

BUILD IT

Buoyancy Assessment

Part 1

Students are testing three underwater robots, called Bot A, Bot B, and Bot C.

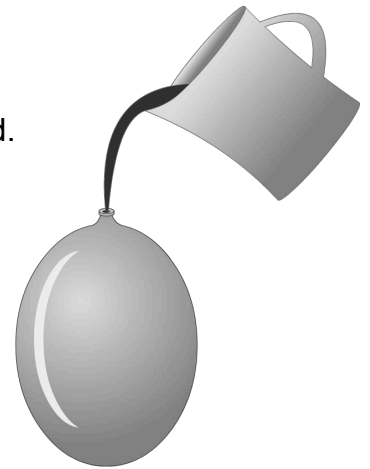
- When Bot A is under the water with the power turned off, it simply stays in place, neither sinking nor rising, no matter how deep it is placed.
- Bot B takes up exactly twice as much space as Bot A, but weighs the same.
- Bot C is the same size as Bot A, but it weighs twice as much.

Given the above information, answer the following.

1. When put completely under the water with the power turned off, Bot A
 - (A) rises to the surface (is positively buoyant).
 - (B) sinks to the bottom (is negatively buoyant).
 - (C) is neutrally buoyant.
 - (D) Not enough information to answer the question.
2. When put completely under the water with the power turned off, Bot B
 - (A) rises to the surface (is positively buoyant).
 - (B) sinks to the bottom (is negatively buoyant).
 - (C) is neutrally buoyant.
 - (D) Not enough information to answer the question.
3. When put completely under the water with the power turned off, Bot C
 - (A) rises to the surface (is positively buoyant).
 - (B) sinks to the bottom (is negatively buoyant).
 - (C) is neutrally buoyant.
 - (D) Not enough information to answer the question.
4. Which robots experience the same buoyant force when they are completely submerged?
 - (A) Bots A and B.
 - (B) Bots A and C.
 - (C) Bots B and C.
 - (D) None – all the buoyant forces are different.

Part 2

Consider two balloons, one green and one red, each a different size. Each one is carefully filled with a different substance such as water, oil, sand, mercury, or syrup until it is completely stretched out and round. Any remaining air is squeezed out, and the end of each balloon is tied shut. They are then each placed under the water, and when they are let go, the green balloon rises to the surface and the red one sinks to the bottom.



5. Which statement is true about the densities of the two balloons?
 - (A) The green one is more dense than the water.
 - (B) The green one is more dense than the red one.
 - (C) The red one is more dense than the water.
 - (D) They both have the same densities.

6. Is it possible that the green balloon could weigh more than the red one?
 - (A) Yes, if it took up more space.
 - (B) Yes, if it took up less space.
 - (C) No, because heavier objects always sink more than lighter ones.
 - (D) No, because the red balloon is more dense than the green one.

7. You now take a blue balloon and fill it with a different substance until it weighs the same as the red balloon. When you place it under the water, it is neutrally buoyant. What must be true?
 - (A) It takes up more space than the red balloon.
 - (B) It takes up less space than the red balloon.
 - (C) It has the same density as the red balloon.
 - (D) Not enough information to answer the question.

8. If the blue balloon from the previous question is the same size as the green balloon, what must be true?
 - (A) It weighs more than the green balloon.
 - (B) It weighs less than the green balloon.
 - (C) It has the same density as the green balloon.
 - (D) Not enough information to answer the question.

9. What could you do to the red balloon to get it to rise to the surface?
 - (A) Make it smaller and heavier by replacing the substance inside it with the same amount of a more dense substance.
 - (B) Make it smaller and lighter by pouring out some of the substance inside it.
 - (C) Make it larger and heavier by filling it with more of the substance inside it.
 - (D) Make it larger without changing its weight by blowing air into it.