1)

semaphore a[3] = 0; /\* a[0] for water, a[1] for ice, a[2] for cup \*/

semaphore server = 1;

Server(void) { int i,j;

While(TRUE){  
i = random(3); /\* returns a random integer 0, 1 or 2 for i \*/ j = random(3); /\* returns a random integer 0, 1 or 2 for j \*/

if (i != j) { /\* i and j must be different \*/

Wait(server);

k = 3 - (i+j); //the drinker with the k-th ingredient is identified

Signal (drinkers)

} }//end of while

}//end of Server

k = 3 - (i+j); //the drinker with the k-th ingredient is identified Signal(client);

Drinker(int r) { /\* r indicates which ingredients this drinker has \*/ While(TRUE){

Wait(\_correctDrinker);

Drink( ); Signal(server);

}  
}//end of Drinker

2)

// The first two are semaphores are mutexes (only 0 or 1 possible)  
Semaphore dentistReady = 0  
Semaphore seatCountWriteAccess = 1 // if 1, the number of seats in the waiting room can be

// incremented or decremented  
Semaphore patientReady = 0 // the number of patients currently in the waiting room, ready to be

//served  
int numberOfFreeWRSeats = N // total number of seats in the waiting room

def Dentist():

while true: // Run in an infinite loop.  
wait(\_\_\_\_\_patientready\_\_\_\_\_\_\_) // Try to acquire a patient - if none is available, go to sleep. wait(\_\_\_\_\_\_seatCountWriteAccess\_\_\_\_\_\_) // Awake - try to get access to modify # of available seats,

//otherwise sleep. numberOfFreeWRSeats += 1 // One waiting room chair becomes free.

signal(\_\_\_\_\_\_Dentist\_\_\_\_\_\_) // I am ready to consult.

signal(\_\_\_\_\_\_\_seatCountWriteAccess \_\_\_\_\_) // Don't need the lock on the chairs anymore. // (Talk to patient here.)

def Customer():

while true: // Run in an infinite loop to simulate multiple patients. wait(\_\_\_\_\_seatCountWriteAccess \_\_\_\_\_\_\_) // Try to get access to the waiting room chairs. if numberOfFreeWRSeats > 0: // If there are any free seats:

numberOfFreeWRSeats -= 1 // sit down in a chair

signal(\_\_\_\_\_dentist\_\_\_\_\_\_) signal(\_\_\_\_\_seatCountWriteAccess \_\_\_\_\_\_\_) wait(\_\_\_\_\_\_\_Dentist\_\_\_\_\_)  
// (Consult dentist here.)

else:

// otherwise, there are no free seats; tough luck -- signal(\_\_\_\_\_\_\_seatCountWriteAccess \_\_\_\_\_) // but don't forget to release the lock on the seats! // (Leave without consulting the dentist.)