High Pass and Low Pass Filters

Apparatus

function generator, resistor, capacitor and 2 channel oscilloscope

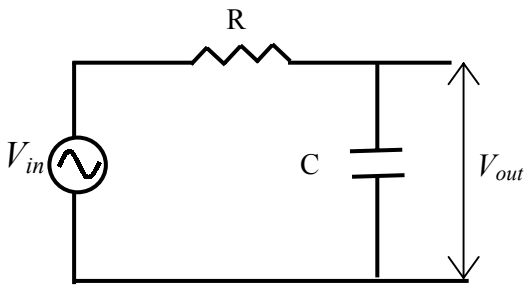
Action

The students vary the input frequency while observing both the input and output on the oscilloscope. They should identify one circuit arrangement as a high pass filter and the other as a low pass filter.

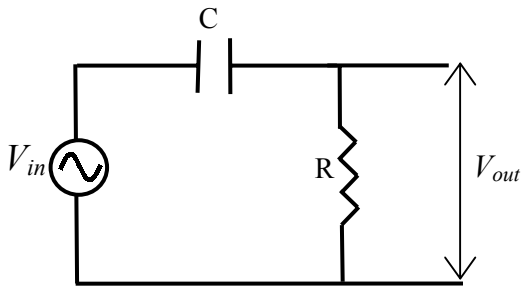
The Physics

The circuit on the left is a low pass filter. As the frequency changes, the reactance of the capacitor changes, hence V_C changes. When the frequency is low, the reactance is high, and most of the voltage is dropped across the capacitance rather than the resistance. Thus V_{out} will be high. We call this a low pass filter as low frequencies provide a significant output, but high frequencies do not.

The right hand circuit is a high pass filter. The output is taken across the resistor now. At high frequencies the reactance of the capacitor is low, so the voltage dropped across the capacitor is low while that across the resistor is high. Hence for a high pass filter we take V_{out} across the resistor.



low pass filter



high pass filter

Accompanying sheet

High Pass and Low Pass Filters

Observe both the input and output of the filter circuit on the oscilloscope.
Now vary the input frequency.
What happens to the output signal?
What sort of a filter is this, and how does it work?

Now try the other circuit.
What sort of filter is this one?