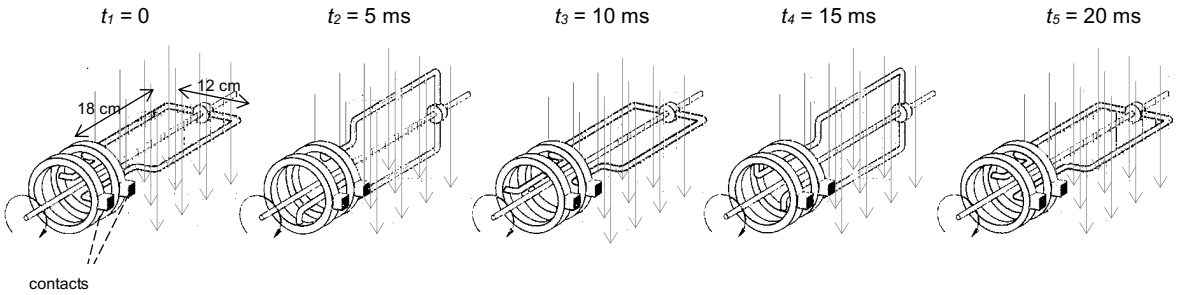
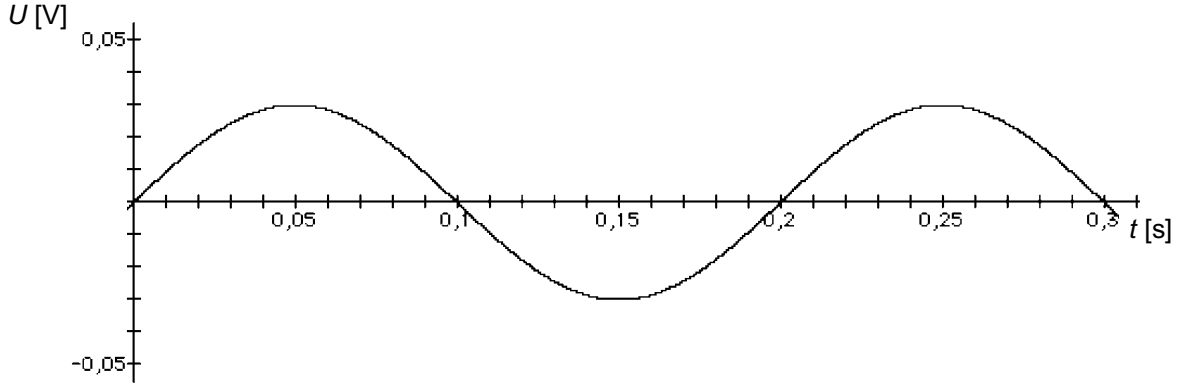
1. Here are five pictures of a loop of wire that is rotating in a magnetic field (B = 0.45 T)



a) Draw in the picture the direction of motion of the two parts of the loop of wire.
b) Draw in the picture the direction of motion of the electrons in the loop of wire (in some of the pictures the electrons do not move).
c) Which one of the contacts is a plus, which one is a minus pole? Draw it in the pictures.
d) In some of the pictures a magnetic force acts on the moving electrons in the loop of wire. In the cases, where a magnetic force is acting, draw the direction of this force.
e) How long does a whole revolution of the loop of wire take?
f) What is the frequency?
g) What is the angular velocity?
h) What is the peak value of the induced voltage?
i) What is the effective value of the induced voltage?

2. A square loop of wire (side length 50.0 cm, with 182 turns) is rotating in the magnetic field of the earth. Here's a graph of the induced alternating voltage $U(t)$ that is produced:



a) Determine the peak voltage from the graph.
b) At what times is the magnitude of the voltage at its maximum?
c) At what times is the voltage zero?
d) Determine the period from the graph.
e) Calculate the frequency.
f) Calculate the angular velocity.
g) Determine the magnitude of the magnetic field of the earth.

solutions:

1. e) 20 ms f) f = 50 Hz g) ω = 314 s^{-1} h) 3.05 V i) 2.16 V
2. a) 30 mV b) t = 0.05 s, 0.15 s, 0.25 s, etc. c) 0, 0.1 s, 0.2 s, 0.3 s, etc.
   d) 0.20s e) 5.0 Hz f) 31.4 s^{-1} g) $2.1 \cdot 10^{-5}$ T