

Buoyancy Practice Problems

Physics

Name:

Period:

1. The Oasis of the Seas is the most massive cruise ship on the water today, with a mass of 200,000,000 kg.

(a) Why is the hull of a cruise ship bowl shaped?

(b) How much ocean water will the Oasis of the Seas need to displace if it is to float?

2. A 40 kg, 1.2 m tall, 20 cm diameter pressurized gas cylinder falls off of a ship in Lake Michigan and gets completely submerged as it splashes into the water.

a) What is the buoyant force on the gas cylinder when it is totally submerged? b) Will the cylinder sink, float or rise? Explain.

3. A scuba diver at a depth of 10 m beneath the surface lets out a 1.7×10^{-6} kg air bubble 1 cm in diameter as they exhale. Volume of a sphere is πr^3 .

(a) What is the buoyant force on the bubble?

(b) Will the bubble sink, float, or rise? Explain.

4. A runner is training in a shoulder deep pool by lifting weights underwater to ease the stress on her joints. She is using a weight labeled 10 kg that is shaped like a disc, with a radius of 11 cm and a width of 3.4 cm.

(a) How much force must she exert to hold the weight over her head, out of the water?

(b) How much force must she exert to lift the weight underwater?

5. Tom Sawyer builds a 2m by 3m by 0.2 meter raft out of branches from Cedar trees, which have a density of 650 kg/m^3 .

(a) When 50 kg Tom is floating on his raft, how deep will the raft reach beneath the surface of the water?

(b) In order to test the raft, Tom pushes it into the river and starts loading his friends onto it. How many 50 kg kids could Tom's raft support without sinking completely.

(c) At the end of the river, Tom and his raft reach the ocean and float out into the sea. How deep beneath the surface of the ocean will the underside of the raft be?

d) If Tom were to float on his raft in a pool of mercury, how deep would the raft sink into the mercury?