Type - 02

1. The surface tension of water is 0.072 N/m. Find the vertical force required to detach a floating pin of length 2.5 cm from the surface of water.

Given:
$$T = 0.072 \text{ N/m}$$

$$F = 8$$

$$1 = 2.5 \text{ cm}$$

$$0 = 8.5 \times 10^{-2} \text{m}$$

Solution:

$$F = T \times 1$$

$$F = 0.072 \times 3.5 \times 10^{-2} \times 2$$

$$F = 0.072 \times 5 \times 10^{-2}$$

$$F = 0.360 \times 10^{-2}$$

$$F = 3.6 \times 10^{-3} \text{ N}$$

$$0.360$$

$$F = 0.360 \times 10^{-2}$$

 $F = 3.6 \times 10^{-3}$ N

$$0.072$$
 $\times 5$
 0.360

2. A U-Shaped wire is dipped in a soap solution and removed. The thin soap film is formed between the wire and the light slider supports a weight of 1.5×10^{-9} N (which includes the small weight of the slider). The length of the slider is 30cm. What is the surface tension of the film.

Given:
$$T = 8$$
 $F = 1.5 \times 10 \text{ N}$
 $l = 30 \times 10^{-2} \text{ m}$

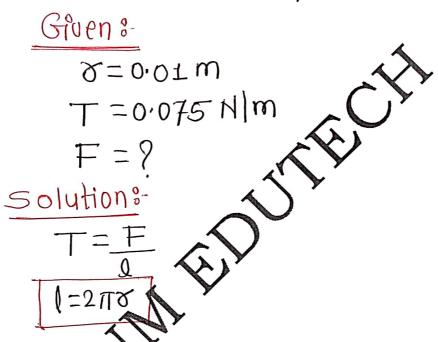
Solution:
T=F
21

$$T = F$$
 21
 $T = 1.5 \times 10^{-2}$
 $2 \times 30 \times 10^{-2}$

$$T = \frac{1.5}{60} = \frac{15^{1}}{60040} = \frac{1}{40}$$

2

3. Calculate the force required to take away a flat circular plate of radius 0.01 m from the surface water. The surface tension of water is 0.075 N/m.

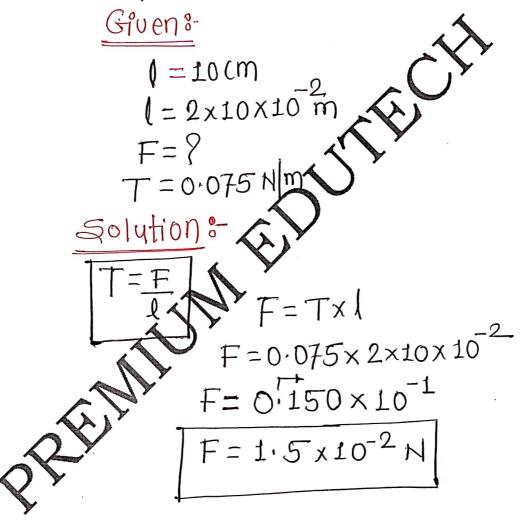


Calculations:

$$F = T \times 2T \times T$$

 $F = 0.075 \times 2 \times 3.142 \times 0.01$
 $F = 0.150 \times 3.142 \times 1.0 \times 10^{-2}$
 $F = 0.150 \times 3.142 \times 10^{-2}$

4. A beaker of radius 10cm is filled with water. Calculate the force of surface tension on any diametrical line on its surface. Surface tension of water is 0.075 N/m.



7.4cm internal and 7.8cm external diameter. This ring with its lower side horizontal is suspended from one arm of a balance so that the lower edge is just immersed in a vessel of water. It is found that an additional weight of 3.62 g must be placed in the other scale pan to compensate for the pull of surface tension on the ring. Calculate the surface tension of water.

(di)

$$31 = 3.7 \times 10^{-2} \text{ m}$$

 $3 = 3.7 \times 10^{-2} \text{ m}$
(do)
 $30 = 3.9 \times 10^{-2} \text{ m}$
 $30 = 3.629$

$$m = 3.62g$$
 $m = 3.62 \times 10^{-3} \text{ kg}$
 $T = \frac{9}{9} = 9.8 \text{ m/s}^2$

Solution:

$$T = \frac{F}{2\pi(\eta^2 + 30)} \qquad \left[x = \eta^2 + 30\right]$$

$$T = \frac{mg}{2\pi(\eta^2 + 30)} \qquad \left[F = mg\right]$$

$$T = \frac{3 \cdot 62 \times 10^{-3} \times 9 \cdot 8}{2 \times 3 \cdot 142 \times (3 \cdot 7 + 3 \cdot 9) \times 10^{-2}}$$

$$T = \frac{35 \cdot 48 \times 10^{-3}}{6 \cdot 284 \times 7 \cdot 6 \times 10^{-2}}$$

$$T = \frac{35 \cdot 48 \times 10^{-3}}{47 \cdot 76 \times 10^{-2}}$$

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$$T = \frac{35 \cdot 48 \times 10^{-3}}{47 \cdot 76 \times 10^$$

6. A horizontal circular loop of a radius 0.02m is lowered into crude oil and a film is formed. The force due to the surface tension of the liquid is 0.0113 N. Calculate the surface tension of the crude oil.(

| ☐ = 3.142|

Given 8-

$$\delta = 0.02m$$

 $l = 2\pi 8 \times 2$
 $l = 2 \times 3.142 \times 0.02 \times 2$
 $l = 4 \times 3.142 \times 0.02$
 $l = 4 \times 3.142 \times 2 \times 10^{-2} \text{ m}$
 $F = 0.0133 \text{ N}$ $T = ?$

Calculation

$$4 \times 3.142$$
 $= 12.568$
 12.568

$$T = \frac{0.0113}{4x3.142x2x10^{-2}}$$

$$T = \frac{0.0113}{12.568x2x10^{-2}}$$

$$T = \frac{0.0113}{25.136x10^{-2}} = \frac{0.011}{25.14x10^{-2}}$$

$$T = 0.011$$

$$25.14 \times 10^{-2}$$

$$T = 4.375 \times 10^{-2} \text{ N/m} | \text{calculations}$$

$$0.011$$

$$0.011$$

$$0.011$$

$$-25.14$$

7. A drop of water of radius 6 mm breaks into number of droplets, each of radius 1mm. How many droplets will be formed?

Given 8-

Radius of big doop,

R=6mm

Radius of smaller

dop,

or = 1 mm

Number of dooplats = }

solutiona:

Number of dooplets = Volm of big 4mp

$$n = \frac{V_{\perp}}{V_{2}}$$

$$n = \frac{R^3}{X^3}$$

$$n = \frac{(1)^3}{(1)^3}$$

8. A drop of mercury of radius 0.2cm is broken into 8 droplets of the same size. Find the work done if the surface tension of mercury is 435.5 dyne/cm.

Given
$$s$$
-

 $R = 0.2 \text{cm}$
 $R = 0.2 \text{x} = 0.2 \text{x} = 0.2 \text{m}$
 $R = 0.2$

$$v = \frac{2 \times 10^{-3}}{9}$$

$$v = 10^{-3} \text{ m}$$

$$v = 10^{-3} \text{ m}$$

work done = $T \times dA$ $w \cdot D \cdot = T \times (n \times 4\pi Y^2 - 4\pi R^2)$ $= T \times 4\pi (n Y^2 - R^2)$

ω·D. = $T \times 4\pi \left(8 \times (10^{-3})^2 - (2 \times 10^{-3})^2\right)$ ω·D. = $435.5 \times 10^{-3} \times 4 \times \pi \left(8 \times 10^{-6} - 4 \times 10^{-6}\right)$

 $\omega \cdot D_0 = 435.5 \times 10^{-3} \times 4 \times 3.142 \times 10^{-6} \times 4$

 $\omega \cdot D. = 1742 \times 12.568 \times 10^{-3} \times 10^{-6}$

 $w.D. = 1742 \times 12.57 \times 10^{-9}$ $w.D. = 2.190 \times 10^{-9} \times 10^{-9}$

W.D. = 2-190 x 10-5 J

calculations

1742 x 12.57

1742 人 12·57

2.190×104

3.2410

+ 1.0993 Talking

4.3403 + Antilog

2.190×104

9. Calculate the work done in blowing a soap bubble to a radius of 1 cm. The surface tension of soap solution is 2.5 x 10 N/m.

$$N.D. = ?$$
 $R = 1 cm$
 $R = 1 \times 10^{-2} m$
 $8 = 1 \times 10^{-2} m$
 $8 = 1 \times 10^{-2} m$

solution8-

Work dome = TxdA

final surface area to soap bubble,

$$w \cdot D = 2.5 \times 10^{-2} \times 8 \pi R^2$$

$$\omega \cdot D$$
 = 2-5×10⁻² x8x3·42×(1x10⁻²)²

$$\omega \cdot D = 2.5 \times 10^{-2} \times 8 \times 3.142 \times 10^{-4}$$

$$\omega \cdot D. = 20.0 \times 10^{-2} \times 3.142 \times 10^{-4}$$

$$w \cdot D = 62.84 0 \times 10^{-6}$$

$$\omega \cdot D = 62.85 \times 10^{-6} \text{ J}$$