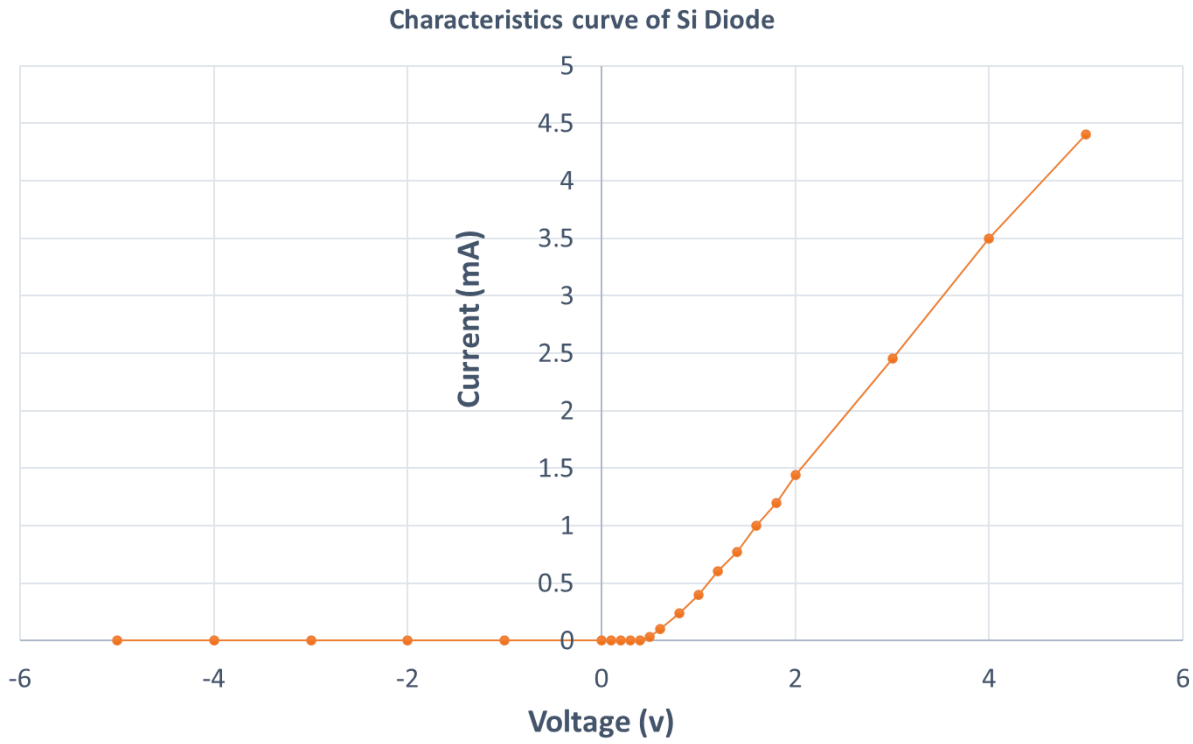
Experiment No.1 Semiconductor diode characteristics

1. Why is the voltage across the diode (V_D) not increasing when increasing the V_S?

Ans.: This is due to the barrier potential (Ge = 0.3V) and (Si = 0.7V) of the doped semiconductor diode. However, the voltage across the P-N junction will increase slightly as the current gets larger because of the built-in diode resistance.

2. On a graphic paper, draw the V-I characteristic curve from the experimental result you recorded.

Ans.:



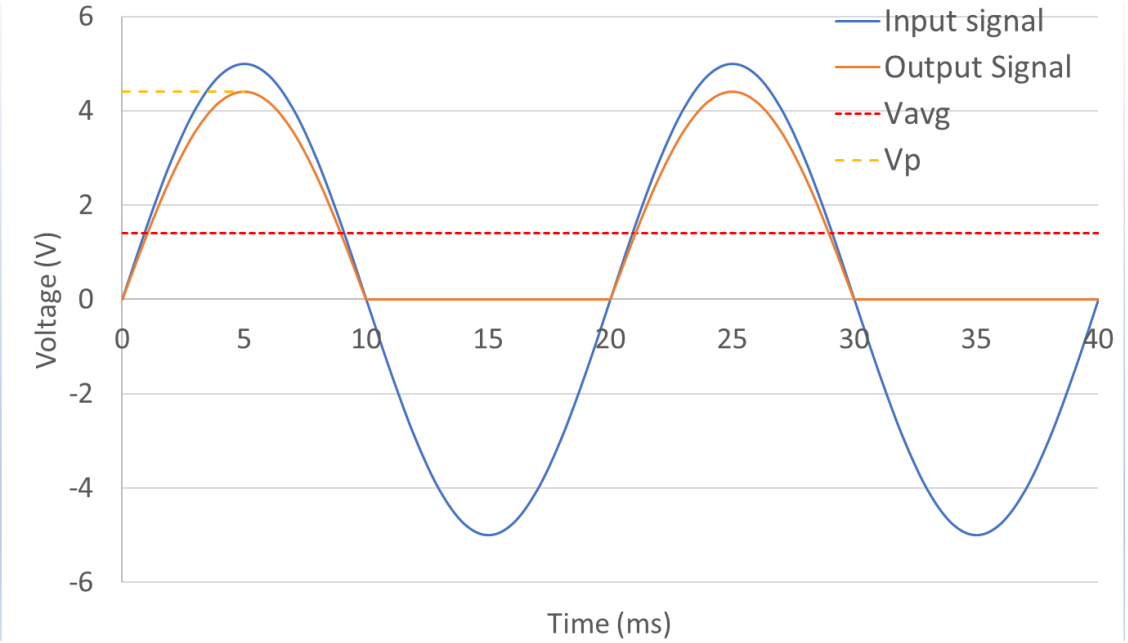
Experiment No.2 Half-Wave Rectifier (HWR)

1. Why is the V_{AVG} of the input signal (Sinusoidal wave) close to zero?

Ans.: Theoretically, the average value (V_{AVG}) of a whole sinusoidal waveform over one complete cycle is zero, as the two halves cancel each other out when calculating the average value. Experimentally, the average value (V_{AVG}) is close to zero due to a slight difference between the two halves (positive and negative) of the input signal.

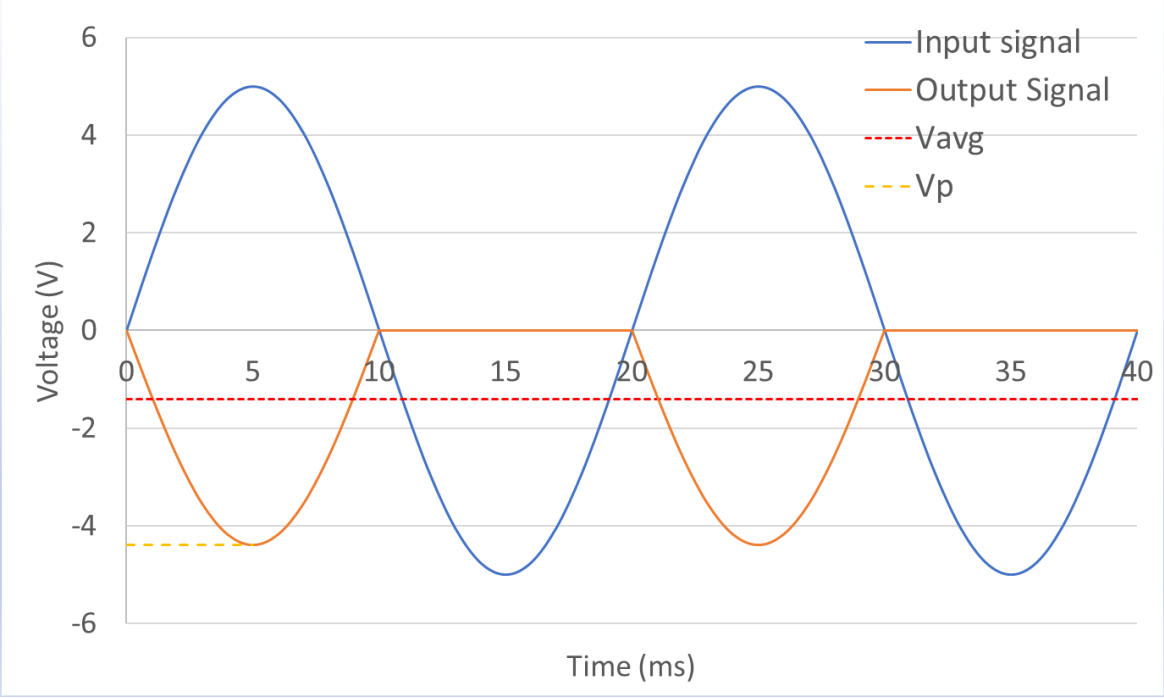
2. On a graphic paper, draw the input and output signals, both on one chart (on top of each other), indicating the voltages (V_p, V_{rms}, and V_{AVG}).

Ans.:



3. What would be the outcome if the diode is flipped? Why? Draw the output signal.

Ans.: Because the diode is forward-biased for the negative half, it appears across the R_L.



Experiment No.3 Center-Tapped Full-Wave Rectifier

1. Is the transformer step-down or step-up? Why?

Ans.: Since the output voltage is smaller than the input voltage, the transformer is a step-down. Its also known from the turns ratio: if

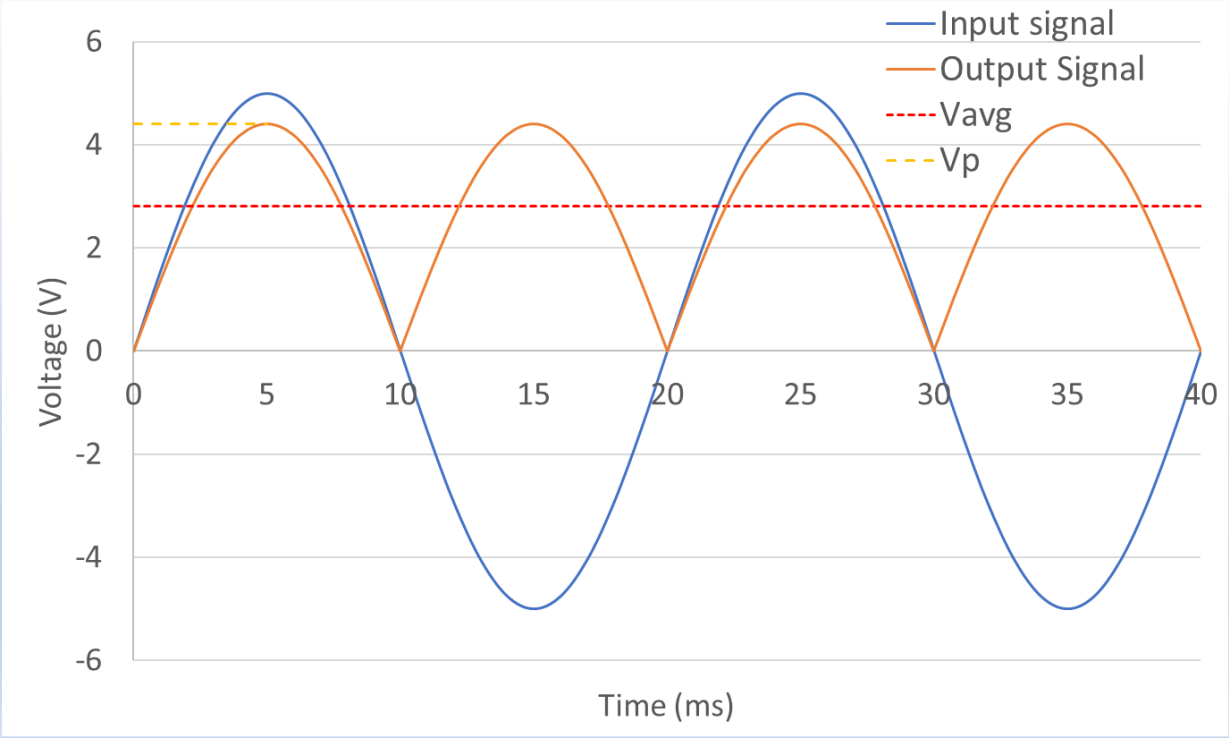
$n > 1$	Step up transformer	$V_{out} > V_{in}$
$n < 1$	Step down transformer	$V_{out} < V_{in}$
$n = 1$	Buffer transformer	$V_{out} = V_{in}$

In our experiment: $$n = \frac{V_{p(sec)}}{V_{p(pri)}} = \frac{5}{311} = 0.016$$

The transformer is step-down.

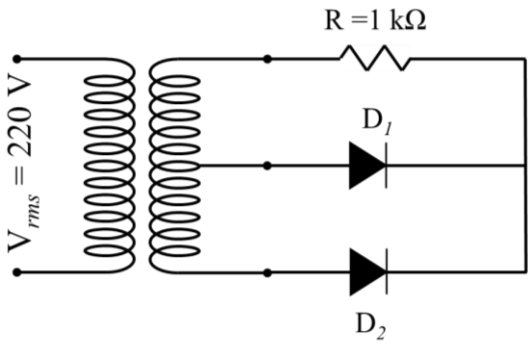
2. On a graphic paper, draw the input and output signals, both on one chart (on top of each other), indicating the voltages (V_p, V_{rms}, and V_{AVG}).

Ans.:



3. What would be the output at R_L if we exchange D_1 by R_L? **(غير داخل بالامتحان)**

Ans.: During the input signal's positive half, no current passes through R_L because both diodes (D_1 and D_2)are reversed-biased. During the negative half, both diodes (D_1 and D_2)are forward-biased. The voltage across R_L is superpositioned between the total secondary voltage $V_{p(sec)}$ sin θ and the $V_{p(in)}$ sin θ of the upper coil.



Experiment No.4 Full-Wave Bridge Rectifier

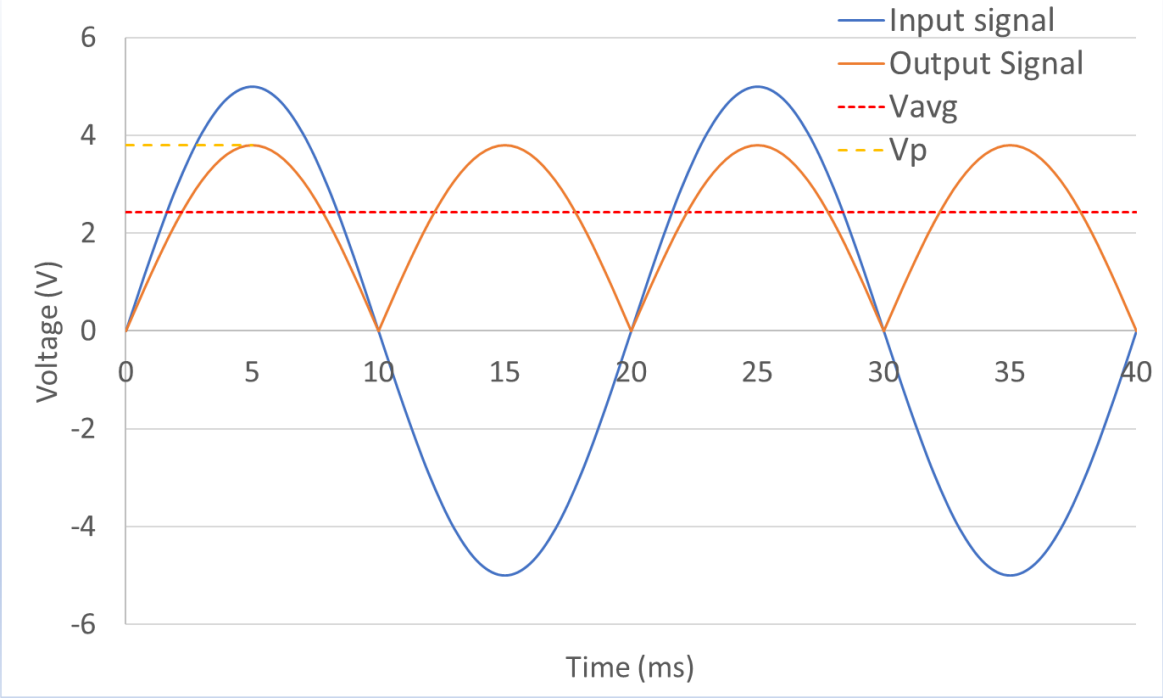
1. What would be the PIV of each diode in the above Full-Wave Bridge Rectifier circuit?

Ans.: $\text{PIV} = V_{p(sec)} = 2V_{p(out)}$

In out experiment, $V_{p(sec)} = V_{p(out)} = 5\ V$

2. On a graphic paper, draw the input and output signals on one chart (on top of each other), indicating the voltages (V_p, V_{rms}, and V_{AVG}).

Ans.:



3. Calculate the period of the input and output signals.

Ans.: In our experiment, the frequency of the input signal is 50 Hz.

The period of the input signal: $T = \frac{1}{f} = \frac{1}{50} = 20ms$

In full wave rectifiers the frequency of the output is douplicated (100Hz)

The period of the input signal: $T = \frac{1}{f} = \frac{1}{100} = 10ms$