

PRODUCT DESCRIPTION

- The Bicinchoninic Acid (BCA) Protein Assay Kit is used to determine protein concentration in an unknown sample.
- At room temperature, cysteine, cystine, tryptophan and tyrosine residues reduce Cu^{2+} to Cu^{1+} . At higher temperatures (37° C to 60° C), peptide bonds in protein also perform this reduction, which produce results that correlate more strongly to protein quantity than to the presence of specific residues.
- Each Cu^{1+} ion forms a complex with two BCA molecules, creating a purple-colored product that absorbs light at 562 nm.
- Absorbance data from unknown samples can be plotted against a standard curve and concentration of unknown samples can thus be calculated.

MATERIALS

The following materials are included with each Santa Cruz Biotechnology BCA Protein Assay Kit: sc-202389.

1 liter Reagent A
25 ml Reagent B
25 ml 2mg/ml BSA Standard

The following materials, which are not included, are recommended for use in BCA protein assays:

FOR MICROPLATE PROCEDURE

UltraCruz™ Microcentrifuge Tube (sc-200629 or sc-200271)
UltraCruz™ Polystyrene Microplates (sc-204453)
ExactaCruz™ Single Channel Pipettor (sc-200241, sc-200235 or sc-200232)
Plate Reader

FOR CUVETTE PROCEDURE

UltraCruz™ Microcentrifuge Tube (sc-200629 or sc-200271)
UltraCruz™ Cuvettes, Methacrylate (sc-201762)
ExactaCruz™ Single Channel Pipettor (sc-200241, sc-200235 or sc-200232)
ExactaCruz™ Single Channel Pipettor (sc-200232 or sc-200237)
Spectrophotometer

SUBSTANCE CONCENTRATION TOLERANCE CHART

SUBSTANCE	CONCENTRATION TOLERANCE
N-Acetylglucosamine in PBS, pH 7.2	10 mM
ACES, pH 7.8	25 mM
Acetone	10%
Acetonitrile	10%
Ammonium sulfate	1.5 M
Aprotinin	10 mg/l
Bicine, pH 8.4	20 mM
Bis-Tris, pH 6.5	33 mM
Brij-35	5%
Brij-52	1%
Calcium chloride in TBS, pH 7.2	10 mM
Cesium bicarbonate	100 mM
CHAPS/CHAPSO	5%
CHES, pH 9.0	100 mM
Cobalt chloride in TBS, pH 7.2	800 mM
Deoxycholic acid	5%
Dithioerythritol (DTE)	1 mM
Dithiothreitol (DTT)	1 mM
DMF	10%

SUBSTANCE	CONCENTRATION TOLERANCE
DMSO	10%
DNA / RNA	2 mg/ml
EDTA	10 mM
EPPS, pH 8.0	100 mM
Emulgen	1%
Ethanol	10%
Ferric chloride in TBS, pH 7.2	10 mM
Glucose	10 mM
Glycerol	10%
Glycine, pH 2.8	100 mM
Guanidine•HCl	4 M
HEPES	100 mM
HCl	100 mM
Imidazole 50	mM
KCl	10 mM
Leupeptin	10 mg/l
Lubrol	PX 1%
2-Mercaptoethanol	1 mM
MES, pH 6.1	100 mM
Methanol	10%
MOPS, pH 7.2	100 mM
Nickel chloride in TBS	10 mM
NaCl pH 7.2	1 M
NaOH	100 mM
Nonidet P-40	5%
Octyl β-glucoside	5%
Octyl β-thioglucoyanoside	5%
PBS; Phosphate	100 mM
PCA	1%
PIPES, pH 6.8	100 mM
PMSF	1 mM
SDS	5%
Sodium acetate, pH 4.8	200 mM
Sodium azide	0.2%
Sodium bicarbonate	100 mM
Sodium citrate, pH 4.8 or pH 6.4	200 mM
Sodium chloride	1 M
Sodium hydroxide	100 mM
Sodium orthovanadate in PBS, pH 7.2	1 mM
Sodium phosphate	25 mM
Span 20	1%
Sucrose	40%
TCA	1%
TLCK	0.1 mg/l
TPCK	0.1 mg/l
Thimerosal	0.01%
Tributyl Phosphine	0.01%
Tricine, pH 8.0	25 mM
Triethanolamine, pH 7.8	25 mM
Tris	100 mM
TBS; Tris (25 mM), NaCl (0.15 M), pH 7.6	undiluted
Tris (25 mM), Glycine (1.92 M), SDS (0.1%), pH 8.3	undiluted
Triton X-100, X-114, X-305, X-405	1%
Tween 20, 60, 80	5%
Urea	3 M
X-Dodecyl	1%
Zinc chloride in TBS, pH 7.2	10 mM
Zwittergents	1%

MICROPLATE PROCEDURE

The microplate procedure requires a smaller volume (200 µl) of protein sample, and because the sample to Reagent AB ratio is 1:8; substances in the Substance Concentration Tolerance Chart on the first page of this protocol are not diluted out as much as with the cuvette procedure.

PREPARATION OF BSA STANDARD

- Use one of the tables below to prepare a set of BSA standards to make a standard curve.
- Select the set of dilutions that most closely corresponds to the expected concentration.
- Standard samples should be tested in triplicate and the results averaged.
- The tables below have volumes sufficient for all eight dilutions in triplicate, which are the standard for one plate.
- Stock BSA standard is 2 mg/ml.

125-2,000 µg/ml

VIAL	µl PBS	µl and SOURCE	CONCENTRATION
A	0	100 µl stock	2,000 µg/ml
B	50	150 µl stock	1,500 µg/ml
C	100	100 µl stock	1,000 µg/ml
D	100	100 µl Vial B	750 µg/ml
E	100	100 µl Vial C	500 µg/ml
F	100	100 µl Vial E	250 µg/ml
G	100	100 µl Vial F	125 µg/ml
H	100	0	0 µg/ml

5-250 µg/ml

VIAL	µl PBS	µl AND SOURCE	CONCENTRATION
A	700	100 µl stock	250 µg/ml
B	100	400 µl Vial A	200 µg/ml
C	100	300 µl Vial B	150 µg/ml
D	100	100 µl Vial B	100 µg/ml
E	100	100 µl Vial D	50 µg/ml
F	100	100 µl Vial E	25 µg/ml
G	400	100 µl Vial F	5 µg/ml
H	100	0	0

PREPARATION OF UNKNOWN SAMPLES

- Below is a suggested serial dilution to perform on the unknown sample to get a broad range of concentrations.
- Unknown samples should be tested in triplicate and the results averaged.
- This table has volumes sufficient for all eight dilutions in triplicate.

For each unknown sample

VIAL	µl PBS	µl AND SOURCE	CONCENTRATION
A	0	200 µl unknown sample	stock
B	100	100 µl Vial A	1/2
C	100	100 µl Vial B	1/4
D	100	100 µl Vial C	1/8
E	100	100 µl Vial D	1/16
F	100	100 µl Vial E	1/32
G	100	100 µl Vial F	1/64
H	100	100 µl Vial G	1/128

PREPARATION OF REAGENT AB

- Determine how much Reagent AB is required for 200 µl per well.

NOTE: a standard is required on each plate.

$$\begin{aligned} 8 \text{ standard dilutions} \times \# \text{ replicates} &= \text{standard wells} \\ \# \text{ unknown} \times 8 \text{ dilutions} \times \# \text{ replicates} &= \text{unknown wells} \\ (\text{standard wells} + \text{unknown wells}) \times 0.2 &= \text{ml of Reagent AB} \end{aligned}$$

Example: 1 standard and 3 unknowns in triplicate:

$$\begin{aligned} 8 \text{ dilutions} \times 3 &= 24 \text{ wells of standard} \\ 3 \text{ unknown} \times 8 \text{ dilutions} \times 3 &= 72 \text{ wells of unknown} \\ (24 + 72) \times 0.2 &= 19.2 \text{ ml for one full 96 well plate} \end{aligned}$$

- Mix Reagent A with Reagent B in a 50:1 ratio

In this example, at least 19.2 ml is needed:

$$20 \text{ ml Reagent A} + 0.4 \text{ ml Reagent B}$$

- When Reagent A and B are mixed, the solution will turn light green. This is the expected result.
- Reagent AB must be prepared immediately before use.

PREPARATION OF MICROPLATE

- Add 25 µl of each BSA standard into microplate wells, columns 1-3. Vial A goes into row A, Vial B goes into row B, and so on.
- Add 25 µl of unknown 1 into microplate wells, columns 4-6. Vial A goes into row A, Vial B goes into row B, and so on.
- In the next columns, repeat for unknown 2 and 3, if applicable.
- Add 200 µl of Reagent AB to every well containing a sample.

READING THE MICROPLATE

- Incubate plate at 60° C for 15 minutes or 37° C for 30 minutes.
- Remove plate from incubator and let cool at room temperature for 5 minutes.
- Measure absorbance of all wells in a microplate reader at 562 nm.
- Plot a standard curve using the data from the standard sample dilutions and use the curve to determine the concentrations of each unknown.
- If plotting the standard curve by hand, it is recommended to use a point-to-point linear approximation as opposed to an overall linear approximation, as this will produce more accurate results.
- If using a microplate reader equipped with a curve-fitting algorithm, a four-parameter curve is most accurate.

INTERFERING SUBSTANCES

Some substances are known to interfere with the BCA Assay, including those with reducing potential, chelating agents, and strong acids or bases. The following substances are known to interfere at even minute concentrations with accurate estimation of protein concentration:

Ascorbic Acid
Catecholamines
Creatinine
EGTA
Hydrazides
Hydrogen Peroxide
Impure Glycerol
Impure Sucrose
Iron
Lipids
Melibiose
Other Protein
Phenol Red
Tryptophan
Tyrosine
Uric Acid

CUVETTE PROCEDURE

The cuvette procedure requires a larger volume (400 µl) of protein sample, and because the sample to Reagent AB ratio is 1:20; substances in the Substance Concentration Tolerance Chart on the first page of this protocol are diluted out more than with the microplate procedure. The cuvette procedure is favorable when high concentrations of intolerant substances are present in sample.

PREPARATION OF BSA STANDARD

- Use one of the tables below to prepare a set of BSA standards to make a standard curve.
- Select the set of dilutions that most closely corresponds to the expected concentration.
- Standard samples should be tested in triplicate and the results averaged.
- The tables below have volumes sufficient for all eight dilutions in triplicate.
- Stock BSA standard is 2 mg/ml.

125-2,000 µg/ml

VIAL	µl PBS	µl and SOURCE	CONCENTRATION
A	0	200 µl stock	2,000 µg/ml
B	100	300 µl stock	1,500 µg/ml
C	200	200 µl stock	1,000 µg/ml
D	200	200 µl Vial B	750 µg/ml
E	200	200 µl Vial C	500 µg/ml
F	200	200 µl Vial E	250 µg/ml
G	200	200 µl Vial F	125 µg/ml
H	200	0	0 µg/ml

5-250 µg/ml

VIAL	µl PBS	µl AND SOURCE	CONCENTRATION
A	700	100 µl stock	250 µg/ml
B	125	500 µl Vial A	200 µg/ml
C	50	150 µl Vial B	150 µg/ml
D	200	200 µl Vial B	100 µg/ml
E	200	200 µl Vial D	50 µg/ml
F	200	200 µl Vial E	25 µg/ml
G	200	50 µl Vial F	5 µg/ml
H	100	0	0

PREPARATION OF UNKNOWN SAMPLES

- Below is a suggested serial dilution to perform on the unknown sample to get a broad range of concentrations.
- Unknown samples should be tested in triplicate and the results averaged.
- This table has volumes sufficient for all eight dilutions in triplicate.

For each unknown sample

VIAL	µl PBS	µl AND SOURCE	CONCENTRATION
A	0	400 µl stock	stock
B	200	200 µl Vial A	1/2
C	200	200 µl Vial B	1/4
D	200	200 µl Vial C	1/8
E	200	200 µl Vial D	1/16
F	200	200 µl Vial E	1/32
G	200	200 µl Vial F	1/64
H	200	200 µl Vial G	1/128

PREPARATION OF REAGENT AB

- Determine how much Reagent AB is required for 1 ml per cuvette.

$$\begin{aligned}
 &8 \text{ standard dilutions} \times \# \text{ replicates} = \text{standard vials} \\
 &\# \text{ unknown} \times 8 \text{ dilutions} \times \# \text{ replicates} = \text{unknown vials} \\
 &(\text{standard vials} + \text{unknown vials}) = \text{ml of Reagent AB}
 \end{aligned}$$

Example: 1 standard and 3 unknowns in triplicate:

$$8 \times 3 = 24 \text{ vials}$$

$$3 \text{ unknown} \times 8 \text{ dilutions} \times 3 = 72 \text{ unknown vials}$$

$$(24 + 72) = 96 \text{ ml}$$

- Mix Reagent A with Reagent B in a 50:1 ratio

In this example, at least 96 ml is needed:

$$100 \text{ ml Reagent A} + 2 \text{ ml Reagent B}$$

- When Reagent A and B are mixed, the solution will turn light green. This is the expected result.
- Reagent AB must be prepared immediately before use.

PREPARATION OF CUVETTES

- Add 50 µl of each standard into labeled cuvettes.
- Add 50 µl of unknown into labeled cuvettes.
- Add 1 ml of Reagent AB to every cuvette.

READING THE CUVETTES

- Incubate cuvettes at 60° C for 15 minutes or 37° C for 30 minutes.
- Remove from incubator and let sit at room temperature for 5 minutes.
- Prepare a blank cuvette of PBS and zero the spectrophotometer at 562 nm.
- Measure absorbance of all samples at 562 nm. Samples must be measured within 10 minutes of each other, since BCA will continue to develop at a slow rate while at room temperature.

NOTE: For best results, it is recommended that each set of triplicate sample dilutions be read together. For example, measure absorbance of each cuvette from the first set of triplicate dilutions, followed by the second set, and the third. This will minimize inaccuracy due to the BCA reaction continuing at room temperature.

- Plot a standard curve using the data from the standard sample dilutions and use the curve to determine the concentrations of each unknown.
- If plotting the standard curve by hand, it is recommended to use a point-to-point linear approximation as opposed to an overall linear approximation, as this will produce more accurate results.

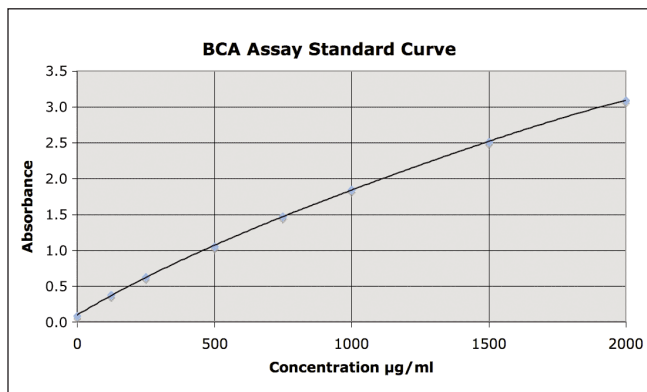
INTERFERING SUBSTANCES

Some substances are known to interfere with the BCA Assay, including those with reducing potential, chelating agents, and strong acids or bases. The following substances are known to interfere at even minute concentrations with accurate estimation of protein concentration:

Ascorbic Acid
 Catecholamines
 Creatinine
 EGTA
 Hydrazides
 Hydrogen Peroxide
 Impure Glycerol
 Impure Sucrose
 Iron
 Lipids
 Melibiose
 Other Protein
 Phenol Red
 Tryptophan
 Tyrosine
 Uric Acid

INTERPRETING THE RESULTS

- By plotting an unknown sample's absorbance on the standard curve and relating that absorbance to the standard, the concentration of the solution can be calculated.
- Example standard curve of 2mg/ml BSA:



- Each dilution is averaged and plotted on a graph, and a trendline is added.
- Though the points may have some degree of deviation, they should be generally linear with a slight downward curve.
- Unknown concentrations are determined by relating their absorbances to the absorbances on the graph.
- Only use the unknown dilutions where the absorbance falls between the bounds of this graph (125-2,000 µg/ml or 5-250 µg/ml, depending on which set of standard dilutions were used).
- Plot the absorbance of each unknown dilution on the standard curve.
- Follow those points down to find the correlating concentration for each unknown dilution.
- Multiply those concentrations by the dilution of the sample to calculate the stock concentration.
- Average the calculated stock concentrations. If one of them is drastically different from the rest, it may be ignored.
- For example:

This is an unknown concentration of BSA using the standard curve above, with these average BCA assay absorbances and the resulting conclusions:

DILUTION	ABSORBANCE	CORRELATING CONCENTRATION	CALCULATED STOCK CONCENTRATION
stock	max	max	
1/2	max	max	
1/4	2.674	1.625	6.500
1/8	1.567	0.820	6.560
1/16	1.009	0.460	7.360
1/32	0.560	0.225	7.200
1/64	0.322	0.100	6.400
1/128	0.193	0.045	5.760

NOTES RE: THE EXAMPLE

- Stock and 1/2 dilution samples were too concentrated and no data was available from the plate reader.
- The 1/64 and 1/128 dilution samples have concentrations outside the effective range of this assay and must be discarded.

Averaging the remaining 4 samples: $(6.5 + 6.56 + 7.36 + 7.2) / 4 = 6.9$

The stock concentration of unknown BSA is 6.9 mg/ml.

STORAGE AND STABILITY

- Store all BCA Protein Assay kit components at room temperature.
- Components remain stable for one year after date of shipment.

RESEARCH USE

For research use only, not for use in diagnostic procedures.

BCA Protein Assay Kit: sc-202389



The Power to Question

Reagent A

MATERIAL SAFETY DATA SHEET

1. Product and company identification

Product name	: Reagent A
Synonym	: BCA Protein Assay Reagent A, BCA Reagent A
Supplier	: Santa Cruz Biotechnology, Inc. 2145 Delaware Avenue Santa Cruz, California 95060 800.457.3801 or 831.457.3800

2. Hazards identification

Physical state	: Liquid. [Clear sparkling liquid.]
Odor	: Odorless.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: WARNING ! CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE. Severely irritating to eyes. Irritating to respiratory system and skin. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not get in eyes. Avoid contact with skin and clothing. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Dermal contact. Eye contact. Inhalation. Ingestion.
<u>Potential acute health effects</u>	
Inhalation	: Irritating to respiratory system. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Ingestion	: No known significant effects or critical hazards.
Skin	: Irritating to skin.
Eyes	: Severely irritating to eyes. Risk of serious damage to eyes.
<u>Potential chronic health effects</u>	
Chronic effects	: Contains material that can cause target organ damage.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.
Target organs	: Contains material which causes damage to the following organs: eyes. Contains material which may cause damage to the following organs: lungs, mucous membranes, gastrointestinal tract, upper respiratory tract, skin.
<u>Over-exposure signs/symptoms</u>	
Inhalation	: Adverse symptoms may include the following: respiratory tract irritation coughing

- Ingestion** : No specific data.
- Skin** : Adverse symptoms may include the following:
irritation
redness
- Eyes** : Adverse symptoms may include the following:
pain or irritation
watering
redness
- Medical conditions aggravated by over-exposure** : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

The preparation is not classified as dangerous according to Directive 1999/45/EC and its amendments.

Classification : Not classified.

See toxicological information (section 11)

3 . Composition/information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>%</u>
BCA (Bicinchoninic Acid)	979-88-4	1%
Sodium Tartrate	868-18-8	0.16%
Sodium Carbonate	497-19-8	2%
Sodium BiCarbonate	144-55-8	0.95%
Sodium Hydroxide	1310-73-2	~0.4%

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in section 8.

4 . First aid measures

- Inhalation** : Move exposed person to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
- Ingestion** : Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Eye contact** : Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention. Chemical burns must be treated promptly by a physician.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See section 11 for more detailed information on health effects and symptoms.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous combustion products : Decomposition products may include the following materials:
carbon oxides
nitrogen oxides
metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store between the following temperatures: 20 to 25°C (68 to 77°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Europe

No exposure limit value known.

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Liquid. [Clear sparkling liquid.]

Color : Colorless to light yellow.

Odor : Odorless.

pH : 11.15 to 11.35

Relative density : 1.03

Solubility : Easily soluble in the following materials: cold water and hot water.

10 . Stability and reactivity

Chemical stability : The product is stable. Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Possibility of hazardous reactions : Will not occur.

11 . Toxicological information

United States

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
sodium carbonate	LD50 Oral	Rat	4090 mg/kg	-

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
sodium carbonate	-	-	-	None.	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

sodium carbonate	-	Positive	-	Mouse - Female	Unreported: - 84800 ng/kg
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Conclusion/Summary : Not available.

Europe

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

United States

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Hazardous waste : Within the present knowledge of the supplier, this product is not regarded as hazardous waste, as defined by EU Directive 91/689/EEC.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*
DOT Classification	Not regulated.	-	-	-
IATA-DGR Class	Not regulated.	-	-	-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Irritating material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: sodium carbonate
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: sodium carbonate: Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: sodium hydroxide
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Canada

WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).
Canadian lists : **CEPA Toxic substances**: None of the components are listed.
Canadian ARET: None of the components are listed.
Canadian NPRI: None of the components are listed.
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Canada inventory : **Canada inventory**: Not determined.

EU regulations

Risk phrases : This product is not classified according to EU legislation.
:

International regulations

International lists : **Australia inventory (AICS)**: Not determined.
China inventory (IECSC): Not determined.
Korea inventory (KECI): All components are listed or exempted.
Philippines inventory (PICCS): Not determined.
Japan inventory (ENCS): Not determined.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	0
Physical hazards	0

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Full text of R-phrases referred to in sections 2 and 3 - Europe : R36- Irritating to eyes.
R36/37/38- Irritating to eyes, respiratory system and skin.

Full text of classifications referred to in sections 2 and 3 - Europe : Xi - Irritant

Notice to reader

The above information is believed to be correct but does not purport to be complete and should be used only as a guide. The burden of safe use of this material rests entirely with the user.

Emergency Contact:

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800
or Luis Yanez 831.251.2170

BCA Protein Assay Kit: sc-202389



The Power to Question

BSA Standard

MATERIAL SAFETY DATA SHEET

1. Product and company identification

Product name : BSA Standard
Synonym : Albumin Standard
Supplier : Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

2. Hazards identification

Physical state : Liquid. [Clear sparkling liquid.]
Odor : Odorless.
OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview : NOT EXPECTED TO PRODUCE SIGNIFICANT ADVERSE HEALTH EFFECTS WHEN THE RECOMMENDED INSTRUCTIONS FOR USE ARE FOLLOWED.
No known significant effects or critical hazards. Avoid prolonged contact with eyes, skin and clothing.

Routes of entry : Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : No known significant effects or critical hazards.
Ingestion : No known significant effects or critical hazards.
Skin : No known significant effects or critical hazards.
Eyes : No known significant effects or critical hazards.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Inhalation : No specific data.
Ingestion : No specific data.
Skin : No specific data.
Eyes : No specific data.

Medical conditions aggravated by over-exposure : None known.

The preparation is not classified as dangerous according to Directive 1999/45/EC and its amendments.

Classification : Not classified.

See toxicological information (section 11)

3 . Composition/information on ingredients

Substance/preparation : Preparation
0.2% BSA_m in 1x PBS / 0.02% Azide

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First aid measures

- Inhalation** : Move exposed person to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention if symptoms occur. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Ingestion** : Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if symptoms occur. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Eye contact** : Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training.
- See section 11 for more detailed information on health effects and symptoms.

5 . Fire-fighting measures

- Flammability of the product** : In a fire or if heated, a pressure increase will occur and the container may burst.
- Extinguishing media**
- Suitable** : Use an extinguishing agent suitable for the surrounding fire.
 - Not suitable** : None known.
- Special exposure hazards** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
- Hazardous combustion products** : No specific data.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

- Large spill** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.
- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

- Handling** : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Storage** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Europe

No exposure limit value known.

Consult local authorities for acceptable exposure limits.

- Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.
- Engineering measures** : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.
- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Personal protection**
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Liquid. [Clear sparkling liquid.]
Color : Colorless to light yellow.
Odor : Odorless.
Solubility : Easily soluble in the following materials: cold water and hot water.

10 . Stability and reactivity

Chemical stability : The product is stable. Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid : No specific data.
Incompatible materials : No specific data.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Possibility of hazardous reactions : Will not occur.

11 . Toxicological information

United States

Acute toxicity

Conclusion/Summary : To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

Chronic toxicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Europe

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

United States

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Hazardous waste : Within the present knowledge of the supplier, this product is not regarded as hazardous waste, as defined by EU Directive 91/689/EEC.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*
DOT Classification	Not regulated.	-	-	-
IATA-DGR Class	Not available.	Not available.	Not available.	-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.

SARA 302/304 emergency planning and notification: No products were found.

SARA 302/304/311/312 hazardous chemicals: No products were found.

SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

Canadian lists : **CEPA Toxic substances**: None of the components are listed.

Canadian ARET: None of the components are listed.

Canadian NPRI: None of the components are listed.

Alberta Designated Substances: None of the components are listed.

Ontario Designated Substances: None of the components are listed.

Quebec Designated Substances: None of the components are listed.

Canada inventory : **Canada inventory**: All components are listed or exempted.

EU regulations

Risk phrases : This product is not classified according to EU legislation.

International regulations

International lists

: **Australia inventory (AICS)**: All components are listed or exempted.

China inventory (IECSC): All components are listed or exempted.

Korea inventory (KECI): All components are listed or exempted.

Philippines inventory (PICCS): All components are listed or exempted.

Japan inventory (ENCS): Not determined.

16 . Other information

Label requirements : NOT EXPECTED TO PRODUCE SIGNIFICANT ADVERSE HEALTH EFFECTS WHEN THE RECOMMENDED INSTRUCTIONS FOR USE ARE FOLLOWED.

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	0
Physical hazards	0

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Notice to reader

The above information is believed to be correct but does not purport to be complete and should be used only as a guide. The burden of safe use of this material rests entirely with the user.

Emergency Contact:

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800
or Luis Yanez 831.251.2170

BCA Protein Assay Kit: sc-202389



The Power to Question

Reagent B

MATERIAL SAFETY DATA SHEET

1. Product and company identification

Product name	: Reagent B
Synonym	: BCA Protein Assay Reagent B; Micro BCA Reagent C; BCA Reagent B; BCA Reagents
Supplier	: Santa Cruz Biotechnology, Inc. 2145 Delaware Avenue Santa Cruz, California 95060 800.457.3801 or 831.457.3800

2. Hazards identification

Physical state	: Liquid. [Clear sparkling liquid.]
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: WARNING ! HARMFUL IF SWALLOWED. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE. Toxic if swallowed. Irritating to eyes, respiratory system and skin. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Eye contact. Inhalation. Ingestion.
Potential acute health effects	
Inhalation	: Irritating to respiratory system.
Ingestion	: Toxic if swallowed.
Skin	: Irritating to skin.
Eyes	: Irritating to eyes.
Potential chronic health effects	
Chronic effects	: Contains material that can cause target organ damage.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.
Target organs	: Contains material which causes damage to the following organs: blood, kidneys, the nervous system, liver, heart, upper respiratory tract.
Over-exposure signs/symptoms	
Inhalation	: Adverse symptoms may include the following: respiratory tract irritation coughing
Ingestion	: No specific data.
Skin	: Adverse symptoms may include the following: irritation redness

- Eyes** : Adverse symptoms may include the following:
 pain or irritation
 watering
 redness
- Medical conditions aggravated by over-exposure** : Pre-existing digestive disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.

- Classification** : N; R51/53
- Environmental hazards** : Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

See toxicological information (section 11)

3. Composition/information on ingredients

United States

<u>Name</u>	<u>CAS number</u>	<u>%</u>
COPPER (II) SULFATE	7758-99-8	4%

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in section 8.

4. First aid measures

- Inhalation** : Get medical attention immediately. Move exposed person to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Ingestion** : Get medical attention immediately. Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing or wear gloves. Continue to rinse for at least 10 minutes. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Eye contact** : Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing or wear gloves.

See section 11 for more detailed information on health effects and symptoms.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
sulfur oxides
metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Product name

United States

copper(ii)sulfate, pentahydrate

Exposure limits

ACGIH TLV (United States).

TWA: 1 mg/m³

OSHA PEL (United States).

TWA: 0.1 mg/m³

Europe

copper(ii)sulfate, pentahydrate

ACGIH TLV (United States).

TWA: 1 mg/m³

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory

: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands

: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eyes

: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin

: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls

: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Liquid. [Clear sparkling liquid.]

Color : Blue.

Solubility : Easily soluble in the following materials: cold water and hot water.

10 . Stability and reactivity

Chemical stability : The product is stable. Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Possibility of hazardous reactions : Will not occur.

11 . Toxicological information

United States

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
copper(ii)sulfate, pentahydrate	LD50 Dermal	Rat	>2 g/kg	-
	LD50 Intraperitoneal	Rat	18700 ug/kg	-
	LD50 Oral	Rat	300 mg/kg	-

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Europe

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

12 . Ecological information

Environmental effects : Water polluting material. May be harmful to the environment if released in large quantities.

United States

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*
DOT Classification	UN3082	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.. Marine pollutant (copper(ii)sulfate, pentahydrate)	9	III
IATA-DGR Class	Not available.	Not available.	Not available.	-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Toxic material
Irritating material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: At least one component is not listed.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: copper(ii)sulfate, pentahydrate
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: copper(ii)sulfate, pentahydrate: Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: copper(ii)sulfate, pentahydrate
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: copper(ii)sulfate, pentahydrate	7758-99-8	3 - 5

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

Canada

WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).
Canadian lists : **CEPA Toxic substances**: None of the components are listed.
Canadian ARET: None of the components are listed.
Canadian NPRI: The following components are listed: Copper
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Canada inventory : **Canada inventory**: Not determined.

EU regulations

Hazard symbol or symbols :



Dangerous for the environment

Risk phrases : R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety phrases : S61- Avoid release to the environment. Refer to special instructions/safety data sheet.

International regulations

International lists

- : **Australia inventory (AICS)**: All components are listed or exempted.
- : **China inventory (IECSC)**: All components are listed or exempted.
- : **Korea inventory (KECI)**: All components are listed or exempted.
- : **Philippines inventory (PICCS)**: All components are listed or exempted.
- : **Japan inventory (ENCS)**: All components are listed or exempted.

16 . Other information

Label requirements : HARMFUL IF SWALLOWED. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	0
Physical hazards	0

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Full text of R-phrases referred to in sections 2 and 3 - Europe

- : R22- Harmful if swallowed.
- : R36/38- Irritating to eyes and skin.
- : R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- : R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Full text of classifications referred to in sections 2 and 3 - Europe

- : Xn - Harmful
- : Xi - Irritant
- : N - Dangerous for the environment

Notice to reader

The above information is believed to be correct but does not purport to be complete and should be used only as a guide. The burden of safe use of this material rests entirely with the user.

Emergency Contact:

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800
or Luis Yanez 831.251.2170