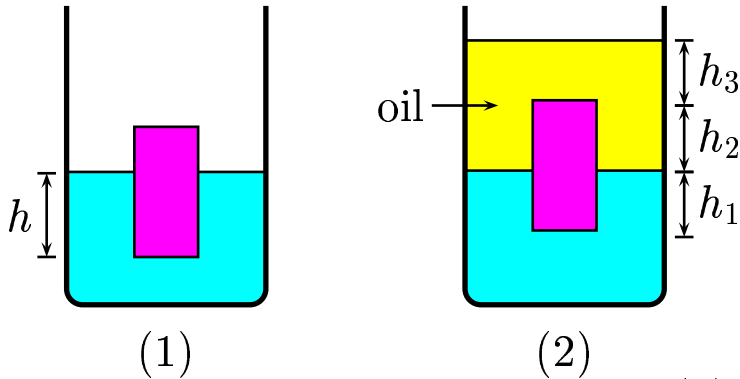


A block floats in water but sinks in oil. Consider following two cases.

Case (1): The block floats in the water. The portion submerged in the water has a height  $h_1$ .

Case (2): The block floats in the oil. The portion submerged in the oil has a height  $h_2$ .

If the cross sectional area of the block is  $A$ . The buoyant force in case (1) is given by  $B = \rho_{water} g h A$ .



What is the buoyant force in case (2)?

- A)  $g \rho_{water} h_1 A$ .
- B)  $g (\rho_{water} h_1 + \rho_{oil} h_2) A$ .
- C)  $g (\rho_{water} h_1 + \rho_{oil} h_2) A + \rho_{oil} h_3 A$ .
- D)  $g (\rho_{water} h_1 + \rho_{oil} h_2) A - \rho_{oil} h_3 A$ .

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Notice that the column above the block gives the same contribution to the pressure at the top of the block as that at the bottom of the the block.

Since the buoyant force depends on the difference between the top pressure and the bottom pressure, the column above the block does no contribute to the buoyant force.

So the answer does not depend on  $h_3$ .

Answer **B**