# *Polymer Basics*

Name _____

*Use the sites on the Matter & Atoms page of the Kid Zone at http://sciencespot.net/ to complete this worksheet.*

**Site #1: HandsOn Plastics**

1. Plastics are _____, which is something made of many _____ similar to a chain. Each link in the chain is the "_____" or basic unit usually made out of _____, _____, _____, and/or _____. To make the chain, many links or units are hooked or _____ together.

2. Many common classes of polymers are composed of _____, which contain the elements carbon and hydrogen. List seven elements that are also found in polymers: _____, _____, _____, _____, _____, _____, and _____.

3. What is one of the most famous silicon-based polymers? _____

4. What are the general attributes (properties) of polymers?

   A. Polymers can be very resistant to _____.

   B. Polymers can be both _____ and _____ insulators.

   C. Polymers are very light in _____ with varying degrees of _____.

   D. Polymers can be _____ in various ways to produce thin fibers or very intricate parts.

5. What percentage of our trash are plastics? _____%

6. What does WTE mean? _____-_____-_____ What are two benefits of WTE?

   1 – We can use plastics that cannot be _____.

   2 – Incineration of polymers produces _____ _____.

**Site #2: History of Plastics**

Read the information on this page to help you complete this section. Fill in the blanks with the year it was first produced and the last name(s) of the person credited with the discovery/development. Use the information to list the substances with dates from the oldest to the most recent in the box.

Rayon – Developed in _____ by _____

Silly Putty - Developed in _____ by _____

Cellophane - Discovered in _____ by _____

Parkesine - Discovered in _____ by _____

Nylon - Developed in _____ by _____

Bakelite - Developed in _____ by _____

Velcro - Developed in _____ by _____

Saran - Discovered in _____ by _____

PVC (Vinyl) – Developed by _____

Polyethylene – Developed in _____ by _____ & _____

Teflon – Discovered in _____ by _____

Celluoid - Developed in _____ by _____

**Plastics Timeline**
**Oldest to Most Recent**

1_____

2_____

3_____

4_____

5_____

6_____

7_____

8_____

9_____

10_____

11_____

**Site #3: Polymers – They're Everywhere**

1. Click the "What are Polymers" link at the bottom of the screen and answer these questions.

   A. Polymers are tiny _____ strung in long repeating _____.

   B. What are three polymers found in our bodies? _____, _____, and _____

2. Click the link for "In Nature" and use your mouse to find eight polymers in the picture. List them below.

   _____ _____ _____ _____

   _____ _____ _____ _____

3. Click the link for "At Home" to learn about polymers that can be found around our homes. Use your mouse to find eight polymers and list them below.

   _____ _____ _____ _____

   _____ _____ _____ _____

4. Click the "Recycling" link and use your mouse to find eleven items made from recycled polymers in the park. For each item listed below, write down what it was used to make after being recycled. The number of blanks indicates the number of items for each polymer.

   Peanut butter jar → _____ and _____

   Foam cup→ _____ and _____

   Bread bag → _____ and _____

   Milk jug→ _____, _____, and _____

   Sandwich box → _____ and _____

**Site #4 – Polymer Flash Activities**

1. Click the link to make a virtual polymer and choose polyethylene.

   A. What type of monomer is used to make this polymer? _____

   B. What elements and how many of each is in one of these monomers?
   C = _____ # - _____ H = _____ # -_____

   C. What starts the process? _____

2. Click the link to try the matching games. Record your times or scores in the blanks below.

   A.  Breakfast Game– 1st Try = _____ 2nd Try = _____ 3rd Try = _____

   B.  Polymer Game - – 1st Try = _____ 2nd Try = _____ 3rd Try = _____

***Done? Turn in your worksheet and visit any of the sites for Chemistry Games & Puzzles listed on the Matter and Atoms page.***

# *Polymer Basics*

**Answer Key**

**Site #1: HandsOn Plastics**

1. Plastics are **polymers**, which is something made of many **units** similar to a chain. Each link in the chain is the "**mer**" or basic unit usually made out of **carbon**, **hydrogen**, **oxygen**, and/or **silicon**. To make the chain, many links or units are hooked or **polymerized** together.

2. Many common classes of polymers are composed of **hydrocarbons**, which contain the elements carbon and hydrogen. List seven elements that are also found in polymers: **oxygen, chlorine, fluorine, nitrogen, silicon, phosphorus,** and **sulfur.**

3. What is one of the most famous silicon-based polymers? **Silly Putty**

4. What are the general attributes (properties) of polymers?

A. Polymers can be very resistant to **chemicals**.

B. Polymers can be both **thermal** and **electrical** insulators.

C. Polymers are very light in **mass** with varying degrees of **strength**.

D. Polymers can be **processed** in various ways to produce thin fibers or very intricate parts.

5. What percentage of our trash are plastics? **9.9**%

6. What does WTE mean? **Waste-to-Energy** What are two benefits of WTE?

1 – We can use plastics that cannot be **recycled.**

2 – Incineration of polymers produces **heat energy**.

**Site #2: History of Plastics**

Read the information on this page to help you complete this section. Fill in the blanks with the year it was first produced and the last name(s) of the person credited with the discovery/development. Use the information to list the substances with dates from the oldest to the most recent in the box.

Rayon – Developed in **1891** by **Bernigaut**

Silly Putty - Developed in **1949** by **Wright**

Cellophane - Discovered in **1900** by **Brandenberger**

Parkesine - Discovered in **1862** by **Parker**

Nylon - Developed in **1939** by **Carothers**

Bakelite - Developed in **1907** by **Baekeland**

Velcro - Developed in **1957** by **Maestral**

Saran - Discovered in **1933** by **Wiley**

PVC (Vinyl) – Developed by **Simon**

Polyethylene – Developed in **1936** by **Fawcett** & **Gibson**

Teflon – Discovered in **1938** by **Plunkett**

Celluoid - Developed in **1869** by **Hyatt**

**Plastics Timeline**

1 Parkesine
2 Celluloid
3 Rayon
4 Cellophane
5 Bakelite
6 Saran
7 Polyethylene
8 Teflon
9 Nylon
10 Silly Putty
11 Velcro

**Site #3: Polymers – They're Everywhere**

1. Click the "What are Polymers" link at the bottom of the screen and answer these questions.

A. Polymers are tiny **molecules** strung in long repeating **chains**.

B. What are three polymers found in our bodies? **DNA**, **proteins**, and **starches**

2. Click the link for "In Nature" and use your mouse to find eight polymers in the picture. List them below.
**Amber (tree sap), silk, turtle's shell, cow's milk, animal horns, latex (tree bark), lac (insect resin), rosin (pine trees)**

2. Click the "At Home" to learn about polymers that can be found around our homes. Use your mouse to find eight polymers and list them below.

**Bakelite, polyethylene, polystyrene, neoprene, acrylics, rubber, vinyl, vulcanized rubber**

3. Click the "Recycling" link and use your mouse to find eleven items made from recycled polymers in the park. For each item listed below, write down what it was used to make after being recycled. The number of blanks indicates the number of items for each polymer.

**Peanut butter jar: Sweatshirt, Tote bag**
**Foam cup: Insulated jacket, Concrete**
**Bread bag: Trash can, Landscape Timber**
**Milk jug: Dog house, Picnic Table, Plastic Fence**
**Sandwich box: Playground equipment, flying disk (Frisbee)**

**Site #4 – Polymer Flash Activities**

1. Click the link to make a virtual polymer and choose polyethylene.

A. What type of monomer is used to make this polymer? **Ethylene**

B. What elements and how many of each is in one of these monomers?
C = **Carbon** # - **2** H = **Hydrogen** # - **4**

C. What starts the process? **Initiator**

2. Click the link to try the matching games. Record your times or scores in the blanks below.

***Various Responses***

A.  Breakfast Game– 1st Try = _____ 2nd Try = _____ 3rd Try = _____

B.  Polymer Game - – 1st Try = _____ 2nd Try = _____ 3rd Try = _____

***Done? Turn in your worksheet and visit any of the sites for Chemistry Games & Puzzles listed the Matter and Atoms page.***