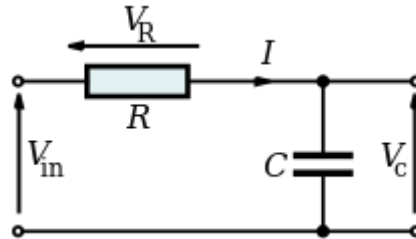## Answer on Question #50347, Physics, Electric Circuits

Calculate the ratio Vc/V at the turn-over frequency (sometimes called the break frequency) if R1=1kΩ and C=2µF.

Solution:

By viewing the circuit as a voltage divider, the voltage across the capacitor is:

$$V_C = \frac{1}{1 + sRC}V$$

where $s = j\omega$.

Generally we will be interested only in the magnitude of the response:

$$\left|\frac{V_C}{V}\right| = \left|\frac{1}{1 + sRC}\right| = \frac{1}{\sqrt{1^2 + (\omega RC)^2}}$$

At ω=1/RC, called the break frequency (or cutoff frequency, or 3dB frequency, or half-power frequency, or bandwidth), the magnitude of the gain is

$$\left|\frac{V_C}{V}\right| = \frac{1}{\sqrt{1 + 1}} = \frac{1}{\sqrt{2}}$$

Answer: $\left|\frac{V_C}{V}\right| = \frac{1}{\sqrt{2}}$