Answer on Question 77750, Physics, Mechanics, Relativity

Question:

The turntable of the record player is turning at 45 rounds per minute. A small object is at rest on the turntable at a distance $d = 10\ cm$ from the centre. Its velocity

A) is tangent to the circumference of radius d and has a magnitude of about 0.47 m/s

B) is tangent to the circumference of radius d and has a magnitude of about 47 m/s

C) is tangent to the circumference of radius d and has a magnitude of about 4.7 m/s

D) is directed radially and has a magnitude of about 0.47 m/s

E) is directed radially and has a magnitude of about 47 m/s

Solution:

Let's first convert rounds per minute to radians per second:

$$\omega = \frac{45\ rounds}{1\ min} \cdot \frac{1\ min}{60\ s} \cdot \frac{2\pi\ rad}{1\ round} = 4.7\ \frac{rad}{s}.$$

We can find the velocity of the object from the formula:

$$v = d\omega,$$

here, ω is the angular velocity of the turntable, d is the distance from the center to the object.

Then, we get:

$$v = d\omega = 0.1\ m \cdot 4.7\ \frac{rad}{s} = 0.47\ \frac{m}{s}.$$

The velocity of the object is tangent to the circumference of radius d.

Answer:

A) is tangent to the circumference of radius d and has a magnitude of about 0.47 m/s