1) to solve the problems we use

$\rho_f V = \rho_w (V + V_{af})$

$\rho_f = 1{,}08\ g/cm^3$

$\rho_{water} = 1 g/cm^3$

$\Leftrightarrow \frac{V_{af}}{V} = 0{,}08$

$\Rightarrow \frac{V_{af}}{V} = 12{,}5$

add 1 on both side we have

$\frac{V_{af}}{V} + 1 = 13{,}5 \Leftrightarrow \frac{V + V_{af}}{V_{af}} = 13{,}5$

$\Leftrightarrow \frac{V_{af}}{V + V_{af}} = 0{,}074 = 7{,}4$ percent

2) we'll use the concept of the pressure and force

$F = P \times A$

~~$\Leftrightarrow P = \frac{F}{A}$~~

because the different between the atmosphere the atmosphere pressure is given as $1{,}0 . 10^5$ Pa

$\Rightarrow P = \frac{F}{A} + P_{atm}$

$\Leftrightarrow P = \frac{480}{72} . 10 . 10^5$

$F = \frac{20 . D^2}{d^2} = \frac{20 . 14{,}4}{2809} = 0{,}102\ N$

38) given that $W_s = 12{,}60\ J$

$W = W_s . \frac{F_{buoyant}}{F_{weight}}$; $F_{weight} = mg$

$F_{buoyant} = \rho_{liq} . g . V_{displaced}$

$\Rightarrow F_b = F_w$

so $\rho_{ball} = \rho_{liq} = \frac{W}{W_s} = 1$

b) We can use formular for density

$\rho = \frac{m}{V} \Rightarrow V = \frac{m}{\rho_{ball}} = \frac{m}{1} = m$

$W = \frac{1}{2} m v^2 = \ldots$

$\Rightarrow m_{ole} = 4{,}082$ and $m_{oil}/\rho_{ole} = 2{,}72 . 10^{-3}$

71) a) $v_0 = \sqrt{2gh}$

Setting $y - y_0 = -(H - h)$

$\Rightarrow t = \sqrt{\frac{-2(H-h)}{-g}} = \sqrt{\frac{2}{g}(H-h)}$

with $x_0 = 0$

We found: $x = v_0 t = \sqrt{2gh} \sqrt{\frac{2(H-h)}{g}} = 2\sqrt{h(H-h)}$

$= 2\sqrt{10(40-10)} = 35$ cm

b) $h^2 - Hh + \frac{x^2}{4} = 0 \Rightarrow h = \frac{H \pm \sqrt{H^2 - x^2}}{2}$

$\Rightarrow h_1 + h_2 = \frac{H + \sqrt{H^2 - x^2}}{2} + \frac{H - \sqrt{H^2 - x^2}}{2} = H$

thus $h' = 40cm - 10cm = 30cm$

c) We wish to maximise the function

$f = x^2 = 4h(H-h)$

$\Leftrightarrow \frac{df}{dh} = 4H - 8h = 0 \Rightarrow h = \frac{H}{2} = \frac{40}{2} = 20$ cm

em nộp trễ do blackboard cập nhật trễạ

17) we'll use the principles of fluid pressure.

$P = \rho . g . h$

$= 1024 . 9{,}81 . 100$

$= 1{,}002 . 10^6$ Pa

Now consider the pressure inside the submarine.

$1 atm = 1{,}01325 . 10^5$ Pa

$\Delta P = P_{out} - P_{in}$

$= (1{,}002 . 10^6) - (1{,}01325 . 10^5)$

$= 9{,}98875 . 10^5$ Pa

Therefore force need to push out the hatch with the pressure

$F = \Delta P \times A$

$= (9{,}98875 . 10^5) . 72$

$\approx 7{,}1921 . 10^5$ N

28) according to Pascal principles

$\frac{F}{A} = \frac{f}{a} \Rightarrow F = \left(\frac{A}{a}\right) . f$

$\Leftrightarrow f = \frac{380}{53} (20 . 10^3) = 103$

b) to find the magnitude on the small piston

we use

$f = 20$ kN

$D = 53{,}0$ cm

$d = 380$ cm

$F = \frac{A}{A'} . F$

$\Rightarrow F = \ldots$

$F = \frac{20 . D^2}{d^2} = \frac{20 . 14{,}4}{2809} = 0{,}102\ N$

39) the downward force

$mg = \rho g V_s$

$\Rightarrow V_s = \frac{1}{2}\left(\frac{4\pi}{3}\right) r^3$

therefore $m = \frac{2\pi}{3} \rho r^3 = \left(\frac{2\pi}{3}\right) (800)(0{,}090)^3$

$\Rightarrow m = 1{,}22$ kg

b) to calculate the density of the material

we use : $\rho_{sphere} = \frac{m}{V}$

$\Leftrightarrow \rho_{sphere} = \frac{1{,}22}{0{,}182} = 6{,}7\ kg/m^3$

48) $V_c = 6 . 12 = 72\ cm^3 = 72 . 10^{-6} m^3$

$V_s = (6 - 2) . 12 = 48\ cm^3$

$= 48 . 10^{-6} m^3$

$T + F_B = m_b g + m g$

but $\rho_V V_s + \rho_V V_b = \rho_b V_b + \rho_c V_c$

$\Leftrightarrow \rho_V V_s - \rho_c V_c = \rho_b V_b - \rho_V V_b$

$\Rightarrow V_b = \frac{(1000 . 48 . 10^{-6}) - (0{,}3 . 10^3 . 72 . 10^{-6})}{7{,}87 . 10^3 - 1000}$

$= 3{,}84 . 10^{-6} (m^3)$

c) $3{,}842 . 10^{-6} = \frac{4}{3}\pi r^3$

$\Rightarrow r = 9{,}71 . 10^{-3}$ m

Negat: $P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$

$\Leftrightarrow P_1 - P_2 = \frac{1}{2}\rho(v_2^2 - v_1^2) + \rho g (h_2 - h_1)$

$= \frac{1}{2} . 10^3 (9{,}5)^2 - (0{,}4)^2 + 10^3 . 9{,}8 (1{,}0)$

$= 1809245$

$= 18{,}09 . 10^5\ N/m^2$

65) a) $P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$

$\Leftrightarrow \frac{1}{2}\rho v_1^2 - \frac{1}{2}\rho v_2^2 = P_2 - P_1$

$\Leftrightarrow \left[\frac{\rho_1}{2} - \frac{\rho_2}{2}\left(\frac{A}{a}\right)^2\right] v^2 = \Delta P$

$\Rightarrow V = \sqrt{\frac{2\Delta P a^2}{\rho(a^2 - A^2)}}$

$V = \sqrt{\frac{2a^2 \Delta P}{\rho(a^2 - A^2)}} = \sqrt{\frac{2 (32 . 10^{-4}) . (41 . 10^3 - 55 . 10^3)}{1000 . [(32 . 10^{-4})^2 - (64 . 10^{-4})^2]}}$

$= 3{,}06$ m/s

we use : $\rho_{sphere} = \frac{m}{V}$

$\Leftrightarrow \rho_{sphere} = \frac{1{,}22}{0{,}182} = 6{,}7\ kg/m^3$

55) according to Bernoulli theorem

Negat: $P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$

$\Leftrightarrow P_1 - P_2 = \frac{1}{2}\rho(v_2^2 - v_1^2) + \rho g (h_2 - h_1)$

$= \frac{1}{2} . 10^3 (9{,}5)^2 - (0{,}4)^2 + 10^3 . 9{,}8 (1{,}0)$

$= 1809245$

$= 18{,}09 . 10^5\ N/m^2$

a) $P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$

$\Leftrightarrow \frac{1}{2}\rho v_1^2 - \frac{1}{2}\rho v_2^2 = P_2 - P_1$

$\Leftrightarrow \left[\frac{\rho_1}{2} - \frac{\rho_2}{2}\left(\frac{A}{a}\right)^2\right] v^2 = \Delta P$