Let "small" = 2cm

1

Its boundary layer becomes turbulent at

$$R = 100\,000$$

Make reasonable assumptions requirement

Reynold's number:

$$R = \frac{\rho L v}{\eta}$$

$\rho = 1000 \text{ kg m}^{-3}$

$L = 2 \times 10^{-2} \text{ m}$

$\eta = 0.001 \text{ Pa s}$

$v = ?$

$$v = \frac{R\eta}{\rho L}$$

$$= \frac{100\,000 \times 0.001}{1000 \times 2 \times 10^{-2}}$$

$$v = 5 \text{ ms}^{-1}$$

Poiseuille's law: $\frac{V}{t} = \frac{\pi \Delta p D^4}{128 L \eta}$

so $\Delta P_{healthy} = \frac{V \times 128 \times L \times \eta}{t \times \pi \times D^4}$

$\Delta P_{tight} = \frac{V \cdot 128 \cdot L \cdot \eta}{t \cdot \pi (0.95D)^4}$ $= \frac{V . 128 . L \times [illegible]}{t . \pi . D^4 \times [illegible]}$

Sa[illegible] [illegible] substitution

$0.95^4 = 0.851$

so $\Delta P_{tight} = \frac{\Delta P_{healthy}}{0.851}$ $= \frac{\Delta P_{healthy}}{0.95^4}$

$\Delta P_{tight} = 1.23 \Delta P_{healthy}$

Use of subscripts to distinguish quantities

$$\frac{V}{t} = \frac{\pi \Delta p \cdot D^4}{128 \cdot L \cdot \eta}$$

Let $Vol = 0.5\,m^3$ and $180\,s = t$

More "reasonable assumptions. I've never timed a bath

so $\dfrac{0.5}{t_{H_2O}} = \dfrac{k}{0.001}$ where $k = \dfrac{\pi \Delta p D^4}{128\, L}$

Bundle everything that doesn't change into a single constant

$$t_{H_2O} = \frac{0.5 \times 0.001}{k}$$

$$t_{oil} = \frac{0.5}{k} \times 0.084\ Pa$$

so $t_{oil} = 84\, t_{H_2O}$

Question doesn't ask for exact time, just how many times longer

$L = 0.6\,m$
$\rho = 1000\,kg\,m^{-3}$
$v = ?$
$\eta = 0.001\,Pa\,s$
$R_{lim} = 2000$

More dodgy assumptions
I've never measured a canoe
R based on no turbulence AT ALL

4

$$R_{lim} = \frac{\rho L v}{\eta}$$

so $$v_{lim} = \frac{R_{lim}\,\eta}{\rho L}$$

$$= \frac{2000 \times 0.001}{1000 \times 0.6}$$

$$= 3.3 \times 10^{-3}\,ms^{-1}$$

i.e. 12 m per hour

Result seems dodgy but I think my maths is OK

$$\frac{V}{t} = \frac{\pi \Delta p D^4}{128 L \eta} \quad \text{——— ①}$$

Let a cup = 300 mL

unit conversion:

$1 m^3 = 10^3 L$ so $1 L = \frac{1}{10^3} = 0.001 m^3$ L in this line is litre

so 1 cup = $300 \times 10^{-3} \times 10^{-3} = 0.3 \times 10^{-3} m^3$

Let $t = 5s$

From ①

$$\frac{\eta}{t} = \frac{\pi \Delta p D^4}{128 L V}$$

so for water, $\frac{\eta}{t_{H_2O}} = \frac{0.001}{5} = 0.0002$

π, Δp, D^4, 128, L & V(ol) are unchanged

and for honey

$$\frac{\eta}{t} = \frac{1000}{t_{hon}} = 0.0002$$

$$t_{hon} = \frac{1000}{0.0002} = 5 \times 10^6 s$$

i.e. about 58 days

∴ bee keepers use ~ 6cm diameter funnels

$D = 1\times10^{-2}\,m$

$R = 2000$

$\rho = 918\ kg\,m^{-3}$

$\eta = 0.084\ Pa\,s$

$$R = \frac{\rho L v}{\eta}$$

$$v = \frac{R\eta}{\rho L}$$

$$= \frac{2000\times0.084}{918\cdot1\times10^{-2}}$$

$$v = 18.3\ m\,s^{-1}$$

Conclusion: don't use a 1cm diameter stick to mix olive oil when blending it.

$L = 15\,m$

$\rho = 1.25\,kgm^{-3}$

$\eta = 0.0000183\,Pa\,s$

$v = ?$

$R_{lim} = 2000$

$$v = \frac{R\eta}{\rho L}$$

$$= \frac{2000 \times 0.0000183}{15 \times 1.25}$$

$v = 1.95 \times 10^{-3}\,ms^{-1}$

i.e. $2\,mm\,s^{-1}$

Does this matter?

No.

Blimps contain lighter than air gas, (helium ≡) and don't rely on wings to float in air, only as control surfaces.