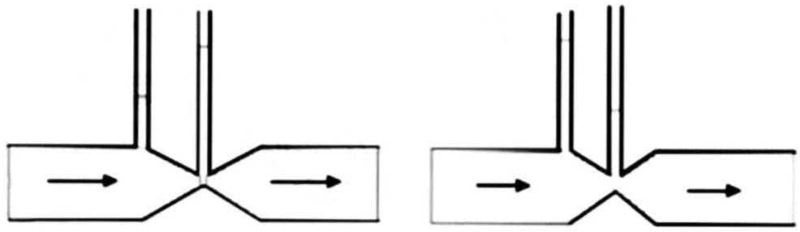
1.Figures (a) and (b) refer to the steady flow of a (non-viscous) liquid. Which of the two figures is incorrect ? Why ?



(a) (b)

Ans) Fig. (a) is incorrect. Accoridng to equation of continuity, i.e., av = Constant, where area of cross-section of tube is less, the velcoity of liquid flow is more. So the velocity of liquid flow at a constriction of tube is more than the other portion of tube.

Accroding to Bernoulli's Theorem,

$$P + \frac{1}{2}\rho v^2 = \text{Constant},$$

where v is more, P is less and vice versa.

2.In a test experiment on a model aeroplane in a wind tunnel,. the flow speeds on the upper and lower surfaces of the wing are 70 m/s and 63m/s respectively. What is the lift on the wing if its area is 2.5 m^2? Take the density of air to be 1.3 kg/m^3

Ans) Speed of wind on the upper surface of the wing, $V_1 = 70\, m/s$

Speed of wind on the lower surface of the wing, $V_2 = 63\, m/s$

Area of the wing, $A = 2.5\, m^2$

Densityof air, $\rho = 1.3\, kg/m^3$

According to Bernoullis theorem, we have the relation:

$$P1 + (1/2)\rho(V_1^2) = P2 + (1/2)\rho(V_2^2)$$

$$P2 - P1 = (1/2)\rho(V_1^2 - V_2^2)$$

Where,

$P1 =$ Pressure on the upper surface of the wing

$P2 =$ Pressure on the lower surface of the wing

The pressure difference between the upper and lower surfaces of the wing provides lift to the aeroplane.

Lift on the wing $= (P2 - P1)A$

$$= (1/2)\rho(V_1^2 - V_2^2)A$$

$$= (1/2)1.3[70^2 - 63^2]2.5$$

$$= 1512.87$$

$N = 1.51 \times 10^3\ N$

Therefore, the lift on the wing of the aeroplane is $1.51 \times 10^3\ N$.