1. What does the buoyant force depend on? Tick the boxes.
a) ❒ planet or moon (e.g. Earth, Venus, Mercury, Moon) you're on
b) ❒ volume of the submerged object
c) ❒ mass of the submerged object
d) ❒ shape of the submerged object
e) ❒ density of the fluid
f) ❒ depth below the surface

2. What is the direction of the buoyant force?

3. Complete the following sentences:

a) The ..... the volume of a submerged object is, the larger is the buyoant force acting on it.

b) The ..... the density of a fluid is, the larger is the buyoant force acting on an object submerged in it.

4. Why is it easier to swim in sea water than in fresh water?

5. A fish can regulate its volume by expanding or contracting an air sac. Doing this, it can move upward or downward in the water. Explain!

6. What is the buoyant force acting on a copper cylinder (V = 1.20 dm^3) submerged in
a) water?
b) alcohol?
c) Would the buoyant force be *larger* / *smaller* / *the same*, if the submerged object were of lead instead of copper (same volume)? Give reasons for you answer.

7. An object of weight 10.7 N is hanging from a spring scale. When submerged in water the spring scale shows 9.5 N.
a) What is the buoyancy?
b) What is its volume?
c) What is its mass?
d) What is the object's density?
e) What's the object's material?

8. A brass figurine of weight F_G = 193 mN shows in alcohol a weight of 175 mN.
a) What is the figure's volume?
b) What is the figure's density?

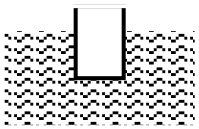
9. A balloon with a volume of 5.0 ℓ is filled with helium. Its cover weighs F_G = 0.030 N.
a) What is the buoyancy acting on the balloon?
b) What is the weight (gravitational force)?
c) What is the force required to hold the balloon?

10. „An immersed object is buoyed up by a force equal to the weight of the fluid it displaces." Show that $F_B = \rho_{liquid} \cdot g \cdot V_{immersed} = ... = F_G$ (liquid) holds.

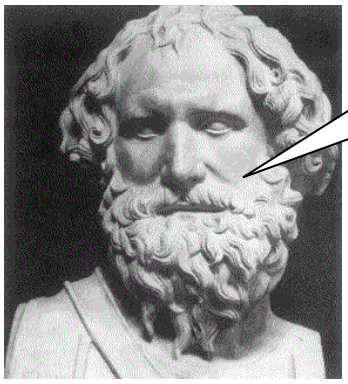
11. Complete the following sentence:

    If the density of an object submerged in a liquid is greater than the density of the liquid in which it is immersed, the object will …… (*rise up and float* / *sink*).

12. A wooden block (V = 50.0 cm^3) is floating in water with 40.0 cm^3 of its volume immersed.
a) What is the buoyant force?
b) What is the weight of the water it displaces?
c) What is the weight (gravitational force) of the wooden block?
d) What is the density of the wooden block?

13. 

A cylindrical cup (m = 200.0 g) with a bottom surface of A = 30.0 cm^2 and height h = 10.0 cm is floating in water.
a) How much of the cup's height is beneath the surface?
b) How many g of sand can be filled into the cup just so it doesn't sink?



"An immersed object is buoyed up by a force equal to the weight of the fluid it displaces."

Archimedes, 285 BC to 212 BC
He spent most of his life in and around Syracuse in Sicily (Italy)

solutions

6. a) 11.7 N b) 9.3 N
7. a) 1.2 N b) 122.3 cm^3 c) 1.09 kg d) 8'917 $\frac{kg}{m^3}$
8. a) 2.3 cm^3 b) 8'470 $\frac{kg}{m^3}$
9. a) 63 mN b) 39 mN c) 25 mN
12. a) 0.39 N b) 0.39 N c) 0.39 N d) 795 $\frac{kg}{m^3}$
13. a) 6.67 cm b) 99 g