

Answer on Question #40679, Physics, Mechanics | Kinematics | Dynamics

Question:

A bacteria of mass 2×10^{-24} kg is rotated in a centrifuge at an angular speed of 4×10^3 rad s $^{-1}$. It is situated at a distance of 5 cm from the axis of rotation. Calculate the effective value of g relative to the rotating frame of reference and the net centrifugal force on the bacteria.

Answer:

Centrifugal acceleration (effective value of g) equals:

$$a = \omega^2 r = 7.9 \cdot 10^6 \frac{m}{s^2}$$

where ω is angular speed, r is distance from the axis of rotation.

Net centrifugal force on the bacteria equals:

$$F = ma = 1.6 \cdot 10^{-17} N$$

where m is mass, a is acceleration

Answer: $a = 7.9 \cdot 10^6 \frac{m}{s^2}$, $F = 1.6 \cdot 10^{-17} N$