Fluids #4

p 383 MC 8, 19, 20
Concept 31
p 387 Problems 54, 62, 66, 69, 77

(9)

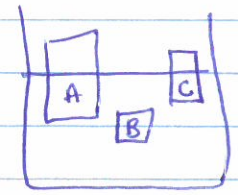
p383 – Multiple Choice

8) How do we know fluid exerts upward F on object submerged?

a) Fluid presses on object all directions
(b) Reading on scale less than when in air
(c) Fluid pressure on bottom greater than top
✓d) both b + c

(3)

19) Three blocks float in oil. Highest density?



B fully submerged

20) Same blocks in oil. Greater buoyant F?

$F_B = F_g$ fluid displaced

A - greatest fluid displaced

- Concept

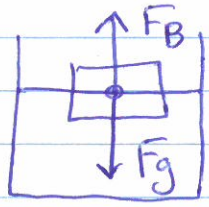
31) Why can you lift object in water that are too heavy in air?

(1) The buoyant F makes it easier to lift heavy objects

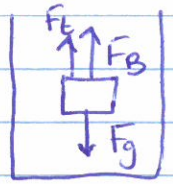
p387 - Problems

54) Draw F diagram for object floating at surface of liquid

(1)



62) $F_{g\ air} = 2.00N$
$F_{g\ submerge} = 1.13N$
$\rho_{ore} = ?$



air 

$F_g = F_t$

(1)

① $\Delta F_t = F_B$ $\quad F_B = 2.00N - 1.13N$
$= .87N$

② $F_B = \rho_w g V_w$ $\quad V_w = \frac{F_B}{\rho_w g}$

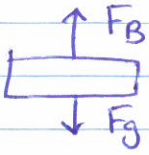
$= \frac{.87N}{(1000 kg/m^3)(9.81 m/s^2)} = 8.87 \times 10^{-5} m^3$

③ $V_{ore} = V_{water}$ $\quad \rho_{ore} = \frac{m_{ore}}{V} = \frac{F_g}{g \cdot V} = \frac{2.00N}{(9.81 m/s^2)(8.87 \times 10^{-5} m^3)}$

$\rho_{ore} = 2298\ kg/m^3$

66) person floats in water fraction submerged

$\rho_{person} = \rho_1$
$\rho_{water} = \rho_2$



$\Sigma F = 0N$
$F_B - F_g = 0N$

fraction = f
V_1 = volume person
$V_2 = f \cdot V_1$

$F_B = F_g$
$\rho_2 g V_2 = \rho_1 g V_1$
$\rho_2 (f V_1) = \rho_1 V_1$
$f = \frac{\rho_1}{\rho_2}$

(1)

69) $m = 60\,kg$
$V = .058\,m^3$
depth = 1.2m
$\rho_{water} = 1025\,kg/m^3$

Will person sink or float?

a) $F_B = \rho_w g V_w$
$= (1025\,kg/m^3)(9.81\,m/s^2)(.058\,m^3)$
$F_B = 580\,N$

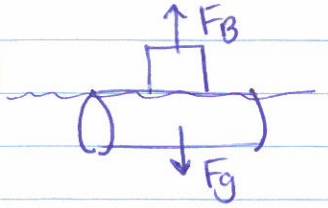
(1)

b) $F_g = mg = (60kg)(9.81\,m/s^2) = 590N$

Sink $\rightarrow$ $F_B < F_g$

or $\rho = \frac{m}{V} = \frac{60kg}{.058m^3} = 1034\,kg/m^3$

$\rho_{person} > \rho_{water}$

77) 

length l diameter d

m_{person} who can stand on log w/o feet wet

$\Sigma F = ON$

$F_B - F_g = ON$

$F_B = F_g$ $\quad \rho_w g V_{log} = (m_p + m_{log}) g$

(1) $m = \rho V$

$m_p = \rho_w V_{log} - m_{log}$

$= \rho_w V_{log} - \rho_{log} V_{log}$

$= V_{log} (\rho_w - \rho_{log})$

$= \pi (\frac{d}{2})^2 l (\rho_w - \rho_{log})$

$= \frac{1}{4} \pi d^2 l (\rho_w - \rho_{log})$