

Foster Grubb

Fluid Mechanics HW 1, 2

Chapter 2

2.17)

- cornstarch
- tooth paste
- blood plasma
- paint

2.18)

Viscosity of water at 40°C .
 $6.3 \times 10^{-4} \text{ N}\cdot\text{s}/\text{m}^2$

2.27)

viscosity of Hydrogen at 40°F
 $1.9 \times 10^{-7} \text{ lb}\cdot\text{s}/\text{ft}^2$

2.35)

Viscosity of SAE 30 oil at 210°F
 $2.3 \times 10^{-4} \text{ lb}\cdot\text{s}/\text{ft}^2$

2.61)

$$F_b = 3\pi\eta v D$$
$$W - F_b - F_a = 0$$

$$D = 1.6 \text{ mm} = 1.6 \times 10^{-3} \text{ m}$$

$$F_b = \gamma_f V$$

$$V = \frac{\pi (1.6 \times 10^{-3})^3}{6}$$

$$0.94 = \frac{\gamma_f}{9.81 \text{ kN/m}^3}$$

$$V = 2.14 \times 10^{-9} \text{ m}^3$$

$$\gamma_f = 9.2214 \text{ kN/m}^3$$

$$F_b = (9.2214 \text{ kN/m}^3) (2.14 \times 10^{-9} \text{ m}^3)$$

$$F_b = 1.97 \times 10^{-8} \text{ kN}$$

$$v = \frac{0.25 \text{ m}}{10.4 \text{ s}} = 0.024 \text{ m/s}$$

2.61 cont

$$W_b = (774 \text{ N/s}) (2.14 \times 10^{-9} \text{ m}^2)$$

$$W_b = 1.6478 \times 10^{-7} \text{ kN}$$

$$W - F_b - F_d = 0$$

$$1.65 \times 10^{-7} \text{ kN} - 1.97 \times 10^{-8} - F_d = 0$$

$$F_d = 1.453 \times 10^{-7} \text{ kN}$$

$$F_d = 3\pi\eta\dot{\gamma}D$$

$$(1.453 \times 10^{-7} \text{ kN}) = 3\pi\eta(0.024 \text{ m/s})(1.6 \times 10^{-5} \text{ m})$$

$$\boxed{\eta = 0.4015 \text{ Pa}\cdot\text{s}}$$

Fluid Mechanics Hw 1.2 cont.

Chapter 3

3.6) True. Gage pressure is equal to absolute pressure minus atmospheric pressure. $\therefore$ absolute pressure will always be greater than gage pressure.

3.7) False. There are changes in elevation along the surface of the Earth. The higher the elevation, the lower the atmospheric pressure.

3.8) False. A negative absolute pressure is not possible.

3.9) True. The gage pressure can be below atmospheric pressure.

3.10) False. Gage pressure above atm. pressure must be positive.

3.11) $\approx 2.7 \text{ psi}$

3.13) 0