



Big Data and Bone Fracture Risk

Teacher Information

..... just add students™

Summary

What factors could be used to predict bone fracture risk? Conduct simulated medical tests, record data, and analyze data. Explore how big data sets collected from many individuals and a variety of sources may reveal other factors that could be used to understand bone fracture risk.

Core Concepts

- Big data sets include information collected from many individuals and a variety of sources over an extended period of time.
- Big data sets provide better evidence for health risk claims than small data sets.
- Analysis of big data sets may reveal factors associated with increased risks for health problems.

Time Required

2–3 forty-minute class periods.

Kit Contains

- Interpreting Bone Density T-Scores
- Hip Bone X-Ray Images
- Graphs: Bone Fracture Risks
- Instructions for Blood Plasma Tests
- Instructions for Bone Marker Test
- Envelope containing 10 Years Later—Additional Data from a Variety of Electronic Sources
- 4 tubes of simulated Blood Plasma
- 4 Blood Plasma Test Strips
- Tube of Bone Marker Test Solution
- 5 labeled droppers
- Bone Marker Test Sheet

Teacher Provides

- Tap water
- 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 Suggestions

- The Science Take-Out kit **Brittle Bones: A Density Problem** provides a hands-on activity related to osteoporosis. <http://www.sciencetakeout.com/product/brittle-bones-a-density-problem/>
- Additional activities related to osteoporosis and big data are available online from University of Rochester's Life Sciences Learning Center website at www.urmc.rochester.edu/life-sciences-learning-center/lessons.aspx

Teacher Resources

Big Data resources:

- **Big Data, Big Knowledge: Big Data For Personalized Healthcare**
<http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7047725>
- **How Big Data is Changing Healthcare**
<https://www.forbes.com/sites/bernardmarr/2015/04/21/how-big-data-is-changing-healthcare/#75f5c6692873>
- **Big Data Coming In Faster Than Biomedical Researchers Can Process It**
<http://www.npr.org/sections/health-shots/2016/11/28/503035862/big-data-coming-in-faster-than-biomedical-researchers-can-process-it>
- **The Power of Big Data Must Be Harnessed for Medical Progress**
<http://www.nature.com/news/the-power-of-big-data-must-be-harnessed-for-medical-progress-1.21026>
- **Millions of Tweets Are a Goldmine for Data Mining**
<http://www.rochester.edu/newscenter/twitter-provides-a-rich-vein-of-data-218722/>

References for Bone Fracture Risks graphs:

- Alcohol consumption and bone fracture risk –
<https://www.sciencedirect.com/science/article/pii/S0009912012002172>
- Exercise and bone fracture risk –
https://www.iofbonehealth.org/sites/default/files/PDFs/WOD%20Reports/move_it_or_lose_it_en.pdf
- Body mass index and bone fracture risk –
<https://courses.washington.edu/bonephys/opnutr.html>
- Smoking and hip fracture risk – <https://courses.washington.edu/bonephys/opsmoke.html>

Reusing the Kit

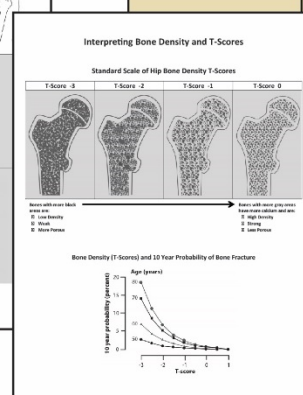
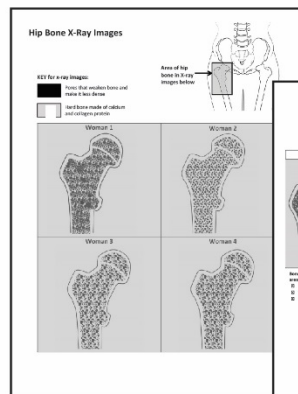
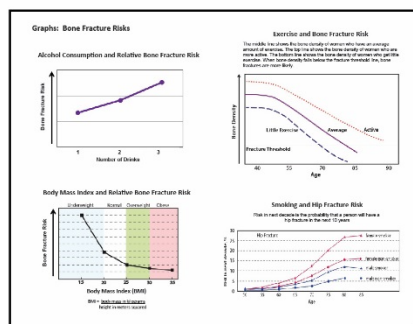
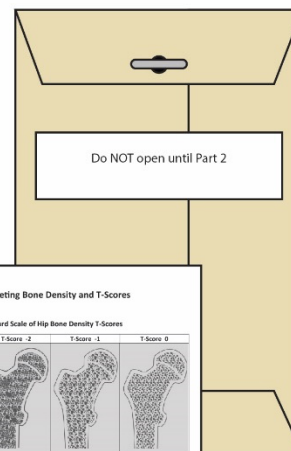
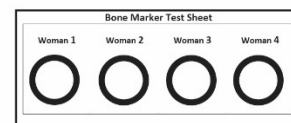
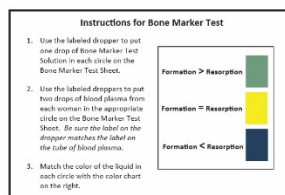
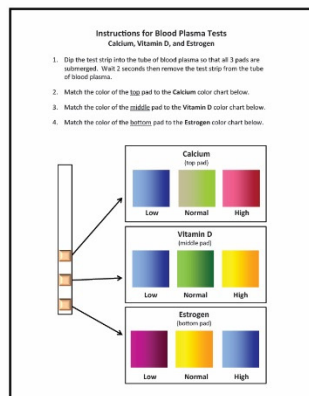
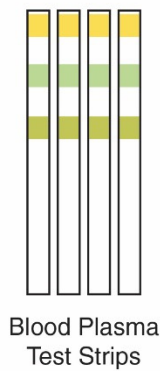
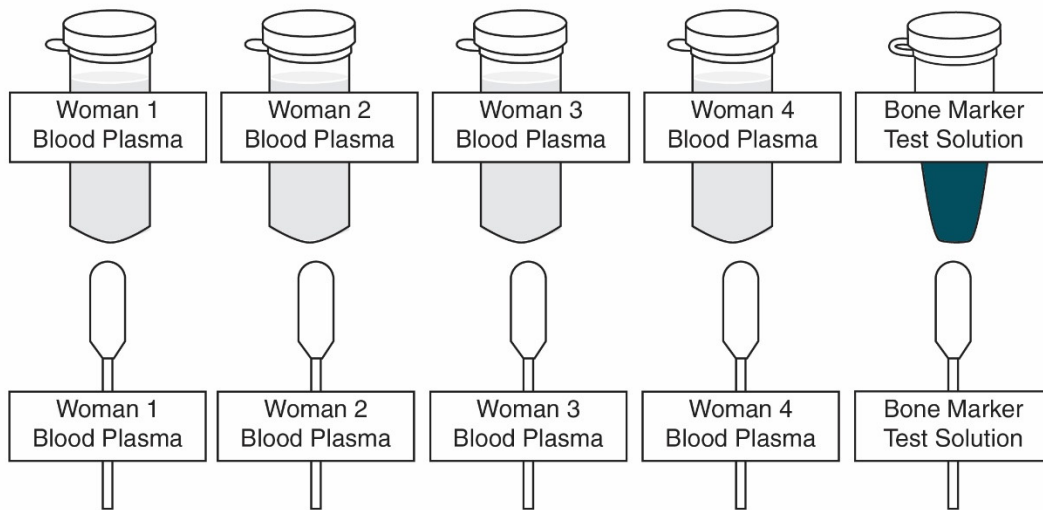
Teachers will need to instruct students on how to handle clean-up and return of the reusable kit materials. For example, teachers might provide the following information for students:

Discard	Return to kit bag
• Used Bone Marker Test Sheet • Used Blood Plasma Test Strips	• Interpreting Bone Density and T-Scores • Hip Bone X-Ray Images • Graphs: Bone Fracture Risks • Instructions for Blood Plasma Tests • Instructions for Bone Marker Test • Envelope containing 10 Years Later—Additional Data from a Variety of Electronic Sources • 4 tubes of simulated blood plasma • Tube of Bone Marker Test Solution • 5 labeled droppers • Bag for Blood Plasma Test Strips

Refills for **Big Data and Bone Fracture Risk** are available at www.sciencetakeout.com. The **10 Kit Refill Pack** includes the following materials:

- Instructions and Quick Guide for refilling kit
- Droppers used for refilling kits
- 20 mL of Woman 1 Blood Plasma (simulated)
- 20 mL of Woman 2 Blood Plasma (simulated)
- 20 mL of Woman 3 Blood Plasma (simulated)
- 20 mL of Woman 4 Blood Plasma (simulated)
- 10 mL of Bone Marker Test Solution (simulated)
- 40 Blood Plasma Test Strips (simulated)
- 10 Bone Marker Test Sheets

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.

Bone Fracture Risk and Big Data

Teacher Answer Key

Part 1: Predicting Bone Fracture Risk

Your laboratory has been asked to conduct medical tests and collect data to determine if the data could be used to predict a woman's risk for bone fractures (breaks) when she gets older. Four women (1, 2, 3, and 4) have volunteered to be subjects in the research study that will collect data about possible risk factors for bone fractures.



Woman 1
50 years old



Woman 2
55 years old



Woman 3
58 years old



Woman 4
53 years old

A. Age

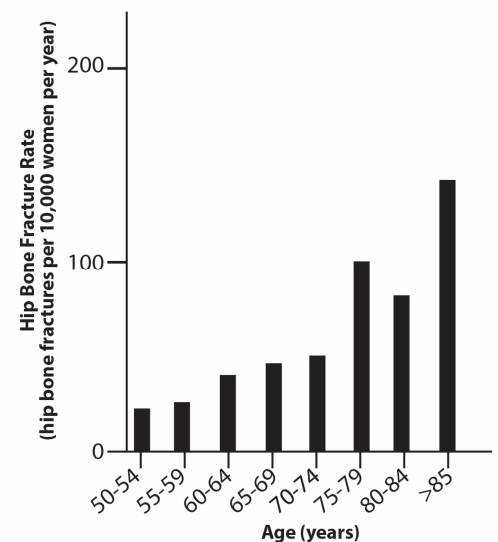
1. Describe the association between age and the rate of hip bone fracture shown in the graph on the right.

As age increases, bone fracture rate increases.

2. Record the ages of the four women on the **Data Set for Bone Fracture Risk** sheet on the last page of this handout. *You should tear this sheet off to make it easier to record your data.*
3. Which of the four women (1–4) is most at risk for hip bone fractures? Support your conclusion with specific information from the graph.

Woman 3 because she is the oldest participant in the research project. As age increases, bone fracture rate increases.

Rate of hip bone fracture versus age



B. Bone Density Test

A bone density test uses a low dose X-ray machine and a computer to determine how much calcium and other bone minerals are contained in a segment of bone. The bones that are most commonly tested are in the spine, hip and forearm. Denser bones have higher bone calcium content and are usually stronger.

A person's bone density test results are compared to the ideal bone density of a healthy 30-year-old adult. Bone density test results are reported as "T-scores." A T-score of 0 means the person's bone density is equal to that of a healthy young adult.

Low T-scores (below 0) mean that the person's bone density is low. Bones with low density are porous (they have many pores or open spaces). Porous bones are weak and more likely to fracture.

1. Put an X in front of all the characteristics of strong bones that are less likely to fracture.

___ High T-score ___ More porous ___ High bone density ___ Less calcium

2. Use the sheet that shows simulated **Hip Bone X-Ray Images** for the four women. Refer to the **Bone Density T-Scores** sheet. Compare the hip bone X-ray images from each of the four women (1, 2, 3 and 4) with the "Standard Scale of Hip Bone Density T-Scores."
3. Record the T-scores for each of the women in the appropriate column on the **Data Set for Bone Fracture Risk** sheet.
4. Based only on the bone density test results which woman (1, 2, 3, or 4) would you predict is most at risk for bone fractures when she gets older? Support your conclusion with evidence from the bone density test results data and the "Bone Density and Bone Fracture Probability" graph.

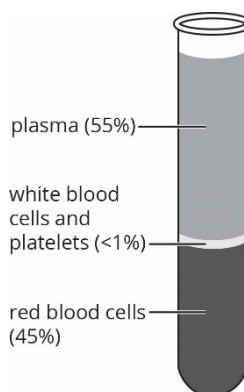
C. Blood Plasma Tests for Calcium, Vitamin D, and Estrogen

Normal levels of calcium, vitamin D, and estrogen (female sex hormone) are thought to play an important role in a bone health. The levels of these chemicals in the body can be tested in blood plasma (the clear watery part of blood). Because calcium, vitamin D, and estrogen are essential for normal bone health, low levels of these chemicals can lead to decreased bone density and increased fracture risk.

1. Test the blood plasma from each of the four women (1, 2, 3, and 4) by following the **Instructions for Blood Plasma Tests: Calcium, Vitamin D, and Estrogen**.

Blood Plasma

Plasma is a pale yellow liquid that makes up 55% of the blood. It is composed of water with dissolved salts, proteins, and enzymes. The primary purpose of plasma is to transport nutrients, hormones, and proteins to the parts of the body that need them. Cells also deposit their waste products into the plasma, and the plasma in turn helps remove this waste from the body.



2. Record the results of the blood plasma tests for estrogen, vitamin D, and calcium in the appropriate columns on the **Data Set for Bone Fracture Risk** sheet.
3. Based only on the blood plasma test results, which woman (1, 2, 3, or 4) would you predict is most at risk for bone fractures when she gets older? Support your conclusion with evidence from the plasma testing data.

D. Bone Marker Tests

Bone is living tissue that is constantly being formed (built up) and resorbed (dissolved). Bones are **strong** when:

- $F = R$ Bone **F**ormation is equal to Bone **R**esorption
- $F > R$ Bone **F**ormation is greater than Bone **R**esorption

Bones become **weak** when:

- $F < R$ Bone **F**ormation is less than Bone **R**esorption

Bone markers are substances in blood plasma that indicate the relative activities of bone forming cells and bone resorbing cells. Bone marker tests measure enzymes and proteins released into the blood plasma during bone formation and during bone resorption. Bone marker tests are done to determine if the rates of bone resorption and bone formation make bone stronger or weaker (likely to fracture).

1. Test the blood plasma from the four women (1, 2, 3, and 4) by following the **Instructions for Bone Marker Test**.
2. Record the results of the bone marker tests in the appropriate column on the **Big Data Set for Bone Fracture Risk** sheet by writing "Strong" or "Weak".
3. Based only on the bone marker test results, which woman (1, 2, 3, or 4) would you predict is most at risk for bone fractures when she gets older? Support your conclusion with evidence from the bone marker testing data.
4. Can you use the results of a woman's bone marker test to accurately predict her bone density? Support your answer.

Follow your teacher's instructions for clean-up before you go on to the next part.

E. Medical Records Information

The **Graphs: Bone Fracture Risks** sheet summarizes other factors such as exercise, body mass index, smoking, and alcohol consumption that affect a woman's risk for bone fractures.

1. Describe the association between **alcohol consumption** and bone fracture risk.
2. Describe the association between **body mass index** and bone fracture risk.
3. Describe the association between **exercise** and bone fracture risk.
4. Describe the association between **smoking** and bone fracture risk.
5. The Medical Records Information for the four women has already been entered on the **Data Set for Bone Fracture Risk** sheet. Circle the data for each factor (alcohol, BMI, exercise, and smoking) that puts women at risk for bone fracture. *See the example for Alcohol Consumption in the data set.*
6. Based only on the Medical Records information and the Graphs: Bone Fracture Risks, which woman (1, 2, 3, or 4) would you predict is most at risk for bone fractures when she gets older? Support your conclusion with evidence from the medical records data.

F. Considering All of the Information

1. Based on all of the information in the data set, which woman (1, 2, 3, or 4) is most likely to have a bone fracture during the next 10 years? Support your answer with evidence from all of the information that you collected.
2. Based on all of the information in the data set, which woman (1, 2, 3, or 4) is least likely to have a bone fracture during the next 10 years? Support your answer with evidence from all of the information that you collected.

Part 2: “Big Data” to Predict Women’s Bone Fracture Risk

It is now 10 years after you collected the original data set from the four women. Since then, additional information (data) that may be related to the women’s bone fracture risks has become available from a variety of electronic source such as health records, insurance records, online purchase activity, and social media.

1. Open the envelope labeled “DO NOT OPEN until Part 2”. This envelope contains information that may be related to the bone health of the four women 10 years later.
2. According to the **10 Years Later – Additional Data from a Variety of Electronic Sources**, which of the four women had bone fractures? ____ and ____
3. Was the data that you collected and analyzed in Part 1 (on the previous pages) accurate in determining which of the four women were likely to have bone fractures when they were 10 years older? Support your answer with evidence.
4. If a researcher conducted the same experiment with four other women, do you think that the results would be similar or different?
5. How could the experiment be improved to provide more reliable data?
6. Why is having reliable data from an experiment important if researchers are trying to make accurate predictions about a woman’s risk of bone fractures?

The data from a research study is **reliable** if it would yield the same or very similar results when done a second time. One way to increase reliability in an experiment is to increase the number of research subjects.

Imagine what a data table would look like if you combined the data you collected from four women with data collected from thousands of other people. This would create a “**big data**” set that could be analyzed to determine which factors (bone density, bone markers, calcium levels, exercise, etc.) are reliable for predicting bone fractures. The data table would have thousands of rows (one for each person). Computers would be needed to record and analyze the data.

7. Collecting data from thousands of people would be time consuming and expensive. Why is creating a “big data set” from thousands of people worth the effort?

Big data research goes beyond simply including a large number of people. A big data research study includes many different **types of data** from many different **data sources**. Analyzing additional types of data increases the likelihood that some of the factors (types of data) might affect bone fracture risk.

Look at the **10 Years Later – Additional Data from a Variety of Electronic Sources**. Notice that most of this data could be “collected” automatically from electronic sources such as phones, computers, medical records, home control devices, and wearable devices. There would be no need to enroll the women in a research study and remain in contact with them over a 10 year period.

8. If you were able use additional factors (types of data), do you think that would improve the ability to predict a woman’s bone fracture risk? Explain why or why not.

9. List at least 10 other factors (types of data) that might have influenced the women's bone fracture risk.

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10. What is the advantage to collecting many different types of data for the people in a “big data” research study?

It is likely that you are already a part of big data studies without even knowing it. There are many data sources that could already be providing different types of data (information) about you! This data could automatically be added to big data sets without your knowledge.

11. The chart below describes some data sources and examples of types of data from those sources. Complete the chart:

- Provide two additional examples of **types** of data about you that could be obtained from each source.
- Suggest another data source, and provide two examples of types of data that could be obtained from this source.

Data Sources	Types of Data (Factors)			
Medical records	Birth month	Blood pressure		
Social media	Appearance	Number of "friends"		
Home monitoring devices (Alexa/Dot)	Time at home	TV shows watched		
Mobile Devices (phone/activity tracker)	Locations visited	Hours of sleep		
Credit card purchases	Medicines purchased	Clothing styles		

12. The types of data in the chart above are not necessarily related to bone density, osteoporosis, or bone fracture risk.

- Circle three types of data on the chart that might be associated with bone fracture risk.
- Draw an X over three types of data on the chart that are unlikely to be associated with bone fracture risk.

The data table you used for the four women only included ten types of data (information) about the four women. Imagine what the “big data” set would look like if you added all of these types of data:

- data from thousands of people
- types of data (factors) listed in question 9
- types of data from the chart in question 11

13. How would the data table from the “big data” set be different from the data table that you made for the four women?

14. What is meant by the term “big data”?

15. Why might analysis of “big data” be more effective than traditional controlled experiments in identifying factors that affect women’s risk for bone fractures?

16. How is “big data” research different from the controlled experiments typically associated with traditional science research?

Data Set for Bone Fracture Risk

Woman	Age	Bone Density (T-Score)	Blood Plasma Tests			Bone Marker Test	Medical Records Information			
			Calcium	Vitamin D	Estrogen	Indicates that bones are... (Strong or Weak)	Alcohol Consumed (Drinks per Day)	Exercise Amount	Smoker	BMI (Body Mass Index)
1							1	Little	Yes	30
2							1	Active	No	25
3							3	Average	No	20
4							1	Average	Yes	15

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

Product	Buffer Solution pH3
Synonyms	"Woman 1 Blood Plasma" (simulated)

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 minor 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	99.74%	231-791-2
Potassium bipthalate	877-24-7	1.08%	212-889-4
Hydrochloric acid	7647-01-0	0.18%	231-595-7

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)
	None	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: 3.0 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
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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: Carbon oxides and chlorine gas.

Section 11 Toxicological Information

Acute toxicity: Data not available

Serious eye damage/irritation: Data not available

Germ cell mutagenicity: Data not available

Skin corrosion/irritation: Data not available

Respiratory or skin sensitization: Data not available

Carcinogenicity: 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 bipthalate	Listed	Not Listed	Not Listed	Listed	Not Listed	Not listed
Hydrochloric acid	Listed	5,000 lbs (2270 kg)	Not Listed	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.

SAFETY DATA SHEET

GENERAL STORAGE CODE GREEN

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

Product	Buffer Solution pH5
Synonyms	"Woman 2 Blood Plasma" (simulated)

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 minor 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	99.82%	231-791-2
Potassium bipthalate	877-24-7	1.08%	212-889-4
Sodium hydroxide	1310-73-2	0.1%	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)
	None	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: 5.0 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
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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: Thermal decomposition will yield carbon oxides.

Section 11 Toxicological Information

Acute toxicity: Data not available

Serious eye damage/irritation: Data not available

Germ cell mutagenicity: Data not available

Skin corrosion/irritation: Data not available

Respiratory or skin sensitization: Data not available

Carcinogenicity: 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 bipthalate	Listed	Not Listed	Not Listed	Listed	Not Listed	Not listed
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.

SAFETY DATA SHEET

GENERAL STORAGE CODE GREEN

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

Product	Buffer Solution pH7
Synonyms	"Woman 3 Blood Plasma" (simulated)

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 minor 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	99.15%	231-791-2
Potassium phosphate, monobasic	7778-77-0	0.72%	231-913-4
Sodium hydroxide	1310-73-2	0.13%	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 phosphate	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: 7.0 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
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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, alkalis, and air will change the buffer's ability.

Hazardous decomposition products: Thermal decomposition will yield phosphates and sodium oxide and/or hydroxides.

Section 11 Toxicological Information

Acute toxicity: Oral-rat LD50: 3,200 mg/kg [Potassium phosphate]

Serious eye damage/irritation: Data not available

Germ cell mutagenicity: Data not available

Skin corrosion/irritation: Data not available

Respiratory or skin sensitization: Data not available

Carcinogenicity: 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 #: TC661500 [Potassium phosphate]

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 phosphate	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.

SAFETY DATA SHEET

GENERAL STORAGE CODE GREEN

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

Product	Buffer Solution pH9
Synonyms	"Woman 4 Blood Plasma" (simulated)

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 minor 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	99.18%	231-791-2
Potassium chloride	7447-40-7	0.40%	231-211-8
Boric acid	10043-35-3	0.33%	233-139-2
Sodium hydroxide	1310-73-2	0.09%	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: 9.0 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
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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

Serious eye damage/irritation: Data not available

Germ cell mutagenicity: Data not available

Skin corrosion/irritation: Data not available

Respiratory or skin sensitization: Data not available

Carcinogenicity: 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.

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

Product	Bromothymol blue, 0.1% aqueous solution
Synonyms	"Bone Marker Test Solution" (simulated)

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: Not classified
Pictograms: Not classified
Target organs: None known

GHS Classification: Not classified
GHS Label information: Not classified
Precautionary Statement: Not classified

Supplementary information:

Do not breathe vapors, spray or mist. Do not get in eyes, on skin, or on clothing. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Get medical attention if you feel unwell.

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	99.9%	231-791-2
Bromothymol blue, sodium salt	34722-90-2	0.1%	252-169-7

Section 4 First Aid Measures

INGESTION: MAY BE HARMFUL IF SWALLOWED. 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: MAY BE HARMFUL IF INHALED. MAY CAUSE RESPIRATORY TRACT IRRITATION. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

EYE CONTACT: MAY CAUSE EYE IRRITATION. 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: MAY CAUSE SKIN IRRITATION. 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: In fire conditions, water may evaporate from this solution which may cause hazardous decomposition products to be formed as dust or fume.

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. Protect from light.

Section 8 Exposure controls / Personal Protection

Exposure Limits:	Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Bromothymol blue	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: Liquid, clear, blue-green. Odor: No odor. Odor threshold: Data not available. pH: Data not available 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
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Section 10 Stability and Reactivity

Chemical stability: Stable

Hazardous polymerization: Will not occur.

Conditions to avoid: Excessive temperatures which cause evaporation. Protect from light.

Incompatibilities with other materials: Strong oxidizers.

Hazardous decomposition products: Carbon oxides, sulfur oxides and bromine gas.

Section 11 Toxicological Information

Acute toxicity: Data not available

Serious eye damage/irritation: Data not available

Germ cell mutagenicity: Data not available

Skin corrosion/irritation: Data not available

Respiratory or skin sensitization: Data not available

Carcinogenicity: 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 irritation.

Eyes: May cause 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
Bromothymol blue, sodium salt	Listed	Not Listed	Not Listed	Listed	Not Listed	Not Listed

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.