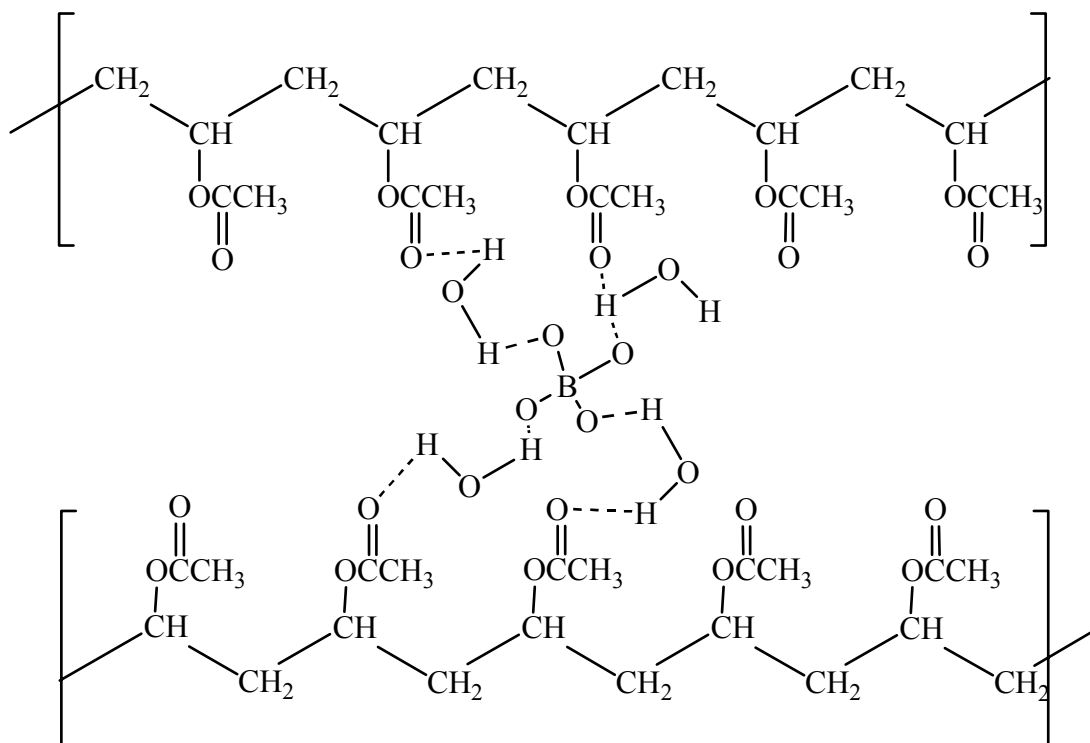


Worksheet for Polymers

Name _____

Partner's Name _____

Glue is made from polyvinylacetate. The borax acts as a crosslinking agent much like sulfur does in vulcanized rubber. A generalized structure is seen below:

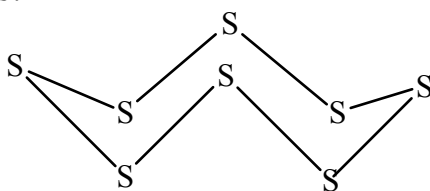


The polymer chain acts like a single hair and by crosslinking you are attaching many hairs together. You should find that it is difficult to pull these “hairs” apart and they do not slide past each other as easily as the single strands. The molecules are connected in such a way that if you apply pressure to them slowly, they will deform since the crosslinks (hydrogen bonds) are not permanent bonds. But if you apply the pressure quickly they usually will deform only slightly, then immediately push back into their original shape. This happens because the bonds are not given time to break and then reform between other atoms. If you continue that quick pressure, the polymers will break sharply because the H--O bonds are broken and you are pulling one strand away from another very cleanly.

1. Does the solid stretch? What happens when it is pulled hard? Does it bounce? Reform the ball and allow it to sit on a flat surface. What do you observe? Take two different colored balls and place one on top of the other for a minute. Can you completely separate the two? Explain how your observations do or don't fit with the molecular explanation above.

2. Draw the monomer for polyvinyl acetate.
3. Styrofoam is polystyrene. Draw the monomeric and the polymeric structure of polystyrene. Draw the structure for acetone and water. Compare the intermolecular forces and explain why the polystyrene was soluble in acetone but not water. Ecofoam is made of starch a structure of which can be seen in CH 15 of your text. Explain why water can solubilize this polymer but acetone cannot.

4. Sulfur has the formula of S_8 and is in the form of a crown as seen below. As it is heated it breaks a S-S bond in the ring and new S-S bonds are formed. What did you see happen in the experiment to substantiate this?



5. As it was continually heated, the fluid liquid got more liquid like. You may have even seen some of it go into the gas phase. What happens on a molecular level here?
6. Once cooled, plastic sulfur was formed. Does it have properties of a rubber? Is plastic sulfur a polymer? Explain.