University of Al-Mustaqbal
College of Science
Department of Medical Physics

Laser in medicine

Practical Experiences

Third Stage

Calculate the Thickness of a Glass Can

Lec 2

Asst. lec. Ali Salman Hamadi

Mohammed abdulzahra

Haneen hani

Experiment: Calculate the Thickness of a Glass Can

Objective:

To determine the thickness of a glass can using simple tools and a systematic procedure.

Tools and Materials:

1. Glass can (transparent preferred).
2. Vernier caliper (or ruler, if unavailable).
3. Digital or mechanical balance (to measure mass).
4. Measuring cylinder (optional, for volume measurement).
5. Water (optional, for volume determination if needed).
6. Calculator (for calculations).

Work Steps

Step 1: Measure the Dimensions of the Glass Can

1. **Outer Diameter**:
   - Use the vernier caliper to measure the outer diameter of the can. Record the measurement as $\mathbf{D_{outer}}$.
2. **Inner Diameter**:
   - Measure the inner diameter of the can using the caliper. Record it as $\mathbf{D_{inner}}$.
3. **Height**:
   - Measure the height of the glass can using the caliper or ruler. Record it as **h** .

Step 2: Calculate the Volume of Glass Material

1. **Calculate the Outer Volume**:
   - Use the formula for the volume of a cylinder:

$$V_{outer} = \pi \left(\frac{D_{outer}}{2} \right)^2 h$$

2. **Calculate the Inner Volume**:
   - Similarly, calculate the volume of the hollow part of the can:

$$V_{inner} = \pi \left(\frac{D_{inner}}{2} \right)_2 h$$

3. **Volume of Glass**:
   - Subtract the inner volume from the outer volume to find the volume of the glass material: $V_{glass} = V_{outer} - V_{inner}$

Step 3: Measure the Mass of the Glass Can

1. Use the balance to measure the mass of the glass can. Record the value as **m** .

Step 4: Determine the Thickness

1. Calculate the surface area of the cylinder using:

$$\text{Surface Area} = 2\pi D_{outer} h \; 2.$$

Verify the thickness using:

$$\text{Thickness} = \frac{V_{glass}}{\text{Surface Area of Outer Cylinder}}$$

Conclusion:

1. Report the measured thickness of the glass.
2. Compare your result with known thickness values for similar cans.
3. Reflect on the accuracy of measurements and assumptions (e.g., uniformity of glass thickness).

Discussion

1: What is the primary objective of the glass can experiences?

A) To measure the height of a glass can.
B) To determine the thickness of the glass can.
C) To calculate the volume of water in the can.
D) To find the density of the can material.
E) To measure the weight of the can.

2: Which tool is used to measure the outer and inner diameters of the can?

A) Digital balance
B) Vernier caliper
C) Ruler
D) Measuring cylinder
E) Compass

3: How is the height of the glass can recorded ?

A) Using the digital balance
B) Using the calculator
C) Using the vernier caliper or ruler
D) Using the measuring cylinder
E) By approximation

4: Which formula is used to calculate the outer volume of the can?

A) $\pi D_{outer} / h$
B) $D_{outer} / 2h$
C) $\pi(D_{inner} / 2)^2 h^2$
D) $2\pi D_{outer} / h^2$
E) $\pi(D_{outer} / 2)^2 h$

5: What is the difference between V_{outer} and V_{inner} ?

A) Surface area of the glass
B) Volume of the glass material
C) Mass of the glass can
D) Thickness of the glass
E) Height of the can

6: Which tool is optional for determining the volume of the glass can?

A) Water
B) Measuring cylinder
C) Calculator
D) Vernier caliper
E) A and B

7: What is the purpose of the digital or mechanical balance?

A) To measure the volume of water
B) To measure the mass of the glass can
C) To calculate the thickness of the glass
D) To measure the outer diameter
E) To determine surface area

8: How is the thickness of the glass calculated?

A) By dividing V_{outer} by the height.

B) By subtracting V_{inner} from V_{outer} .

C) By dividing the volume of glass by the surface area of the outer cylinder.

D) By multiplying D_{outer} and D_{inner} .

E) By using the height and mass of the can.

9: What formula is used to find the surface area of the outer cylinder?

A) $\pi(D_{outer} / 2)^2$
B) $2\pi D_{outer} h\ 2$
C) $\pi D_{inner} h$
D) $2\pi D_{inner}{}^2$
E) V_{glass} / h

10: What are the tools used in the experiment?

A) Glass can .

B) Digital or mechanical balance.

C) Calculator .

D) All of the above.

E) None of the above.

11: Which variable is represented by m?

A) Inner diameter

B) Mass of the glass can

C) Volume of the glass material

D) Thickness of the glass

E) Height of the can

12: What is the significance of subtracting V_{outer} from V_{inner} ?

A) To find the volume of the glass material

B) To calculate the thickness directly

C) To find the mass of the glass can

D) To determine the surface area of the can

E) To measure the height of the can

13: What should you use to perform calculations in this procedure?

A) Vernier caliper
B) Digital balance
C) Calculator
D) Measuring cylinder
E) Compass

14: What is the relationship between surface area and thickness in this procedure?

A) Thickness is proportional to the surface area.

B) Thickness is inversely proportional to the surface area.

C) Thickness is measured using a vernier caliper.

D) Thickness is directly calculated from the height.

E) None of the above.

15. Which factor does NOT used in the experiment of the thickness of the glass can?

A) Height of the can.
B) Outer diameter of the can.
C) Inner diameter of the can.
D) Mass of the can.
E) Color of the can.