Quest Chapter 19

#	Problem	Hint
1	Which situation is likely to hurt you more? 1. Unable to determine 2. Your bare foot was stepped on by a 270-lb man wearing flat-soled loafer. 3. Either 4. Your bare foot was stepped on by a 130-lb woman wearing high heels.	Pressure is F/A. Which situation would subject you to more pressure?
2	A 1.4 m wide by 2.3 m long water bed weighs 1045 N. Find the pressure that the water bed exerts on the floor. Assume that the entire lower surface of the bed makes contact with the floor.	First find the area of the bed. Next use the equation for pressure: P = F/A.
3	At what level (vertically) should you hold a cut finger to reduce bleeding? 1. as high as possible 2. at the same level as your heart 3. as far from your heart as possible at any level 4. as low as possible	Where will the effect of gravity reduce the bodies blood pressure the most?
4	You want a blood pressure reading as close as possible to that of your heart. Where should you place the cuff? 1. anywhere the cuff will fit 2. at a level above the heart 3. at a level even with the heart 4. at a level below the heart	Where is the place where the person's blood pressure is the least affected by gravity?
5	The depth of water behind the Hoover Dam in Nevada is 135 m. What is the water pressure at a depth of 135m? The weight density of water is 9800 N/m^3.	Weight density is d_w=Weight/Volume. Pressure = d_w * Depth
6	The pressure in a 3-foot-deep lake is P1. The pressure in a 3-foot-deep hot tub 2 meters in diameter is P2. What relationship would P1 and P2 have? 1. P1 > P2 2. Unable to determine 3. P1 = P2 4. P1 < P2	Assuming that the water is the same, will there be a difference in weight densities? If not, refer to #5 for the equation to interpret.

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7	In a deep dive, a whale is appreciably compressed by the pressure of the surrounding water. What happens to the whale's density? 1. It cannot be determined. 2. Its density decreases. 3. Its density increases. 4. Its density remains the same as before.	If the whale is compressed, what happens to its volume? Does the whale's mass change? What must happen to its density if those two situations occur?
8	If a liquid only half as dense as mercury were used in a barometer, how high would its level be on a day of normal atmospheric pressure (when the mercury barometer reads 76 cm)? 1. 19 cm 2. 76 cm 3. 38 cm 4. 152 cm 5. 304 cm	Normal atmospheric pressure. That means the air pressure on the columns of the two liquids is the same and that the height of the Hg column will be 76cm. Remember from #5: Pressure = d_w * Depth So, d_w is halved, what happens to depth?
9	A block of aluminum with a volume of 8.5 cm^3 is placed in a beaker of water filled to the brim and sinks. Water overflows. The same happens in another beaker with a 8.5 cm^3 block of lead. The lead will displace (more, less, the same amount of) water than the aluminum block does. 1. more 2. less 3. the same 4. It cannot be determined without a direct measurement.	Does density play a part in this problem? No. This is simply a matter of volume. How do the two volumes compare?

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10	Imagine holding two identical bricks under water. Brick A is just beneath the surface of the water, while brick B is at a greater depth. What is the force needed to hold brick B in place? (Assume the density of water doesn't change with height.) 1. smaller than the force required to hold brick A in place. 2. the same as 3. larger	What determines the force needed to hold the bricks in place? Weight and Buoyant Force. What determines the size of the $F_{buoyant}$? Remember Archimedes Principle. So, Weight = $F_{buoyant} + F_{Holding}$ Identical blocks: Weight = Weight Volume = Volume
11	Suppose that a volleyball A and a bowling ball B are completely submerged in water and have the same volume, as in the figure. (Of course, you would have to hold the volleyball beneath the water to keep it from popping up to the surface.) Which feels a greater buoyant force? 1. They feel the same buoyant force. 2. bowling ball B 3. volleyball A 4. Unable to determine	Remember Archimedes Principle. What determines the $F_{buoyant}$?
12	Suppose that a volleyball A floats on the water, and a bowling ball B, being denser than water, is completely submerged in water. Assume they have the same volume. Which feels a greater buoyant force? 1. bowling ball B 2. volleyball A 3. They feel the same buoyant force. 4. Unable to determine	Same balls as in #11, but the volleyball is allowed to float. What has changed as you consider Archimedes principle?

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13	(part 1 of 2) A 20-N rock hangs from a spring scale. The rock is lowered into a beaker of water that sits on another spring scale, but is not allowed to touch the bottom of the beaker. How does the reading on the scale A change? 1. decreases correct 2. remains the same 3. Unable to determine 4. increases	Back to Archimedes. Scale A reads the effective force of gravity on the rock: 20N before it enters the water. Do any other forces affect that reading when it enters the water? See #10.
14	(part 2 of 2) How does the reading on scale B change? 1. Unable to determine 2. increases 3. remains the same 4. decreases	Remember Newton's 3rd Law? If a buoyant force that acts on the rock in the water is the action, what is the reaction? How would that be seen in Scale B?
15	Why does a can of diet drink float in water, while a can of regular soda sinks? 1. It depends on the brand and the actual ingredients. 2. Sugar is heavier than a sugar substitute. 3. Diet soda is less dense than a regular soda. 4. Diet soda cans are slightly smaller. 5. Regular soda has fewer gas bubbles.	Do the cans have the same volume? Yes. If one floats and the other sinks and their volumes are the same, what must be different? How does that difference affect the cans?

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16	Helga says that although it’s impossible to walk on a sea of water, it is possible to walk on a sea of mercury. She claims that if you step into a pool of mercury, you will only sink enough so that about half of your calf muscles is submerged. Ali disagrees with her statement. Who is right and why? 1. Helga; mercury is much denser than water. 2. Helga; mercury is a kind of metal but water is not. 3. Ali; water and mercury have similar properties. You’ll sink in the mercury, too.	The human body has a density that is almost 1 g/cm^3. So how would we fair in mercury? (How does mercury’s density compare to ours?)
17	When you gently push down on the pan of the scale, the display show an increase in force. Likewise if you do the same on the rim of a beaker full of water. However, what if you immerse you finger in the water, without touching the beaker? Then the scale reading 1. shows a decrease. 2. shows an increase. 3. doesn’t change.	Besides wetness, what does your finger experience when you immerse it in water? Would that affect the reading on the scale?
18	When pickling cucumbers or other vegetables, it’s very important to use the right amount of salt. An old recipe recommends putting an egg into the pickling solution and making sure it neither sinks nor floats: A sinking egg indicates too little salt while an egg that floats on the surface indicates too much salt. What is the assumption behind this recipe? 1. All eggs have the same density. correct 2. All eggs have the same shape. 3. All eggs have the same weight. 4. All eggs have the same volume. 5. The salt tends to neutralize the cholesterol in the egg.	What property of an egg is being use to test the pickling solution?

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19	A piece of iron is sitting on a block of wood floating in water. If the iron were instead suspended beneath the wood, would the wood float at the same level, lower, or higher? 1. It depends on the ratio of iron and wood volumes. 2. Higher, because there is a buoyant force acting on the iron now. 3. Definitely lower, because the iron is under the wood. 4. It would float only slightly lower, because the iron displaces a little water and the overall water level rises. 5. It would float at the same level.	What would the iron experience is suspended below the wood that it did not experience on top of it? How would that affect the level at which the wood floats?
20	Compared to an empty ship, would a ship loaded with a cargo of Styrofoam sink deeper or rise in the water? 1. It depends on the weight of the Styrofoam. 2. Since Styrofoam is less dense than water, the ship rises. 3. The ship will float at the same level because its density hasn't changed. 4. Since Styrofoam pushes down on the ship with its weight, the ship sinks deeper.	What does adding all that Styrofoam do to the properties of the boat? How would that affect the level of the boat?
21	A ship sailing from the ocean into a fresh water harbor sinks slightly deeper into the water. How does the buoyant force on it change? 1. It doesn't change at all. 2. It decreases slightly. 3. It increases a lot. 4. It decreases a lot. 5. It increases slightly.	What determines the buoyant for on an object?
22	How does the water level in a glass change when a floating ice cube melts? 1. It depends on how many air bubbles were trapped inside of the ice cube. 2. It falls. 3. It remains unchanged. 4. It rises. 5. It depends on the size of the piece of ice.	How much water is displaced by ice? How much water is "displaced" when that same ice melts?

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23	Why do some iron objects such as ships float when placed in water while other iron objects such as nails sink? 1. Iron ships have large air pockets inside them, making them less dense than water and thus able to float. 2. They are composed of different types of iron. 3. The same reason that makes planes fly in the sky.	What determines "float-ability"? How do the difference iron differ that would allow some to float and others to sink?
24	A wedge-shaped piece of wood floats in water with the widest part on the bottom and the narrowest part on top. If we want the wood to displace the least amount of water, what should we do? 1. Rotate it 90◦. 2. Turn it over. 3. It doesn't matter. 4. Leave it as is.	What determines how much water is displaced by an object placed in it? Archimedes…
25	Two identical glasses are filled to the same level with water. One of the two glasses has some ice cubes floating in it. Which glass weighs more? 1. Not enough information is given. 2. They weigh the same. 3. The glass with ice cubes. 4. The glass without ice cubes.	See #22.
26	A piston A has a diameter of 0.64 cm, as shown. A second piston B has a diameter of 3.1 cm. In the absence of friction, determine the magnitude of the force F necessary to support the 569.4 N weight.	Pascal's Principle. Set up your ratio: $F_{in}/A_{in} = F_{out}/A_{out}$ and solve for the unknown force.