



Consider a balloon floating in the air. See sketch. There is a string tied to the balloon. The string has a weight of  $W_{string}$ , and a length  $L$ .

Define the following set of symbols.

$V_b$  = Volume of the balloon.

$W_b$  = Weight of the balloon.

$W_{He}$  = Weight of the helium within  $V_b$ .

$W_{air}$  = Weight of the air in a volume  $V_b$ .

$h$  = Length of the part which is in the

air.

Choose the correct relation (neglect the string volume)

- A)  $W_{air} = W_{He} + W_{string} \left( \frac{h}{L} \right)$ .
- B)  $W_{He} = W_b + W_{string}$ .
- C)  $W_{air} = W_b + W_{He} + W_{string}$ .
- D)  $W_{air} = W_b + W_{He} + W_{string} \left( \frac{h}{L} \right)$ .

Apply Archimedes' principle.

The buoyant force equals to  $W_{air}$ , which lifts the weight of the portion of the object, which floats in the air.

Answer **D**