CS 3413
Assignment 4

Due Date: February 3rd, 2020 at 12:30 pm

ASSIGNMENT IS TO BE COMPLETED INDIVIDUALLY BY ALL STUDENTS!

Your solution is to be written in C and submitted via D2L.

There are three kinds of threads: oxygen, hydrogen and bond. Oxygen and hydrogen threads produce oxygen and hydrogen respectively that needs to be assembled to create water molecules. Once two hydrogen and one oxygen element are available, the bond thread consumes two hydrogen elements and one oxygen element to produce a water molecule.

You do not want extra hydrogen or oxygen elements. Therefore, you must guarantee that the producing threads (hydrogen and oxygen) will wait to produce more elements until after the water molecule is created.

In other words:

- If an oxygen thread produces oxygen when no hydrogen is present, it has to wait for two hydrogen elements to be produced.
- If a hydrogen thread produces hydrogen (twice) when no oxygen is present, it has to wait for an oxygen element and another hydrogen element to be produced.

It takes a random amount of time, between 2 and 5 seconds, to create each hydrogen or oxygen element.

Write synchronization code for oxygen and hydrogen producers, as well as the bond consumer, that enforces these constraints. Note that:

- There is one hydrogen thread and one oxygen thread.
- There is a bond thread that consumes two hydrogen and one oxygen to produce water.

When an element is created you are to output what was produced. For example,

```
We have hydrogen.
We have oxygen.
```

When you have two hydrogen and one oxygen, they are consumed to form water. For example,

```
We now have water!
```

Your program will run for n seconds, where n is specified on the command line (ie. 100 seconds):

```
./a.out 100
```
