33.2 Blood has a dynamic viscosity of $3.3cP$ and a density of $66.2\frac{lb_m}{ft^3}$. What is the kinematic viscosity of blood?

A. $1.0 \times 10^{-6} \frac{ft^2}{s}$

B. $2.3 \times 10^{-6} \frac{ft^2}{s}$

C. $3.4 \times 10^{-5} \frac{ft^2}{s}$

D. $1.1 \times 10^{-3} \frac{ft^2}{s}$

Look up Kinematic Viscosity and Dynamic Viscosity in the reference handbook and use the formula below, where ν is kinetic viscosity, μ is dynamic viscosity, and ρ is density.

$$\nu = \frac{\mu}{\rho}$$

The dynamic viscosity has been given in units of cP. For the final answer to be in the desired units, convert the dynamic viscosity to $\frac{lb_f \cdot sec}{ft^2}$. Use the conversion factors in the reference handbook by searching Measurement Relationships as necessary.

$$\mu = (3.3cP)\left(\frac{.001Pa \cdot sec}{1cP}\right)\left(\frac{14.7\frac{lb_f}{in^2}}{101,325Pa}\right)\left(\frac{144in^2}{1ft^2}\right) = 6.9 \times 10^{-5}\frac{lb_f \cdot sec}{ft^2}$$

Apply the kinematic viscosity formula. In order to eliminate lb_m and lb_f from the units, it is necessary to multiply by $\frac{32.2\frac{lb_m \cdot ft}{sec^2}}{1lb_f}$, an expression that is equal to 1.

$$\nu = \frac{\mu}{\rho} = \frac{6.9 \times 10^{-5}\frac{lb_f \cdot sec}{ft^2}}{66.2\frac{lb_m}{ft^3}}\left(\frac{32.2\frac{lb_m \cdot ft}{sec^2}}{1lb_f}\right) = 3.4 \times 10^{-5}\frac{ft^2}{sec}$$

Answer C