

## Basic Logic Gates

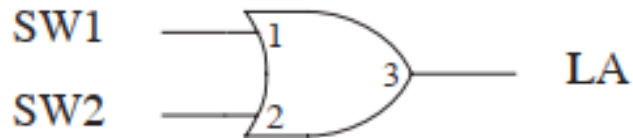
**Object:** To investigate the properties of the various types of logic gates, and construct some useful combinations of these gates.

**Parts:** NAND gate, NOR gate, inverter, AND gate, OR gate and XOR gate

### 1. OR gate function ( $A + B$ )

Set the switches as indicated in the truth table of Figure 1 and record the light conditions (on = 1), (off = 0).

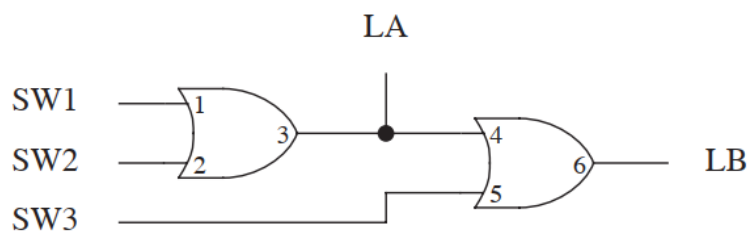
SW1	SW2	LA
0	0	0
0	1	1
1	0	1
1	1	1



### 2. Two-level 3-input OR gate

SW1	SW2	SW3	LA	LB
0	0	0	0	0
0	0	1	0	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

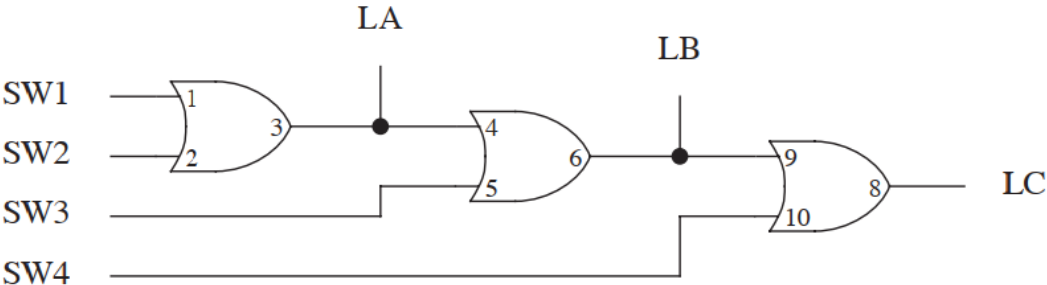
Make the connections as shown in the figure below. Set the switches as shown in the truth table of the figure and record the light conditions.



### 3.Three-level 4-input OR gate

SW1	SW2	SW3	SW4	LA	LB	LC
0	0	0	0			
0	0	0	1			
0	0	1	0			
0	0	1	1			
0	1	0	0			
0	1	0	1			
0	1	1	0			
0	1	1	1			
1	0	0	0			
1	0	0	1			
1	0	1	0			
1	0	1	1			
1	1	0	0			
1	1	0	1			
1	1	1	0			
1	1	1	1			

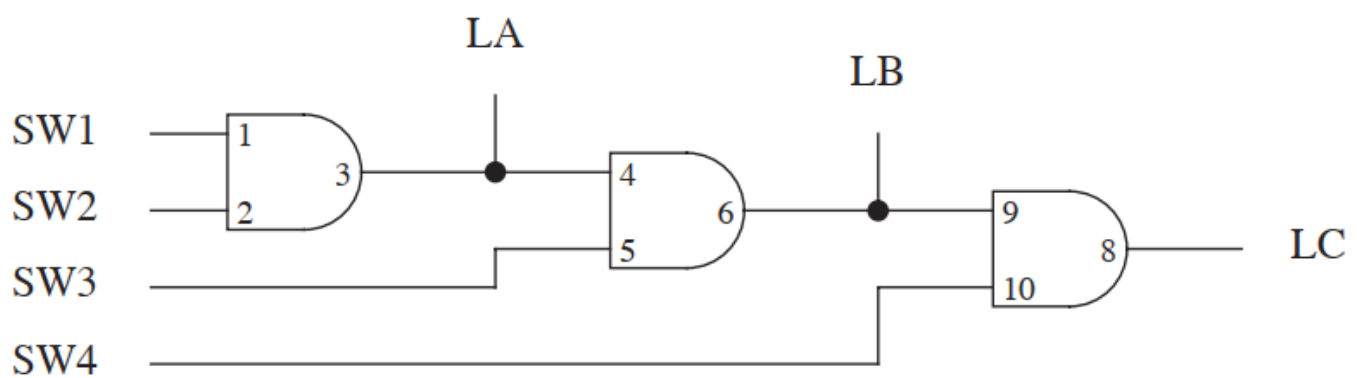
Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.



#### 4.AND gate function (AB)

Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.

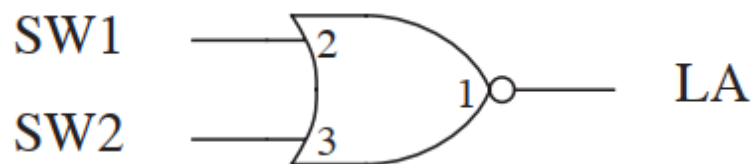
SW1	SW2	SW3	SW4	LA	LB	LC
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	1
0	0	1	1	0	1	1
0	1	0	0	1	1	1
0	1	0	1	1	1	1
0	1	1	0	1	1	1
0	1	1	1	1	1	1
1	0	0	0	1	1	1
1	0	0	1	1	1	1
1	0	1	0	1	1	1
1	0	1	1	1	1	1
1	1	0	0	1	1	1
1	1	0	1	1	1	1
1	1	1	0	1	1	1
1	1	1	1	1	1	1



### 5. NOR gate function ( $A + B$ )!

Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.

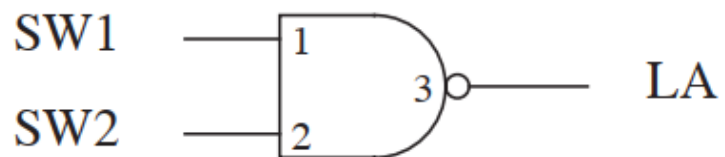
SW1	SW2	LA
0	0	1
0	1	0
1	0	0
1	1	0



### 6.NAND gate function (AB)!

Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.

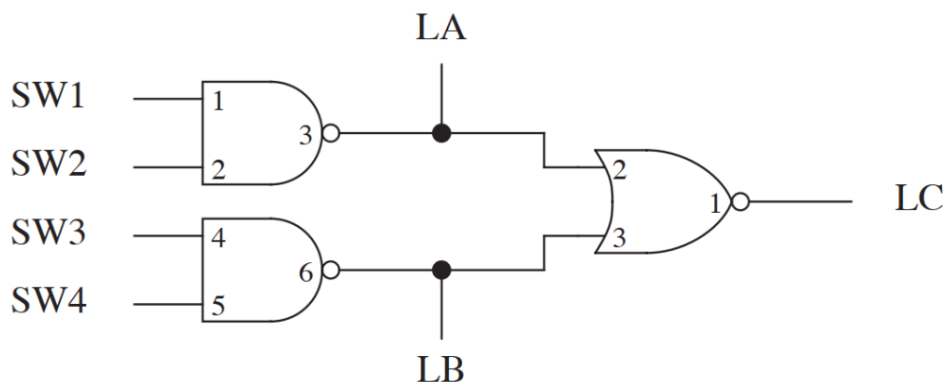
SW1	SW2	LA
0	0	1
0	1	1
1	0	1
1	1	0



SW1	SW2	SW3	SW4	LA	LB	LC
0	0	0	0	1	1	0
0	0	0	1	1	1	0
0	0	1	0	1	1	0
0	0	1	1	1	0	0
0	1	0	0	1	1	0
0	1	0	1	1	1	0
0	1	1	0	1	1	0
0	1	1	1	1	0	0
1	0	0	0	1	1	0
1	0	0	1	1	1	0
1	0	1	0	1	1	0
1	0	1	1	1	0	0
1	1	0	0	0	1	0
1	1	0	1	0	1	0
1	1	1	0	0	1	0
1	1	1	1	0	0	1

### 7. The negated-input OR and the negated-input AND concept

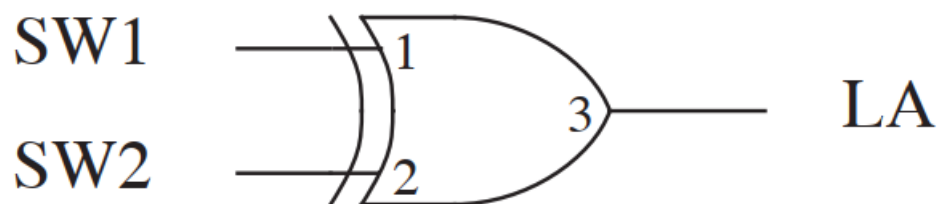
Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.



### 8. The XOR function

Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.

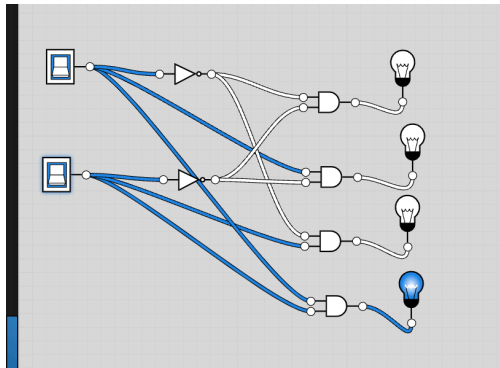
SW1	SW2	LA
0	0	0
0	1	1
1	0	1
1	1	0





### 9. A mystery circuit

Wire the circuit shown in the figure below. Set switches as indicated in the truth table of figure below and record the light conditions.



B SW2	A SW1	D0 LA	D1 LB	D2 LC	D3 LD
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

