BTU1113 PHYSICS: REVISION 4

Fluid Mechanics

1- The radius of the aorta is ~ 10 mm and the blood flowing through it has a speed ~ 300 mm.s^{-1}. A capillary has a radius ~ 4×10^{-3} mm but there are literally billions of them. The average speed of blood through the capillaries is ~ 5×10-4 m.s^{-1}.
Calculate the effective cross sectional area of the capillaries and the approximate number of capillaries.

2- Water circulates throughout a house in a hot-water heating system. If the water is pumped at a speed of 0.5 m/s through a 4.0-cm-diameter pipe in the basement under a pressure of 3.0 atm, what will be the flow speed and pressure in a 2.6-cm-diameter pipe on the second floor 5.0 m above? Assume the pipes do not divide into branches.

3- A body of density ρ is dropped from rest from a height h into a lake of density δ, where $\delta > \rho$. Neglecting all dissipative forces, the maximum depth to which the body sinks before returning to float on surface.

4- A wooden cube just floats inside water with a 200 g mass place on it. When the mass is removed, the cube floats with its top surface 2 cm above the water level. What is the side of cube?

5- A block of wood float in water with $\frac{4}{5}$th of its volume submerged, but it just floats in another liquid. Find the density of liquid in kg/m^3.