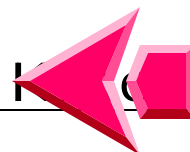
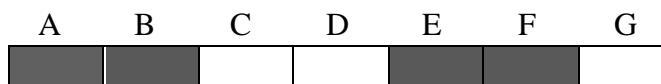


Plastic Formations of All Kinds



Concept: Shaping plastic materials through blow molding, injection molding, and extrusion

National Science Standards:



Background:

One of the most commonly used types of polymers are plastics. Plastics are both natural and synthetic polymeric substances. They are formed in molds under high levels of heat and pressure.

There are many different methods used to form plastics. Blow molding, injection molding, and extrusion are among three of the most commonly used methods of plastic formation. Blow molding is a two-step process in which plastic is inserted into a heated mold. Next, hot air is blown into the plastic causing it to take on the shape of the mold. Injection molding is a process in which melted plastic is introduced into a heated mold. As the plastic cools, it hardens and retains the shape of the mold. Extrusion is a process in which plastic is heated, then the molten plastic is pushed through a mold in the shape of an object or material. Fibers, pipe coating, and molded pipes are examples of materials formed through extrusion.

Objectives: The student will demonstrate the ability to blow mold, injection mold, and extrude plastics into shapes.

The student will be able to differentiate between the different methods used to mold plastic.

The student will be able to list the various characteristics of shaping plastic.

Suggested grade levels: 1-6

Estimated time:

- Teacher prep: 15 minutes
- Activity: 30 minutes per part (90 minutes)

Materials needed:

- Play Doh™ (Explain to students that Play Doh™ is not a plastic, but acts like one when put through an extrusion mold. The quantity needed is two small canisters per group of four.)
- Play Doh Fun Factory™ (1 set per group of 4)
- 1 two-liter pop bottle

- 1 sharp knife or razor blade
- 1 medium oblong-shaped balloon
- plastic candy mold (1 set per group of 4)
- assorted bottles of colored glue (a couple of bottle per group)
- 1 bottle of spray cooking oil (Pam™)
- 1 roll of wax paper
 - 1 cork or rubber stopper

Safety/Disposal: Do not allow young students to use a knife or razor blade to cut extruded materials.
(Teacher or aide should cut materials.)

Teacher should coat molds with cooking oil for injection molding activity.

Play Doh™ can be reused and should be stored in canister.

Recycle two-liter pop bottle in proper receptacle.

Defective glue models can be thrown in the garbage.

Procedure:

Part I: Blow Molding

1. Define blow molding.
2. To demonstrate how blow molding works, poke a hole in the bottom of a two-liter bottle.
Place a medium-size oblong balloon in bottle so you can stretch the open end over the pop bottle opening. When the balloon is inside the bottle and secure, blow into the balloon so it fills up inside the pop bottle. When balloon has conformed to shape of bottle, cork the bottle so the balloon keeps its shape.
3. Discussion questions:
 - a. What happened to the balloon's shape?
 - b. Why did this happen?
 - c. What would happen if you squeezed the middle of the bottle?
4. Can you identify other examples of blow molding?

Part II: Injection Molding

1. Define injection molding.
2. Pass out a candy mold and assorted bottles of colored glue to each group of four. Teacher should go around and spray the candy molds with cooking oil. Students may choose a glue color and squeeze into candy mold. Wait patiently for ten minutes until glue dries completely. The teacher should circulate around groups and help students to remove models from mold.
3. Discussion questions:
 - a. While molds are setting, ask students to hypothesize on how their models are going to turn out. Name them or have them write a brief summary about it.
 - b. After models are completed, have students compare hypotheses with final products.
 - c. What would you do differently next time? Have them implement their ideas.

Part III: Extrusion

1. Define extrusion.
2. Pass out a Play Doh Fun Factory™ kit along with two canisters of different colored Play Doh™ to each group of four. Slide in shape stencil. Place Play Doh™ between base and

lever of Fun Factory™. Push down on lever and observe the extrusion take place.

3. Discussion questions:

- a. What happened when you pushed down on the lever?
- b. Why did this happen?
- c. What kinds of other objects might companies create through extrusion?

Wrap-up:

- Expected results:
 - Part I: Blow molding: The balloon will take the shape of the bottle.
 - Part II: Injection molding: The glue will conform to the shape of the mold and create a model.
 - Part III: Extrusion: The Play Doh™ will emerge in the shape of the stencil
- Draw and label a diagram of each process.
- As a class, discuss examples of the students' work.

Extensions:

- Have each student go home and find examples of the three plastic formation methods to share with the class.
- To extend the process of extrusion, provide students with cake decorating materials and graham crackers.
- To extend the process of injection molding, provide students with candy molds and softened butter.
- To extend the process of blow molding, provide students with a bottle of bubbles and a blow wand.

Resources:

This activity is based on a presentation by Sandy Van Natta at the MATR Institute in 1997.