Fluids - 1

Car in a Lake (1): Density of water $\rho = 10^3\, kg/m^3$,

$$M = V\,\rho\,, \quad F_{outside} = M\,g + A\,atm$$

with V volume and A area. F_{inside} is then obvious.

Ballon (2): $M = V\,(\rho_a - \rho_g)\,.$

Ballon II (3):

$$F_B = M\,g\,, \quad M = V\,\rho\,.$$

Then:

$$F_w + F_r = F = V\,g\,(\rho - \rho_b)$$

and solve for for ρ_b.

Specific Gravity (4):

$$sg = \frac{\text{weight of object in air}}{\text{weight loss when submerged in water}}\,.$$

Then multiply sg with the density of water.

Fluids - 2

Debris in Ocean (5). Visible volume:

$$V_{out} = V\,\frac{\rho_{sw} - \rho}{\rho_{sw}}\,.$$

Floating Hollow Sphere (6): Let the number m and n be given, (i.e., $m\,R$ and $n\,\rho_0$). Solve

$$\frac{4\pi}{3}\left[(m\,R)^3 - R^3\right]\,\rho_0 + \frac{4\pi}{3}\,R^3\,\rho_m = \frac{4\pi}{3}\,(m\,R)^3\,n\rho_0$$

for ρ_m.

Hurricane Force (7): Use Bernoulli's equation

$$\triangle P = \frac{1}{2}\,\rho\,v^2\,.$$