Hw set 8

3.) Both examples are diamonds, and all diamonds have roughly the same density.

7.) The copper pipes will contract with the cold, but water expands when it freezes.

11.) The molecular forces are stronger; as the book says, we can easily freeze and melt substances, but it takes more effort to break apart the chemical/molecular structure.

21.) Air underneath the sheet provides upwards pressure.

23.) Scientists prefer to think that the atmospheric pressure pushes the spheres together, and not that the vacuum pressure "sucks them shut. Since Denver has lower atmos. pressure, less force will be needed.

29.) The pressure at the bottom of the tube does not depend on the radius of the tube, only on the height of water in the tube. The Force depends on the tube, but we only care about the pressure. How much pressure do we need? about 20 feet, regardless of the tube size.

43.) As your mass decreases, gravity on you decreases. As your volume decreases, bouyant force decreases. You probably lose more volume than mass, so you will sink.

49.) Bouyant force depends only on the volume of the object. Both cubes feel the same bouyant force, although they feel different gravitational forces.

57.) The moving water tends to drag the air along with it. The moving air causes a decrease in pressure inside the curtain.

Exercises

1.) $D = \frac{M}{V} =$ ~~.270 N~~ ~~.10 27 kg~~

$= 27g/10\ cm^3 = 2.7\ g/cm^3 \rightarrow$ aluminum

3.) $M = D \cdot V = (.2\ m^3)(3000\ kg/m^3) = 600\ kg$

5.) $V = \frac{m}{D} = \frac{80\ kg}{1000\ kg/m^3} = .08\ m^3$

9.) $W = mg = (V)(D)g = (10\ m^3)(1000\ \frac{kg}{m^3}) \cdot 10\ \frac{m}{s^2} = 100{,}000\ N$

$P = F/A = \frac{10^5 N}{1 m^2} = 10^5\ Pa$ = atmos phrc prsr.

13.) $P = \frac{Mg}{A}$. $M = (\text{height}) \cdot \text{Area} \cdot D_{\text{nst}}$, so $P = (\text{height}) \cdot (D_{\text{nst}})$

$= (30\ in)(.5\ lb/in^3)$

$= 15\ lb/in^2 = 15\ psi$

15.] Since the block floats, it displaces an ~~much~~ amount of Water equal to its weight (since bouyant force equals gravity frc). Thus, $(.400)g$ $= \boxed{4\ N}$

17.] ~~The~~ The 1st exprmnt, is like ~~problem~~ Exercise (15).
Since the wax floats, it's mass equals the displaced water's mass. $M = (18\ cm^3)\cdot(1\ g/cm^3) = \underline{18\ g}$

In exp. 2, the ball is completely submerged in the alcohol, so its volume equals the volume of displaced liquid: $V = 20\ cm^3$.

Then, $D = \frac{M}{V} = \frac{18\ g}{20\ cm^3} = \underline{.9\ g/cm^3}$.

19.] The displaced water's mass is $M_{H_2O} = (1m^3)\cdot(\frac{1000\ kg}{m^3})$ $= 1000\ kg$.

The bouyant force is thus $M_{H_2O}\cdot g = \underline{10,000\ N}$.

The grav force on block is $M_{block}\cdot g = \underline{89,300\ N}$.

The cable feels tension $T = M_{block}\, g - M_{H_2O}\, g = \underline{79,300\ N}$.

20.] Bouyant force $=$ ~~.006~~ $g\cdot 6\ cm^3\cdot(.001\ \frac{kg}{cm^3}) = .06\ N$

weight $= M_{ball}\cdot g =$ ~~.03~~ $.3\ N$.

The Normal force balances the difference, so

$N = g(M_{ball} - M_{H_2O}) = \underline{.24\ N}$