Example 1.3: The diameter and length of a metal cylinder measured with the help of vernier callipers of least count 0.01 cm are 1.22 cm and 5.35 cm. Calculate the volume V of the cylinder and uncertainty in it.

Solution: Given data is

Diameter d = 1.22 cm with least count 0.01 cm

Length l = 5.35 cm with least count 0.01 cm

Absolute uncertainty in length = 0.01 cm

$$\%\text{age uncertainty in length} = \frac{0.01\,\text{cm}}{5.35\,\text{cm}} \times 100 = 0.2\%$$

Absolute uncertainty in diameter = 0.01 cm

$$\%\text{age uncertainty in diameter} = \frac{0.01\,\text{cm}}{1.22\,\text{cm}} \times 100 = 0.8\%$$

As volume is $V = \frac{\pi d^2 l}{4}$

$\therefore$ total uncertainty in V = 2 (%age uncertainty in diameter) + (%age uncertainty in length)

$= 2 \times 0.8 + 0.2 = 1.8\%$

Then $V = \frac{3.14 \times (1.22\,\text{cm})^2 \times 5.35\,\text{cm}}{4} = 6.2509079\ \text{cm}^3$ with 1.8% uncertainty

Thus $V = (6.2 \pm 0.1)\ \text{cm}^3$

Where 6.2 cm^3 is calculated volume and 0.1cm^3 is the uncertainty in it.

This is an example from my textbook.

My objection is that there should be three significant figures in the final answer 6.25 cm^3, as least number of significant figures in measurement (diameter and length both) is three. Moreover, the absolute uncertainty should be 0.11cm^3 with two decimal places as present in 6.25cm^3.