Archimedes Lab

$N/kg = m/s^2$

Water:

$r = .95cm$

$d = 1.4cm$

1. slope = .03 N/cm $\quad \frac{.03\ N}{1\ cm} \times \frac{100\ cm}{1\ m} = 3\ N/m$

2. $3\ N/m = 9.8(2.84E^{-4})\ \varphi$

$\varphi = 1077.89\ kg/m^3$

3. $\frac{1077.9 - 1000\ kg/m^3}{1000\ kg/m^3} \times 100 = 7.79\%$ error

Oil:

$r = 1.25cm = .0125\ m$

$d = 2.5cm$

$\pi r^2 = 4.91E^{-4}$

1. slope = .046 N/cm $\cdot \frac{100\ cm}{1\ m} = 4.6\ N/m$

2. $4.6\ N/m = g(A)\varphi$ $\quad \frac{4.6\ N/m}{\frac{9.8}{4.91E^{-4}\ m^2}} = \varphi = 956.23\ kg/m^3$

3. $\frac{956.23\ kg/m^3 - 910\ kg/m^3}{910\ kg/m^3} \times 100 = 5.08\%$ error

Wood:

$M_{small} = 129.8g \quad V = 129.43\ cm^3 \quad \frac{6.8}{7.0}$ submerged $\quad \varphi = 1\ g/cm^3$

$M_{large} = 163.2g \quad V = 213.75\ cm^3 \quad \frac{2.66}{3.5}$ submerged $\quad \varphi = .76\ g/cm^3$

$\varphi_{small} = \frac{m}{V} = \frac{129.8g}{129.43\ cm^3} = 1\ g/cm^3$

$\varphi_{large} = \frac{m}{V} = \frac{163.2g}{213.75\ cm^3} = .76\ g/cm^3$

Discussion Q's:

1. The sub fills itself with water to dive under, then releases to surface

2. No, the surface of the wood submerged would have the same volume, but the height submerged would be different

3. No, because even though the volume of liquid changes, the amount displaced and the density wouldn't change.

4. $F_B = 2.8 - 1.9 = .9\,kg$

$2700\,kg/m^3 = 2.8\,kg/V \quad V = .001\,m^3 \quad \frac{.9\,kg}{.001\,m^3} = 900\,kg/m^3$

b) $\frac{m_o}{V_o} = \frac{F_B}{V_o}$

5. Yes, they may not have the same mass but if submerged at the same height for [illegible] the same