# Worksheet: Oscilloscope

Name: Date:

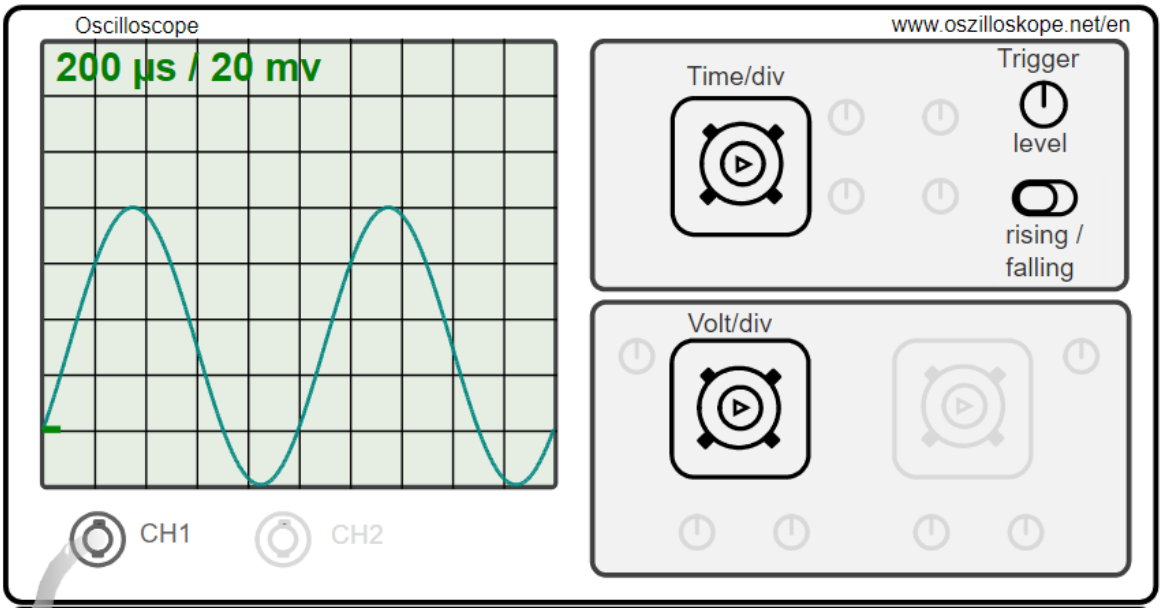


Figure 1: Oscilloscope in an experimental setup

**Question 1:**

*Figure 1 shows an oscilloscope in a basic setup. Explain the intended use of the following elements:*

- **Channel input (CH1 / CH2)**
  The signal to be measured is applied to the channel inputs. This can be done either by a BNC cable or a probe head

- **Knob Volt / div**
  The knobs adjust the voltage level per division. A div in the Y direction corresponds to the selected value.

- **Knob Time / div**
  The rotary knob sets the time base per division. A div in X direction corresponds to the selected value.

- **Trigger-level**
  The trigger level defines the starting value at which the oscilloscope starts to measure. The value is displayed as an arrow at the left edge of the display.

- **Slope**
  Slope defines triggering on falling or rising edge. If falling edge is selected, measurement is not performed until the trigger level has been reached and the level drops afterwards. Rising edge triggers means a measurement is triggered when the selected level is reached and the level rises afterwards.

**Question 2:**

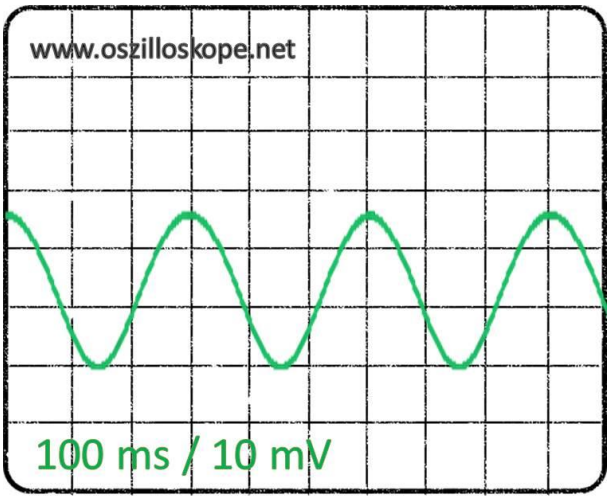


Figure 2: Measured sine wave

*Figure 2 shows a sine wave. The oscilloscope settings are located at the bottom left of the display. Calculate the vibration amplitude and frequency of the vibration.*

The amplitude is 2.5 divs high. At 10 mV per div: 10mV*2.5 = 25 mV peak to peak. The frequency is three boxes wide. At 100 ms per box this is 300 ms, i.e. 1/0.3 s = 3.33 Hz.

**Question 3:**

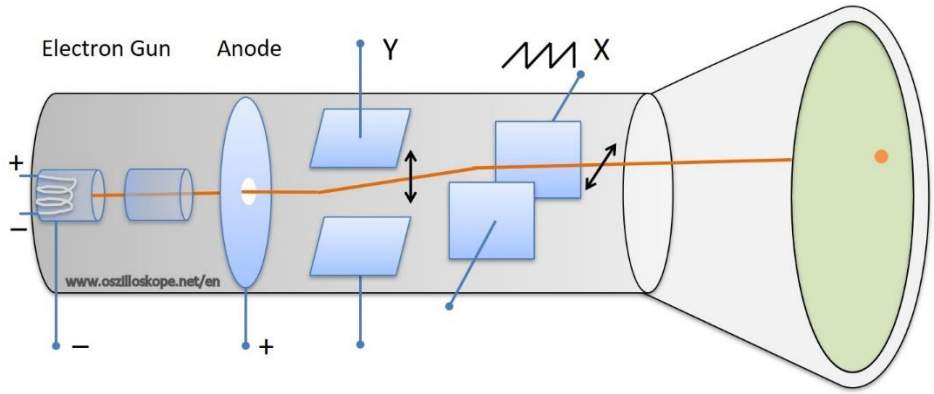


Figure 3: Analog oscilloscope

*Explain the operating principle of an analog oscilloscope / cathode ray tube.*

A wire in the electron gun is heated (left side oft he figure). As a result, negatively charged electrons are released and are attracted by the positively charged anode. Due to the high acceleration voltage of the anode in a vacuum, the electrons reach a speed that allows them to pass through the opening in the anode. A capacitor with plates at the top and bottom controls the electrons in the Y direction. The signal to be measured is applied to these plates and controls the Y-direction (by electrostatic attraction or repulsion) taking into account the factor volts /div. In the X-direction, two further capacitor plates serve to deflect the beam to the left and right. A sawtooth signal is applied according to the selected time base. The beam is visible at the end of the phosphorescent screen.