

3. 解: $\bar{L} = \frac{1}{7} \sum_{i=1}^7 L_i = 10.1 \text{ (mm)}$

$$s_{\bar{L}} = \sqrt{\frac{\sum_{i=1}^7 (L_i - \bar{L})^2}{7(7-1)}} = 0.0976 \text{ (mm)}$$

$$u_L = \frac{\Delta x}{\sqrt{3}} = 0.2887 \text{ (mm)}$$

$$U = \sqrt{s_{\bar{L}}^2 + u_L^2} \approx 0.3 \text{ (mm)}$$

$$L = (10.1 \pm 0.3) \text{ mm}$$

$$E = \frac{U}{\bar{L}} \times 100\% = 3.02\%$$

$$P = 68.3\%$$

4. 解: $u_t = \frac{\Delta x}{3} = 0.035$

$$t = (20.20 \pm 0.03) \text{ s}$$

$$E = \frac{u_t}{t} \times 100\% = 0.1485\%$$

$$P = 68.3\%$$

5. (1) 解: $U = \sqrt{\left(\frac{\partial Y}{\partial A}\right)^2 u_1^2 + \left(\frac{\partial Y}{\partial B}\right)^2 u_2^2 + \left(\frac{\partial Y}{\partial C}\right)^2 u_3^2} = 0.0895$

$$\bar{Y} = \bar{A} + 2\bar{B} - 5\bar{C} = 21.37 \text{ (cm)}$$

$$E = \frac{U}{\bar{Y}} = 0.42\%$$

$$Y = (21.37 \pm 0.09) \text{ cm}$$

(2) 解: $U = \sqrt{\left(\frac{\partial Y}{\partial m}\right)^2 u_1^2 + \left(\frac{\partial Y}{\partial D}\right)^2 u_2^2 + \left(\frac{\partial Y}{\partial h}\right)^2 u_3^2} = 0.03$

$$\bar{Y} = \frac{4\bar{m}}{\pi \bar{D}^2 \bar{h}} = 6.65 \text{ (g/cm}^3\text{)}$$

$$E = \frac{U}{\bar{Y}} \times 100\% = 0.44\%$$

$$Y = (6.65 \pm 0.03) \text{ g/cm}^3$$

6. 解: (1) $N = (10.8 \pm 0.2) \text{ cm}$

(2) $q = (1.6 \pm 0.3) \times 10^{-19} \text{ C}$

(3) $L = (12.0 \pm 0.1) \text{ km}$

(4) $E = (19.3 \pm 0.7) \times 10^{10} \text{ N/m}^2$

7. 解: (1) 21.50

(2) 43.46

(3) 8.131

(4) 1.800

9. (1) 解: $a = \frac{1}{3} \left(\frac{69.56 - 74.22}{30} + \frac{67.91 - 72.75}{30} + \frac{66.18 - 71.18}{30} \right) = -0.1611$

$$\bar{T} = \frac{1}{6} \sum_{i=1}^6 T_i = 308.15$$

$$\bar{\alpha} = \frac{1}{6} \sum_{i=1}^6 \alpha_i = 70.3$$

$$b = a\bar{T} - \bar{\alpha} = -119.946$$

(2) 解: $a = \frac{\bar{T} \cdot \bar{\alpha} - \overline{T\alpha}}{(\bar{T})^2 - \overline{T^2}} = -0.161$

$$b = a\bar{T} - \bar{\alpha} = -119.903$$