



Week 1 Review

Reminders

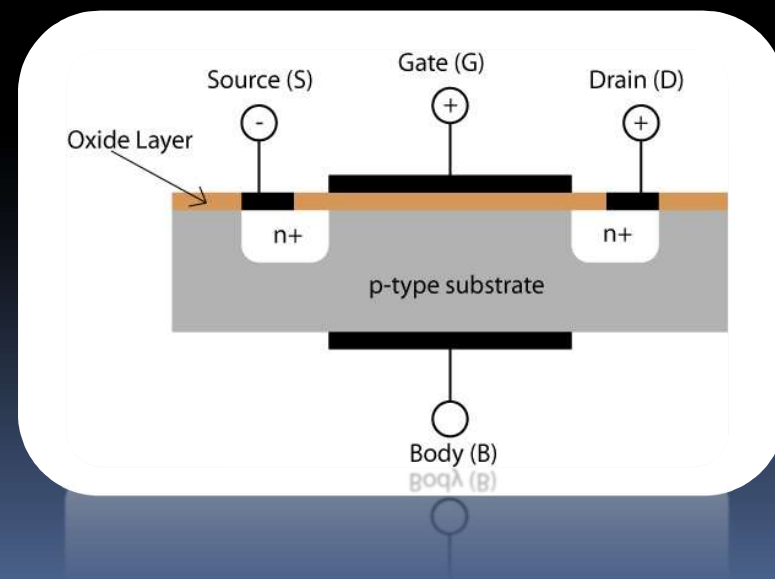
1. Have you activated your ECF account for the labs? See our announcements on Portal.
2. Here are the current lab assignments:
 - **Section L0101 - Wednesday Labs**
 - BA3145: Abady - Kanaan
 - BA3155: Kapadia - Tao
 - BA3165: Truong - Zou
 - **Section L5101 - Thursday Labs**
 - BA3145: Abboud-Seryani - Hu
 - BA3155: Hua - Rhee
 - BA3165: Saynorath - Zou
3. Have you done your Lab1 prelab? 😊
 - Check out the Breadboard Demo video; link posted under Course Materials -> Labs.

Textbook

- In case you don't want to purchase a full-price textbook but want access to it for reference:
 - 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

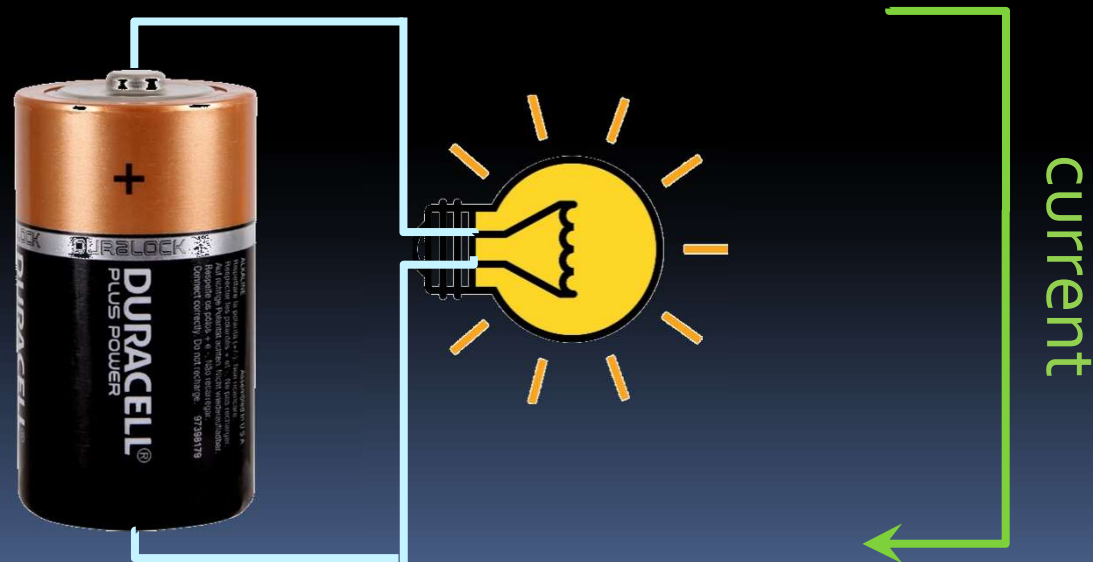
- Each week has three hours of classroom time.
 - Two hours of lectures,
 - One hour of tutorials.
- The tutorial is split into two halves:
 - The first half hour at the beginning, reviewing last week's material and potential exam questions.
 - The second half hour is later in the week, reviewing what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

Midterm Short Answer Q's

- 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**

Electricity review

- If electrons are traveling from the bottom of the battery to the top, which way is current said to be traveling?
 - Current is measured as the movement of **positive charges**.



Transistor 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.

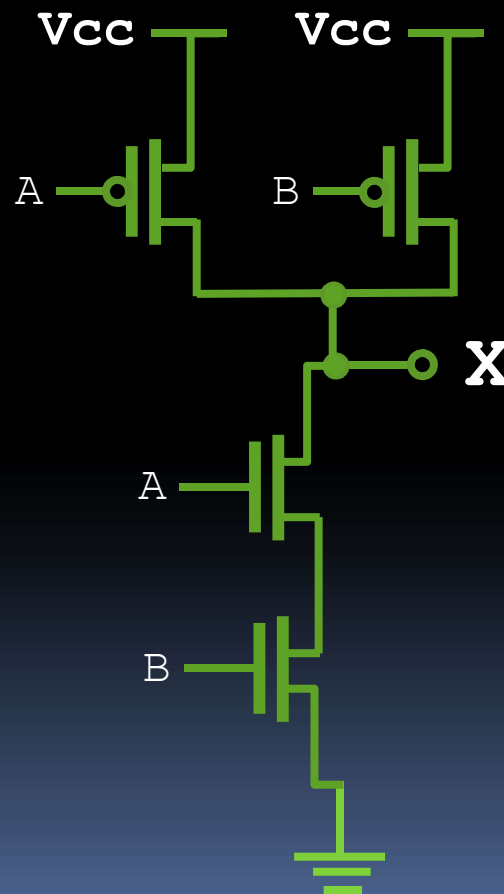


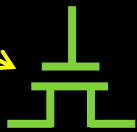
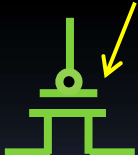
This transistor is called pMOS

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

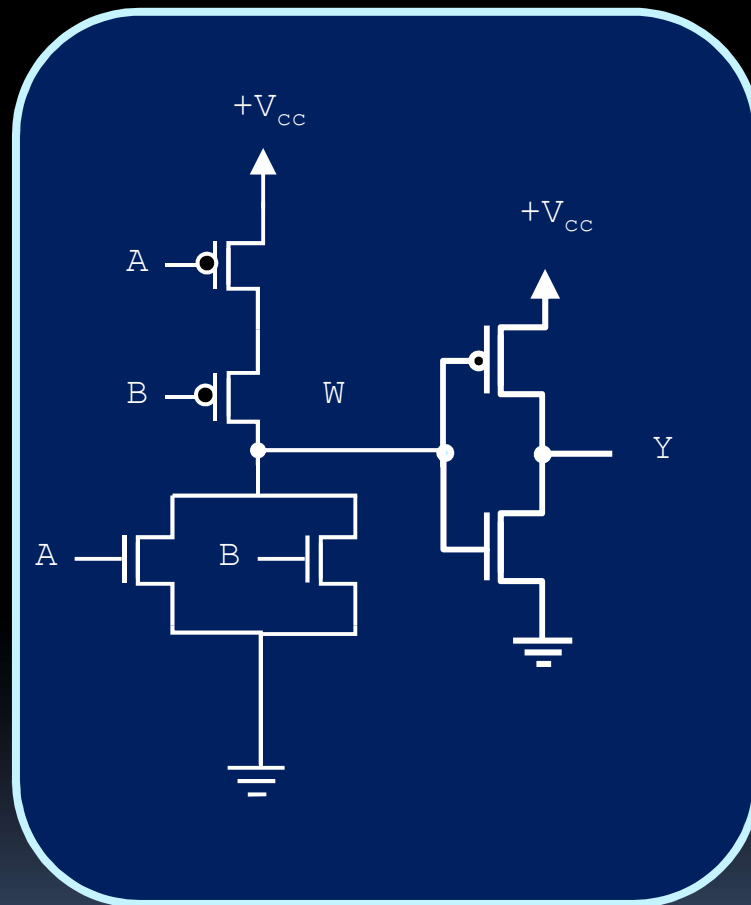
More Transistor Questions

- 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.

Which gate is this one?

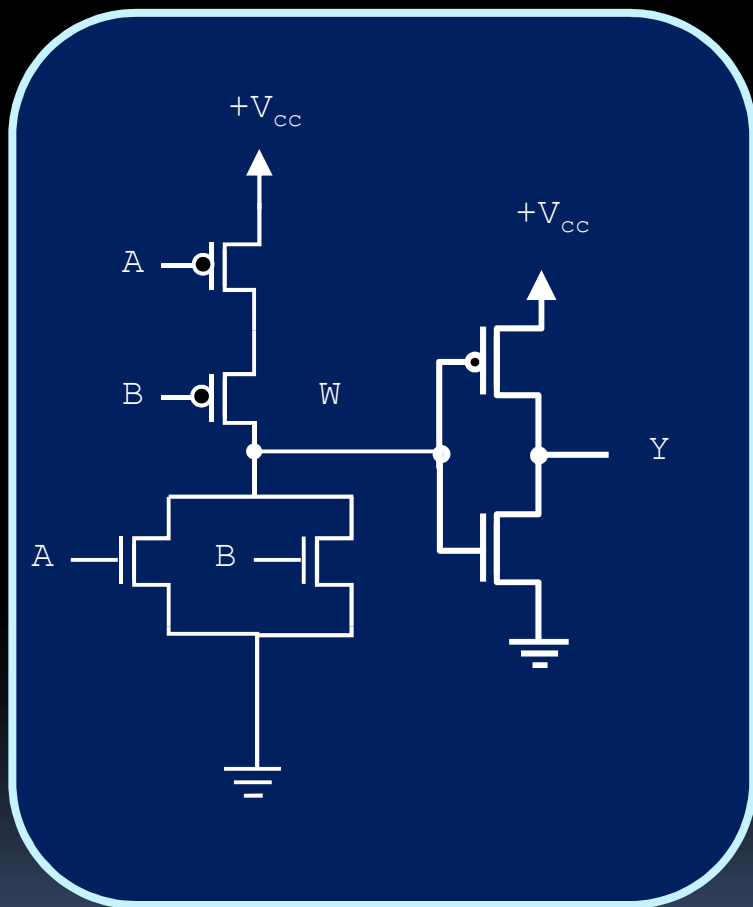


A	B	W	Y
0	0		
0	1		
1	0		
1	1		

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

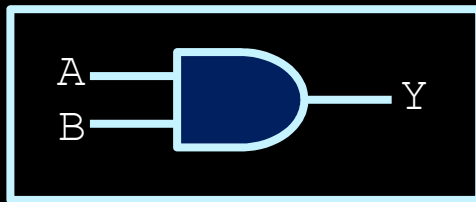
$$W = \overline{(A + B)}$$

$$Y = (A + B)$$

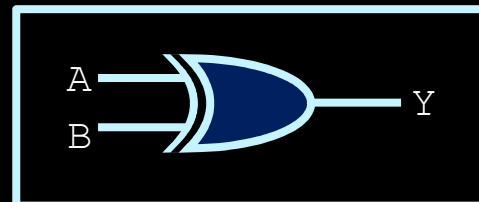
Basic Logic Gates: Symbols and Truth Tables

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

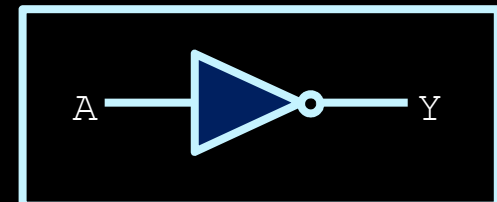
How many transistors do you need to build a NOT gate?



A	B	Y
0	0	
0	1	
1	0	
1	1	



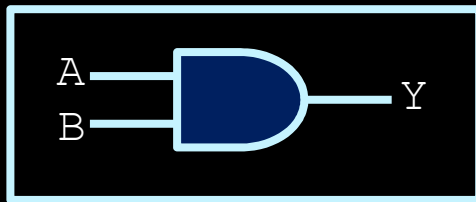
A	B	Y
0	0	
0	1	
1	0	
1	1	



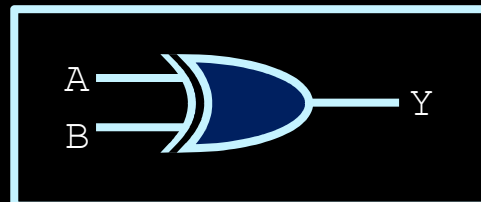
A	Y
0	
1	

Basic Logic Gates: Symbols and Truth Tables

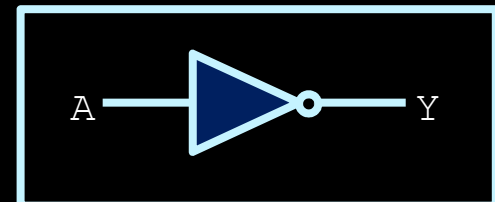
- What are the names and truth table values for the following gates?



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



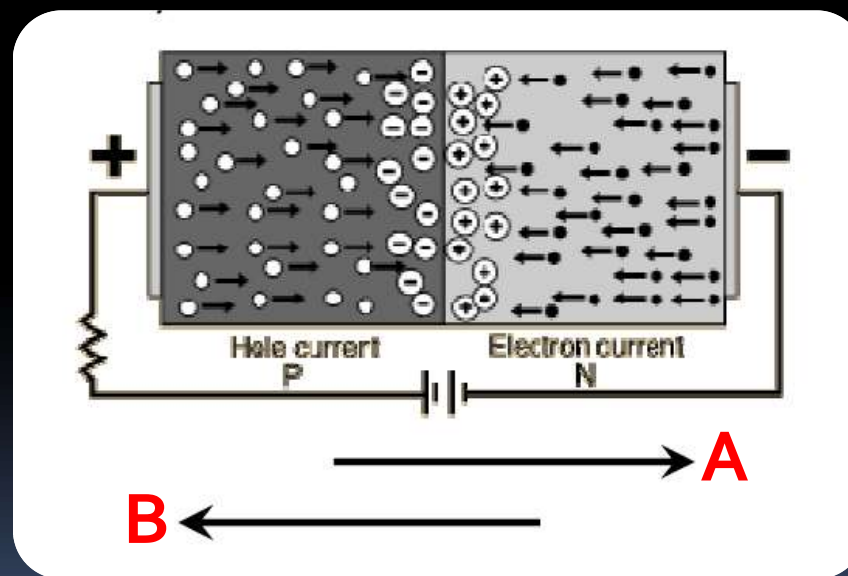
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0



A	Y
0	1
1	0

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**).
 - Remember: 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

