

# LABORATORY WASTE MANAGEMENT

Department of Medicine, NUS Medicine  
Safety Day 16<sup>th</sup> May 2017

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OSHE

# OVERVIEW

- Singapore Legislations
- Waste Management & Hierarchy
- Disposal Practices
  - Biohazardous waste (solid, liquid)
  - Chemical waste
  - Radiation waste

# PRUDENT HANDLING OF LABORATORY WASTE

“No activity should begin unless a plan for disposal of **non-hazardous and hazardous waste** has been formulated.”

“Maximize safety and minimize environmental impact.”

The generator must ensure that the procedure eliminates the **regulated hazard** before the products are disposed of as nonhazardous waste. In addition, if the procedure suggests disposal of the product into the sanitary sewer, this strategy **must comply with local regulations**.

# Register of Safety & Health Legislations Applicable to NUS

This table provides an overview of national safety and health legislations and standards applicable to NUS. Staff are kindly advised to consult their respective Faculty Safety and Health Officers for more information. Information about OSHE's programmes and services can be found at the following website (<http://www.nus.edu.sg/osh/>).

You may use the [Online Regulated Material Identifier](#) (ORMI) to assess whether the chemicals that you possess and use in your workplace are regulated chemicals.

**Shortcut to the following section:** [Animals and Birds Act](#) | [Arms and Explosives Act](#) | [Biological Agents and Toxins Act](#) | [Chemical Weapons \(Prohibition\) Act](#) | [Control of Plants Act](#) | [Control of Vectors & Pesticides Act](#) | [Environmental Protection & Management Act](#) | [Environmental Public Health Act](#) | [Fire Safety Act](#) | [Misuse of Drugs Act](#) | [Protected Areas and Protected Places Act](#) | [Poisons Act](#) | [Radiation Protection Act](#) | [Sewerage & Drainage Act](#) | [The Singapore Biosafety Guidelines for Research on Genetically Modified Organisms \(GMOs\)](#) | [Unmanned Aircraft \(Public Safety and Security\) Act](#) | [WHO Laboratory Biosafety Manual](#) | [Workplace Safety and Health Act](#)

# LEGISLATIONS

## – STORAGE AND USAGE

NUS National University of Singapore  
Office of Safety, Health and Environment

### Legislations & Authorities

<b>1</b> Fire Safety (Petroleum & Flammable Materials) Regulations  The Life Saving Force	<b>2</b> Environmental Protection & Management (Hazardous Substances) Regulations  National Environment Agency Safeguard - Nurture - Cherish	<b>3</b> Arms & Explosives Act  Singapore Police Force A member of the Home Team
<b>4</b> Chemical Weapons (Prohibition) Act  SINGAPORE CUSTOMS	<b>5</b> Poisons Act  HSA HEALTH SCIENCE AUTHORITY	<b>6</b> Misuse of Drugs Act  CNB CENTRAL NARCOTICS BUREAU

NUS National University of Singapore  
Office of Safety, Health and Environment

### Chemicals & substances of concern...

 <b>Petroleum &amp; Flammable Materials</b>	 <b>Hazardous Substances</b>	 <b>Explosives &amp; Explosive Precursors</b>
 <b>Chemical Weapons</b>	 <b>Scheduled Poisons</b>	 <b>Controlled Drugs</b>

Click on the respective image for more details

Presented by Mr Jedison Ong (OSHE)  
DoM Safety Talk 2016

# LEGISLATIONS

## - DISPOSAL

### Environmental Public Health Act (EPHA)

Specifies the regulatory requirements for public cleansing, disposal and treatment of toxic and environmentally hazardous chemicals, **etc.**

### Sewerage & Drainage (Trade Effluent) Regulations

Regulates the discharge of waste water into public sewers.

### Radiation Protection Act

Regulates the disposal of radioactive materials.

### Biological Agents and Toxins Act (BATA)

Proper decontamination is required for all waste prior to disposal

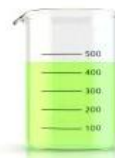
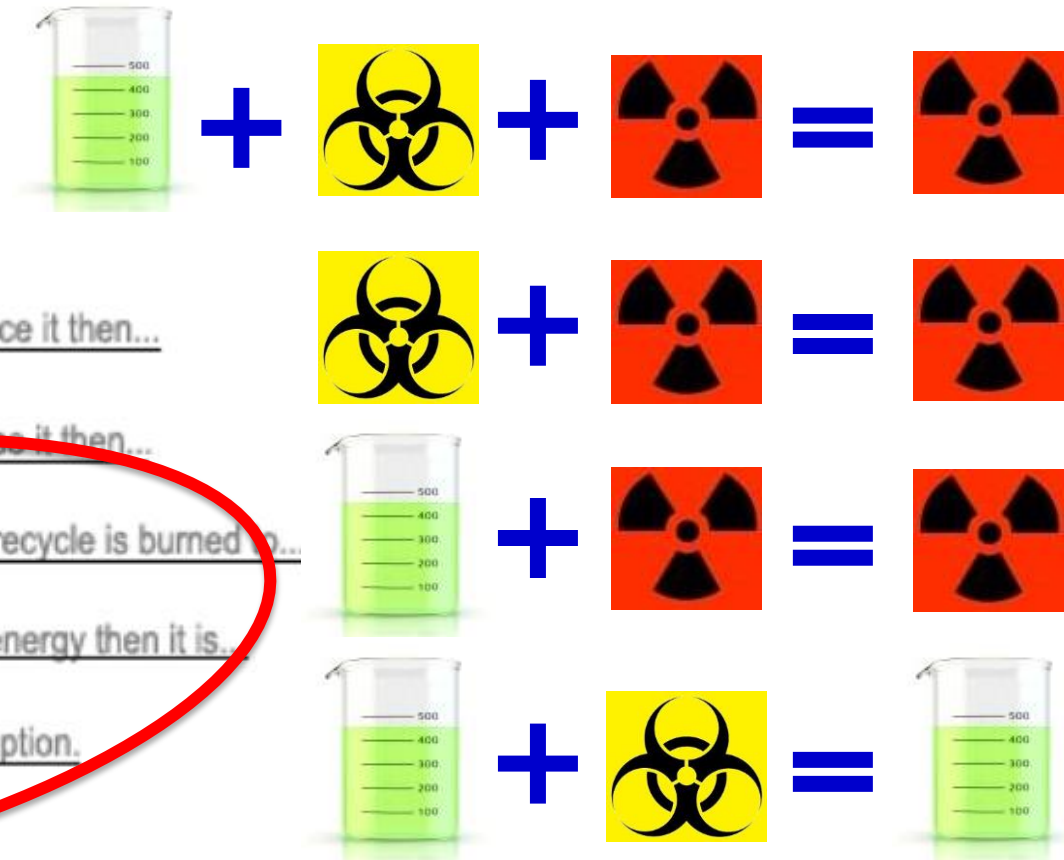
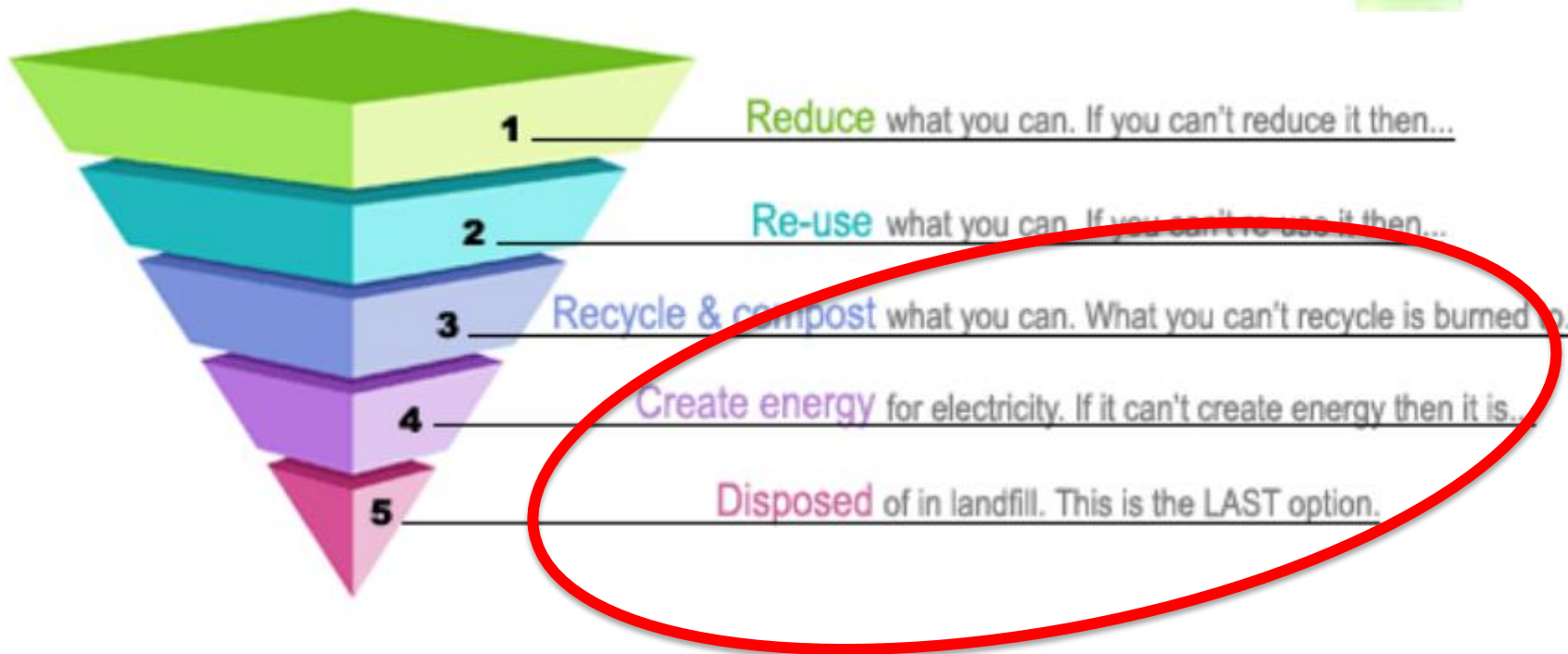
### Environmental Public Health (Toxic Industrial Waste) Regulation

Regulates the disposal of toxic and environmentally hazardous chemicals

### Environmental Public Health (General Waste Collection) Regulation

Regulates the disposal of general waste.

# WASTE MANAGEMENT AND HIERARCHY



Chemical



Biological



Radioactive

# SOLID BIOHAZARD WASTE DISPOSAL

## Risk Group 3 Waste



Highly infectious

Autoclave (onsite)

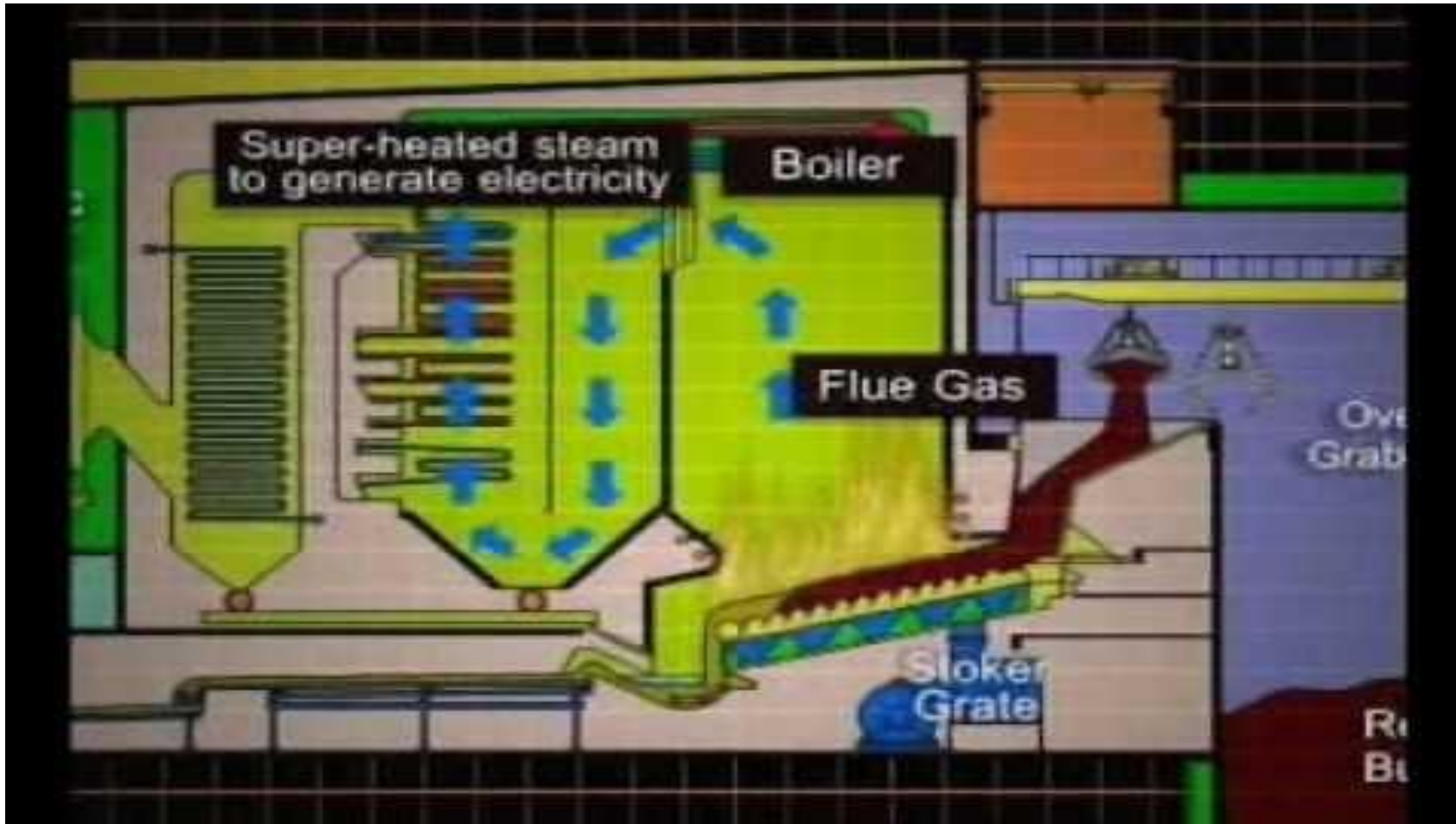
Less Hazardous



## Risk Group 1 or 2 Waste



# INCINERATION PLANTS AND SEMAKAU LANDFILL



[HTTP://WWW.NEA.GOV.SG/ENERGY-WASTE/WASTE-MANAGEMENT/VISIT-NEA%27S-INCINERATION-PLANTS-AND-SEMAKAU-LANDFILL](http://www.nea.gov.sg/energy-waste/waste-management/visit-nea%27s-incineration-plants-and-semakau-landfill)

# LIQUID BIOHAZARD WASTE



**1:10 bleach (final conc)**

**\* In compliance with PUB  
Sewerage and Drainage Act**

**Provided waste is not  
contaminated with  
hazardous chemicals or  
radioactive materials**

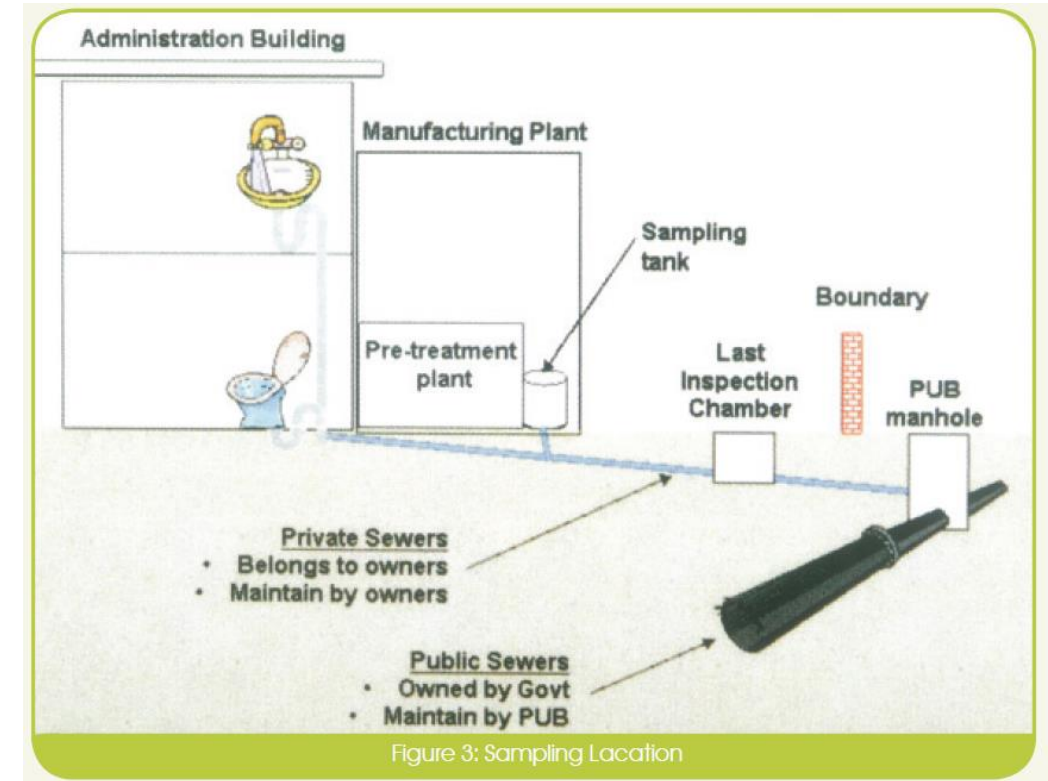
# SEWERAGE AND DRAINAGE (TRADE EFFLUENT) REGULATIONS

## A. Discharge limits of certain parameters and substances in trade effluent

- pH 6 to 9
- Temperature < 45 deg C
- Refer to link below for other parameters<sup>1</sup>

## B. Substances not to be discharged

- Any toxic industrial waste specified in first column of the schedule to EPH (TIW) Regulations
- Petroleum spirit or other inflammable substances**
- Any organic compound specified in the first schedule to the Sewerage and Drainage (Trade Effluent) Regulations
  - 30 listed chemicals - Xylene, **DMSO**, DMF, Toluene, Benzene
- Blood waste**
- Infectious waste**
- Any radioactive material**



If the water reclamation process is disrupted due to illegal discharge of substances into the sewers, the treated used water may not be able to meet the water standards to produce NEWater.<sup>2</sup>

<sup>1</sup> [HTTPS://WWW.PUB.GOV.SG/DOCUMENTS/REQUIREMENTS\\_UW.PDF](https://www.pub.gov.sg/Documents/Requirements_UW.pdf)

<sup>2</sup> [HTTPS://WWW.PUB.GOV.SG/DOCUMENTS/GUIDEBOOK\\_GOOD\\_PRACTICES\\_ON\\_TED\\_INTO\\_SEWERS.PDF](https://www.pub.gov.sg/Documents/Guidebook_Good_Practices_On_TED_Into_Sewers.pdf)

# PENALTY

- **Environmental Public Health (TIW) Regulations, Section 41**
  - Fine not exceeding **\$10'000**; continuing offence, to a further fine not exceeding \$100 for every day
- **Biological Agents & Toxins Act, Section 45**
  - Fine not exceeding **\$10'000** or to imprisonment for a term not exceeding **12 months** or to both; continuing offence, to a further fine not exceeding \$1000 for every day
- **Radiation Protection Act, Section 11**
  - Fine not exceeding **\$50'000** or to imprisonment for a term not exceeding **12 months** or to both
- **Sewerage and Drainage (Trade Effluent) Regulations, Section 14**
  - Fine not exceeding **\$5'000**; continuing offence, to a further fine not exceeding \$500 for every day

# WHAT IS A HAZARDOUS WASTE? WHEN TO DISPOSE AS TOXIC INDUSTRIAL WASTE?

## NUS SAFETY & HEALTH ALERTS

09 January 2017, Ref No 012017



### Reminder: Proper disposal of hazardous wastes from laboratories

We would like to remind all staff and students that disposal of prohibited hazardous wastes into our sewer system could affect the efficiency of our water reclamation and treatment plants. In addition, NUS could be subjected to punitive measures by the regulatory authority. Staff and students must comply with all NUS standards regarding the proper handling and disposal of hazardous wastes from laboratories, such as:

- 1) Engage NEA-licensed toxic industrial waste collectors to dispose all their hazardous wastes such as biological, chemical and radiological waste. The list of NEA-licensed toxic industrial waste collectors can be found [here](#).
- 2) Empty drums and containers, previously used for storing chemicals such as solvents and oil must be disposed by NEA-licensed collectors or chemical manufacturers.
- 3) In the event where any non-compliant discharge into the sink/sewer has taken place, please contact your Safety and Health Officer as soon as possible.

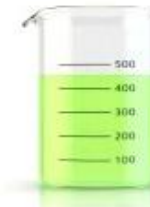
The Public Utilities Board (PUB) takes a strong stand on the discharge of any prohibited hazardous substances into the public sewers. More information on proper disposal practices and list of prohibited hazardous wastes can be found in the NUS safety and health standards.

[HTTPS://SHARE.NUS.EDU.SG/OSH/OSHE-ALERT/SHARED%20DOCUMENTS/012017.PDF](https://share.nus.edu.sg/osh/oshe-alert/shared%20documents/012017.pdf)

#### Trade effluent to be free of certain substances

9. A person must not discharge or caused to be discharged any trade effluent which contains any of the following substances:

- (a) any toxic industrial waste specified in the first column of [the Schedule to the Environmental Public Health \(Toxic Industrial Waste\) Regulations \(Cap. 95, Rg 11\)](#);
- (b) calcium carbide;
- (c) petroleum spirit or other inflammable substance;
- (d) any organic compound specified in [the First Schedule](#);
- (e) any substance that either by itself or in combination or by reaction with other waste or refuse may give rise to any gas, fume, odour or substance which is or is likely to be a hazard to human life, a public nuisance, injurious or otherwise objectionable, or which prevents or is likely to prevent entry into the public sewer by workmen maintaining or repairing it;
- (f) yeast, spent or unspent molasses, crude tar, tar oil, crude oil, carbon disulphide, hydro-sulphide and poly-sulphide;
- (g) any radioactive material;
- (h) any waste or refuse liable to form a viscous or solid coating or deposit on any part of the public sewer or sewerage system;
- (i) any excessively discolouring substance;
- (j) [\[Deleted by S 46/2013 wef 01/02/2013\]](#)
- (k) any pesticide, fungicide, herbicide, insecticide, rodenticide or fumigant;
- (l) blood waste;
- (m) infectious waste.



(<20 mL, culture media)  
DMSO, drugs, 20% EtOH,  
endocrine disrupting  
chemicals (EDC)

#### Laboratory Wastes

1. Obsolete laboratory chemicals	0 kg	0 kg
2. Toxic chemical wastes from chemical analysis	0 kg	0 kg

# SDS - WATER

## SIGMA-ALDRICH

[sigma-aldrich.com](http://sigma-aldrich.com)

### SAFETY DATA SHEET

Version 6.0

Revision Date 28.12.2016

Print Date 28.02.2017

#### 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

##### 1.1 Product identifiers

Product name : Water

Product Number : W4502

Brand : Sigma

##### 1.2 Other means of identification

No data available

##### 1.3 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

##### 1.4 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Pte Ltd  
(Co. Registration No. 199403788W)  
1 Science Park Road  
#02-14 The Capricorn, S'pore Sci. PkII  
SINGAPORE 117528  
SINGAPORE

Telephone : +65 6779-1200

Fax : +65 6779-1822

##### 1.5 Emergency telephone number

Emergency Phone # : 1-800-262-8200

#### 13. DISPOSAL CONSIDERATIONS

##### 13.1 Waste treatment methods

###### Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

###### Contaminated packaging

Dispose of as unused product.

# How?



# What is GHS?

- ✓ Globally Harmonised System of Classification and Labelling of Chemicals
- ✓ Developed by United Nations (UN)
- ✓ Standardised labels and Safety Data sheets
- ✓ Worldwide implementation (67 countries)
- ✓ Singapore Standard SS586
  - Specification for hazard communication for hazardous chemicals and dangerous goods



# GHS Pictograms



## 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifiers	
Product name	: Phosphate buffered saline
Product Number	: P4417
Brand	: Sigma
1.2 Other means of identification	
PBS	
1.3 Relevant identified uses of the substance or mixture and uses advised against	
Identified uses	: Laboratory chemicals, Manufacture of substances
1.4 Details of the supplier of the safety data sheet	
Company	: Sigma-Aldrich Pte Ltd (Co. Registration No. 199403788W) 1 Science Park Road #02-14 The Capricorn, S'pore Sci. PkII SINGAPORE 117528 SINGAPORE
Telephone	: +65 6779-1200
Fax	: +65 6779-1822
1.5 Emergency telephone number	
Emergency Phone #	: 1-800-262-8200

## 2. HAZARDS IDENTIFICATION

2.1 GHS Classification	
Not a hazardous substance or mixture.	
2.2 GHS Label elements, including precautionary statements	
Pictogram	none
Signal word	none
Hazard statement(s)	none
Precautionary statement(s)	none
Not a hazardous substance or mixture.	
2.3 Other hazards - none	

## SIGMA-ALDRICH

## SAFETY DATA SHEET

sigma-aldrich.com

Version 6.0

Revision Date 28.12.2016

Print Date 15.05.2017

## 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifiers	
Product name	: Hanks' Balanced Salt solution
Product Number	: H6648
Brand	: Sigma
1.2 Other means of identification	
No data available	
1.3 Relevant identified uses of the substance or mixture and uses advised against	
Identified uses	: Laboratory chemicals
1.4 Details of the supplier of the safety data sheet	
Company	: Sigma-Aldrich Pte Ltd (Co. Registration No. 199403788W) 1 Science Park Road #02-14 The Capricorn, S'pore Sci. PkII SINGAPORE 117528 SINGAPORE
Telephone	: +65 6779-1200
Fax	: +65 6779-1822
1.5 Emergency telephone number	
Emergency Phone #	: 1-800-262-8200

## 2. HAZARDS IDENTIFICATION

2.1 GHS Classification	
Not a dangerous substance or mixture according to the Globally Harmonised System (GHS).	
2.2 GHS Label elements, including precautionary statements	
Pictogram	none
Signal word	none
Hazard statement(s)	none
Precautionary statement(s)	none
Not a dangerous substance or mixture according to the Globally Harmonised System (GHS).	

No GHS pictogram = no chemical hazard  
Is it still a biological hazard?  
Does it contain radioactive materials?

Ok to pour down the sink?

# RADIOACTIVE WASTE

- Radioactive waste generated in NUS must be **tested** and disposed in a safe and environmentally sound manner.
- All radioactive waste ~~should~~ **shall** be in the dry form for regulators to accept the waste for disposal.
- Liquid waste should be minimized and ~~should~~ **shall** be absorbed in a chemically compatible absorbent before waste pick up
- One container = one radionuclide.
- Sealed sources cannot be disposed in Singapore. Either return to vendor or engage a authorised vendor (oversea).
- Radioactive waste must be secured at all times.

# THANK YOU

