

Oscillations



Oscillator – a device able to freely to oscillate – make a periodic motion
(a spring oscillator, pendulum)

•**Period:**

T – time needed to make one complete cycle (s)

•**Frequency:**

f - gives number of complete cycles per a time (s^{-1})

- if the time is given in seconds, frequency is measured in s^{-1} – Hz
(hertz)

- there might be frequency given in revs per minute (revs/min)

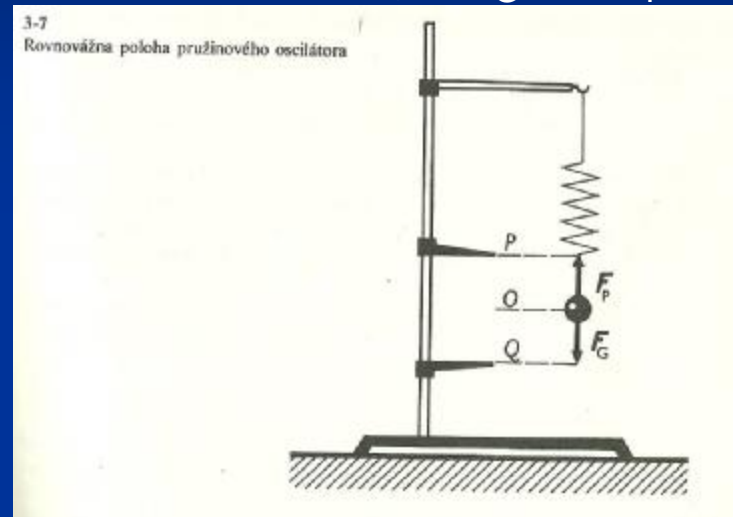
- $f = 1/T$ (kilohertz – 1 kHz = 10^3 Hz, megahertz – 1 MHz = 10^6 Hz)

- oscilloscope

- A heart makes beats 75 times per minute. Calculate frequency and period of human heart.

Kinematics of oscillations

- According to the 3. Newton's law of motion (action – reaction) there are two forces acting on a body hanging on the spring – F_G (force due to the weight of the body) and F_P (force due to the spring): $F_G = - F_P$ (O – body is in equilibrium)



- A body oscillating on a spring – deflections from the equilibrium – y (m).
- A maximum of deflections – amplitude – y_m (m).

•Angular speed:

$$\omega = d\phi / dt \text{ (change of angle per a time)} \Rightarrow \phi = \omega t$$

$$y = y_m \sin \phi = y_m \sin \omega t$$

$$\omega = 2\pi / T = 2\pi f \text{ (\omega – angular frequency) (rad.s}^{-1}\text{)}$$

