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| **Title:** | *Paper or Plastic?* |
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| **Age Appropriateness:** | 4th -- 6th grade  7th – 9th grade  10th – 12th grade |
| **Flesh Kincaid Reading Level:** | *Use the readability statistics* [*tool*](http://office.microsoft.com/en-us/word-help/test-your-document-s-readability-HP010354286.aspx?CTT=1) *in Microsoft Word and insert the calculated reading level here.*  *9th* |
| **Article Text:** | |
| *NOTE: I have included a table which takes the article beyond 450; if it is not used, the related text in the article should be cut.*  We all use paper, but most of us haven’t stopped to think about how important it has been to human progress. The word “paper” comes from “papyrus”, a plant grown in Egypt where paper was first made about 5000 yr ago. Other peoples developed paper that used the inner surface of various tree barks. To find paper we might recognize, we have to go to China around 100 AD. Today paper is available with different “weights” (thicknesses), coatings, absorbencies and “see through” qualities as well as other properties—for many different applications. To “take notes” you actually need a paper that will accept ink or pencil but not blur it, and will fold, but not break.  The word “Plastic” is used for all kinds of materials that are man-made (synthetic), although some of them have natural ingredients. The first man-made plastic was developed by Alexander Parkes who invented “Parkesine” (interestingly enough, related to paper) in 1856. Plastics can be soft or hard, brittle or flexible; their many possible properties are all thanks to chemistry!  Paper and plastic, although very different, do have things in common. Both are POLYMERS—long chains, like necklaces, of many (“poly”) repeating subunits (the beads). Paper is made of one kind of natural polymer (cellulose) whose subunits are sugars. Different plastics, like silicones, acrylates, or polyethylene each have their own subunits. Paper is made of cellulose fibers; nylon is one example of a plastic fiber. Both paper and plastic can be molded, but plastics are be much more versatile. Both can be written on, but plastic takes special inks.  The decision “paper or plastic?” should be based on what properties you are looking for. [See the table below, for a general comparison of paper and one type of plastic.] This question is usually associated with being “green”, but the answer is complicated. Paper itself is basically **biodegradable** (it can be broken down into smaller pieces by living things like bacteria). What’s added to make it colored or waterproof (think milk cartons) is not necessarily environment-friendly, though, and food-contaminated paper can’t be recycled. Paper comes from trees, which we need to reduce carbon dioxide in the air, and paper (like plastic) is made and recycled using water and energy. Most plastics are made from oil and not biodegradable. Some can be broken down by ultraviolet (sun)light; some but not all are recyclable. Plastics are collecting in our oceans and some can even choke or entrap wildlife.  Chemistry gives us many choices; the one between paper and plastic should be made after thinking about what you need, how much waste will be made, and the impact on the environment. The future of paper as well as plastics may depend on new ways to make, reuse and recycle them.   |  |  | | --- | --- | | **Loose-leaf paper** | **Low density polyethylene (#4)** | | Natural | Man-made | | Absorbs water | Repels water | | Burns | Melts | | Broken down by bacteria | Broken down by sunlight | | Destroyed by acid | Resistant to acid | | Easily torn | Hard to tear |   <https://science.howstuffworks.com/environmental/green-science/paper-plastic1.htm>  <http://www.afandpa.org/our-industry/fun-facts>  <http://www.paperonline.org/paper-making/paper-uses>  <https://plastics.americanchemistry.com/Plastics-101/> | |
| **References:** | |
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