Oxford Text Unit 1 pp. 24-25 # 1-4, 7-9, 11

① a) $1N = 1kg \cdot m \cdot s^{-2}$

b) $1W = 1J/s = \frac{1kg\,m\cdot s^{-2}}{s} = 1kg \cdot m \cdot s^{-3}$

c) $1Pa = 1N/m^2 = \frac{1kg\,m\cdot s^{-2}}{m^2} = 1kg \cdot m^{-1} s^{-2}$

d) $C = 1A \cdot s$

e) $V = 1kg\,m^2 s^{-3} A^{-1}$

② a) 258.

b) 0.00235

c) 0.178

d) 7870

e) 2.00

③ a) $1.34 \times 3.2 = 4.3$

b) $\frac{1.34 \times 10^2}{2.1 \times 10^3} = 6.4 \times 10^{-2}$

c) $1.87 \times 10^2 + 1.97 \times 10^3 = 2.16 \times 10^3$

d) $(1.97 \times 10^{-1}) \times (1.0 \times 10^{1}) = 2.0 \times 10^{1}$

e) $(9.47 \times 10^{-2}) \times (4.0 \times 10^{3}) = 380$ or 3.8×10^2

④ a) 11 kV

b) .422 mm or 422 μm

c) 85 GW

d) 422 nm

e) 350 fC

(7) 3.0 ± 0.4 (absolute)

$\frac{0.4}{3.0} \times 100 = \pm 13.3\%$ → round to $\pm 13\%$

(8) % uncert for $t = \pm 3\%$ and for $g = \pm 2\%$ $\quad S = \frac{1}{2} g t^2$

What is % uncertainty in value of S?

$S = \frac{1}{2} g \cdot t \cdot t$ (add % uncerts for each term being multiplied)

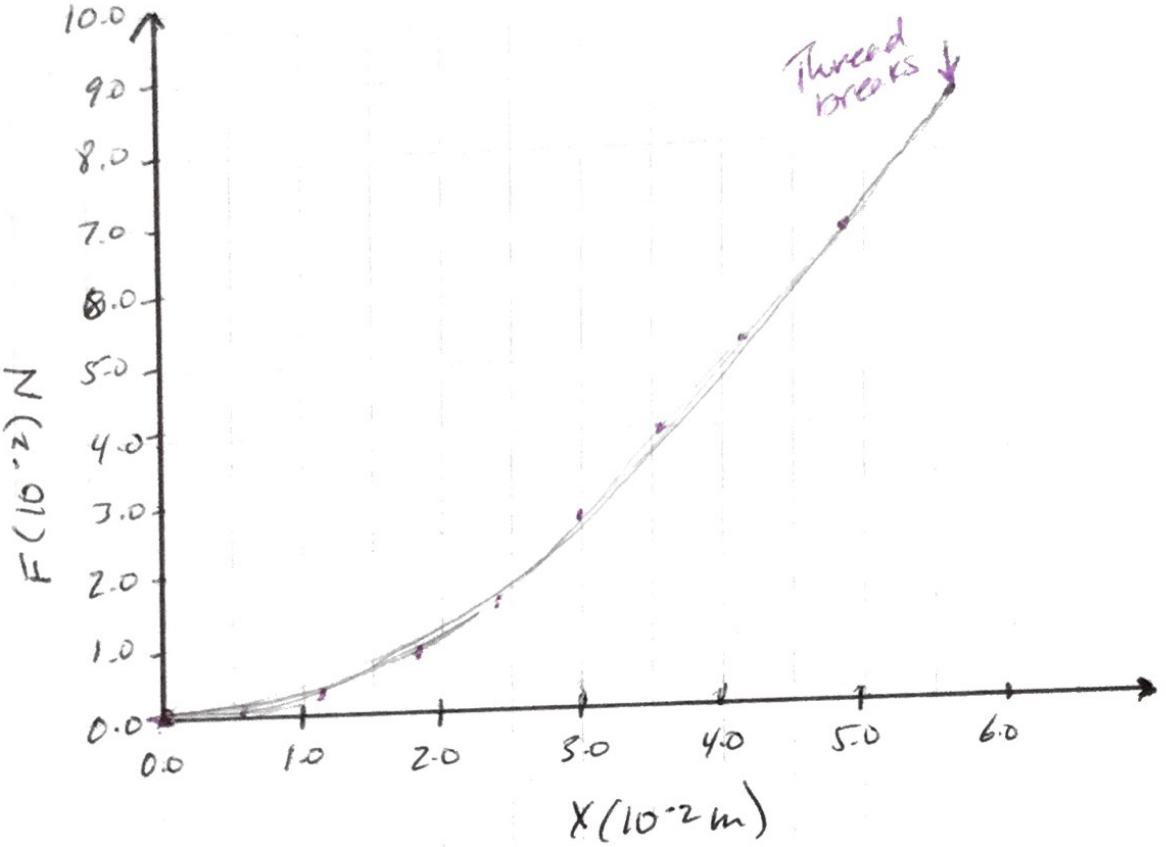
$= 2\% + 3\% + 3\% = \boxed{8\%}$

(9) $V = \pi r^2 h \quad r = \sqrt{\frac{V}{\pi h}}$ with $V = \pm 5\%$ and $h \pm 2\%$

What is % uncert in r?

$\frac{\Delta r}{r} = \frac{1}{2}\left(\frac{\Delta h}{h} + \frac{\Delta V}{V}\right) = \frac{1}{2}(5\%) + \frac{1}{2}(2\%) = 3.5 \rightarrow \boxed{4\%}$

(11) a)



b) $F = kx^n$ To find n, you would graph

$\log F = \log k + n \log x$ $\log F = \boxed{n} \log x + \boxed{\log k}$ $(y = mx + b)$

Slope $\log F$ intercept

c) Stress $p = \frac{F}{A}$ At breaking pt. of spider web

broke at $F = 8.5 \times 10^{-2} N$

Area $= \pi (4.5 \times 10^{-6})\, m^2$

$$p = \frac{F}{A} = \frac{8.5 \times 10^{-2} N}{\pi (4.5 \times 10^{-6}\, m)^2} = \boxed{1.3 \times 10^{9}\ N \cdot m^{-2}}$$

d) Uncert. in $r = \pm 0.1 \times 10^{-6}$ So uncert in area (r^2)

So % uncert. $= \frac{0.1 \times 10^{-6}}{4.5 \times 10^{-6}} \times 100 = 2.2\%$ for r $A = \pi r^2$ $a = b^n$

$\frac{\Delta a}{a} = n \frac{\Delta b}{b}$ $\frac{\Delta A}{A} = 2 \frac{\Delta r}{r} = 2 \frac{(0.1 \times 10^{-6})}{(4.5 \times 10^{-6})} = .04 \times 100 = \boxed{4\%}$