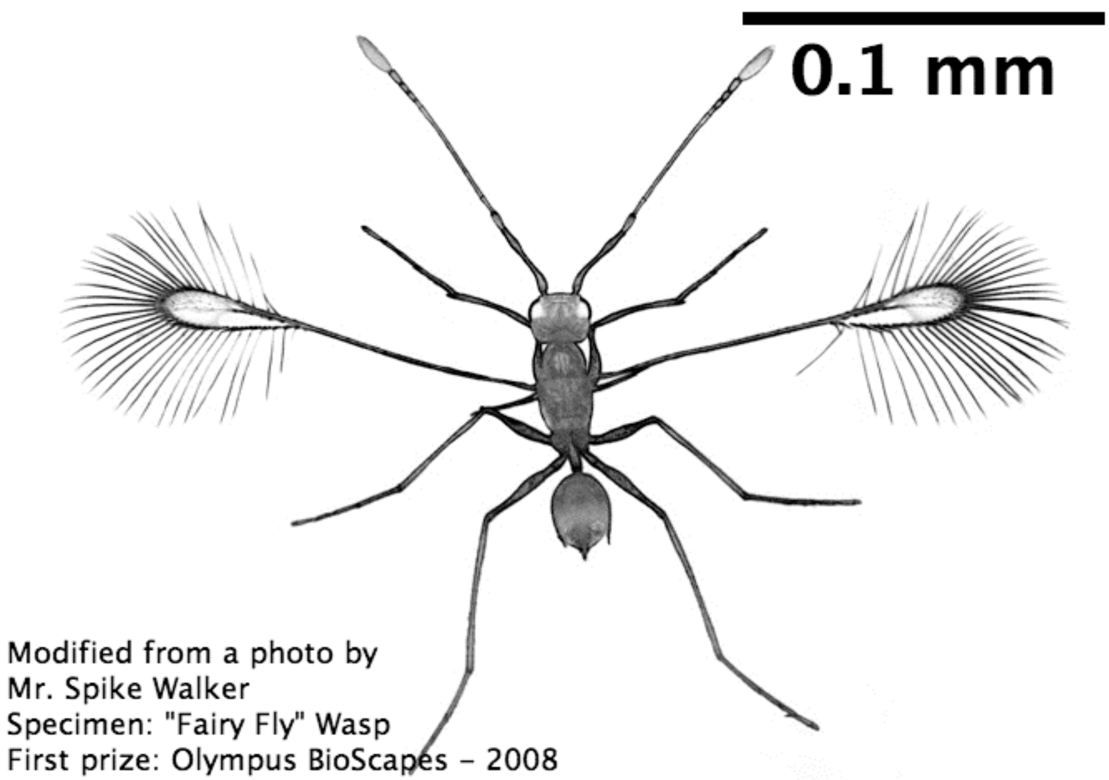
SAMPLE ASSIGNMENT

The fairy fly is reputedly the smallest flying insect. In fact, the feathery appendages can barely be considered wings. How is it that a fairy fly can fly?



Hints:

The drag coefficient (C_d) and its relation to the Reynolds number (Re) may give some insight into the effect of small size on air-borne animals. Considering acceleration versus air friction may also offer insight into how a fairy fly can fly (for example, comparative estimates of terminal velocity).

The viscosity (η) of air is $1.716 \bullet 10^{-5}$ poise at 0ºC, $1.813 \bullet 10^{-5}$ poise at 20ºC, $1.907 \bullet 10^{-5}$ poise at 40ºC. A poise has units of Pa sec; Pascal (Pa) has units of N m^{-2}; Newton (N) has units of kg m sec^{-1}. The kinematic viscosity (υ) of air is $1.327 \bullet 10^{-5}$ m^2 sec^{-1} at 0ºC, $1.505 \bullet 10^{-5}$ m^2 sec^{-1} at 20ºC, $1.691 \bullet 10^{-5}$ m^2 sec^{-1} at 40ºC. The kinematic viscosity is the viscosity divided by the density ($\upsilon = \eta/\rho$) (m^2 sec^{-1} = N m^{-2} / kg m^{-3}).