

## Dynamics problems

Starting from rest, a skier slides 200 m down a 35 degrees slope. How much longer does the run take if the coefficient of kinetic friction is 0.3 instead of 0? (2.75 s)

A bicycle is moving at 10 m/s. What is the angular speed of its tires if their radius is 30 cm? ( $33 \text{ s}^{-1}$ )

A tension of 6000 Newtons is experienced by the elevator cable of an elevator moving upwards with an acceleration of  $2 \text{ m/s}^2$ . What is the mass of the elevator? (500 kg)

A man drops a 10 kg rock from the top of a ladder of height 5 m. What is its speed just before it hits the ground? What is its Kinetic Energy when it reaches the ground? ( $v = 10 \text{ m/s}$ ,  $E = 500 \text{ J}$ )

The heart pumps 5.6 l blood through the aorta of 1 cm radius in one minute. What is the average flow velocity of the blood in the aorta? (30 cm/s)

What wavelengths correspond to the 27 MHz and 2.37 GHz frequency of the heat therapy generators? (11 m and 12.6 cm respectively)

If a spring has a spring constant of 400 N/m, how much work is required to compress the spring 25.0 cm from its undisturbed position? (12.5 J)

A compressed spring that obeys Hooke's law has a potential energy of 18 J. If the spring constant of the spring is 400 N/m, find the distance by which the spring is compressed. (30 cm)

Collagen fiber is stressed with 12 N force. The cross-sectional area of the fiber is  $3 \text{ mm}^2$ , its coefficient of elasticity is 500 MPa. Give the percentage of relative extension. (0.8 %)

The length of an elastic thread used in orthodontics is 6 cm, its cross-sectional area is  $1 \text{ mm}^2$ , its coefficient of elasticity is 5 MPa. We extend the thread with 40 %. How large is the retracting force and what is the amount of elastic energy stored in the thread? ( $F = 2 \text{ N}$ ,  $E = 24 \text{ mJ}$ )