

## 9.14 Exit Question

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## 0.1 Question

An astronaut rotates at the end of a test machine whose arm has a length of 10.0 m. If the maximum acceleration she reaches must not exceed  $5g$ , what is the maximum number of revolutions per minute of the arm?

## 0.2 Solving

### 0.2.1 Variables

$$g = 9.81 \times 5 = 49.05.$$

$$L = 10.0 \text{ m}.$$

### 0.2.2 Solve

We can use the equation for acceleration,

$$a_c = \frac{v^2}{r}.$$

Plugging values in,

$$49.05 = \frac{v^2}{10}.$$

$$v = 22.14 \frac{\text{m}}{\text{s}}.$$

Divide by the circumference and multiply by 60 to get the total period.

$$\frac{22.14}{20\pi} \times 60 = \boxed{21.14 \text{ rpm}}.$$