作业

P22 ③ (1) $N = x + y + 2z$

$dN = dx + dy + 2dz$

$\Delta N = \sqrt{\Delta x^2 + \Delta y^2 + 4\Delta z^2}$

(2) $f = \frac{ab}{a-b} \quad (a \neq b)$

$\ln f = \ln a + \ln b - \ln(a-b)$

$\frac{df}{f} = \frac{da}{a} + \frac{db}{b} - \frac{da-db}{a-b}$

$= \left(\frac{1}{a} - \frac{1}{a-b}\right) da + \left(\frac{1}{b} + \frac{1}{a-b}\right) db$

$\frac{\Delta f}{f} = \sqrt{\frac{b^2}{a^2(a-b)^2}\Delta a^2 + \frac{a^2}{b^2(a-b)^2}\Delta b^2}$

⑤

(1) $l=(10.8000\pm0.20)\ cm$ $l=(10.80\pm0.20)\ cm$

(2) $M=(31690\pm200)\ kg$ $M=(3.169\pm0.020)\times10^{4}\ kg$

(3) $l=(18.5476\pm0.3123)\ cm$ $l=(18.55\pm0.32)\ cm$

(4) $d=(18.652\pm1.4)\ cm$ $d=(18.65\pm1.4)\ cm$

(5) $28\ cm=280\ mm$ $28\ cm=2.8\times10^{2}\ mm$

(6) $2500\ \Omega=2.5\times10^{3}\ \Omega$ $2500\ \Omega=2.500\times10^{3}\ \Omega$

(7) $0.0221\times0.0221=0.00048841$ $0.0221\times0.0221=0.000488$

(8) $\frac{400\times1500}{12.60-11.6}=600000$ $\frac{400\times1500}{12.60-11.6}=\frac{400\times1500}{1.0}=6.0\times10^{5}$

(9) $a=0.0025\ cm$, $b=0.12\ cm$ 改为 $a\times b=3.0\times10^{-4}\ cm^{2}$

$a+b=0.12\ cm$

取 $a\times b=3\times10^{-4}\ cm^{2}$

$a+b=0.1225\ cm$

⑦

21.495 ⇒ 21.50

43.465 ⇒ 43.46

8.1308 ⇒ 8.131

1.799501 ⇒ 1.800

⑧ $g = 4\pi^2 \frac{l}{T^2} = 4 \times 3.14159^2 \times \frac{100.010}{2.0021^2} \doteq 984.99 \ (cm/s^2)$

$\ln g = \ln 4\pi^2 + \ln l - \ln T^2$

$\frac{dg}{g} = \frac{dl}{l} - \frac{2dT}{T}$

$\frac{\Delta g}{g} = \sqrt{\left(\frac{\Delta l}{l}\right)^2 + 4\left(\frac{\Delta T}{T}\right)^2}$

$= \sqrt{\left(\frac{0.010}{100.010}\right)^2 + 4 \times \left(\frac{0.0020}{2.0021}\right)^2}$

$= \sqrt{9 \times 10^{-9} + 4.0 \times 10^{-6}} \doteq 0.0020 = 2.0\%$

$\Delta g = g \cdot \left(\frac{\Delta g}{g}\right) = 984.99 \times 2.0\% \doteq 2.0 \ (cm/s^2)$

$\therefore \ g = (985.0 \pm 2.0) \ cm/s^2$