

Diver Pressure

You and a friend are going scuba diving in three different locations. You know that:

depth of each dive = 10 m

density of fresh water = $\rho_{water} = 1,000 \text{ kg/m}^3$

density of salt water $\rho_{water} = 1,025 \text{ kg/m}^3$

sea level air pressure = $P_0 = 1.00 \times 10^5 \text{ Pa}$

density of air = $\rho_{air} = 1.29 \text{ kg/m}^3$

(we will assume that this is constant)

A	B	C	D	E	F	G	H
Dive	Water type	height above/below sea level h_{dive} at which the dive begins in m	P_{air} at the given height above/below sea level in Pa	ρ_{water} needed to calculate the pressure at 10 m depth in kg/m^3	P_{10m} pressure at the dive depth in Pa	$\frac{P_{10m}}{P_{air}}$	Pressure change ratio rank
FW1	fresh	500 m below					
FW2	fresh	0 m, sea level					
FW3	fresh	500 m above					
SW1	salt	500 m below					
SW2	salt	0 m, sea level					
SW3	salt	500 m above					

- 1) Calculate P_{air} for each dive, $P_{air} = P_0 + \rho_{air}gh_{dive}$. Write the answers in column D.
- 2) Indicate which value of ρ_{water} is needed to calculate the pressure at 10 m depth. Write the answers in column E.
- 3) Calculate P_{10m} for each dive using the correct value for ρ_{water} . Write the answers in column F.
- 4) Calculate the ratio $\frac{P_{10m}}{P_{air}}$ for each dive. Write the answers in column G.
- 5) Rank the pressure change ratios $\frac{P_{10m}}{P_{air}}$ from highest to lowest, using the number 1 to indicate the highest ratio, the number 6 to indicate the lowest pressure change ratio. Write the answers in column H.