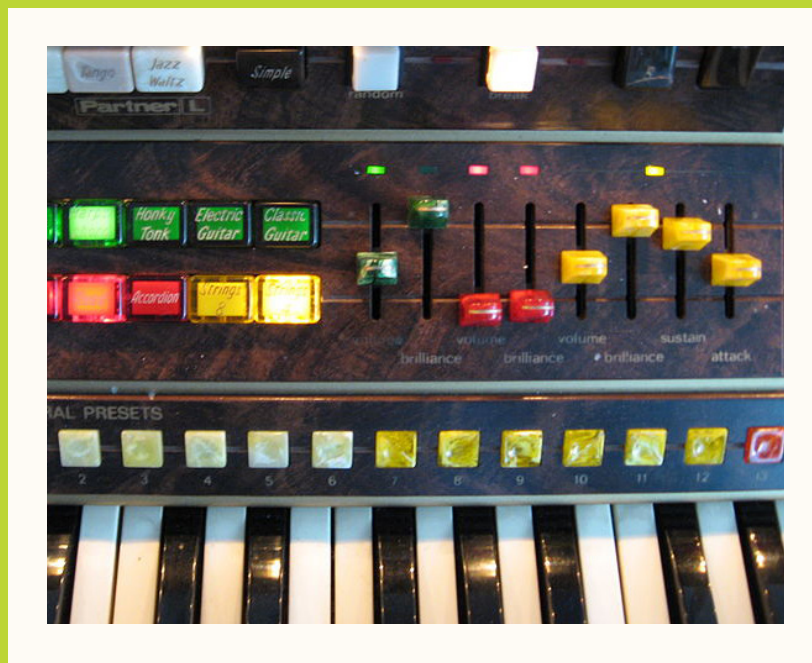


STEM *Sims*™

# Modular Synthesizer



# Modular Synthesizer

**Do you need an idea for a scientific study?  
Try out one of our ideas or make one of your own.**

**Start learning right now about how a sound synthesizer manipulates sound waves. Take the following brief quiz to see how much you already know about sound waves. See the bottom of page 4 to check your answers.**

1. Sound travels the fastest through which of the following materials?
  - a. air
  - b. water
  - c. steel
  - d. Sound travels the same speed through air, steel, and water.
2. About how far can sound waves emitted by certain whales travel through ocean water?
  - a. 8 km
  - b. 80 km
  - c. 800 km
  - d. 8,000 km
3. Which organism *cannot* hear sound?
  - a. dogs
  - b. bats
  - c. dolphins
  - d. flies
4. A flute player plays a 1040 hertz sound while a tuba player standing right next to the flute player plays a 65 hertz sound. Which sound does a person standing 50 feet away hear first?
  - a. the flute sound
  - b. the tuba sound
  - c. both flute and tuba sounds reach the person at the same time
5. What is the “fear of music” called?
  - a. soundophobia
  - b. melophobia
  - c. acophobia
  - d. musophobia



## Making a Water Xylophone

Making a musical instrument is easier than you think. In this activity, you'll take some very common household materials and create an instrument for making great sounds. Get ready to tap your way into the world of music.

### Materials

5 identical 20 oz glass jars

Metal spoon

Measuring cup

Water supply

Marker

### Procedure

1. Use the marker to label the jars 1 – 5.
2. Place the jars on a level surface with a small space between each of the five jars.
3. Use the measuring cup to fill each of the jars with water according to Table 1 below.



Table 1.

Jar #	Amount of Water Added (in ounces)
1	19
2	13
3	11
4	8
5	6

4. Using the metal spoon, lightly tap each jar to hear the note produced by that jar. Table 2 displays the musical note most likely played by each jar.

Table 2.

Jar #	Note Played
1	F
2	G
3	A
4	C
5	D

5. Use your water xylophone to make some music. Remember to always tap the jars gently with the spoon so the glass jars are not broken or chipped.

# Modular Synthesizer

## In the “Moog” for Music

Although a number of earlier synthesizers were developed by others, the R.A. Moog Company is generally credited with marketing the first commercial modular synthesizer. Their device developed in 1963 led to the development of synthesizers with prices low enough for many musicians to purchase and incorporate into their instrumentation. The widespread use of synthesizers led to the electronic music wave that reached listeners during the 1970's and 1980's. Many artists today still make use of modular synthesizers to achieve their distinct style and sound.

A modular synthesizer consists of multiple modules coupled together with patch cords. The modules are not hardwired together so users can quickly connect and disconnect components for a desired function. Each module's function is determined by how it is used and is not necessarily limited to the built-in components. For instance, a single module might output directly to speaker for one function, then be disconnected from the speaker, connected to the input of another module and serve an entirely different function.

Modular synthesizers have three common modules: 1) signal, 2) control, and 3) logic and timing. The output of each of these modules is in the form of an electrical voltage. The modules' outputs are manipulated to produce sounds with a variety of waveforms, loudness, and various other qualities. These voltage outputs result in many pleasing, strange, funky, and just plain weird sounds that musicians incorporate into their songs.



Photo credit: Maximilian Schönherr, 2011

Please visit our site for more helpful information:  
**[STEMsims.com](http://STEMsims.com)**

Answers: 1) c, 2) c, 3) d, 4) c, 5) b. Page 2 Answers:

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