Section 1. Identification

1.1 Product identifier
Product name: PfuUltra High-Fidelity DNA Polymerase, Part Number 600384
Part No. (Chemical Kit): 600384
Part No.: PfuUltra HF DNA Polymerase 600380-51
10X PfuUltra HF Reaction Buffer 600380-52
Validation date: 6/21/2017

1.2 Relevant identified uses of the substance or mixture and uses advised against
Material uses:
- PfuUltra HF DNA Polymerase 40 µl (100 U 2.5 U/µl)
- 10X PfuUltra HF Reaction Buffer 4 x 1 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
In case of emergency: CHEMTREC®: 1-800-424-9300

Section 2. Hazards identification

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

Classification of the substance or mixture

PfuUltra HF DNA Polymerase
H320
EYE IRRITATION - Category 2B

10X PfuUltra HF Reaction Buffer
H319
EYE IRRITATION - Category 2A

Ingredients of unknown toxicity:
- PfuUltra HF DNA Polymerase
- 10X PfuUltra HF Reaction Buffer

Percentage of the mixture consisting of ingredient (s) of unknown inhalation toxicity: 30 - 60%
Percentage of the mixture consisting of ingredient (s) of unknown dermal toxicity: 1 - 10%
Percentage of the mixture consisting of ingredient (s) of unknown oral toxicity: 1 - 10%

2.2 GHS label elements
Hazard pictograms:
- 10X PfuUltra HF Reaction Buffer

Date of issue: 06/21/2017
Section 2. Hazards identification

Signal word:

- PuUltra HF DNA Polymerase: Warning
- 10X PuUltra HF Reaction Buffer: Warning

Hazard statements:
- PuUltra HF DNA Polymerase: H320 - Causes eye irritation.
- 10X PuUltra HF Reaction Buffer: H319 - Causes serious eye irritation.

Precautionary statements:

Prevention:
- PuUltra HF DNA Polymerase: P264 - Wash hands thoroughly after handling.
- 10X PuUltra HF Reaction Buffer: P280 - Wear eye or face protection.
- 10X PuUltra HF Reaction Buffer: P264 - Wash hands thoroughly after handling.

Response:
- PuUltra HF DNA Polymerase: 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.
- 10X PuUltra HF Reaction 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:
- PuUltra HF DNA Polymerase: Not applicable.
- 10X PuUltra HF Reaction Buffer: Not applicable.

Disposal:
- PuUltra HF DNA Polymerase: Not applicable.
- 10X PuUltra HF Reaction Buffer: Not applicable.

Supplemental label elements:
- PuUltra HF DNA Polymerase: None known.
- 10X PuUltra HF Reaction Buffer: None known.

2.3 Other hazards

Hazard not otherwise classified:
- PuUltra HF DNA Polymerase: None known.
- 10X PuUltra HF Reaction Buffer: None known.

Section 3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Substance/mixture</th>
<th>PuUltra HF DNA Polymerase</th>
<th>Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerol</td>
<td>≥50 - ≤75</td>
<td>56-81-5</td>
</tr>
</tbody>
</table>

10X PuUltra HF Reaction Buffer

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride</td>
<td>≤5</td>
<td>1185-53-1</td>
</tr>
<tr>
<td>Polyoxethylene 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: 06/21/2017
Section 4. First aid measures

4.1 Description of necessary first aid measures

**Eye contact**: PfuUltra HF DNA Polymerase

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.

**10X PfuUltra HF Reaction 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**: PfuUltra HF DNA Polymerase

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.

**10X PfuUltra HF Reaction 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**: PfuUltra HF DNA Polymerase

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.

**10X PfuUltra HF Reaction 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**: PfuUltra HF DNA Polymerase

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...
Section 4. First aid measures

4.1 General information

Inhalation: 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: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

Causes eye irritation.

10X PfuUltra HF Reaction Buffer

Causes serious eye irritation.

Inhalation: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

No known significant effects or critical hazards.

10X PfuUltra HF Reaction Buffer

No known significant effects or critical hazards.

Skin contact: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

No known significant effects or critical hazards.

10X PfuUltra HF Reaction Buffer

No known significant effects or critical hazards.

Ingestion: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

No known significant effects or critical hazards.

10X PfuUltra HF Reaction Buffer

No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

Adverse symptoms may include the following:
irritation

watering

redness

10X PfuUltra HF Reaction Buffer

Adverse symptoms may include the following:

pain or irritation

watering

redness

Inhalation: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

No specific data.

10X PfuUltra HF Reaction Buffer

No specific data.

Skin contact: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

No specific data.

10X PfuUltra HF Reaction Buffer

No specific data.

Ingestion: PfuUltra HF DNA Polymerase 10X PfuUltra HF Reaction Buffer

No specific data.

10X PfuUltra HF Reaction Buffer

No specific data.

4.3 Indication of immediate medical attention and special treatment needed, if necessary
### Section 4. First aid measures

<table>
<thead>
<tr>
<th>Notes to physician</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction 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>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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific treatments</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No specific treatment.</td>
<td>No specific treatment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection of first-aiders</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></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>
<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

<table>
<thead>
<tr>
<th>Suitable extinguishing media</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use an extinguishing agent suitable for the surrounding fire.</td>
<td>Use an extinguishing agent suitable for the surrounding fire.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unsuitable extinguishing media</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None known.</td>
<td>None known.</td>
</tr>
</tbody>
</table>

#### 5.2 Special hazards arising from the substance or mixture

<table>
<thead>
<tr>
<th>Specific hazards arising from the chemical</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In a fire or if heated, a pressure increase will occur and the container may burst.</td>
<td>In a fire or if heated, a pressure increase will occur and the container may burst.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazardous thermal decomposition products</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decomposition products may include the following materials: carbon dioxide carbon monoxide</td>
<td>Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides halogenated compounds</td>
</tr>
</tbody>
</table>

#### 5.3 Advice for firefighters

<table>
<thead>
<tr>
<th>Special protective actions for fire-fighters</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>
Section 5. Fire-fighting measures

Special protective equipment for fire-fighters: PfuUltra HF DNA Polymerase

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

10X PfuUltra HF Reaction Buffer: PfuUltra HF DNA Polymerase

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

Section 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel:

- PfuUltra HF DNA Polymerase: 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.

10X PfuUltra HF Reaction Buffer: 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.

For emergency responders:

- PfuUltra HF DNA Polymerase: 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 "For non-emergency personnel".

10X PfuUltra HF Reaction Buffer: 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 "For non-emergency personnel".

6.2 Environmental precautions:

- PfuUltra HF DNA Polymerase: 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).

10X PfuUltra HF Reaction Buffer: 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).

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

Methods for cleaning up

PfuUltra HF DNA Polymerase
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.

10X PfuUltra HF Reaction Buffer
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.

Section 7. Handling and storage

7.1 Precautions for safe handling

Protective measures

PfuUltra HF DNA Polymerase
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.

10X PfuUltra HF Reaction Buffer
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.

Advice on general occupational hygiene

PfuUltra HF DNA Polymerase
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.

10X PfuUltra HF Reaction Buffer
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.

7.2 Conditions for safe storage, including any incompatibilities

PfuUltra HF DNA Polymerase
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.
Section 7. Handling and storage

10X PfuUltra HF Reaction 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

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PfuUltra HF DNA Polymerase</td>
<td>Industrial applications, Professional applications.</td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer</td>
<td>Industrial applications, Professional applications.</td>
</tr>
</tbody>
</table>

Industrial sector specific solutions

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PfuUltra HF DNA Polymerase</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

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>PfuUltra HF DNA Polymerase</td>
<td>OSHA PEL 1989 (United States, 3/1989). TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 10 mg/m³ 8 hours. Form: Total dust</td>
</tr>
<tr>
<td>Glycerol</td>
<td>OSHA PEL (United States, 6/2016). TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust</td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer</td>
<td>None.</td>
</tr>
<tr>
<td>2-Amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride</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 : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

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.

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.

Date of issue : 06/21/2017
### 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.

**Skin protection**

**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**

<table>
<thead>
<tr>
<th>Physical state</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Odor</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>pH</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Melting point</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Boiling point</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Flash point</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Lower and upper explosive (flammable) limits</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
<tr>
<td>Vapor density</td>
<td>PfuUltra HF DNA Polymerase</td>
<td>10X PfuUltra HF Reaction Buffer</td>
</tr>
</tbody>
</table>

**Date of issue**: 06/21/2017
### Section 9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>Not available.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relative density</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Solubility</strong></td>
<td></td>
<td>Soluble in the following materials: cold water and hot water.</td>
</tr>
<tr>
<td><strong>Partition coefficient: n-octanol/water</strong></td>
<td></td>
<td>Not available.</td>
</tr>
<tr>
<td><strong>Auto-ignition temperature</strong></td>
<td></td>
<td>Not available.</td>
</tr>
<tr>
<td><strong>Decomposition temperature</strong></td>
<td></td>
<td>Not available.</td>
</tr>
<tr>
<td><strong>Viscosity</strong></td>
<td></td>
<td>Not available.</td>
</tr>
</tbody>
</table>

### Section 10. Stability and reactivity

**10.1 Reactivity**
- PfuUltra HF DNA Polymerase: No specific test data related to reactivity available for this product or its ingredients.
- 10X PfuUltra HF Reaction Buffer: No specific test data related to reactivity available for this product or its ingredients.

**10.2 Chemical stability**
- PfuUltra HF DNA Polymerase: The product is stable.
- 10X PfuUltra HF Reaction Buffer: The product is stable.

**10.3 Possibility of hazardous reactions**
- PfuUltra HF DNA Polymerase: Under normal conditions of storage and use, hazardous reactions will not occur.
- 10X PfuUltra HF Reaction Buffer: Under normal conditions of storage and use, hazardous reactions will not occur.

**10.4 Conditions to avoid**
- PfuUltra HF DNA Polymerase: No specific data.
- 10X PfuUltra HF Reaction Buffer: No specific data.

**10.5 Incompatible materials**
- PfuUltra HF DNA Polymerase: May react or be incompatible with oxidizing materials.
- 10X PfuUltra HF Reaction Buffer: May react or be incompatible with oxidizing materials.

**10.6 Hazardous decomposition products**
- PfuUltra HF DNA Polymerase: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- 10X PfuUltra HF Reaction 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**

**Date of issue**: 06/21/2017
## 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>PfuUltra HF DNA Polymerase Glycerol</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>12600 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer 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>PfuUltra HF DNA Polymerase 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>10X PfuUltra HF Reaction Buffer 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>10X PfuUltra HF Reaction Buffer 2-Amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride</td>
<td>Category 3</td>
<td>Not applicable.</td>
<td>Respiratory tract irritation</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>Route of Entry</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>Routes of entry anticipated: Oral, Dermal, Inhalation.</td>
<td>Routes of entry anticipated: Oral, Dermal, Inhalation.</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>
<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>Eye contact</td>
<td>Causes eye irritation.</td>
<td>Causes serious eye irritation.</td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer</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

<table>
<thead>
<tr>
<th>Route of Entry</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye contact</td>
<td>Causes eye irritation.</td>
<td>Causes serious eye irritation.</td>
</tr>
<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>

### Symptoms related to the physical, chemical and toxicological characteristics

<table>
<thead>
<tr>
<th>Route of Entry</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye contact</td>
<td>Adverse symptoms may include the following:</td>
<td>Adverse symptoms may include the following:</td>
</tr>
<tr>
<td></td>
<td>irritation</td>
<td>pain or irritation</td>
</tr>
<tr>
<td></td>
<td>watering</td>
<td>watering</td>
</tr>
<tr>
<td></td>
<td>redness</td>
<td>redness</td>
</tr>
<tr>
<td>Inhalation</td>
<td>No specific data.</td>
<td>No specific data.</td>
</tr>
<tr>
<td>Skin contact</td>
<td>No specific data.</td>
<td>No specific data.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>No specific data.</td>
<td>No specific data.</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Category</th>
<th>PfuUltra HF DNA Polymerase</th>
<th>10X PfuUltra HF Reaction Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Teratogenicity</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Developmental effects</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
<tr>
<td>Fertility effects</td>
<td>No known significant effects or critical hazards.</td>
<td>No known significant effects or critical hazards.</td>
</tr>
</tbody>
</table>

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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>10X PfuUltra HF Reaction Buffer Oral</td>
<td>180000 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>PfuUltra HF DNA Polymerase</td>
<td>Acute LC50 54000 mg/l Fresh water</td>
<td>Fish - Oncorhynchus mykiss</td>
<td>96 hours</td>
</tr>
<tr>
<td>Glycerol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer</td>
<td>Acute LC50 5.85 mg/l Fresh water</td>
<td>Crustaceans - Ceriodaphnia rigaudi - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</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>Aquatic half-life</th>
<th>Photolysis</th>
<th>Biodegradability</th>
</tr>
</thead>
<tbody>
<tr>
<td>10X PfuUltra HF Reaction Buffer Polyoxyethylene octyl phenyl ether</td>
<td>-</td>
<td>-</td>
<td>Readily</td>
</tr>
</tbody>
</table>

## 12.3 Bioaccumulative potential

<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>PfuUltra HF DNA Polymerase</td>
<td>-1.76</td>
<td>-</td>
<td>low</td>
</tr>
<tr>
<td>Glycerol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer Polyoxyethylene octyl phenyl ether</td>
<td>4.86</td>
<td>-</td>
<td>high</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.

Section 15. Regulatory information

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

U.S. Federal regulations: TSCA 8(a) PAIR: Poly(oxy-1,2-ethanediyl).alpha.-(1,1,3,3-tetramethylbutyl)phenyl.-omega.-hydroxy-. Polyoxylethylene octyl phenyl ether
TSCA 8(a) CDR Exempt/Partial exemption: Not determined
Clean Water Act (CWA) 311: Edetic acid

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

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Section 15. Regulatory information

DEA List II Chemicals: Not listed
(Essential Chemicals)

SARA 302/304
Composition/information on ingredients
No products were found.

SARA 304 RQ: Not applicable.

SARA 311/312
Classification: Immediate (acute) health hazard
PfuUltra HF DNA Polymerase
Immediate (acute) health hazard
10X PfuUltra HF Reaction Buffer
Immediate (acute) health hazard

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Fire hazard</th>
<th>Sudden release of pressure</th>
<th>Reactive</th>
<th>Immediate (acute) health hazard</th>
<th>Delayed (chronic) health hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>PfuUltra HF DNA Polymerase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10X PfuUltra HF Reaction Buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyoxyethylene octyl phenyl ether</td>
<td>≤2.3</td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</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-PROSPANETRIOL
Pennsylvania: The following components are listed: 1,2,3-PROSPANETRIOL

California Prop. 65
Not available.

International regulations

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

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

Stockholm Convention on Persistent Organic Pollutants
Not listed.

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

UNECE Aarhus Protocol on POPs and Heavy Metals
Not listed.

Inventory list

Australia: All components are listed or exempted.
Canada: All components are listed or exempted.
China: All components are listed or exempted.
Europe: All components are listed or exempted.

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Section 15. Regulatory information

Malaysia: Not determined.
New Zealand: All components are listed or exempted.
Philippines: All components are listed or exempted.
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: 06/21/2017
Date of previous issue: 10/28/2015.
Version: 4

Indicates information that has changed from previously issued version.

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