

Name:

Date:

Class:

## Measuring Force on Materials Worksheet

### Part 1: Introduction to Young's Modulus

1. Fill in the following table by researching the Young's Modulus value for each material:

Material	Young's Modulus

2. Based on your findings, what kind of conclusions can you make? Write at least three. (Young's Modulus= YM)

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### Part 2: Average Rate of Change

1. Fill in the following table by finding the average rate of change (ARC) of force over the given time intervals for each material:

Material	ARC (0-5 sec)	ARC (5-10 sec)	ARC (10-15 sec)

2. What do you notice about the rate of change for each material over the different time intervals? Were they the same, or different?

3. Based on your answer above, why do you think that happened?

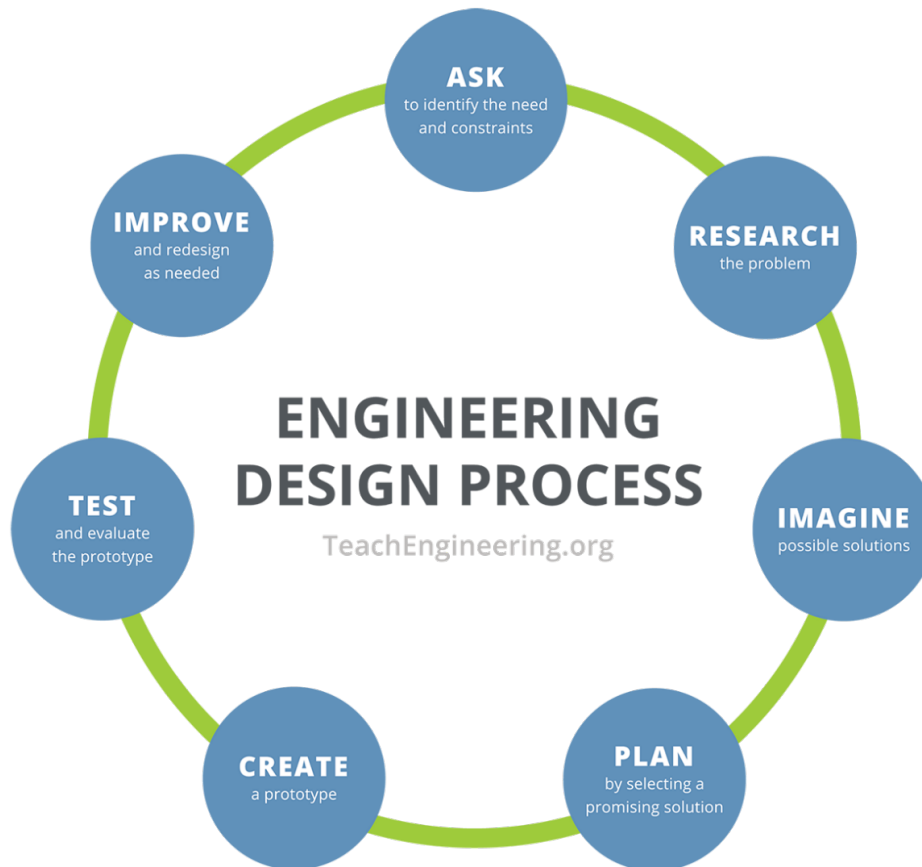
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### Part 3: Engineering Design Challenge

**Instructions:** Now you are going to use the engineering design process to prototype a device to that will allow you to apply pressure at the same angle every time for each material.



1. **Ask** – Identify the need and constraints of your problem.

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2. **Research** – What do we know about measuring Young's Modulus? What did we learn in the previous activities?

3. **Imagine** – Individually sketch out four possible solutions.

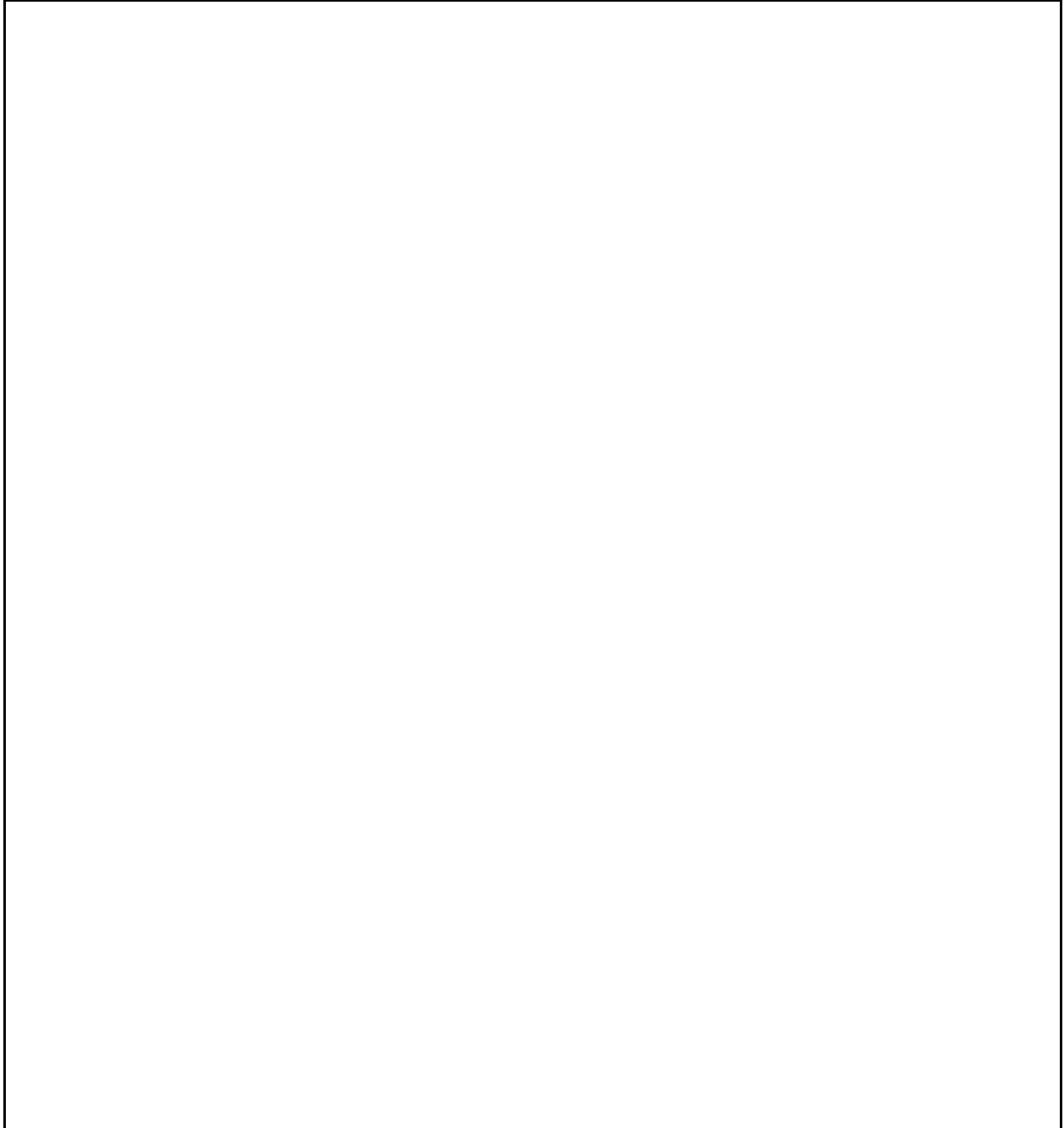
a.	b.
c.	d.

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4. **Plan** – Have each team member share their ideas. As a team, select ONE solution. This can be one specific solution or a mixture of ideas. Draw your team’s solution in the box below. Make sure to identify which materials you will be using.



5. **Create** – Build your prototype as shown in your group’s drawings.

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6. **Test** – Test your design by measuring and recording the average rate of change in the table below.

Material	ARC (0-5 sec)	ARC (5-10 sec)	ARC (10-15 sec)

7. **Improve** – Based on your testing and results, how would you improve your design? Why?

**Reflection Questions:**

8. What do you notice about the rate of change for one material over the different time intervals? Were they the same, or different?.

9. Based on your answer above, why do you think that happened?