# Lab Worksheet

### Material Mixer Milling Station Instructions and Questions:

- 1. Take one piece of paper and cut it into 12 strips.
- 2. Place the paper strips into the blender.
- 3. Add in optional colored paper strips or food coloring.
- 4. Blend the paper for 3 seconds. Record observations of the blended paper below.
- 5. Close the lid and blend the paper for 3 more seconds. Record your observations of the blended paper below.
- 6. Close the lid and blend the paper for a final 4 seconds.
- 7. Record your observations of the blended paper below. What does your paper look like? Is there a temperature difference? What does the paper feel like?
- 8. Add enough water to just cover the paper. Don't add too much or you will create paper soup instead of paper pulp!
- 9. Blend the paper mixture until smooth.
- 10. Place the grate or screen over a bucket. Put the paper pulp on the screen and press the paper pulp flat, draining the excess water (into the bucket below).
- 11. Use paper towels to absorb the extra moisture.
- 12. Leave the paper pulp on the screen to dry (approximately 1 to 2 days.)
- 13. Clean up the station and materials.

### **Material Mixer Milling Reflection Questions:**

- 1. What properties are you trying to give this paper? Is there a certain strength/texture you are looking for?
- 2. Write a hypothesis about <u>how</u> the materials you added will make the paper better than it was before:





#### **Extrusion Station Instructions and Questions:**

(Note: Engineering Design Process Worksheet MUST be completed before doing this station!)

- 1. Place parchment paper or a tablecloth on the table or lab station countertop.
- 2. Put Play-Doh into the piping bag.
- 3. Starting from the back of the dough ball, gently squeeze the Play-Doh into a shape.
- 4. Repeat Step 3 and gently squeeze the Play-Doh into a line.
- 5. Have each person in the group extrude a shape and a line.
- 6. Clean the station by making sure all extruded Play-Doh is put back into the Play-Doh container.

#### **Extrusion Reflection Questions:**

1. \	Which process too	k more force? T	The first one	(shape), c	or the second	(line)? Wh	٧?
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2.	If the material were	less dense.	would it be	easier to	extrude, and	l if so, why?

3. V	vnen would y	you need to	extrude materials	into strands like this	s? Provide three	examples
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4. What material(s) goes through the extrusion process: plastic, metal, or composites? Why?





### **Injection Molding Station Instructions and Questions:**

(Note: Engineering Design Process Worksheet MUST be completed before doing this station!)

- 1. Make sure the mold is lying flat on the table/desktop.
- 2. Put Play-Doh in the piping bag.
- 3. Place the tip of the piping bag into the mold.
- 4. Squeeze enough material to fill up the mold, and remove the tip of the piping bag from the mold.
- 5. Let everyone in the group repeat this process, and if more Play-Doh is needed, use enough for everyone to fill one mold.
- 6. After everyone has taken a turn, take a piece of parchment paper and lay it over the top of the filled molds.
- 7. Smooth the tops of the molds to flatten out the undersides of the items molded.
- 8. Carefully pop out the new items molded onto the parchment paper.
- 9. Clean up the station before moving on to the next.

### **Injection Molding Reflection Questions:**

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2. What is the difference between injection molding and extrusion?

3. What applications and items would you use an injection molding process for? Provide multiple examples.

4. What material goes through the injection process: plastic, metal, or composites? Why?





## Forging Station Instructions and Questions:

(Note: Engineering Design Process Worksheet MUST be completed before doing this station!)

- 1. Each student gets only a one-foot piece of aluminum foil. BE CAREFUL! THIS IS THE ONLY PIECE OF FOIL YOU GET!
- 2. Create your creature, its habitat, or its food with the foil using ONLY your hands or small hand tools—no other materials.
- 3. Forge any part of your creature, habitat, or food for the creature.

### Forging Reflection Questions:

1	What material(s)	aces through	the forging	process: plastic	metal or	r composites? Why
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2.	What	application	would	vou use	forging	for?

3. What was difficult about this part of the station? What went well with this station?



