

Answer on Question #79653, Physics / Quantum Mechanics

Question. If the same force is applied to a ping-pong ball and to a tennis ball that are initially at rest, which ball will move faster?(Assume that there is no friction between the ball and the table.) Explain.

Answer. According to the second Newton's law

$$\vec{F} = m\vec{a} \rightarrow \vec{a} = \frac{\vec{F}}{m}$$

Assume that m_1 is a mass of a ping-pong ball and m_2 is a mass of a tennis ball. We know, that $m_1 \approx 2.7 \text{ g}$ and $m_2 \approx 58.5 \text{ g}$.

So, If the same force is applied to a ping-pong ball and to a tennis ball (without friction and air resistance), then we get

$$a_1 = \frac{F}{m_1} \quad \text{and} \quad a_2 = \frac{F}{m_2}$$

$$m_2 > m_1$$

$$a_1 > a_2$$

Thus, a ping-pong ball will move faster. If $F = 20 \text{ N}$ then

$$a_1 = \frac{F}{m_1} = \frac{20}{0.0027} = 7407 \frac{\text{m}}{\text{s}^2} \quad \text{and} \quad a_2 = \frac{20}{0.0585} = 342 \frac{\text{m}}{\text{s}^2}$$

$$7407 \frac{\text{m}}{\text{s}^2} > 342 \frac{\text{m}}{\text{s}^2}$$

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