



# DESIGN & BUILD LAB

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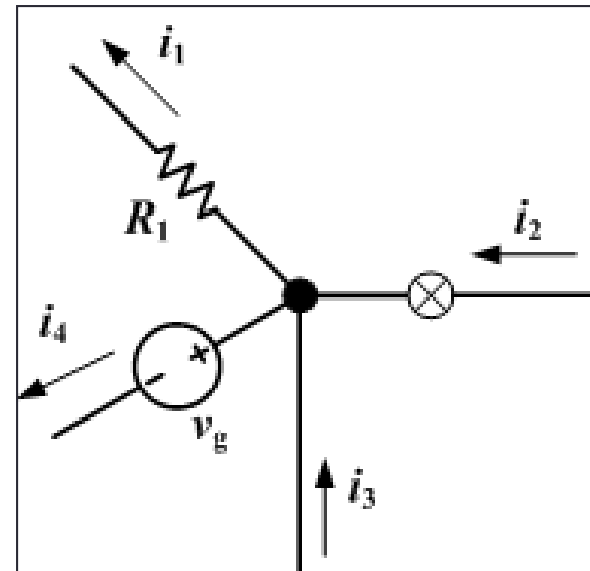
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- Theory
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# Theory – Kirchoff's law

- Kirchoff's circuit laws

→ The current **entering** any junction is equal to the current **leaving** that junction.



$$i_2 + i_3 = i_1 + i_4$$

# Theory – Kirchoff's law

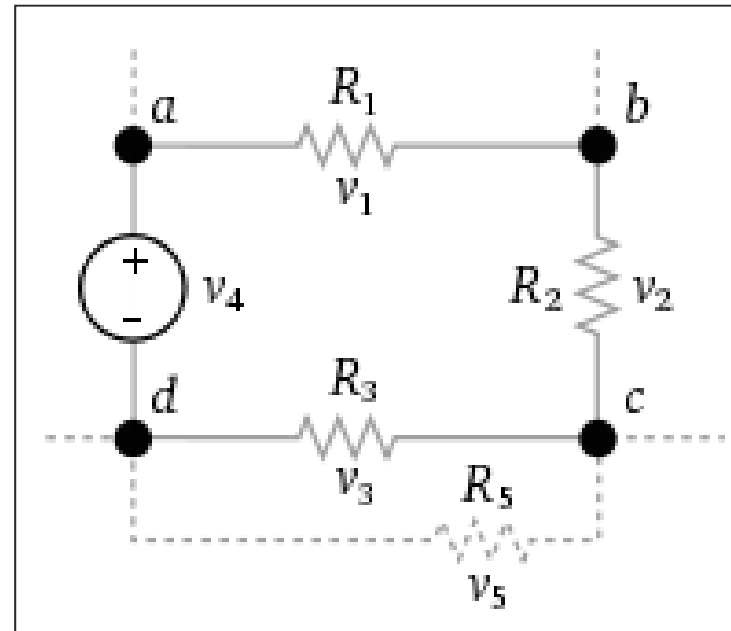
- Kirchoff's voltage law

→ The directed sum of the

**electric potential differences**

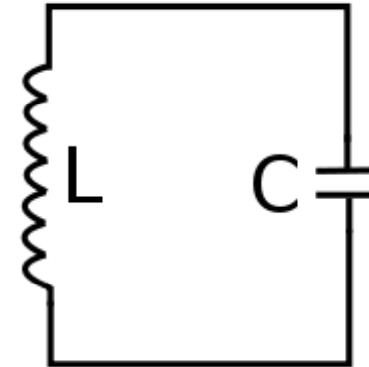
around any closed circuit

is **zero**.

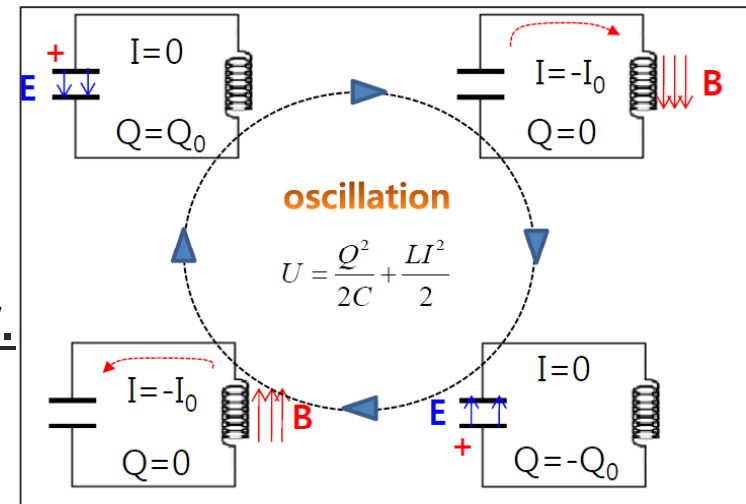


# Theory – LC Circuit

- An LC Circuit consists of an **inductor**, and a **capacitor**.



- Electromagnetic energy **oscillates** between the capacitor and inductor.



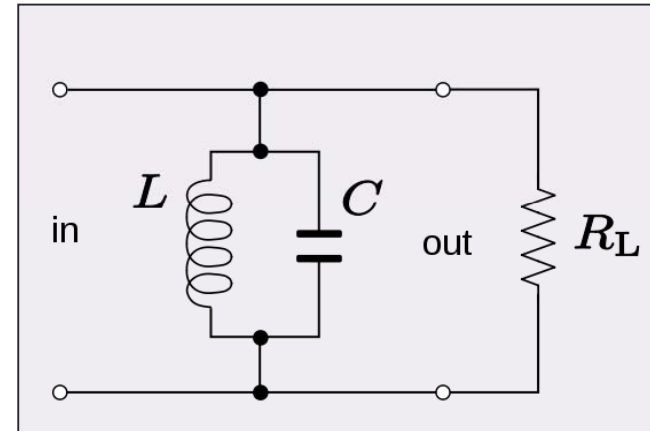
# Theory – LC Circuit

- LC Circuit forms **a band-pass filter**.

$$\frac{1}{Z} = \frac{1}{Z_C} - \frac{1}{Z_L}$$

$$Z = \frac{Z_C Z_L}{Z_C - Z_L}$$

$$Z = \frac{1/\omega C \cdot \omega L}{1/\omega C - \omega L} = \frac{\omega L}{1 - \omega^2 LC}$$

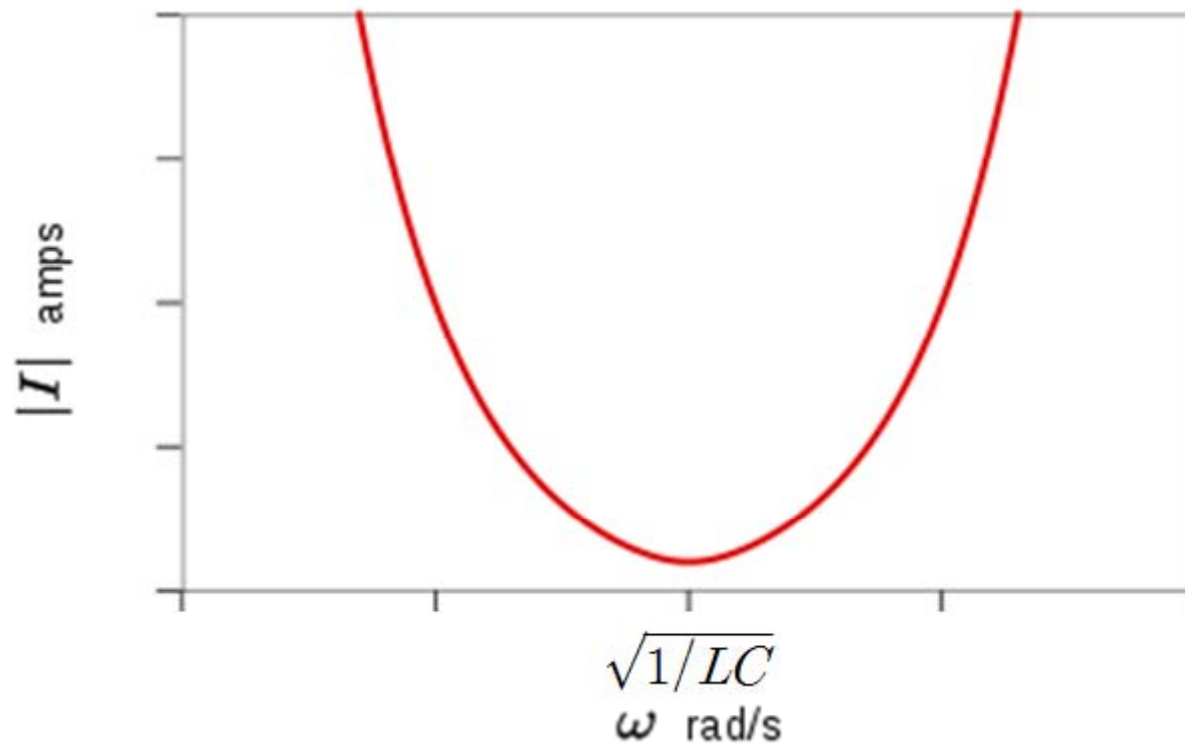


$$\omega L = \frac{1}{\omega C}$$

$$\lim_{\omega^2 LC \rightarrow 1} Z = \infty$$

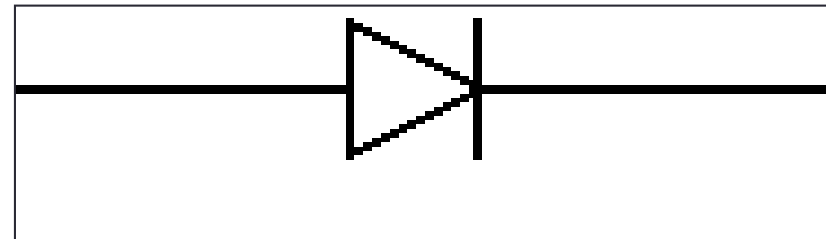
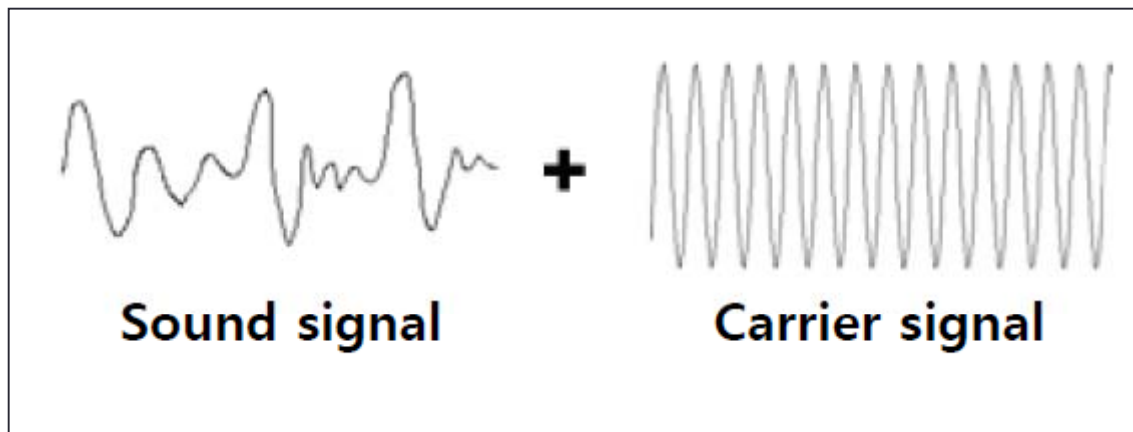
# Theory – LC Circuit

- LC Circuit forms **a band-pass filter.**



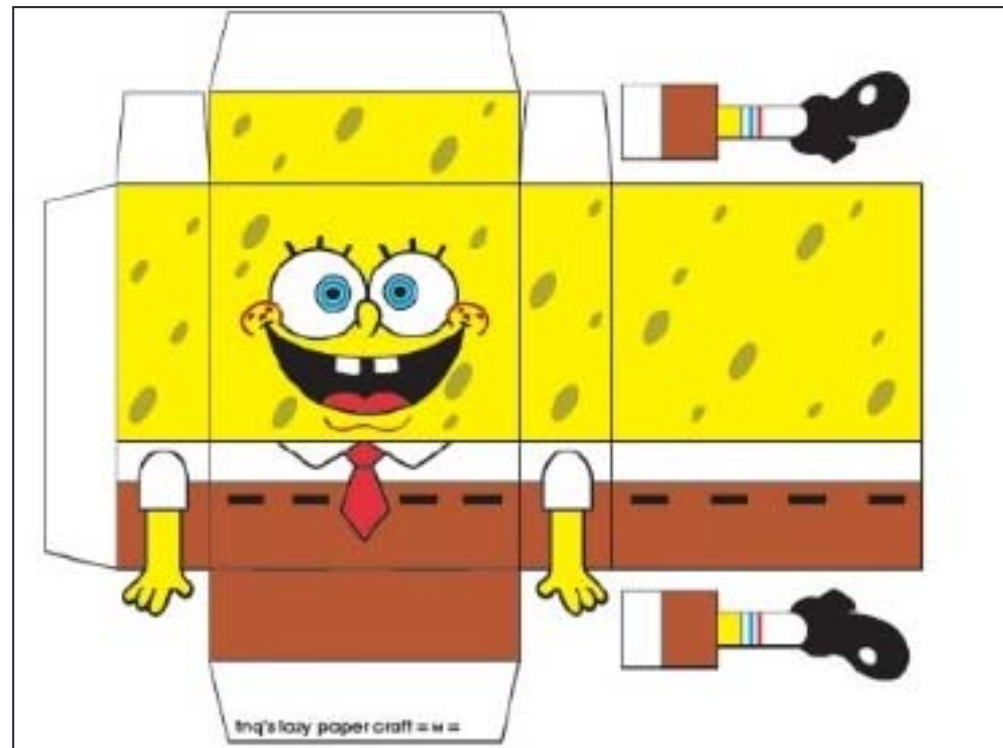
# Theory – Detector Circuit

- A detector is a device that **recovers information of interest** contained in a modulated wave.

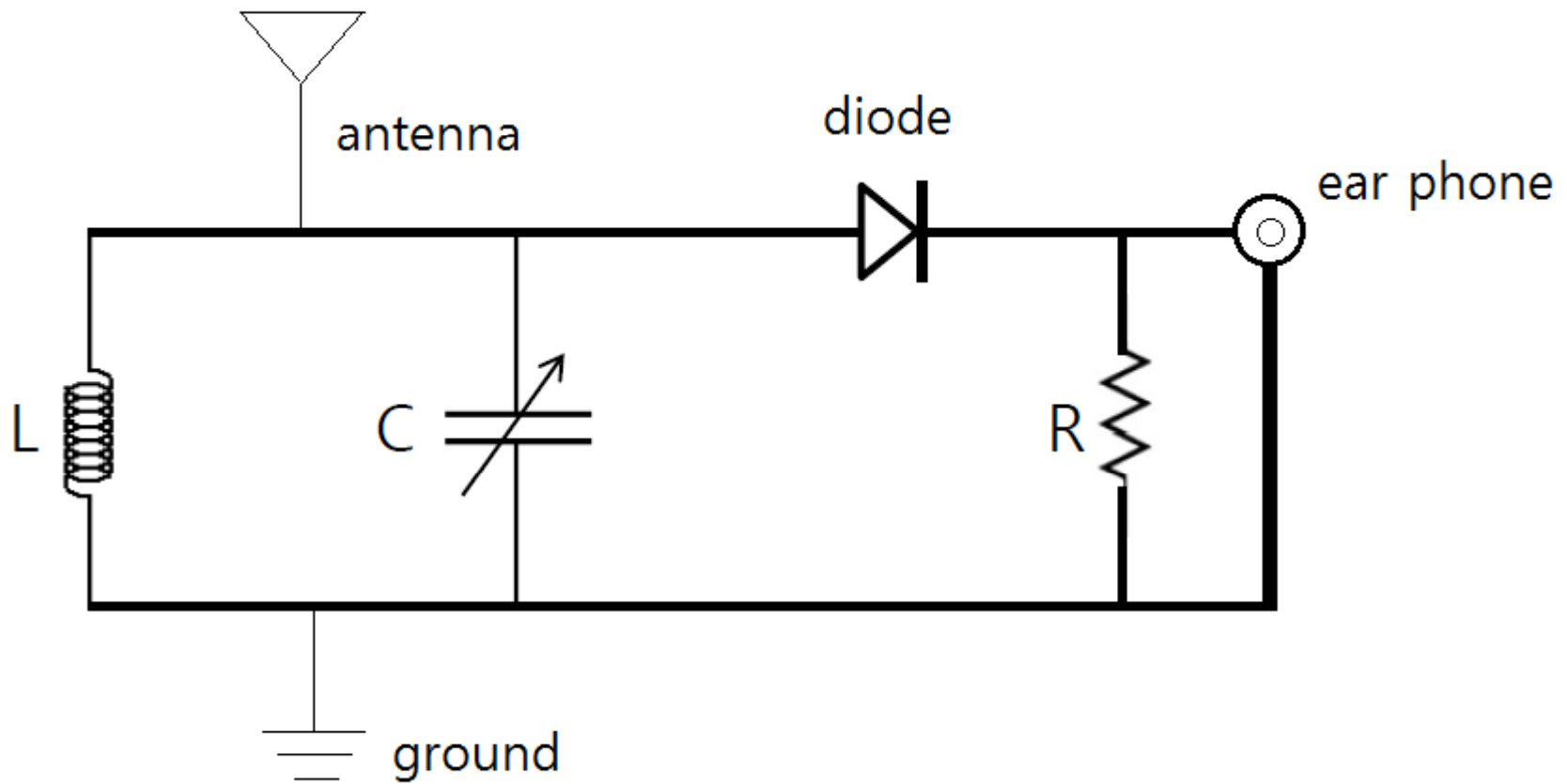




# Design - Box



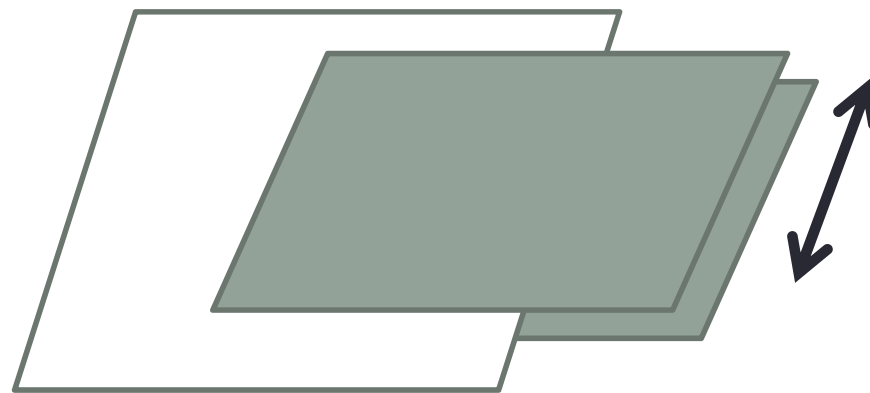
# Design - Circuit



# Device & Material

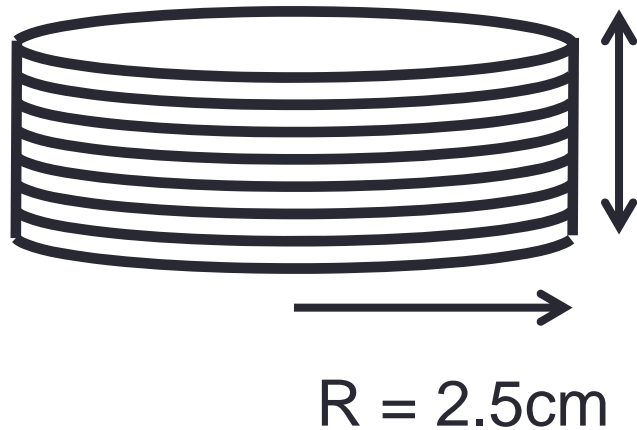


Inductor



Condenser

## Device & Material - Inductor

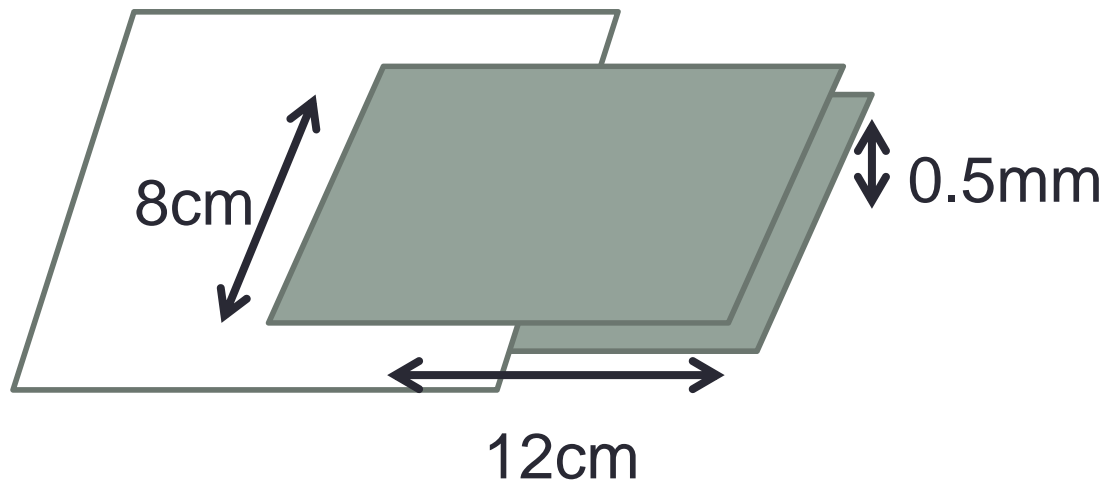


Coil it 20 times.

Then it is 4mm if the thickness of wire is 0.2mm.

$$L = \frac{\mu_0 N^2 A}{l} = \frac{(4\pi \cdot 10^{-7}) \cdot (20)^2 \cdot (0.025)^2 \cdot \pi}{4 \cdot 10^{-3}}$$
$$= 2.4674 \cdot 10^{-4} H$$

## Device & Material - Conductor



$$C = \epsilon_0 \frac{A}{d} = \frac{(8.85 \cdot 10^{-12}) \cdot A}{0.5 \cdot 10^{-3}} = 0.8377 \cdot 10^{-10} F$$

$$\therefore A = 0.0047 m^2 = 47 cm^2$$

## Device & Material

$$f = \frac{1}{2\pi \sqrt{LC}} = 1107 \cdot 10^3 \text{ Hz}$$

$$\therefore LC = 2.067 \cdot 10^{-14}$$



$$\therefore A = 0.0096 \text{ m}^2$$

$$LC = 4.193 \cdot 10^{-14}$$

$$f = 7772 \cdot 10^2$$

# Time Table ( Experiment plan )

- 2011. 10. 05. Submit experiment protocol and presentation
- 2011. 10. 10. Plan experiment process in detail
- 2011. 10. 12. Design, Build, Performance, and Analysis
- 2011. 10. 31. Discussion and study about result
- 2011. 11. 02. Submit interim report and DBPA
- 2011. 11. 07. Discussion and study about final product
- 2011. 11. 09. Demonstrate product and presentation poster
- 2011. 11. 14. Discussion and study about final report
- 2011. 11. 16. Submit final report.

# Reference

- Wikipedia – LC Circuit, Band pass filter, Diode
- <http://edulab.postech.ac.kr>





THANK YOU!

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