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Lab – Significant Digits

The Thickness of a Thin Aluminium Sheet

Name - _____

Partner's Name - _____

Instructions – show all work using unit factors where needed for full marks.

Pre-lab Questions

1.) What is the density of a $100.0\ g$ block of metal with dimensions $2.00\ cm \times 4.50\ cm \times 6.25\ cm$?

2.) If the density of copper is $8.96\ \frac{g}{cm^3}$, what is the volume of a $50.\ g$ sample of the metal?

3.) A certain brand of binder paper measures $21.3\ cm\ \times 27.8\ cm$. If a $200.$ sheet package of the paper has a volume of $858.6\ cm^3$, then what is the thickness of each sheet?

4a.) What is the main purpose of anodizing aluminium?

b.) What is the very thin layer composed of?

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Purpose – to discover the thickness of a sheet of aluminium foil and present how accurate and precise your results are to the accepted standard. To review calculations of area, volume and density and use these calculations to practice significant digits.

Materials –

1.) aluminium foil

2.) protractor

3.) scissors

4.) scale accurate to thousandths

Procedure –

1.) Very carefully cut three rectangular pieces of aluminium foil. Make sure that each dimension is at least $15\ cm$ long and the corners are $90°$. ***Measure each dimension to two places past the decimal in centimetres***. Enter the results in the **table 1**.

2.) Record the mass of each piece of aluminium foil and enter your results in **table 1**. If available use a sensitive balance which measures at least 3 or 4 places past the decimal.

3.) The known density of aluminium is $2.6989\frac{g}{cm^3}$. Calculate the surface area of each piece of aluminium foil. From the mass of each sample and the density value above, calculate the volume of each piece of foil.

4.) Now that you know the volume $(L \times W \times T)$ and the surface area $(L \times W)$, you can calculate the thickness of the aluminium. When calculating thickness, ***use your "all digits" values in the table 2***. ***Calculate the average of your calculations.***

Data and Observations –

Table 1 – measurements of dimensions and mass of aluminium foil sheets.

Sample #	Length (cm)	Width (cm)	Mass (g)
1			
2			
3			

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Ex. Calculation for Surface Area -

Ex. Calculation for Volume –

Table 2 – calculations for the surface area and volume of aluminium foil.

Sample #	Surface area (cm^2) all digits	Surface area (cm^2) sig. figs.	Volume (cm^3) all digits	Volume (cm^3) sig. figs.
1				
2				
3				

Table 3 – calculations of the thickness of aluminium foil sheets.

Ex. Calculation for Thickness –

Sample #	Thickness (cm) all digits	Thickness (cm) sig. Figs.
1		
2		
3		

Mean Thickness

=

Calculate the percent deviation (how accurate was your measuring) of your average thickness calculation from the accepted standard for aluminium foil at $0.00\ 153\ cm$, using the following equation.

$$\%\ deviation = \left(\frac{(your\ calculated\ value)-(accepted\ value)}{(accepted\ value)}\right) \times 100$$

$$\%\ deviation = \_\_\_\_\_ \times 100 = \_\_\_\_\_ \%$$

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Post-lab Questions –

1.) From your measurements and calculations in this lab, what data is needed in order to calculate the thickness of any very thin metal? (Hint - this is worth 3 marks).

_____ _____ _____

2.) A sample of gold has a mass of $12.5\ g$. If the sample is pounded into a very thin sheet which covers the surface of a table top – $90.0\ cm \times 155.0\ cm$ - what will be the thickness of the gold sample? The density of gold is $19.3 \frac{g}{cm^3}$.

3.) If you were to drop $5.00\ mL\ (=\ 5.00\ cm^3)$ of oil onto the surface of Athans Pool, how thick would the resulting oil slick be? Athans Pool measures $25.0\ m \times 15.0\ m$. The density of the oil is $0.750 \frac{g}{cm^3}$. (Hint – before you start change metres to centimetres).

Conclusion – (your statement should include your results to the purpose along with a statement on your accuracy and precision based on your standard deviation calculation.)