Week 2 Review

Announcements & Reminders

1. Have you activated your ECF account for the labs? See our announcements on Portal.

2. Lab divisions have shifted!
   - Section L0101 - Wednesday Labs
     - BA3145: Aayani - Limam
     - BA3155: Lin - Zhu
   - Section L0201 - Monday Labs
     - BA3145: Abdin - Li (Cheuk Man)
     - BA3155: Li (Justin) - Zhou
   - Section L5101 - Tuesday Labs
     - BA3145: Afrashteh - Kajo
     - BA3155: Kang - Shek
     - BA3165: Shi - Zuo

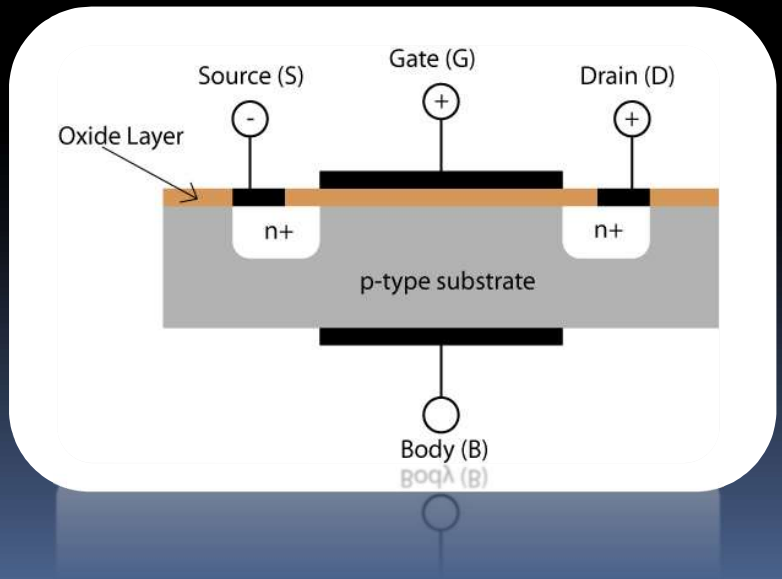
3. Have you done your Lab1 prelab? ☺
   - Check out the Breadboard Demo video; link posted under Course Materials -> Labs.

Textbook

- The bookstore is still ordering the textbook ☹
- For now, you may want to:
  - Check the book out first in the library (it's under course reserves).
  - Look for a used copy
- If you have a different edition:
  - You can find the table of contents of the 4th edition under Course Materials -> General Course Information.

Week 1 Review

- Properties of electricity
- Semiconductor materials
  - Doping (n-type and p-type)
- p-n junctions
- Transistors
  - MOSFETs



How CSC258 tutorials work

- Each week has three hours of classroom time.
  - Two hours of lectures,
  - One hour of tutorials.
- The tutorial is split into two halves:
  - The first half hour at the beginning, reviewing last week's material and potential exam questions.
  - The second half hour is later in the week, reviewing what you need to know for the upcoming lab.

Midterm Questions

- True or False? Doping gives a semiconductor an overall positive or negative charge. **False**
- What kind of bias on a pn junction causes the depletion layer to expand? **Reverse bias**
- Phosphorus has 5 electrons in its outer valence shell. When added in small amounts to silicon, the result is a _____ semiconductor. **Doped or N-Type**

Let's review

- Logic gates are built from

Let's review

- Logic gates are built from transistors.

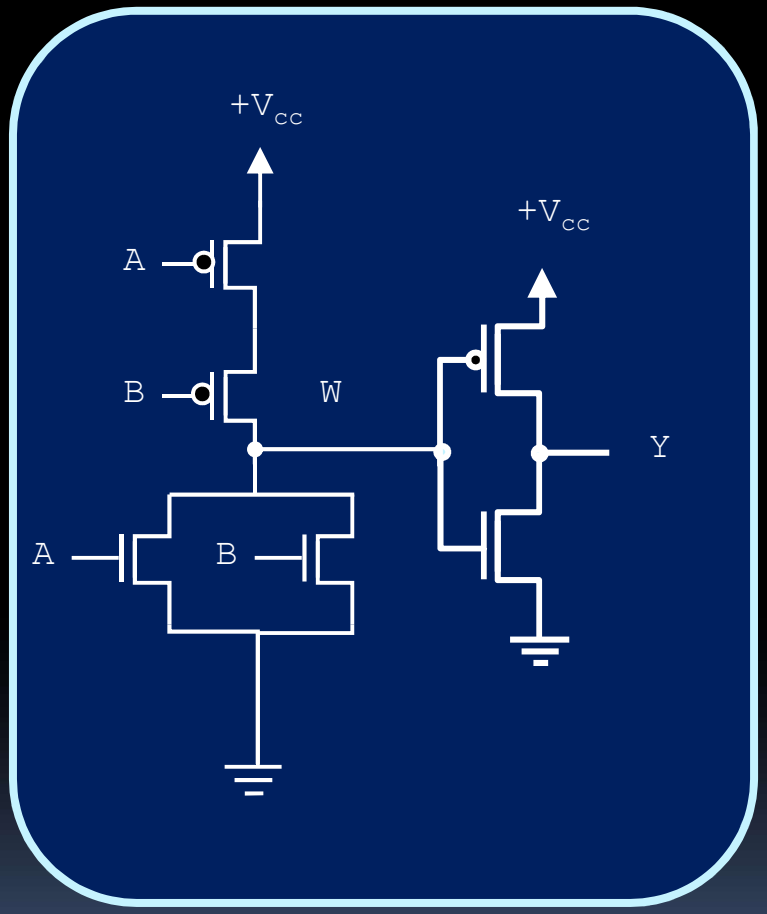
This transistor is called nMOS.

It conducts (i.e. acts as a closed switch) if we apply 5 Volts (logic 1) at its gate.

This transistor is called pMOS

It conducts (i.e. acts as a closed switch) if we apply 0 Volts (logic 0 , Ground) at its gate.

Which gate is this one?

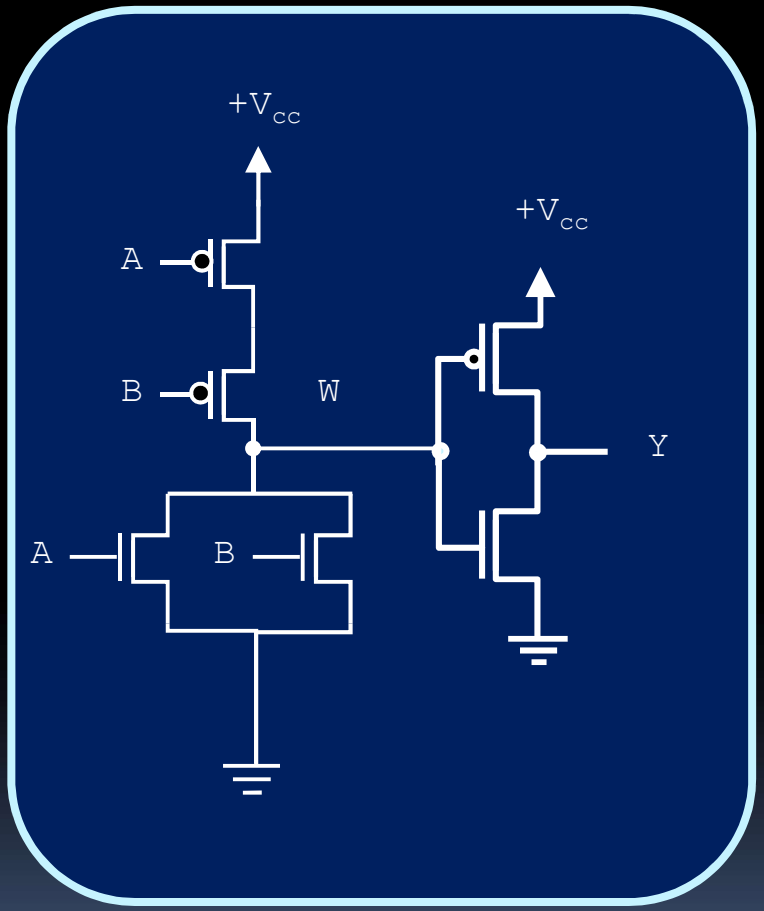


A	B	W	Y
0	0		
0	1		
1	0		
1	1		

W =

Y =

Which gate is this one?



A	B	W	Y
0	0	1	0
0	1	0	1
1	0	0	1
1	1	0	1

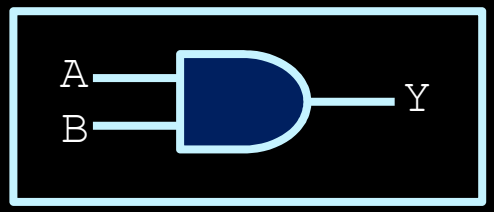
$$W = \overline{(A + B)}$$

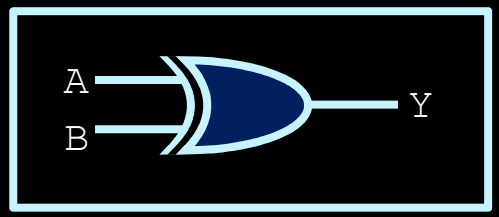
$$Y = (A + B)$$

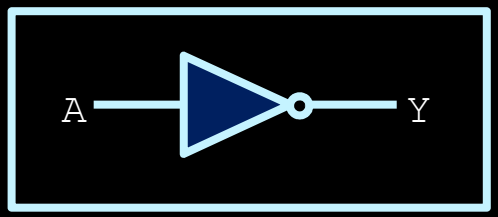
Basic Logic Gates: Symbols and Truth Tables

- What are the names and truth table values for the following gates?

How many transistors do you need to build a NOT gate?







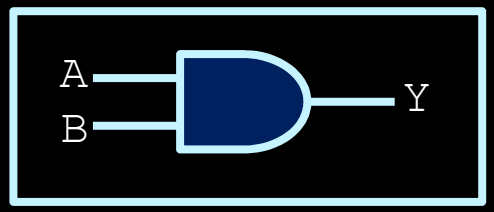
A	B	Y
0	0	
0	1	
1	0	
1	1	

A	B	Y
0	0	
0	1	
1	0	
1	1	

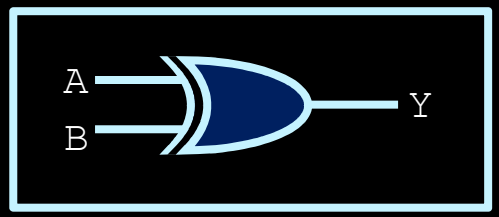
A	Y
0	
1	

Basic Logic Gates: Symbols and Truth Tables

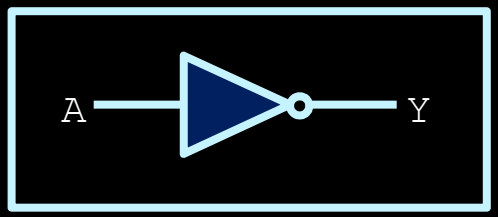
- What are the names and truth table values for the following gates?



A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



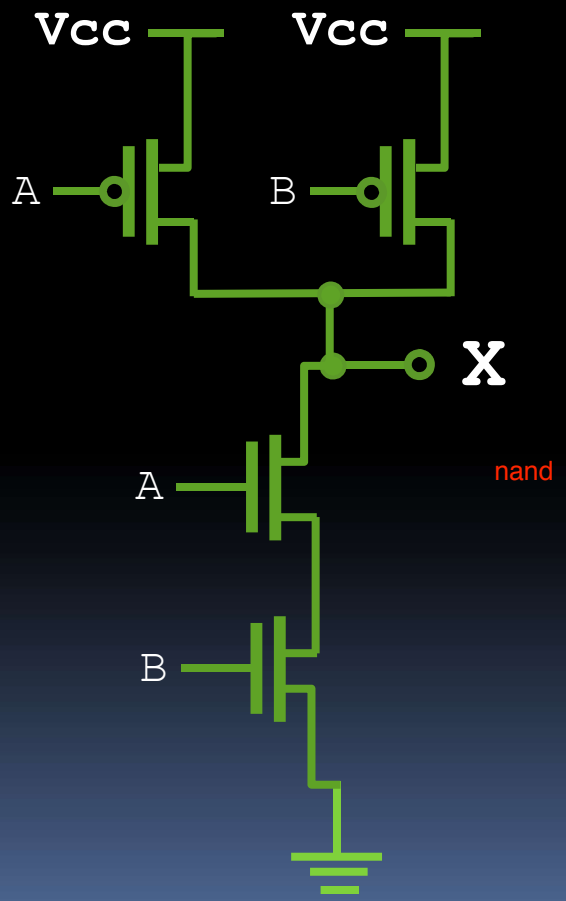
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0



A	Y
0	1
1	0

More Questions

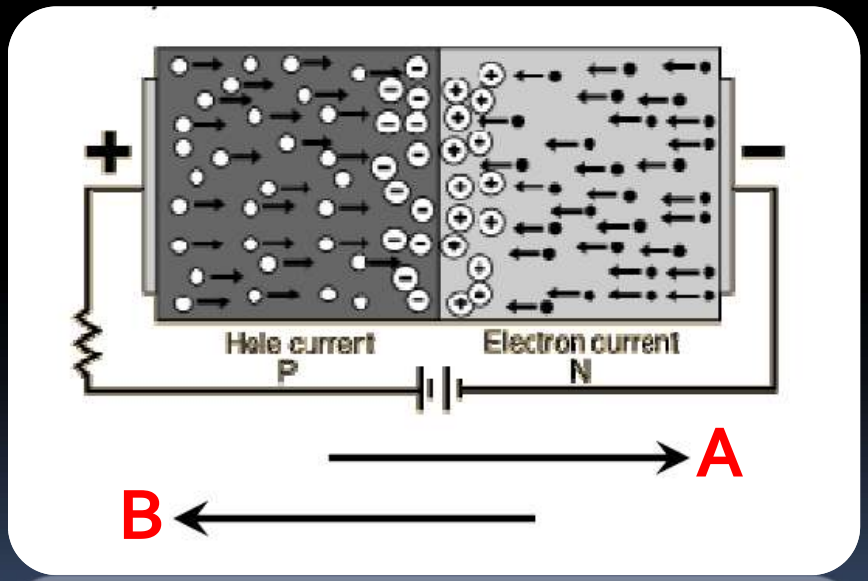
- What gate is created by the following?



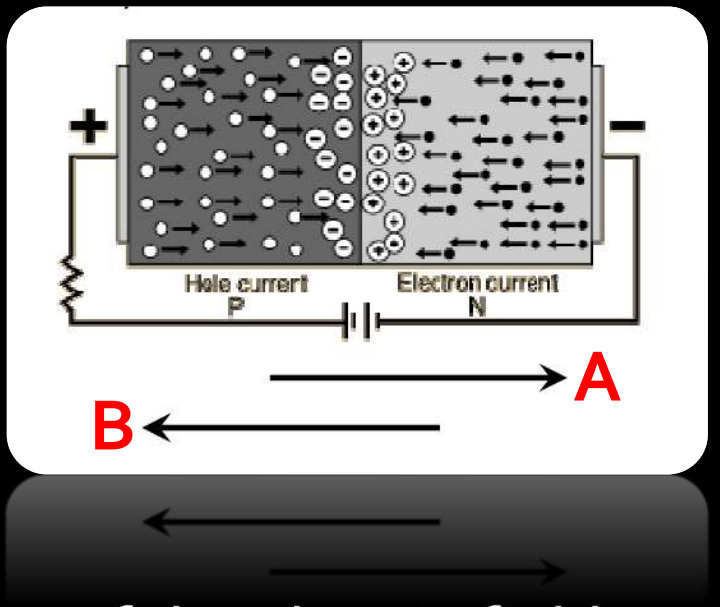
Remember: transistors that look like  are activated when the gate input is high, whereas transistors that look like  are activated when the gate input is low.

Kinds of current

- What is the name of currents A and B, and how are they produced?



Kinds of current



- Two things to note here:
  - Need to determine which electrons are moving from high concentration to low concentration (diffusion), and which are moving because of the electric field (drift).
  - Note: Current is measured in the opposite direction of electron flow (i.e. as *the flow of positive charge* through the material)
  - A → diffusion B → drift