

Exercise 10-19

oxygen requirement: O_{2R} \propto mass $\propto L^3 \propto r^3$

oxygen intake: O_{2i} \propto surface area $\propto L^2 \propto r^2$

$$\therefore \frac{O_{2i}}{O_{2R}} \propto \frac{r^2}{r^3} \propto \frac{1}{r} \quad (\text{or } \propto r^{-1})$$

As r increases, the ratio O_{2i}/O_{2R} decreases.

Eventually, O_{2i} will become less than O_{2R} , and the cell will be oxygen-starved. Thus, a cell cannot grow indefinitely and survive.