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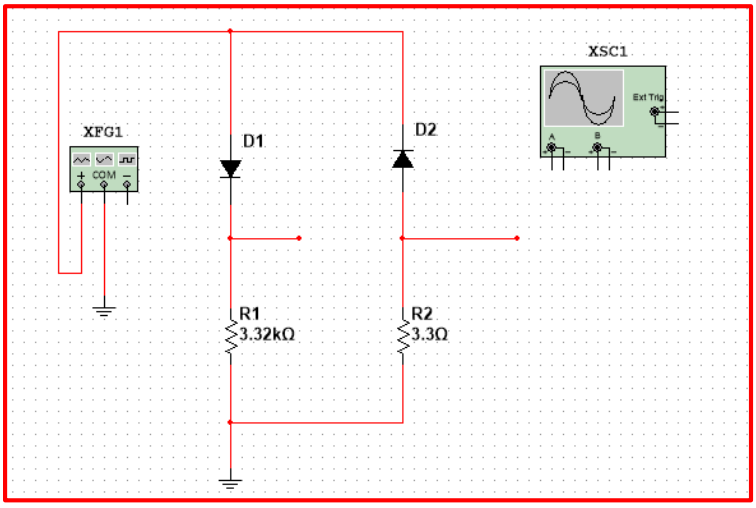
ECE101-1L – FUNDAMENTALS OF ELECTRONIC CIRCUITS (LAB)

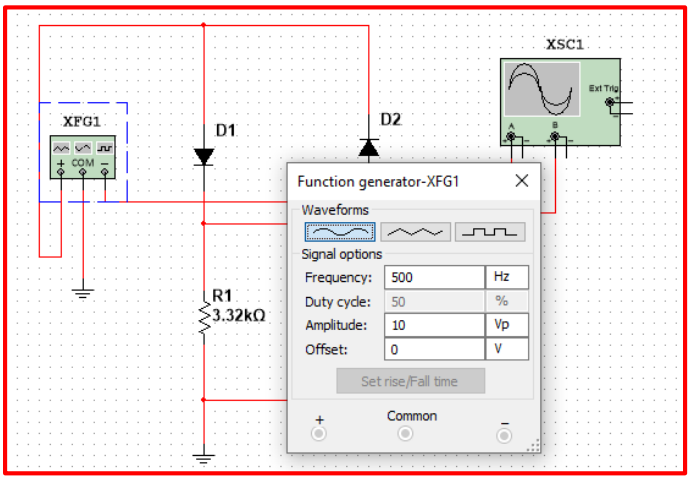
Activity #2: Diode Rectification

Part A. Multisim 1. Open Multisim

2. Create the schematic diagram shown below (Function Generator, Resistor, Diode)



3. Change the Function Generator Settings



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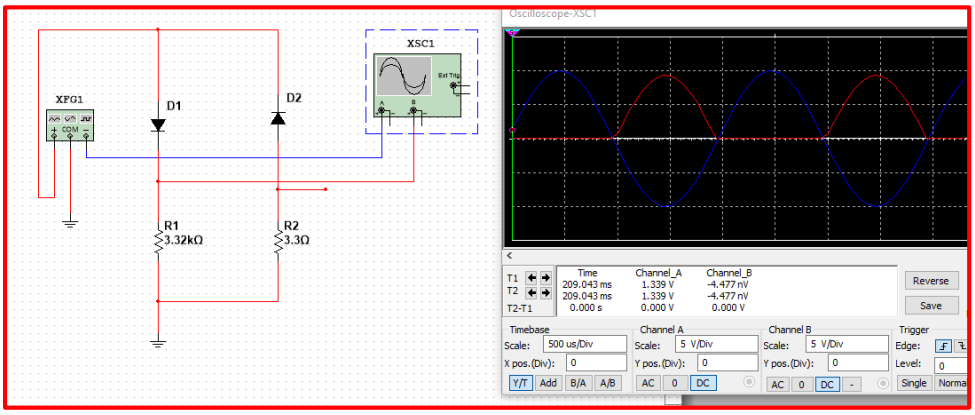
4. Place an Oscilloscope and Probe Channel A to Output of the Function Generator and Channel B to the Output A (Across R1) (You may change the color to identify each waveform and adjust the y-position of each waveform)

a. Screenshot the Output waveform

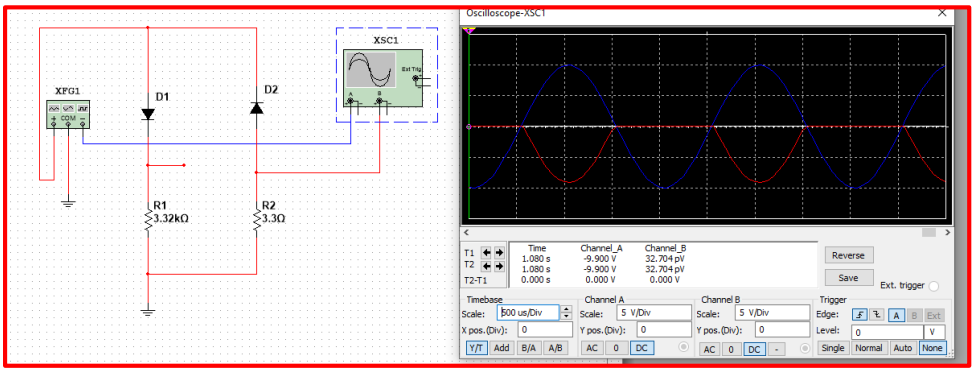


b. Explain the output waveform by comparing the input and output

The Channel A to Output of the Function Generator has a waveform on both upper and lower part from the Oscilloscope while the Channel B to the Output A only has a waveform from the upper part that's because diode D1 conducts only on the positive half cycles of the input wave and during negative half cycle it is reverse biased.

5. Probe channel A to Output of the Function Generator and Channel B to the Output of A (Across R2)

a. Screenshot the Output waveform (You may change the color to identify each waveform)



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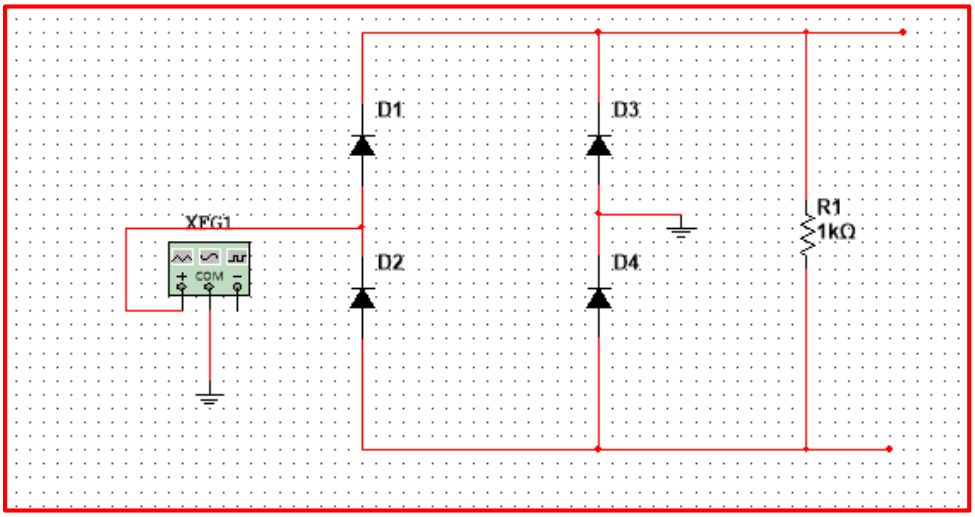
b. Explain the output waveform by comparing the input and output

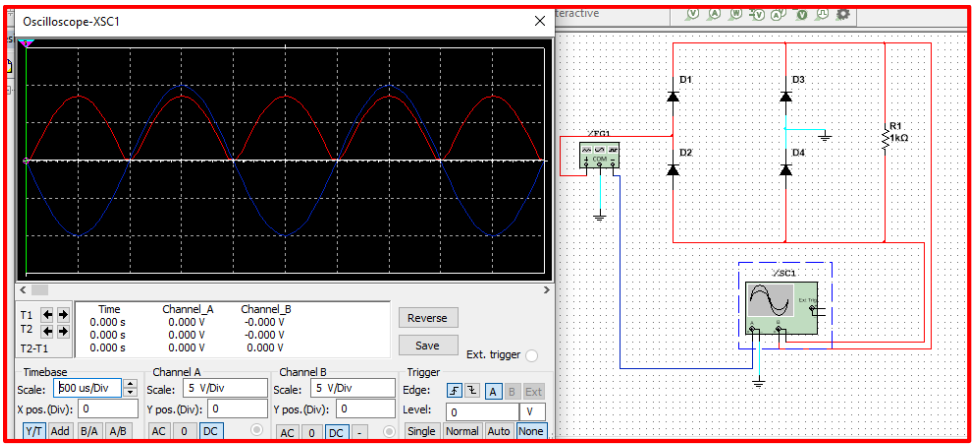
The waveform output was reversed compared to the other output, Channel B to the Output A (Across R2) seems to have a combination of sine and square wave on the lower part while the Channel A to Output of the Function Generator has a sine type wave.

6. Create the schematic diagram shown below with same function generator settings from Part A.



7. Place an oscilloscope and Probe Channel A to the Input (Output of the Function Generator), negative probe terminal must be connected to Ground, then probe Channel B to the Output (+) and the negative terminal to the (-) of the Output. (Change the Colors and Position of waveforms)

a. Screenshot the Output waveform



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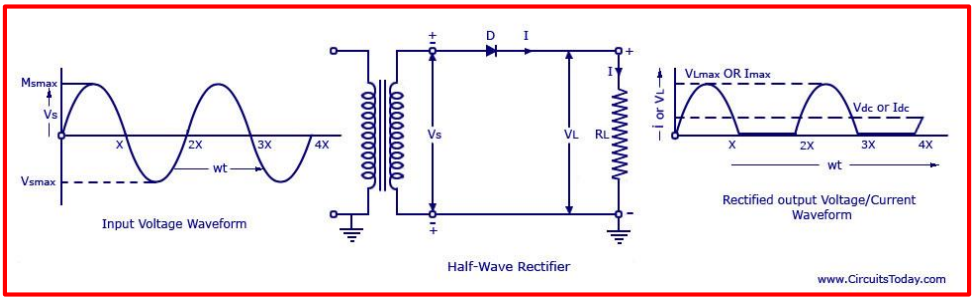
b. Explain the output waveform by comparing the input and output

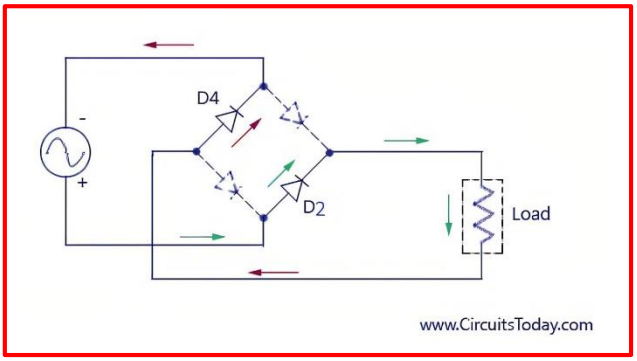
In the input wave, the electricity flows from positive to negative that is why the wave is going up and down. However, the other wave which is the output does not cross the x-axis which indicate it has changed into a pulsating direct current.

8. Explain how Half-Wave Rectifier works (Use Diagram /Figures)



Half wave rectifier only allows half of the cycle to pass through creating a DC flow. Since the current only passes through one direction, if it tries to pass through the opposite part, it will be blocked by a diode thus creating a gap between the waves. Moreover, the diode will be forward biased during positive half cycle while it will be reversed in the negative half cycle. Hence, the output can be significant in positive half cycle or zero and insignificant in negative half cycle.

9. Explain how Full-wave Rectifier works (Use Diagram /Figures)



A full-wave rectifier makes use of both half-cycles to create a DC flow. A transformer will first convert the high voltage input AC into low voltage AC. Center tapped diode's anode will be connected to the secondary winding of the transformer and then connected to the load resistor. During the positive half cycle of the AC, the top half of the secondary winding will also be positive, while the bottom half will be negative. In addition, at the positive half cycle, D1 will be forward biased while D2 will be reversed biased. With these, D1 will act as a short circuit while D2 will be an open circuit. On the contrary, at the negative half cycle, the D1 will be reversed biased while D1 will be forward biased.

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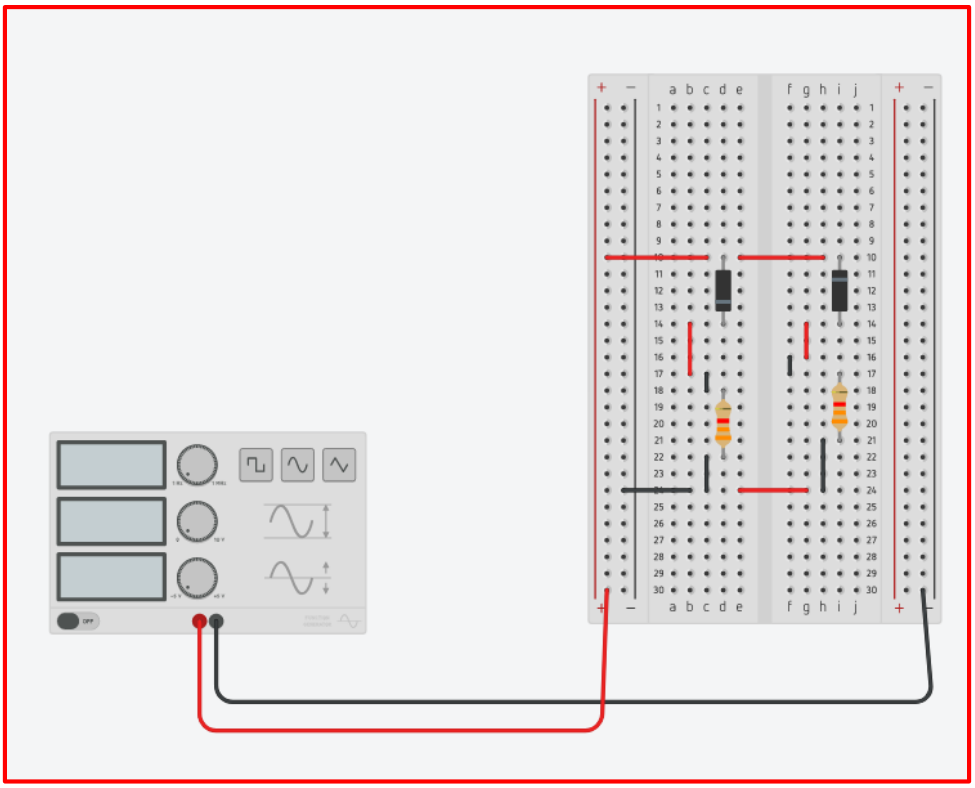
Part B. TinkerCAD

1. Create a similar circuit using TinkerCAD

a. Screenshot your Breadboard



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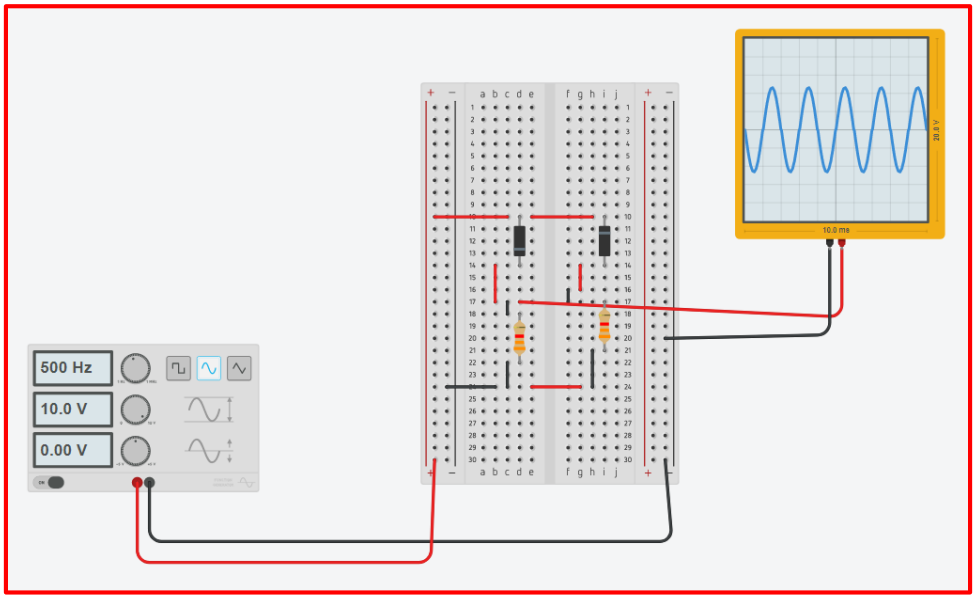
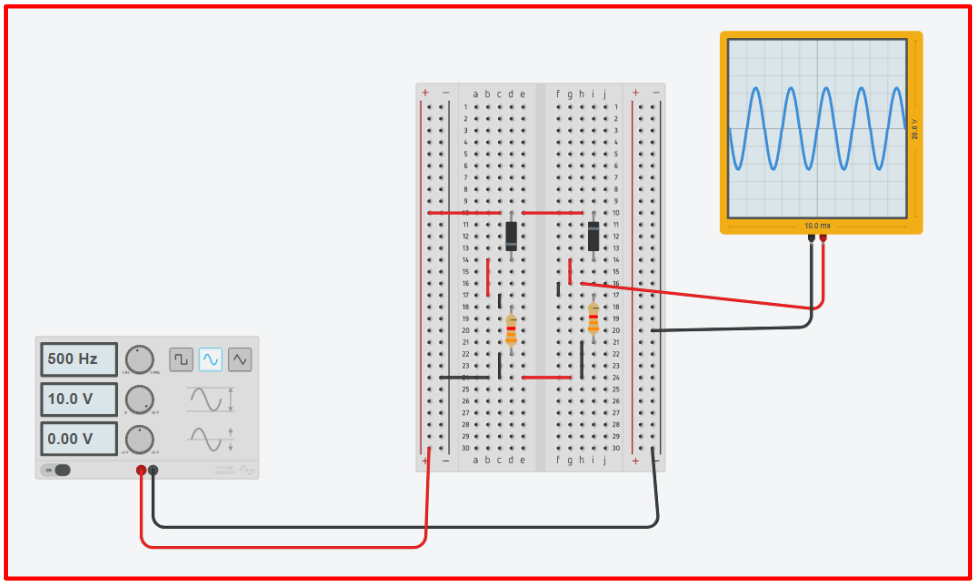
2. Place Two Oscilloscope (Connected to Output A and Connected to Output B)

a. Screenshot the Output waveform of Oscilloscope at Output A



b. Screenshot the Output waveform of Oscilloscope at Output B



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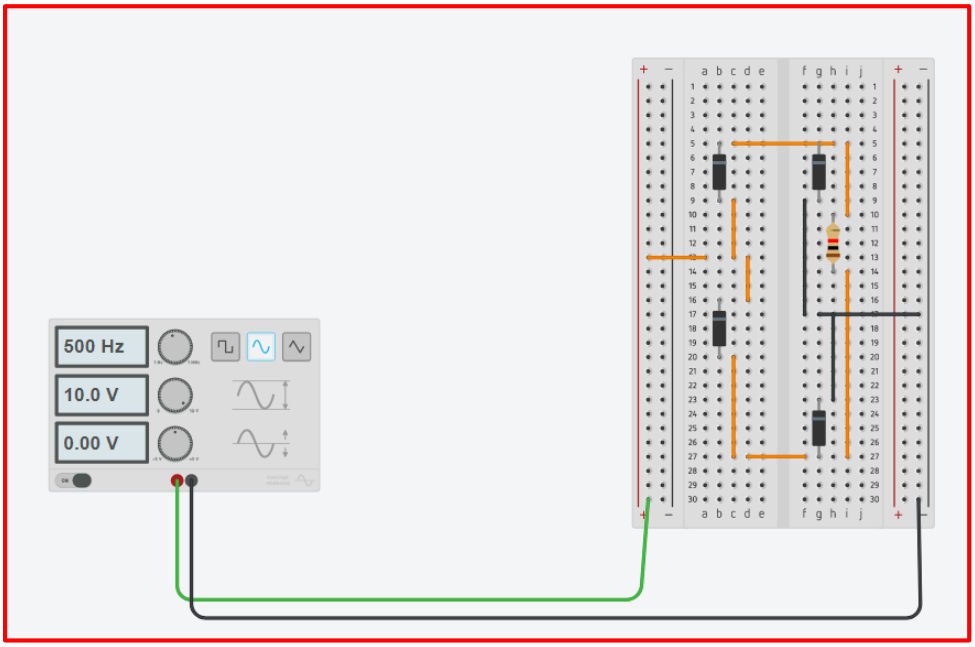
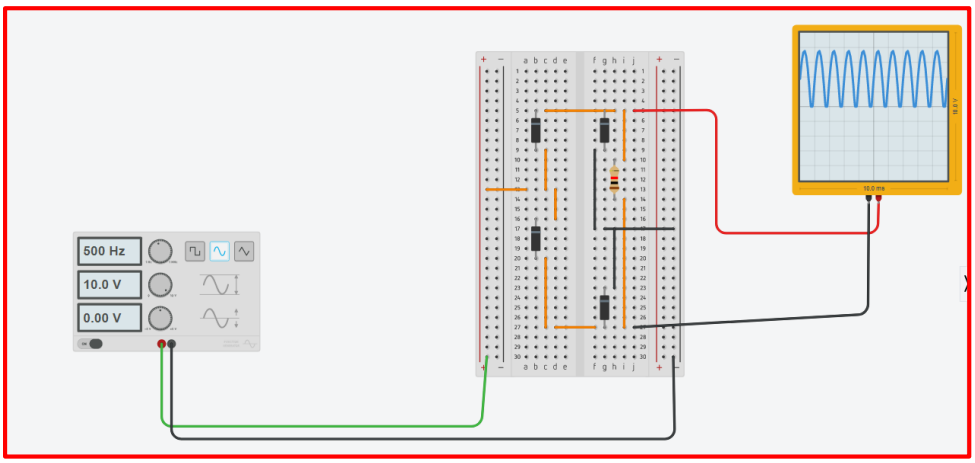
3. Create a similar circuit using TinkerCAD

a. Screenshot your Breadboard



4. Place Oscilloscope

a. Take a screenshot of the Output waveform of Oscilloscope at Output



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Discussions:

We simulated converting AC to DC voltage through Half-Wave and Full-Wave rectifier processes via Multisim and TInkerCAD. Through testing we have observed that the effectiveness of using a Full-Wave rectifier is more efficient at conversion from AC to DC compared to a Half-Wave one after comparing their respective waveforms in both simulation programs.