SAFETY DATA SHEET

Pfu DNA Ligase, Part Number 600191

Section 1. Identification

1.1 Product identifier
Product name : Pfu DNA Ligase, Part Number 600191
Part No. (Chemical Kit) : 600191
Part No. : Pfu DNA Ligase 600191-51
Pfu DNA Ligase 10X Buffer 600191-52
Validation date : 1/23/2018

1.2 Relevant identified uses of the substance or mixture and uses advised against
Pfu DNA Ligase : 0.1 ml (400 U 4 U/µl)
Pfu DNA Ligase 10X Buffer : 0.3 ml

1.3 Details of the supplier of the safety data sheet
Supplier/Manufacturer : Agilent Technologies, Inc.
5301 Stevens Creek Blvd
Santa Clara, CA 95051, USA
800-227-9770

1.4 Emergency telephone number
CHEMTREC®: 1-800-424-9300

Section 2. Hazards identification

2.1 Classification of the substance or mixture
OSHA/HCS status : Pfu DNA Ligase This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Pfu DNA Ligase 10X Buffer This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture
Pfu DNA Ligase
H320 EYE IRRITATION - Category 2B

Pfu DNA Ligase 10X Buffer
H319 EYE IRRITATION - Category 2A

Ingredients of unknown toxicity : Pfu DNA Ligase
Pfu DNA Ligase 10X Buffer

2.2 GHS label elements

Date of issue : 01/23/2018
Section 2. Hazards identification

**Hazard pictograms** : Pfu DNA Ligase 10X Buffer

**Signal word**
- Pfu DNA Ligase: Warning
- Pfu DNA Ligase 10X Buffer: Warning

**Hazard statements**
- Pfu DNA Ligase: H320 - Causes eye irritation.
- Pfu DNA Ligase 10X Buffer: H319 - Causes serious eye irritation.

**Precautionary statements**

**Prevention**
- Pfu DNA Ligase: P264 - Wash hands thoroughly after handling.
- Pfu DNA Ligase 10X Buffer: P280 - Wear eye or face protection. P264 - Wash hands thoroughly after handling.

**Response**
- Pfu DNA Ligase: P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337 + P313 - If eye irritation persists: Get medical attention.
- Pfu DNA Ligase 10X Buffer: P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337 + P313 - If eye irritation persists: Get medical attention.

**Storage**
- Pfu DNA Ligase: Not applicable.
- Pfu DNA Ligase 10X Buffer: Not applicable.

**Disposal**
- Pfu DNA Ligase: Not applicable.
- Pfu DNA Ligase 10X Buffer: Not applicable.

**Supplemental label elements**
- Pfu DNA Ligase: None known.
- Pfu DNA Ligase 10X Buffer: None known.

2.3 Other hazards

**Hazards not otherwise classified**
- Pfu DNA Ligase: None known.
- Pfu DNA Ligase 10X Buffer: None known.

Section 3. Composition/information on ingredients

**Substance/mixture**
- Pfu DNA Ligase: Mixture
- Pfu DNA Ligase 10X Buffer: Mixture

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glycerol</td>
<td>≥50 - ≤75</td>
<td>56-81-5</td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride</td>
<td>≤5</td>
<td>1185-53-1</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>≤3</td>
<td>7447-40-7</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td>≤2.3</td>
<td>9002-93-1</td>
</tr>
</tbody>
</table>

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no 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.

Date of issue: 01/23/2018
Section 4. First aid measures

4.1 Description of necessary first aid measures

**Eye contact**  
Pfu DNA Ligase  
Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. If irritation persists, get medical attention.

Pfu DNA Ligase 10X Buffer  
Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

**Inhalation**  
Pfu DNA Ligase  
Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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.

Pfu DNA Ligase 10X Buffer  
Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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.

**Skin contact**  
Pfu DNA Ligase  
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.

Pfu DNA Ligase 10X Buffer  
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.

**Ingestion**  
Pfu DNA Ligase  
Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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
Section 4. First aid measures

Pfu DNA Ligase, Part Number 600191

Section 4. First aid measures

occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. 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.

Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 adverse health effects persist or are severe. 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.

4.2 Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact: Pfu DNA Ligase
Pfu DNA Ligase 10X Buffer

Inhalation: Pfu DNA Ligase
Pfu DNA Ligase 10X Buffer

Skin contact: Pfu DNA Ligase
Pfu DNA Ligase 10X Buffer

Ingestion: Pfu DNA Ligase
Pfu DNA Ligase 10X Buffer

Pfu DNA Ligase 10X Buffer

No known significant effects or critical hazards.

Causes eye irritation.

Causes serious eye irritation.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

No known significant effects or critical hazards.

Adverse symptoms may include the following:
irritation
watering
redness

Adverse symptoms may include the following:
pain or irritation
watering
redness

No specific data.

No specific data.

No specific data.

No specific data.

No specific data.

4.3 Indication of immediate medical attention and special treatment needed, if necessary

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Section 4. First aid measures

<table>
<thead>
<tr>
<th>Notes to physician</th>
<th>Pfu DNA Ligase</th>
<th>Pfu DNA Ligase 10X Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.</td>
<td></td>
</tr>
<tr>
<td>Protection of first-aiders</td>
<td>Pfu DNA Ligase</td>
<td>No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.</td>
</tr>
<tr>
<td></td>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>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.</td>
</tr>
<tr>
<td>Specific treatments</td>
<td>Pfu DNA Ligase</td>
<td>No specific treatment.</td>
</tr>
<tr>
<td></td>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>No specific treatment.</td>
</tr>
<tr>
<td>Protection of first-aiders</td>
<td>Pfu DNA Ligase</td>
<td>No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.</td>
</tr>
<tr>
<td></td>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.</td>
</tr>
</tbody>
</table>

See toxicological information (Section 11)

Section 5. Fire-fighting measures

5.1 Extinguishing media

| Suitable extinguishing media | Pfu DNA Ligase | Use an extinguishing agent suitable for the surrounding fire. |
|                             | Pfu DNA Ligase 10X Buffer | Use an extinguishing agent suitable for the surrounding fire. |
| Unsuitable extinguishing media | Pfu DNA Ligase | None known. |
|                               | Pfu DNA Ligase 10X Buffer | None known. |

5.2 Special hazards arising from the substance or mixture

| Specific hazards arising from the chemical | Pfu DNA Ligase | In a fire or if heated, a pressure increase will occur and the container may burst. |
|                                           | Pfu DNA Ligase 10X Buffer | In a fire or if heated, a pressure increase will occur and the container may burst. |
| Hazardous thermal decomposition products | Pfu DNA Ligase | Decomposition products may include the following materials: carbon dioxide, carbon monoxide |
|                                           | Pfu DNA Ligase 10X Buffer | Decomposition products may include the following materials: carbon dioxide, carbon monoxide, nitrogen oxides, halogenated compounds, metal oxide/oxides |

5.3 Advice for firefighters

| Special protective actions for fire-fighters | Pfu DNA Ligase | 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. |
|                                           | Pfu DNA Ligase 10X Buffer | 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. |

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Section 5. Fire-fighting measures

Special protective equipment for fire-fighters:

<table>
<thead>
<tr>
<th>Pfu DNA Ligase</th>
<th>Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.</td>
</tr>
</tbody>
</table>

Section 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel:

<table>
<thead>
<tr>
<th>Pfu DNA Ligase</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>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.</td>
</tr>
</tbody>
</table>

For emergency responders:

<table>
<thead>
<tr>
<th>Pfu DNA Ligase</th>
<th>If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in &quot;For non-emergency personnel&quot;.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in &quot;For non-emergency personnel&quot;.</td>
</tr>
</tbody>
</table>

6.2 Environmental precautions:

<table>
<thead>
<tr>
<th>Pfu DNA Ligase</th>
<th>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).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>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).</td>
</tr>
</tbody>
</table>

6.3 Methods and materials for containment and cleaning up
### Section 6. Accidental release measures

<table>
<thead>
<tr>
<th>Methods for cleaning up</th>
<th>Pfu DNA Ligase 10X Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.</td>
<td></td>
</tr>
</tbody>
</table>

### Section 7. Handling and storage

#### 7.1 Precautions for safe handling

<table>
<thead>
<tr>
<th>Protective measures</th>
<th>Pfu DNA Ligase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put on appropriate personal protective equipment (see Section 8). 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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advice on general occupational hygiene</th>
<th>Pfu DNA Ligase 10X Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.</td>
<td></td>
</tr>
</tbody>
</table>

#### 7.2 Conditions for safe storage, including any incompatibilities

<table>
<thead>
<tr>
<th>Pfu DNA Ligase 10X Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. See Section 10 for incompatible materials before handling or use.</td>
</tr>
</tbody>
</table>

**Date of issue:** 01/23/2018
Section 7. Handling and storage

Pfu DNA Ligase 10X Buffer

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. See Section 10 for incompatible materials before handling or use.

7.3 Specific end use(s)

Recommendations
Industrial sector specific solutions

Pfu DNA Ligase
Industrial applications, Professional applications.

Pfu DNA Ligase 10X Buffer
Industrial applications, Professional applications.

Section 8. Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase</td>
<td>OSHA PEL 1989 (United States, 3/1989). TWA: 5 mg/m³ 8 hours. Form: Respirable fraction</td>
</tr>
<tr>
<td>Glycerol</td>
<td>TWA: 10 mg/m³ 8 hours. Form: Total dust</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>OSHA PEL (United States, 6/2016). TWA: 5 mg/m³ 8 hours. Form: Respirable fraction</td>
</tr>
<tr>
<td>2-Amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride</td>
<td>TWA: 15 mg/m³ 8 hours. Form: Total dust</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>None.</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td>None.</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

Appropriate engineering controls
Environmental exposure controls

: Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

: 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.

Individual protection measures

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.

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Section 8. Exposure controls/personal protection

Eye/face protection: 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. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Hand protection: 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. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection: 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.

Other skin protection: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state: Pfu DNA Ligase Liquid.
Pfu DNA Ligase 10X Buffer Liquid.

Color: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Odor: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Odor threshold: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

pH: Pfu DNA Ligase 7.5
Pfu DNA Ligase 10X Buffer 7.5

Melting point: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Boiling point: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Flash point: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Evaporation rate: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Flammability (solid, gas): Pfu DNA Ligase Not applicable.
Pfu DNA Ligase 10X Buffer Not applicable.

Lower and upper explosive limits: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Vapor pressure: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

Vapor density: Pfu DNA Ligase Not available.
Pfu DNA Ligase 10X Buffer Not available.

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Section 9. Physical and chemical properties

Relative density
- Pfu DNA Ligase: Not available.
- Pfu DNA Ligase 10X Buffer: Not available.

Solubility
- Pfu DNA Ligase: Soluble in the following materials: cold water and hot water.
- Pfu DNA Ligase 10X Buffer: Easily soluble in the following materials: cold water and hot water.

Partition coefficient: n-octanol/water
- Pfu DNA Ligase: Not available.
- Pfu DNA Ligase 10X Buffer: Not available.

Auto-ignition temperature
- Pfu DNA Ligase: Not available.
- Pfu DNA Ligase 10X Buffer: Not available.

Decomposition temperature
- Pfu DNA Ligase: Not available.
- Pfu DNA Ligase 10X Buffer: Not available.

Viscosity
- Pfu DNA Ligase: Not available.
- Pfu DNA Ligase 10X Buffer: Not available.

Section 10. Stability and reactivity

10.1 Reactivity
- Pfu DNA Ligase: No specific test data related to reactivity available for this product or its ingredients.
- Pfu DNA Ligase 10X Buffer: No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability
- Pfu DNA Ligase: The product is stable.
- Pfu DNA Ligase 10X Buffer: The product is stable.

10.3 Possibility of hazardous reactions
- Pfu DNA Ligase: Under normal conditions of storage and use, hazardous reactions will not occur.
- Pfu DNA Ligase 10X Buffer: Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid
- Pfu DNA Ligase: No specific data.
- Pfu DNA Ligase 10X Buffer: No specific data.

10.5 Incompatible materials
- Pfu DNA Ligase: May react or be incompatible with oxidizing materials.
- Pfu DNA Ligase 10X Buffer: May react or be incompatible with oxidizing materials.

10.6 Hazardous decomposition products
- Pfu DNA Ligase: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Pfu DNA Ligase 10X Buffer: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

11.1 Information on toxicological effects
- Acute toxicity
Section 11. Toxicological information

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glycerol</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>12600 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>2600 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>1800 mg/kg</td>
<td>-</td>
</tr>
</tbody>
</table>

Irritation/Corrosion

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Score</th>
<th>Exposure</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glycerol</td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 500 milligrams</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 500 milligrams</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 500 milligrams</td>
<td>-</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td>Eyes - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 10 microliters</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 500 microliters</td>
<td>-</td>
</tr>
</tbody>
</table>

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Route of exposure</th>
<th>Target organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>Category 3</td>
<td>Not applicable.</td>
<td>Respiratory tract irritation</td>
</tr>
<tr>
<td>2-Amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.
Section 11. Toxicological information

Information on the likely routes of exposure

<table>
<thead>
<tr>
<th></th>
<th>Pfu DNA Ligase</th>
<th>Pfu DNA Ligase 10X Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Skin contact</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
</tbody>
</table>

Potential acute health effects

Eye contact :  
- Pfu DNA Ligase: Causes eye irritation.
- Pfu DNA Ligase 10X Buffer: Causes serious eye irritation.

Inhalation :  
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Skin contact :  
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Ingestion :  
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact :  
- Pfu DNA Ligase: Adverse symptoms may include the following:
  - irritation
  - watering
  - redness
- Pfu DNA Ligase 10X Buffer: Adverse symptoms may include the following:
  - pain or irritation
  - watering
  - redness

Inhalation :  
- Pfu DNA Ligase: No specific data.
- Pfu DNA Ligase 10X Buffer: No specific data.

Skin contact :  
- Pfu DNA Ligase: No specific data.
- Pfu DNA Ligase 10X Buffer: No specific data.

Ingestion :  
- Pfu DNA Ligase: No specific data.
- Pfu DNA Ligase 10X Buffer: No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects: Not available.
- Potential delayed effects: Not available.

Long term exposure

- Potential immediate effects: Not available.
- Potential delayed effects: Not available.

Potential chronic health effects

General: No known significant effects or critical hazards.
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Carcinogenicity: No known significant effects or critical hazards.
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Mutagenicity: No known significant effects or critical hazards.
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Teratogenicity: No known significant effects or critical hazards.
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Developmental effects: No known significant effects or critical hazards.
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

Fertility effects: No known significant effects or critical hazards.
- Pfu DNA Ligase: No known significant effects or critical hazards.
- Pfu DNA Ligase 10X Buffer: No known significant effects or critical hazards.

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Section 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

<table>
<thead>
<tr>
<th>Route</th>
<th>ATE value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer Oral</td>
<td>89087.8 mg/kg</td>
</tr>
</tbody>
</table>

Section 12. Ecological information

12.1 Toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase Glycerol</td>
<td>Acute LC50 54000 mg/l Fresh water</td>
<td>Fish - Oncorhynchus mykiss</td>
<td>96 hours</td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer Potassium chloride</td>
<td>Acute EC50 1337000 µg/l Fresh water</td>
<td>Algae - Navicula seminulum</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 9.24 g/L Fresh water</td>
<td>Algae - Desmodesmus subspicatus</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 141460 µg/l Fresh water</td>
<td>Daphnia - Daphnia magna</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 12.92 mg/l Fresh water</td>
<td>Crustaceans - Pseudosida ramosa - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 880 mg/l Fresh water</td>
<td>Fish - Pimephales promelas</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 5.85 mg/l Fresh water</td>
<td>Crustaceans - Ceriodaphnia rigaudi - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 11.2 mg/l Fresh water</td>
<td>Daphnia - Daphnia magna - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 4500 µg/l Fresh water</td>
<td>Fish - Pimephales promelas</td>
<td>96 hours</td>
</tr>
</tbody>
</table>

12.2 Persistence and degradability

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Result</th>
<th>Dose</th>
<th>Inoculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase Glycerol</td>
<td>301D Ready Biodegradability - Closed Bottle Test</td>
<td>93 % - 30 days</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

12.3 Bioaccumulative potential

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Aquatic half-life</th>
<th>Photolysis</th>
<th>Biodegradability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase 10X Buffer Potassium chloride Polyoxyethylene octyl phenyl ether</td>
<td>-</td>
<td>-</td>
<td>Readily</td>
</tr>
</tbody>
</table>

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Section 12. Ecological information

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP&lt;sub&gt;ow&lt;/sub&gt;</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase</td>
<td>-1.76</td>
<td>-</td>
<td>low</td>
</tr>
<tr>
<td>Glycerol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>-0.46</td>
<td>-</td>
<td>low</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>4.86</td>
<td>-</td>
<td>high</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12.4 Mobility in soil

Soil/water partition coefficient (K<sub>oc</sub>): Not available.

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

Section 13. Disposal considerations

13.1 Waste treatment methods

Disposal methods: The generation of waste should be avoided or minimized wherever possible. 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. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

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

Section 14. Transport information

DOT / TDG / Mexico / IMDG / IATA: Not regulated.

Special precautions for user: Transport within user’s premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code: Not available.

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Section 15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

U.S. Federal regulations

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)
Not listed

Clean Water Act (CWA) 311
Edetic acid

Clean Air Act Section 602 Class I Substances
Not listed

Clean Air Act Section 602 Class II Substances
Not listed

DEA List I Chemicals (Precursor Chemicals)
Not listed

DEA List II Chemicals (Essential Chemicals)
Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ
Not applicable.

SARA 311/312

Classification

Pfu DNA Ligase
EYE IRRITATION - Category 2B

Pfu DNA Ligase 10X Buffer
EYE IRRITATION - Category 2A

No products were found.

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfu DNA Ligase</td>
<td>≥50 - ≤75</td>
<td>EYE IRRITATION - Category 2A</td>
</tr>
<tr>
<td>Glycerol</td>
<td>≤75</td>
<td></td>
</tr>
<tr>
<td>Pfu DNA Ligase 10X Buffer</td>
<td>≤5</td>
<td>SKIN IRRITATION - Category 2A</td>
</tr>
<tr>
<td>2-Amino-2-(hydroxymethyl) propane-1,3-diol hydrochloride</td>
<td></td>
<td>SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>≤3</td>
<td>EYE IRRITATION - Category 2A</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td>≤2.3</td>
<td>ACUTE TOXICITY (oral) - Category 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SKIN IRRITATION - Category 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SERIOUS EYE DAMAGE - Category 1</td>
</tr>
</tbody>
</table>

State regulations

Massachusetts: The following components are listed: GLYCERINE MIST
New York: None of the components are listed.
New Jersey: The following components are listed: GLYCERIN; 1,2,3-PROPANETRIOL
Pennsylvania: The following components are listed: 1,2,3-PROPANETRIOL

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals
Not listed.

Montreal Protocol (Annexes A, B, C, E)
Not listed.

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Section 15. Regulatory information

Stockholm Convention on Persistent Organic Pollutants
Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)
Not listed.

UNEP Aarhus Protocol on POPs and Heavy Metals
Not listed.

Inventory list
Australia : Not determined.
Canada : Not determined.
China : All components are listed or exempted.
Europe : All components are listed or exempted.
Japan :
  Japan inventory (ENCS): Not determined.
  Japan inventory (ISHL): Not determined.
Malaysia : Not determined.
New Zealand : Not determined.
Philippines : Not determined.
Republic of Korea : Not determined.
Taiwan : All components are listed or exempted.
Thailand : Not determined.
Turkey : Not determined.
United States : All components are listed or exempted.
Viet Nam : Not determined.

Section 16. Other information

History
Date of issue : 01/23/2018
Date of previous issue : 10/25/2017.
Version : 5
*Indicates information that has changed from previously issued version.

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