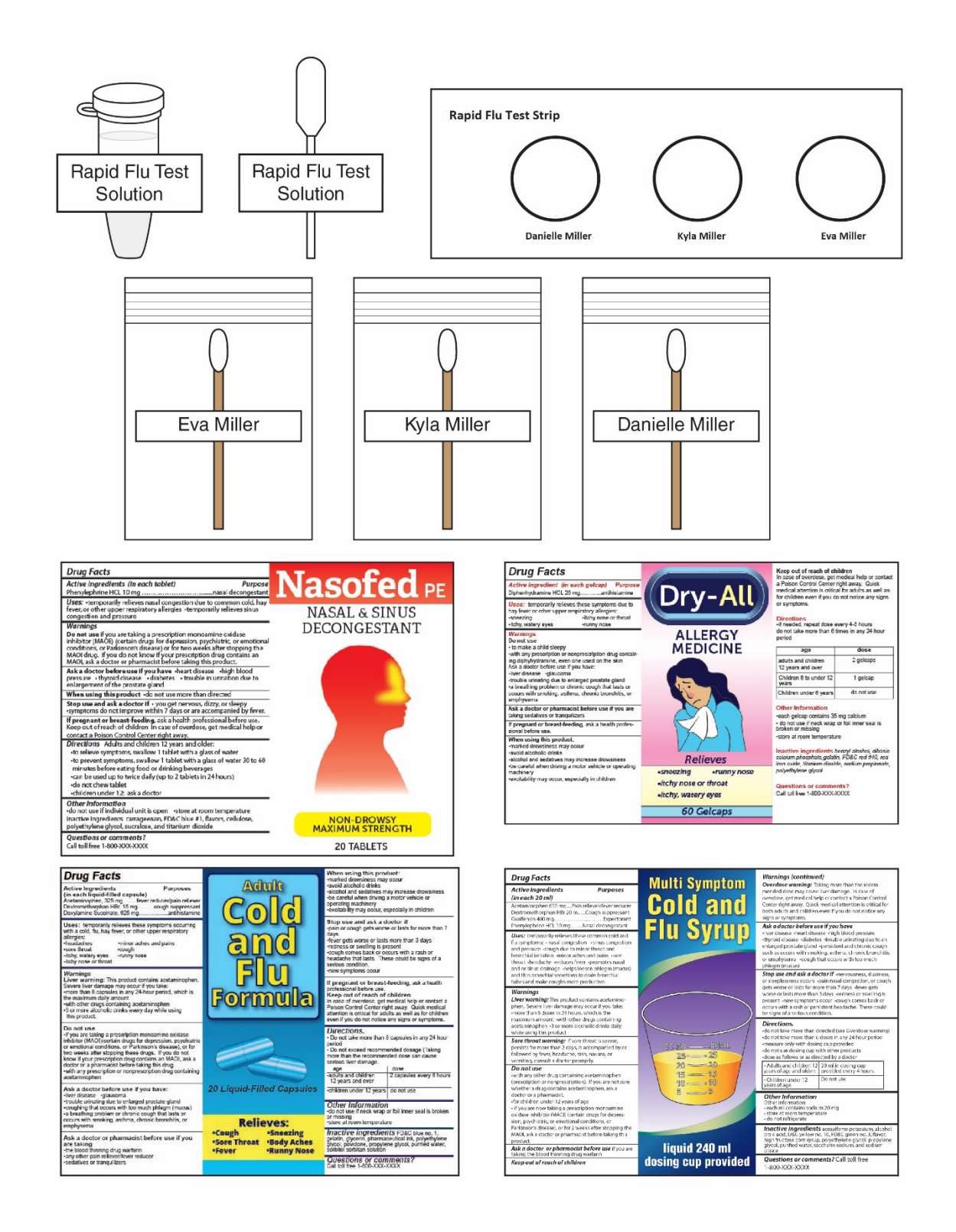
Teachers will need to instruct students on how to handle clean-up and return of the reusable kit materials. For example, teachers might provide the following information for students:

Discard	Return to kit bag
• Used swabs • Used Rapid Flu Test Strip	• Microtube of Rapid Flu Test Solution • Dropper • 4 medicine labels • 3 bags for swabs *Consider laminating the medicine labels if the kit will be reused.*

Refills for **Cold, Flu, or Allergy** kits are available at www.sciencetakeout.com. The **10 Kit Refill Pack** includes the following materials:

- Instructions and Quick Guide for refilling kit
- Transfer pipet for refilling tubes
- 10 mL of Rapid Flu Test Solution
- 10 Eva Miller swabs
- 10 Kyla Miller swabs
- 10 Danielle Miller swabs
- 10 Rapid Flu Test Strips

Kit Contents Quick Guide



Read these instructions before using Science Take-Out kits

Parental or Adult Supervision Required

This kit should be used only under the supervision of an adult who is committed to ensuring that the safety precautions below, and in the specific laboratory activity, are followed.

Safety Goggles and Gloves Strongly Recommended

We encourage students to adopt safe lab practices, and wear safety goggles and gloves when performing laboratory activities involving chemicals. Safety goggles and gloves are not provided in Science Take-Out kits. They may be purchased from a local hardware store or pharmacy.

Warning: Choking and Chemical Hazard

Science Take-Out kits contain small parts that could pose a choking hazard and chemicals that could be hazardous if ingested. Do not allow children under the age of seven to have access to any kit components. Safety Data Sheets (SDS) provide specific safety information regarding the chemical contents of the kits. SDS information for each kit is provided in the accompanying teacher instructions.

Chemicals Used in Science Take-Out Kits

Every effort has been made to reduce the use of hazardous chemicals in Science Take-Out kits. Most kits contain common household chemicals or chemicals that pose little or no risk.

General Safety Precautions

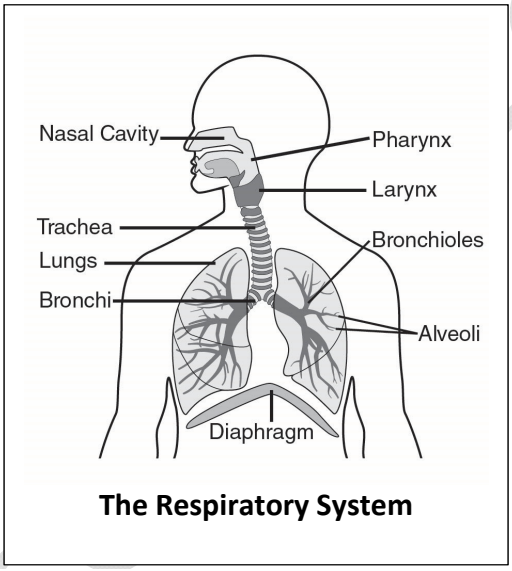
1. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
2. Read and follow all instructions carefully.
3. Pay particular attention to following the specific safety precautions included in the kit activity instructions.
4. Goggles and gloves should be worn while performing experiments using chemicals.
5. Do not use the contents of this kit for any other purpose beyond those described in the kit instructions.
6. Do not leave experiment parts or kits where they could be used inappropriately by others.
7. Never taste or ingest any chemicals provided in the kit - they may be toxic.
8. Do not eat, drink, or apply make-up or contact lenses while performing experiments.
9. Wash your hands before and after performing experiments.
10. Chemicals used in Science Take-Out experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
11. At the end of the experiment, return ALL kit components to the kit plastic bag. Dispose of the plastic bag and contents in your regular household trash

No blood or body fluids from humans or animals are used in Science Take-Out kits. Chemical mixtures are substituted as simulations of these substances.

Cold, Flu, or Allergy?
Teacher Answer Key

Introduction:

A cold, the flu, and allergies all affect the respiratory system and have many similar symptoms. It can be difficult to tell whether someone has a cold, the flu, or allergies.



The Respiratory System

Mrs. Miller took her three daughters to see their doctor because they have respiratory system symptoms.

- Danielle Miller (13 years old) has been sniffling, coughing and sneezing for about a week.
- Kyla Miller (16 years old) has a bad cough and a runny nose. She also has a headache and a 100°F fever.
- Eva Miller (12 years old) has asthma so she usually has a cough. Today she notices that she is very tired and it is difficult for her to breathe. She has a 102°F fever.

Part 1: Rapid Influenza Tests

Mrs. Miller is worried that her daughters may have influenza (the flu). Often, a doctor can make a flu diagnosis simply based on the person's symptoms. However, the Miller family's doctor has asked you to conduct rapid influenza tests to determine if any of the three Miller girls have influenza. Do the Miller girls have influenza (the flu)?

1. The rapid influenza test begins by using a swab to take a sample of mucus from a patient's nose. You have three bags that each contain a cotton swab with a (simulated) mucus sample from either Danielle's, Kyla's or Eva's nose.

2. Place 2 drops of Rapid Flu Test Solution onto each of the circles on the **Rapid Flu Test Strip**. Then, close the lid of the Rapid Flu Test Solution tube to prevent spills.

3. Dip each swab into the appropriate circle of the **Rapid Flu Test Strip**.

4. Record the results of the flu tests in the data table below.
    - If the swab turns pink, the patient has the flu.
    - If the swab remains white, the patient does not have the flu.

Name	Color of Swab	Interpretation (Flu or Not Flu)
Danielle		
Kyla		
Eva		

5. Which of the Miller girls have the flu? Explain how you can tell.

Part 2: Danielle's Case

Use the results of the Rapid Flu Tests and the **Allergy Facts** below to answer questions 1 through 6.

Allergy Facts

Normally, the immune system fights germs called pathogens. An allergy occurs when a person's immune system overreacts to an **allergen** that is harmless for most people. Allergens that cause allergic reactions include things such as pollen, dust mites, mold spores, pet dander, some foods, insect stings, and some drugs.

During an allergic reaction the immune system releases an excess of chemicals called **histamines**. Histamines can cause symptoms such as a runny nose, sneezing, itching, rashes, swelling, ear congestion or asthma. Medicines that contain **antihistamines** as an active ingredient can be used to treat allergies because antihistamines block the action of histamines.

1. Based on the results of the flu test, and her symptoms, the doctor explained that Danielle's symptoms are most likely due to exposure to an allergen. What is an allergen?

2. Danielle's allergic reaction symptoms include sneezing, itchy cough, runny nose, and watery eyes. What chemical made in the body causes Danielle's symptoms?

3. The doctor suggested that Danielle treat her allergy with an over-the-counter allergy drug. What active ingredient should Danielle look for if she wants a drug that blocks the action of the chemical you selected for question 2?

4. When selecting a drug, it is best to select a drug that only treats the symptoms that you are experiencing. Look at the four drug labels provided. Which drug would you recommend for relieving Danielle's allergy symptoms? Explain your choice.

5. What side effects should Danielle be aware of before she takes this drug?

6. What drug interactions should Danielle be aware of before she takes this drug?

Side Effect
Any effect of a drug or dietary supplement that is in addition to its intended effect, especially an effect that is harmful or unpleasant.

Drug Interaction
A drug interaction occurs when a substance (another drug, food, or a dietary supplement) affects the activity of a drug when both are administered together. Drug facts labels may warn that the drug should not be taken with another drug or food.

Part 3: Kyla's Case

Use the results of the Rapid Flu Tests and the **Cold Facts** below to answer questions 1 through 8.

Cold Facts

The common **cold** is the most common contagious infectious disease in humans. A cold is caused by a rhinovirus, a type of virus that is usually less harmful than the influenza virus that causes the flu. The body's reaction to the cold virus causes cold symptoms such as sore throat, cough, mild fever, ear congestion, blocked nose, and runny nose. Colds are common because the human body cannot develop immunity to all of the different types of rhinoviruses that can cause the common cold.

Antibiotics are not effective in treating colds. They do not cure a cold or speed up recovery because they kill bacteria but do not kill the viruses that cause a cold. Doctors will not prescribe antibiotics for a common cold because they are concerned that overuse of antibiotics will promote the evolution of antibiotic resistant bacteria that are not killed by antibiotics. Colds are usually treated by using over-the-counter drugs, drinking fluids, and getting plenty of rest.

1. Based on the results of the flu test, the doctor explained that Kyla has a cold, not the flu. Kyla asks the doctor for a prescription for an antibiotic, but the doctor said she did not need one. Explain why he would not give her a prescription for an antibiotic.

2. For her cough, the doctor suggested that she could take an **antitussive**. Antitussives are cough suppressant drugs that block the cough reflex. Look at the four drug labels provided. Which drug(s) contain an antitussive to suppress Kyla's cough?

3. For her stuffy nose, Kyla could take a **decongestant**. Decongestants reduce the swelling of tissues in your nose, making breathing easier. Look at the four drug labels provided. Which drug(s) contain a decongestant to relieve Kyla's stuffy nose?

4. If Kyla's respiratory tract (lungs, trachea, and bronchi) is clogged with mucus, she could use an **expectorant**. Expectorants are drugs that thin the mucus and promote removal of mucus from the respiratory tract. Look at the four drug labels provided. Which drug(s) contain an expectorant to promote removal of mucus from Kyla's respiratory tract?

5. To relieve Kyla's headache, she could take an **analgesic**. Analgesics are drugs that relieve pain. If you have a fever, you could take an **antipyretic**. Antipyretics are drugs used to reduce fevers. The common over-the-counter fever reducers (aspirin, ibuprofen, and acetaminophen) are also pain relievers. Look at the four drug labels provided. Which drugs contain an analgesic/antipyretic to relieve Kyla's headache?

6. **To avoid potential overdoses, it is important to NOT take two drugs with the same ingredient.** This is especially true for acetaminophen, a common fever reducer and pain reliever found in a variety of cold medications. Taking too much acetaminophen increases the risk of liver damage. Select the <u>one</u> cold drug that you would recommend that Kyla purchase and use for treating her cold symptoms. Explain your selection.

7. Would it be safe for Kyla to take both the drug you selected for question 6 <u>and</u> a pain reliever that contains acetaminophen for her headache? Explain why or why not.

Pharmacists are a good source of information for both prescription and over-the-counter drugs. Kyla isn't sure she has chosen the best drug for her cold so she asks the pharmacist for advice. The pharmacist asks Kyla if she is already taking any prescription or other non-prescription drugs.

The pharmacist discovers that Kyla is taking a prescription antidepressant – a drug used to treat depression. He points out that some antidepressant drugs may result in dangerous **drug interactions** with ingredients in some cold drugs. The pharmacist also shows Kyla the warnings on the drug that she was considering buying. He recommends that Kyla talk with her doctor for advice on what drugs to take to treat her cold symptoms.

A ***drug interaction*** is a situation in which a substance (usually another drug) affects the activity of a *drug* when both are administered together. Drug interactions usually have a harmful effect.

8. Explain why it is important for Kyla to talk with a doctor before she takes medicine such as ***Multi-Symptom Cold + Flu Syrup***.

Part 4: Eva's Case

Use the results of the Rapid Flu Tests and the **Flu Facts** below to answer questions 1 through 6 on the next page.

Flu Facts

The flu (also known as influenza) is a viral infection that attacks the respiratory system — the nose, throat and lungs.

- Flu symptoms include a high temperature (101°F or above), cold sweats, shivers, aching joints, aching limbs, headaches, and extreme fatigue.
- Flu may cause respiratory system symptoms such as a cough and runny nose.

The flu is highly contagious.

- People who have the flu should stay home and avoid contact with other people.
- The flu can be deadly, particularly for young children and people over 65 years old.
- The flu can be deadly for people with chronic diseases (long lasting diseases that can be treated but not cured) such as asthma, heart disease, immune system problems, kidney disease, and diabetes.

The flu is usually treated by using over-the-counter (OTC) drugs, drinking fluids, and getting plenty of rest.

- Inhaling steam may also help ease the respiratory symptoms of the flu.
- Because the flu is caused by a virus, antibiotics will not reduce flu symptoms or cure the flu.
- Do not take OTC drugs if a doctor has prescribed drugs to treat flu symptoms - such as a pain reliever, fever reducer or a cough suppressant. A dangerous overdose may result if the active ingredients in the prescription drugs are the same as the active ingredients in the OTC drugs.

The flu can be prevented by getting a flu vaccination ("flu shot") each year.

- A yearly flu vaccination is important because the flu virus mutates rapidly.
- This year's flu vaccine may not work to prevent flu next year.

A doctor can prescribe antiviral flu drugs (such as Tamiflu or Relenza) to reduce the severity and duration of flu symptoms.

- Antiviral drugs do not cure or prevent the flu.
- To be most effective, antiviral drugs need to be given within one to three days of a person's first flu symptoms.

1. The doctor explained that Eva's symptoms made him suspect that she has the flu. List two flu symptoms that are not usually associated with a cold or allergies.

2. The results of the rapid flu test show that Eva definitely has the flu. Explain two reasons why people who have flu symptoms should seek prompt medical advice from a doctor.

3. Eva has two chronic diseases—asthma and diabetes. Explain how a chronic disease is different from diseases such as the flu or a cold.

4. The doctor gave Eva a prescription for an antiviral drug (Tamiflu). This antiviral drug will not prevent or cure the flu. Why would Eva want to take the antiviral drug?

5. The doctor also gave Eva prescriptions for a pain and fever reducer (acetaminophen) and a cough suppressant (dextromethorphan). Which over-the-counter flu drug would you recommend that Eva use for treating her flu symptoms? Explain your selection.

6. Danielle and Kyla know that the flu is contagious. They do not want to catch the flu from Eva. Should they take some of Eva's prescription antiviral drug? Explain why or why not.

Section 1 Chemical Product and Company Information

Science Take-Out
80 Office Park Way
Pittsford, NY 14534
(585)764-5400

CHEMTREC 24 Hour Emergency
Phone Number (800) 424-9300
For laboratory use only. Not for drug, food or household use

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Product	Buffer Solution pH10
Synonyms	"Rapid Flu Test Solution"

Section 2 Hazards Identification

This substance or mixture has not been classified at this time according to the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals.

Signal word: WARNING
Pictograms: None required
Target organs: None known

GHS Classification:
Skin irritation (Category 3)
Eye irritation (Category 2B)

GHS Label information: **Hazard statement(s):**
H316: Causes mild skin irritation.
H320: Causes eye irritation.

Precautionary statement(s):

P264: Wash hands thoroughly after handling.

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P332+P313: If skin irritation occurs: Get medical attention.

P337+P313: If eye irritation persists: Get medical attention.

Ca Prop 65 - This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Water	7732-18-5	99.77%	231-791-2
Potassium chloride	7447-40-7	0.10%	231-211-8
Boric acid	10043-35-3	0.08%	233-139-2
Sodium hydroxide	1310-73-2	0.05%	215-185-5

Section 4 First Aid Measures

INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

EYE CONTACT: Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

SKIN ABSORPTION: Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

Section 5 Fire Fighting Measures

Suitable Extinguishing Media: Use any media suitable for extinguishing supporting fire.

Protective Actions for Fire-fighters: In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool.

Specific Hazards: During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Section 6 Accidental Release Measures

Personal Precautions: Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.

Environmental Precautions: Avoid runoff into storm sewers and ditches which lead to waterways.

Containment and Cleanup: Absorb with inert dry material, sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.

Section 7 Handling and Storage

Precautions for Safe Handling: Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale vapors, spray or mist. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

Conditions for Safe Storage: Store in a cool, well-ventilated area away from incompatible substances.

Section 8 Exposure controls / Personal Protection

Exposure Limits:

Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
Potassium chloride	None established	None established	None established

Engineering controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

Respiratory protection: None should be needed in normal laboratory handling at room temperatures. If misty conditions prevail, work in fume hood or wear a NIOSH/MSHA approved respirator.

Section 9 Physical and Chemical Properties

Appearance: Clear, colorless liquid.
Odor: No odor.
Odor threshold: Data not available.
pH: 10.0
Melting/Freezing point: Approx. 0°C (32°F) (water)
Boiling point: Approx. 100°C (212°F) (water)
Flash point: Data not available

Evaporation rate (Water = 1): <1
Flammability (solid/gas): Data not available.
Explosion limits: Lower/Upper: Data not available
Vapor pressure (mm Hg): 14 (water)
Vapor density (Air = 1): 0.7 (water)
Relative density (Specific gravity): Approx. 1.0 (water)
Solubility(ies): Complete in water.

Partition coefficient: Data not available
Auto-ignition temp.: Data not available
Decomposition temp.: Data not available
Viscosity: Data not available.
Molecular formula: Mixture
Molecular weight: Mixture

Section 10 Stability and Reactivity

Chemical stability: Stable
Hazardous polymerization: Will not occur.

Conditions to avoid: Excessive temperatures which cause evaporation.
Incompatibilities with other materials: Acids, alkalies, and air will change the buffer's ability.
Hazardous decomposition products: Boron oxide and chlorine gas.

Section 11 Toxicological Information

Acute toxicity: Data not available
Skin corrosion/irritation: Data not available
Serious eye damage/irritation: Data not available
Respiratory or skin sensitization: Data not available
Germ cell mutagenicity: Data not available
Carcinogenity: Data not available

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity: Data not available
STOT-single exposure: Data not available
Aspiration hazard: Data not available
STOT-repeated exposure: Data not available

Potential health effects:
Inhalation: May be harmful if inhaled.
Ingestion: May be harmful if swallowed.
Skin: May cause mild irritation.
Eyes: May cause mild irritation.

Signs and symptoms of exposure: To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Specific data is not available. Exercise appropriate procedures to minimize potential hazards.
Additional information: RTECS #: Data not available

Section 12 Ecological Information

Toxicity to fish: No data available
Toxicity to daphnia and other aquatic invertebrates: No data available
Toxicity to algae: No data available
Persistence and degradability: No data available
Bioaccumulative potential: No data available
Mobility in soil: No data available
PBT and vPvB assessment: No data available
Other adverse effects: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

Section 14 Transport Information

UN/NA number: Not applicable
Shipping name: Not Regulated
Hazard class: Not applicable
Packing group: Not applicable
Reportable Quantity: No
Marine pollutant: No
Exceptions: Not applicable
2012 ERG Guide # Not applicable

Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL	WHMIS Classification
Potassium Chloride	Listed	Not Listed	Not Listed	Listed	Not Listed	Uncontrolled Product
Sodium hydroxide	Listed	1,000 lbs (454 kg)	D002	Listed	Not Listed	E

Section 16 Additional Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees.
NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

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