

Materials Summary

Name _____

In the past few labs, you have measured physical qualities of various metals; density, specific heat capacity, and coefficient of linear expansion. Below you will summarize the procedures:

Density: Using Archimedes Principle

Select two trials and provide your measurements and calculations below.

| |
|------------------------------|
| What equation did you solve? |
|------------------------------|

| | Material? | Mass out of water | Mass in the water | ρ unknown | ρ accepted | % Error |
|---|-----------|-------------------|-------------------|----------------|-----------------|---------|
| 1 | | | | | | |
| 2 | | | | | | |

What specific lab factors could have caused the error you found?

Calorimetry : Finding specific heat capacity

Select two trials and provide your measurements and calculations below.

| |
|------------------------------|
| What equation did you solve? |
|------------------------------|

| | Material? | Mass of Cup | Mass of Water | Mass of Sample | T Initial | T Final |
|---|-----------|-------------|---------------|----------------|-----------|---------|
| 1 | | | | | | |
| 2 | | | | | | |

| | ΔT (hot) | ΔT (cold) | Heat Transfer | c exp. | % Error |
|---|------------------|-------------------|---------------|--------|---------|
| 1 | | | | | |
| 2 | | | | | |

What specific lab factors could have caused the error you found?

Coefficient of Linear Expansion

Select two trials and provide your measurements and calculations below.

What equation did you solve?

| | Material? | L unknown | R₁ | R₂ | Δ L |
|---|------------------|------------------|----------------------|----------------------|------------|
| 1 | | | | | |
| 2 | | | | | |

| | T₁ | T₂ | Δ T | α unknown | α accepted | % Error |
|---|----------------------|----------------------|------------|------------------|-------------------|----------------|
| 1 | | | | | | |
| 2 | | | | | | |

What three measuring tools did you use, and what did each one measure?

What specific aspect of the experiment could have caused the greatest part of your error?

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The same experiments were completed by a good, but not perfect, student with one of the metals from the table below. Complete the calculations and determine which of the metals the student used.

| Metal | Density g / cm ³ | Specific Heat cal / g C° | α ($\times 10^{-6}$ / C°) | Melting / Boiling Point C° | |
|-------|--------------------------------|-----------------------------|--------------------------------------|-------------------------------|-----|
| A | 3 | 2 | 14 | -30 | 200 |
| B | 3 | 2 | 24 | -20 | 240 |
| C | 5 | 2 | 14 | -10 | 300 |
| D | 3 | 6 | 24 | 10 | 340 |
| E | 5 | 6 | 14 | 20 | 160 |
| F | 3 | 6 | 14 | 30 | 260 |

For the density experiment, the student followed procedures that matched our methods in class.

| Mass (in air) | Mass (in water) | calculated density | Possible Metals |
|---------------|-----------------|--------------------|-----------------|
| 60.2 g | 40.8 g | | |

For the calorimetry section, you may ignore the cup that was used, and accept that all of the heat is absorbed by the water. The metal was heated using boiling water.

| Mass of Water | Mass of Metal | Initial Temp | Final Temp | c | Possible Metals |
|---------------|---------------|--------------|------------|---|-----------------|
| 200 g | 18 g | 20 °C | 32 °C | | |

For the expansion lab, the student has found the temperatures by using a chart of resistances.

| L ₀ | ΔL | T ₁ | T ₂ | ΔT | α | Possible Metals |
|----------------|------------|----------------|----------------|------------|----------|-----------------|
| 60.0 cm | 1.25 mm | 12 °C | 99 °C | | | |

Which metal did the student use for the experiment?