**36.58** **The product of a cyclist's coefficient of drag and frontal area, $C_D \times A$, is $3.2ft^2$. How much power must the cyclist generate to maintain $20mph$ on a flat, smooth road at sea level with no wind? Consider only aerodynamic drag. Ignore rolling resistance and power chain losses.**

A. $94W$

B. $127W$

C. $171W$

D. $327W$

Use the equation for Drag Force. Include the gravitational constant, $g_c$, in the denominator to make the units work.

$$F_D = \frac{C_D \rho v^2 A}{2g_c}$$

Convert the velocity to $\frac{ft}{s}$.

$$v = 20\frac{mi}{hr}\left(\frac{5280ft}{mi}\right)\left(\frac{1hr}{3600s}\right) = 29.3\frac{ft}{s}$$

Calculate the drag force.

$$F_D = \frac{\left(3.2ft^2\right)\left(0.075\frac{lb_m}{ft^3}\right)\left(29.3\frac{ft}{s}\right)^2}{2\left(32.2\frac{lb_m \cdot ft}{lb_f \cdot s^2}\right)} = 3.2lb_f$$

Find the power by using the equation under Power and Efficiency which is the product of force and velocity. Convert units to watts.

$$P = F \cdot v$$

$$P = \frac{\left(3.2lb_f\right)\left(29.3\frac{ft}{s}\right)\left(746\frac{W}{hp}\right)}{550\frac{ft \cdot lb_f}{s \cdot hp}} = 127W$$

**Answer B**