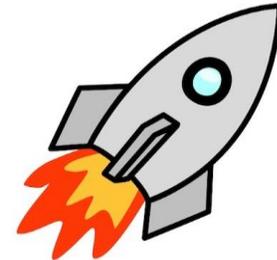


Name: _____ Date: _____ Class: _____

Density and Specific Strength Student Handout



Background: To ensure the safety of the astronauts during liftoff, the engine and engine turbines must successfully complete their jobs. As learned in the article, *RS-25: The Clark Kent of Engines for Space*, the four total engines on the Space Launch System (SLS) each include both high-pressure and low-pressure fuel turbo pump turbine blades. For this task, collect and calculate data for a given alloy and report this data on the class data table.

Determine roles: Agree within your team who will perform each of the four roles below:

Role	Description	Fulfilled by
Senior quality engineer	Supports the principal aerospace engineer and senior aerospace engineer by recording the data in the task table.	_____
Senior engineering manager	Converts data obtained by the principal aerospace engineer. Records the final data obtained by the principal aerospace engineer and the senior aerospace engineer on the class data table.	_____
Principal aerospace engineer	Designates group members to determine the mass and volume of the sample. Calculates the density.	_____
Senior aerospace engineer	Calculates the specific strength of the sample. Asks group members to verify accuracy.	_____

Task: Individually complete the procedure for your role, as described in the task table on page 2.

Task Table

Senior Quality Engineer	Principal Aerospace Engineer	Senior Engineering Manager	Senior Aerospace Engineer
<ol style="list-style-type: none"> 1. Keep this task table in your possession. 2. Help and support group members in completing their individual tasks. 3. Record in this table the data obtained by your group members. 	<ol style="list-style-type: none"> 1. Ask the Senior Aerospace Engineer to measure the mass (grams) of the sample. 2. Direct the Senior Quality Engineer to go with the Senior Aerospace Engineer to record the mass on this line: _____. 3. Ask the Senior Quality Engineer to use the digital calipers to determine the sample volume. Have the Senior Quality Engineer should record the volume on this line: _____. 4. Use the space below to calculate the density of the sample: 	<ol style="list-style-type: none"> 1. Help and support group members in completing their individual tasks. 2. Once the Principal Aerospace Engineer determines the density of the sample, convert the density to kg/m³ in the space below: 3. Once determined, record the density and specific strength of your alloy sample on the class data table. 	<ol style="list-style-type: none"> 1. Help and support group members in completing their individual tasks. 2. Once the density of the sample is determined by the Principal Aerospace Engineer, calculate the specific strength of your group’s alloy using the equation: specific strength = $\frac{UTS}{density}$ 3. Ask your group members to confirm the accuracy of your calculations.