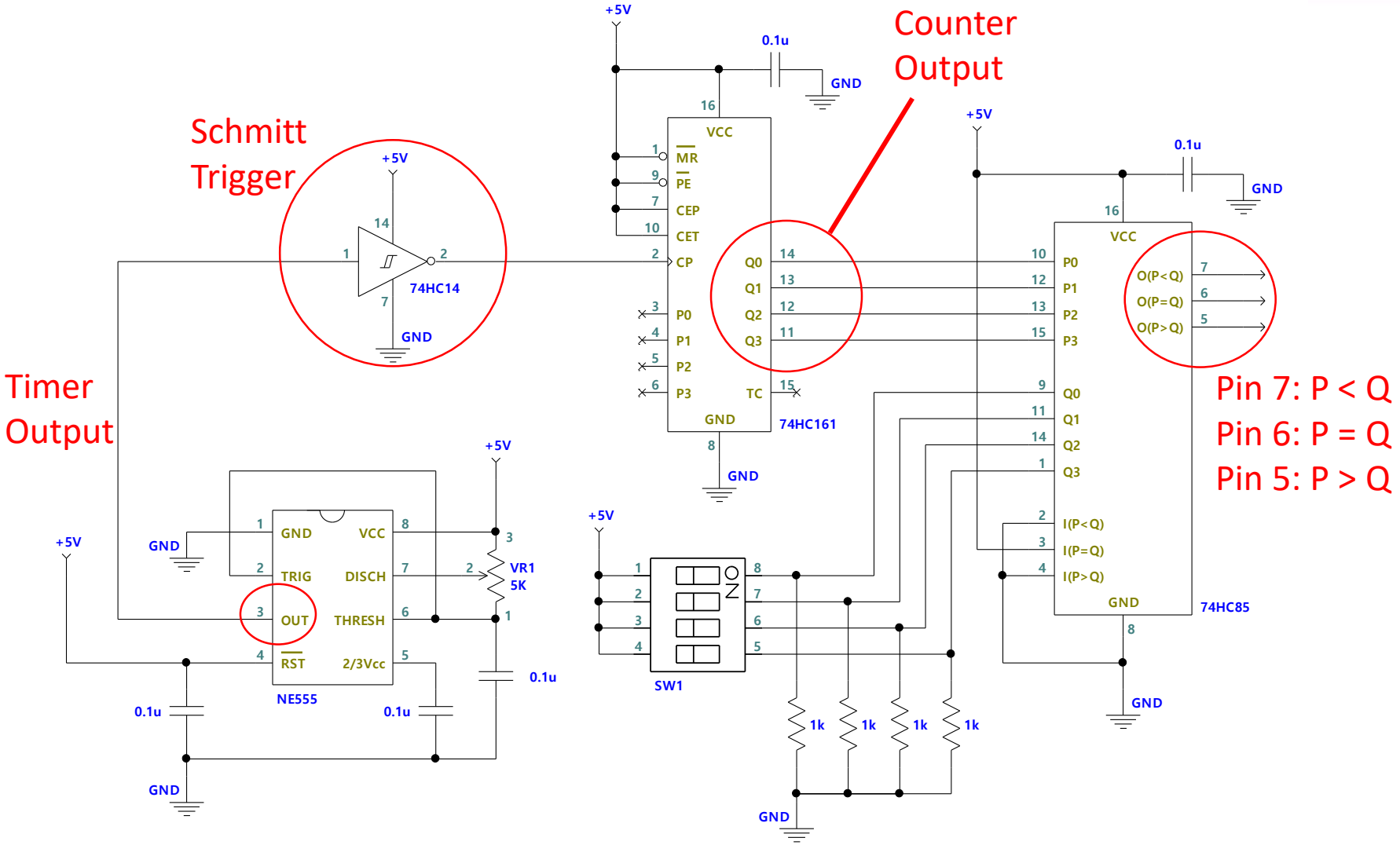
ELEC1100 - Tutorial 4

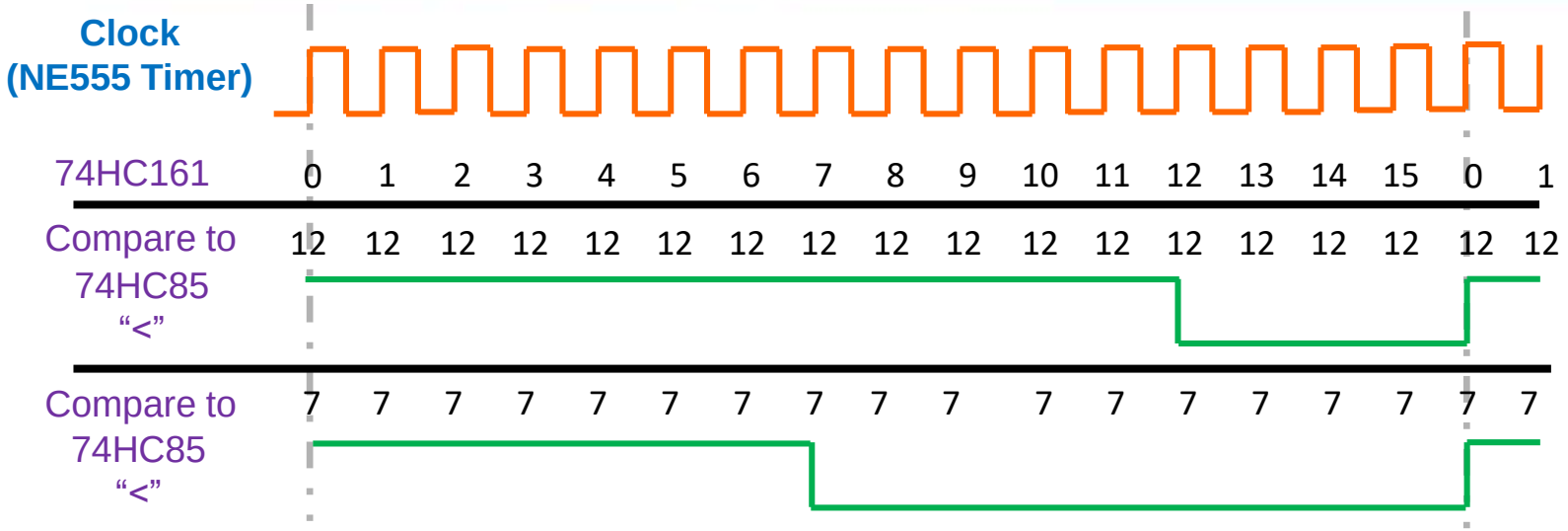
Transistor & H-bridge

Introduction to Lab#04

Review: PWM Control



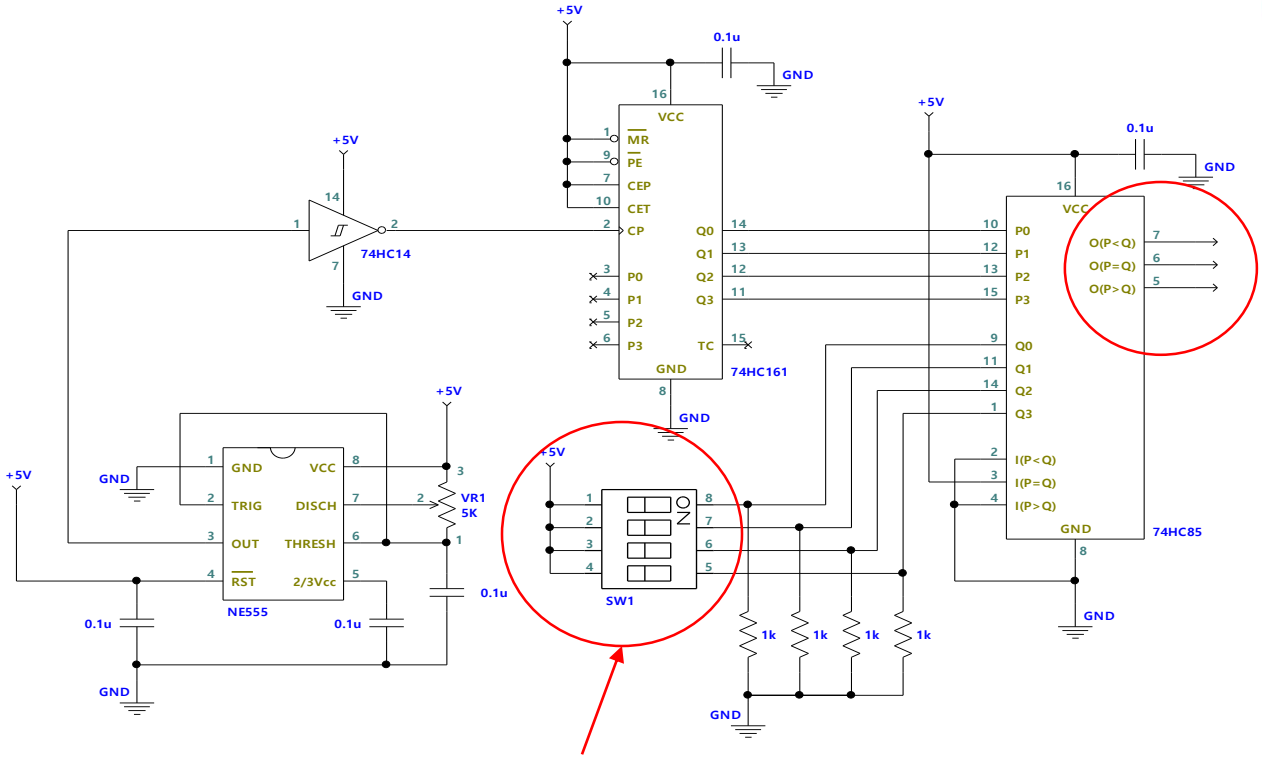
Between NE555 & 74HC85



	NE555 Timer (clock)	74HC85 Comparator (PWM at pin 7 "<")
Frequency	$f_{555} = \frac{1}{T} = \frac{1}{0.7(R_A + 2R_B)C_1}$	$f_{85} = \frac{f_{555}}{16}$
Duty Cycle	$\frac{R_A + R_B}{R_A + 2R_B}$	$\frac{Q}{16}$

***Q is the manual input to 74HC85*

74HC85 Outputs



Pin 7: P < Q

Pin 6: P = Q

Pin 5: P > Q

0101 = 5

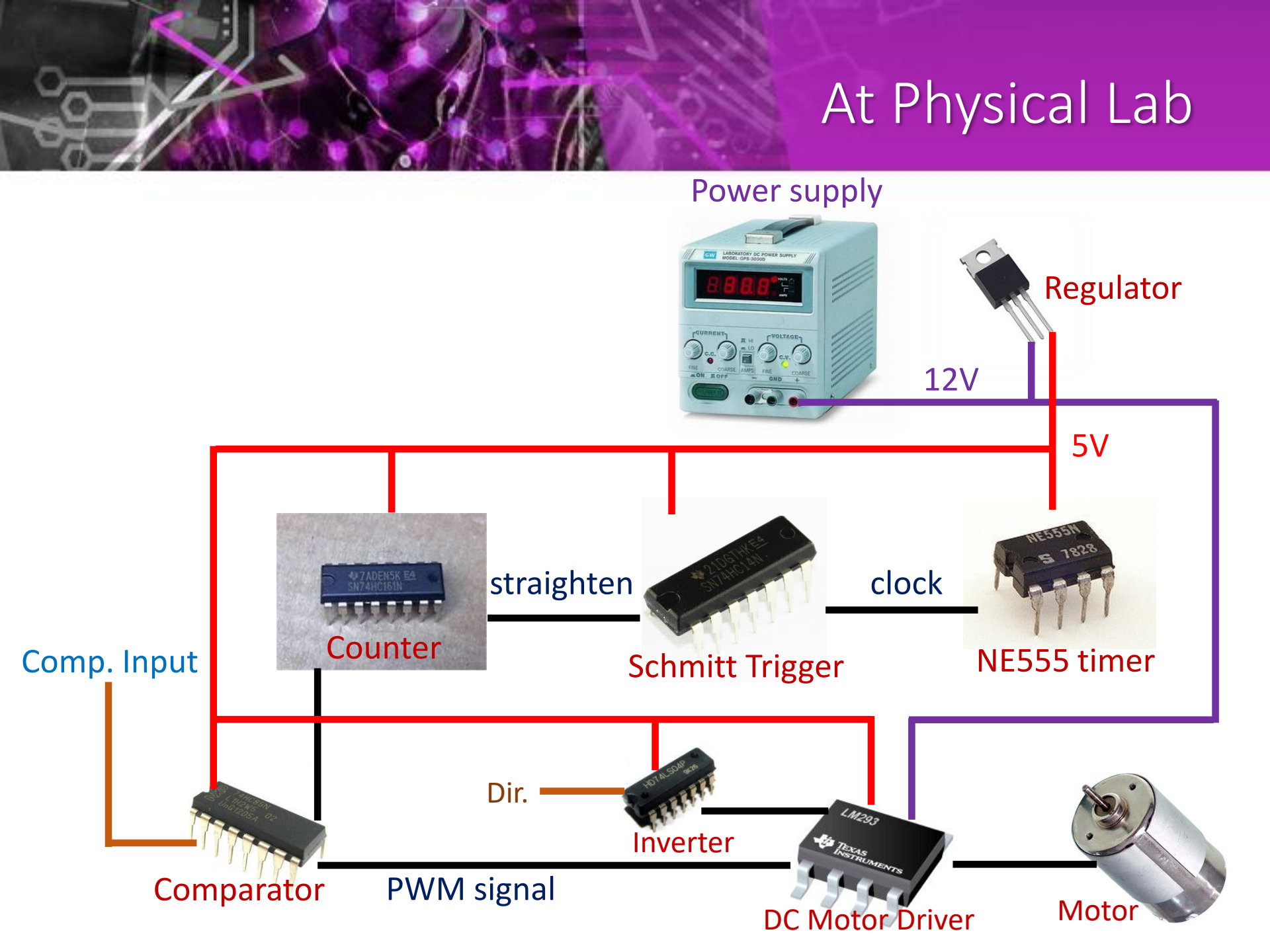
Pin 7: 5/16

Pin 6: 1/16

Pin 5: (16-5-1)/16

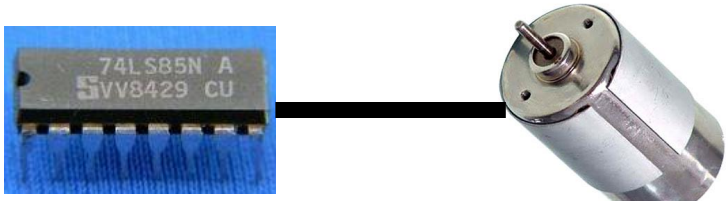
Given that Q (Q3Q2Q1Q0)=0101, what is the duty cycle value at Pin 7/6/5 of the 74HC85 comparator?

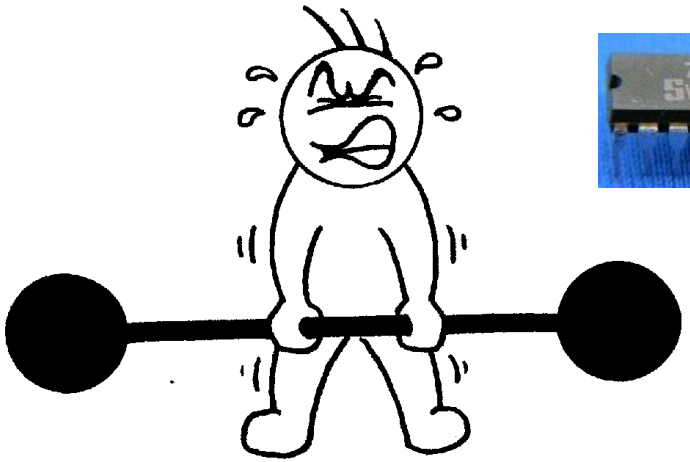
At Physical Lab



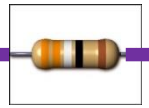
Use of BJT

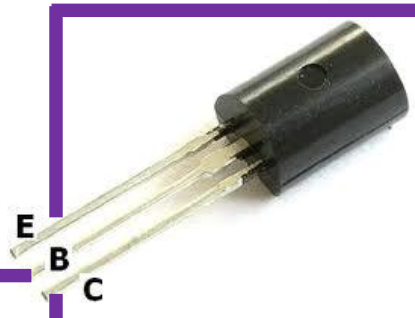
- However, if you use the PWM signal on a motor, it will/may/will not work. WHY?





PWM

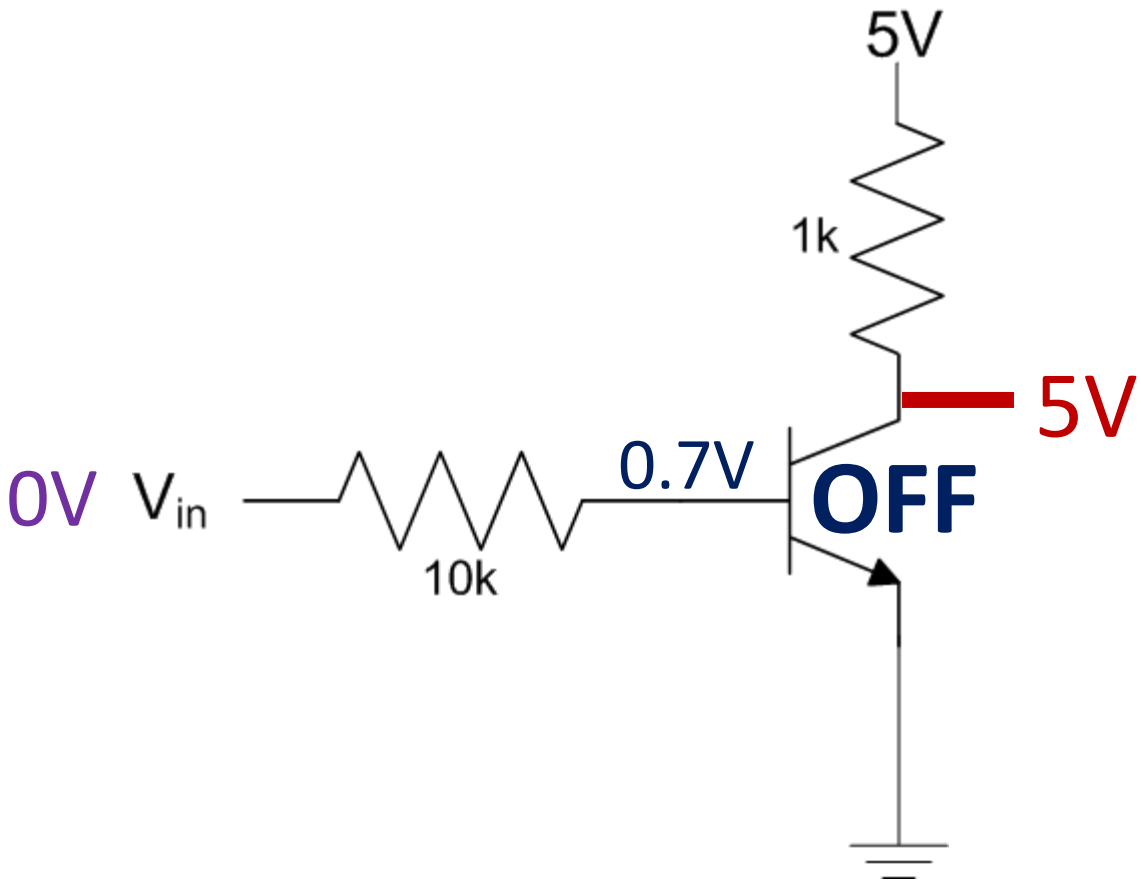


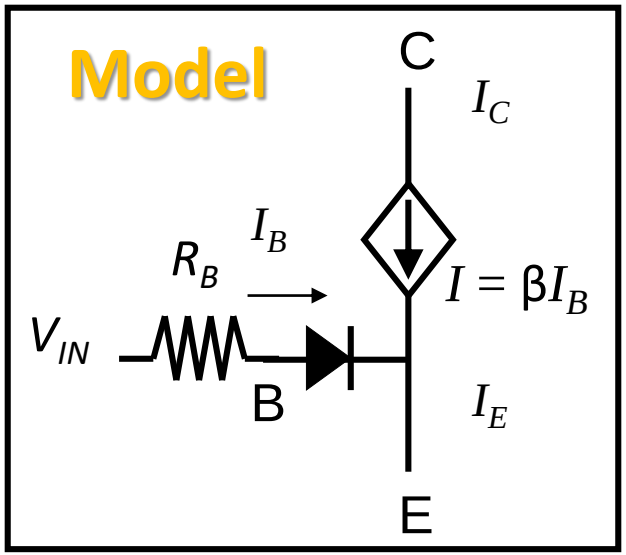


Transistor analysis

❖**Consider this circuit:**

Turn on voltage V_{be} = 0.7 Current Gain β=100





Transistor analysis

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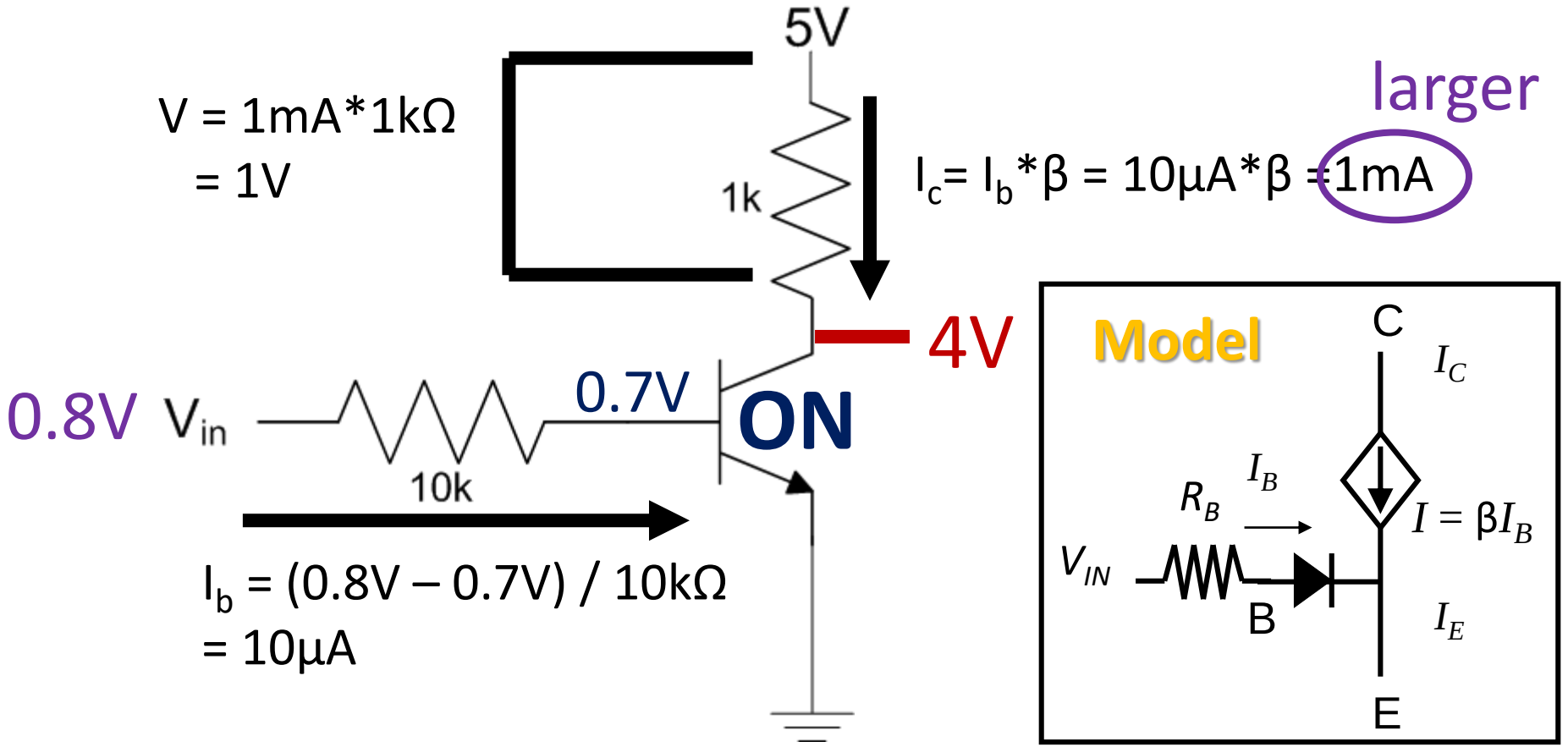
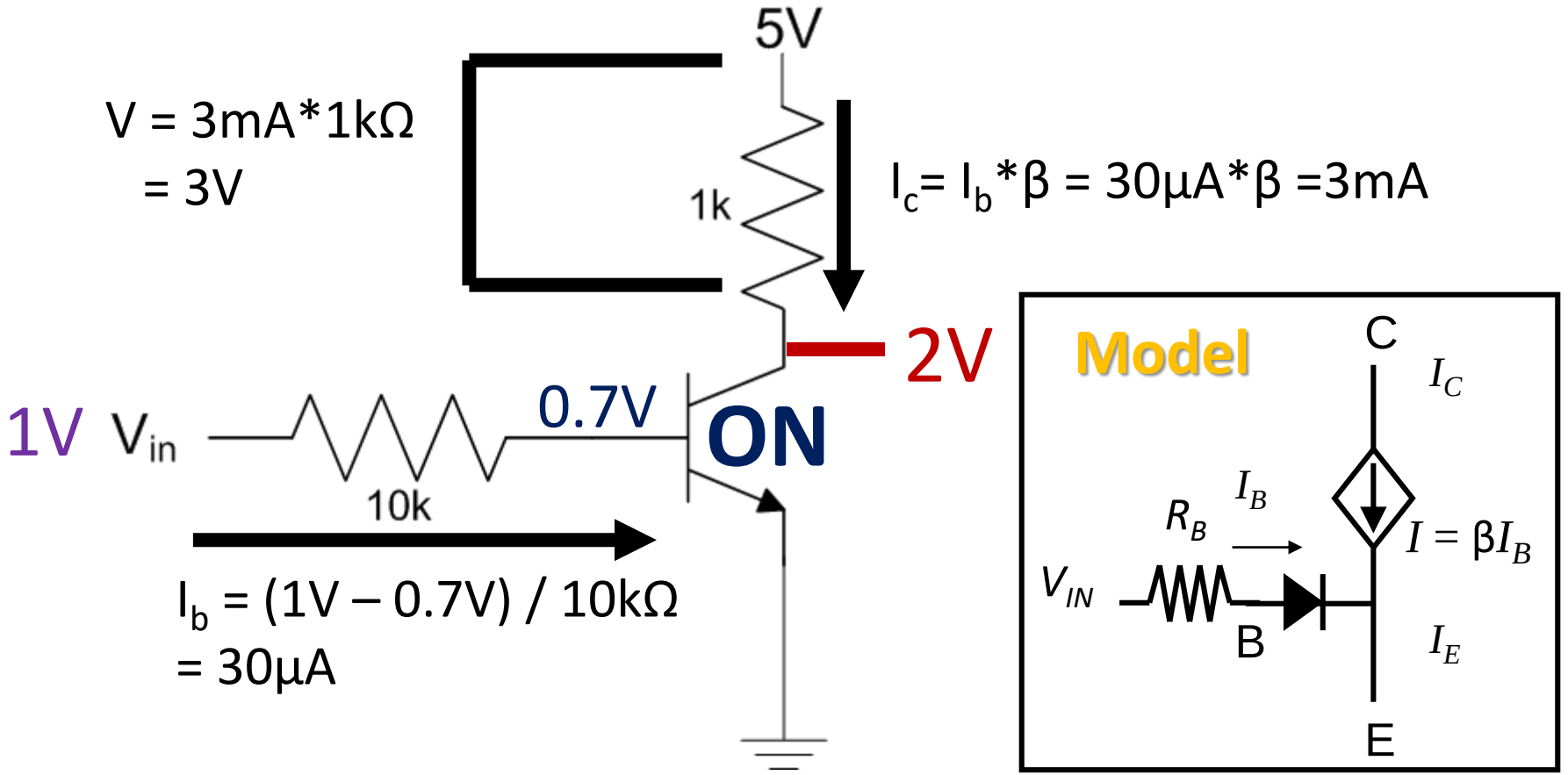


Transistor analysis

❖**How about if Vin = 1V?**

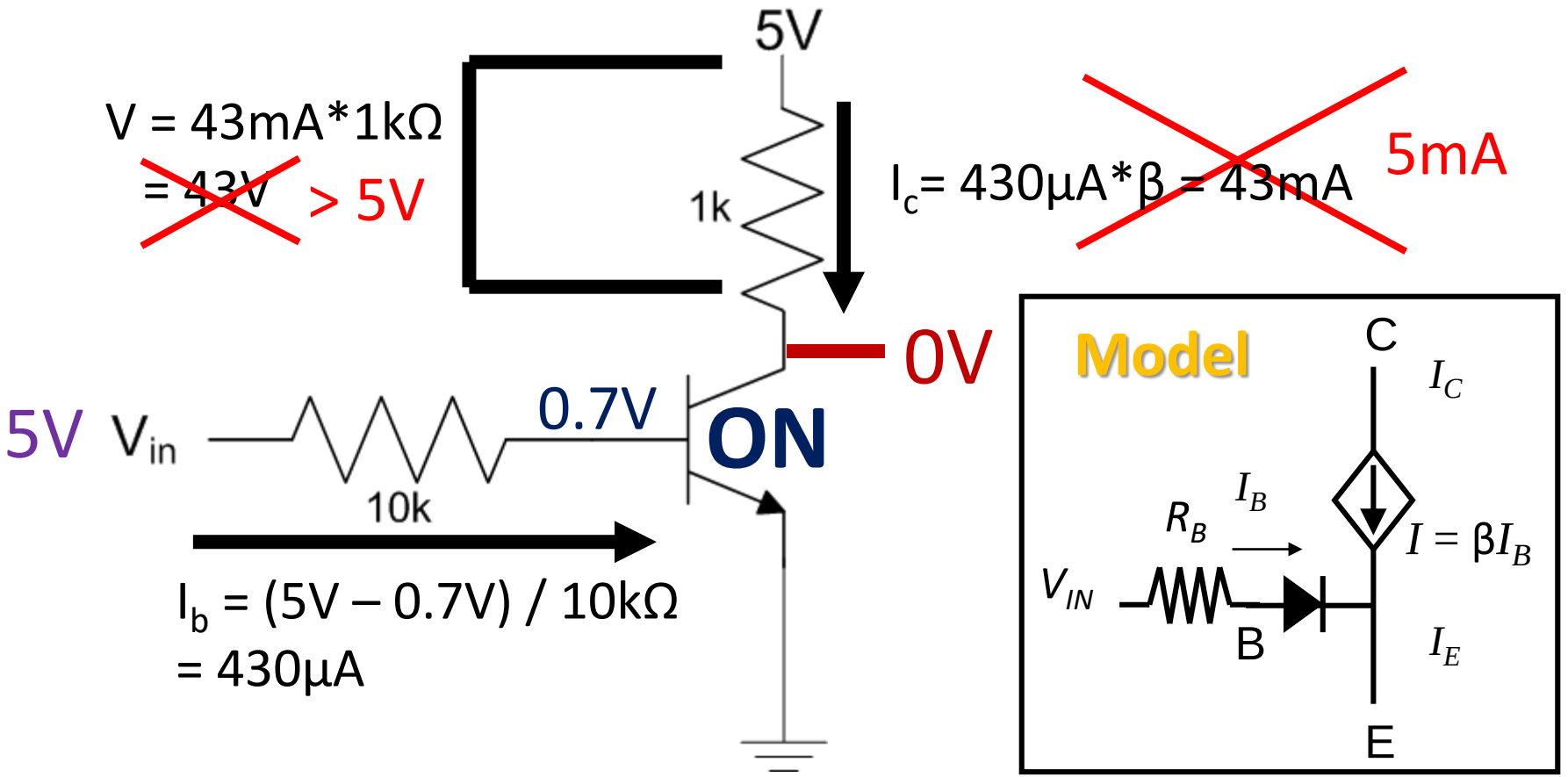
Turn on voltage V_{be} = 0.7 Current Gain β=100



Transistor analysis

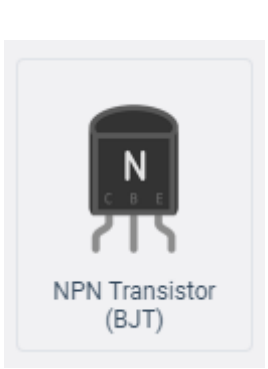
❖**How about if Vin = 5V?**

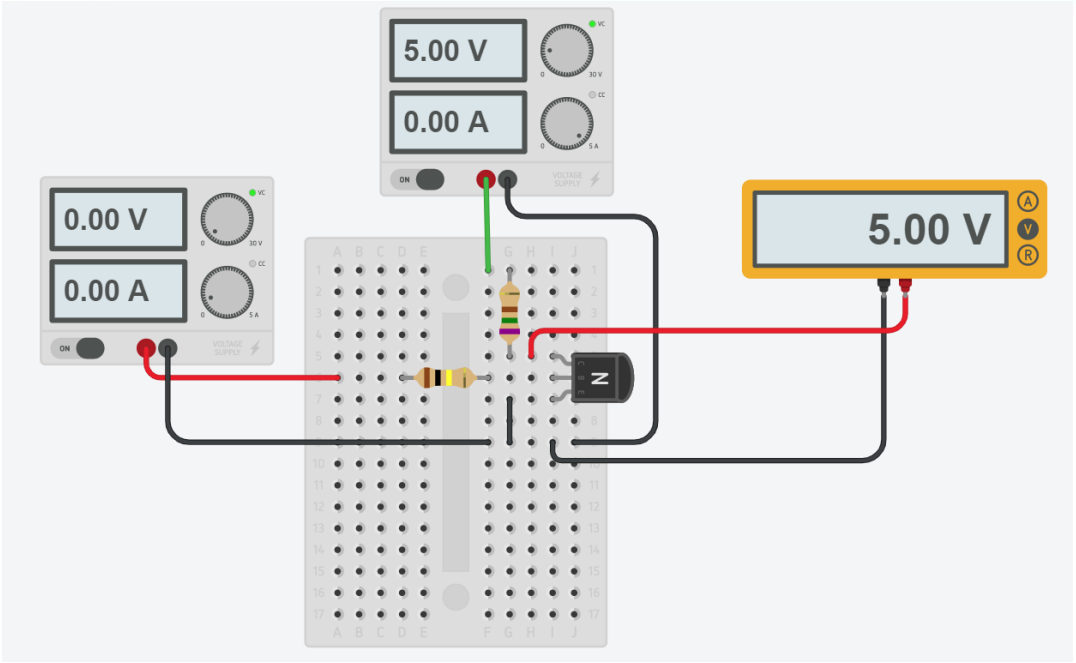
Turn on voltage V_{be} = 0.7 Current Gain β=100

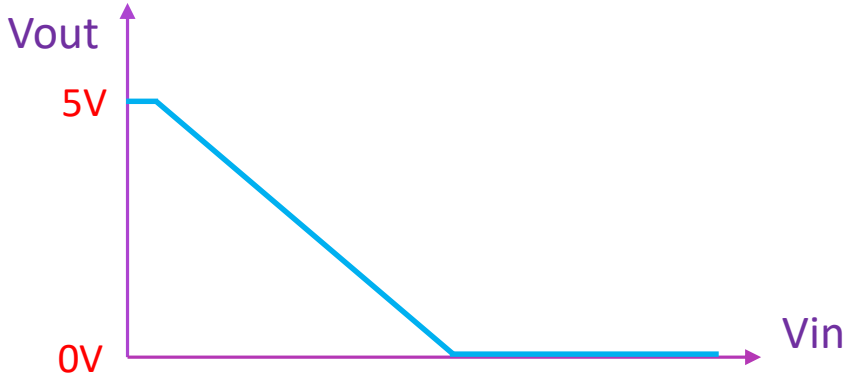


Breadboard Time!

Lab#04: Simulation 1

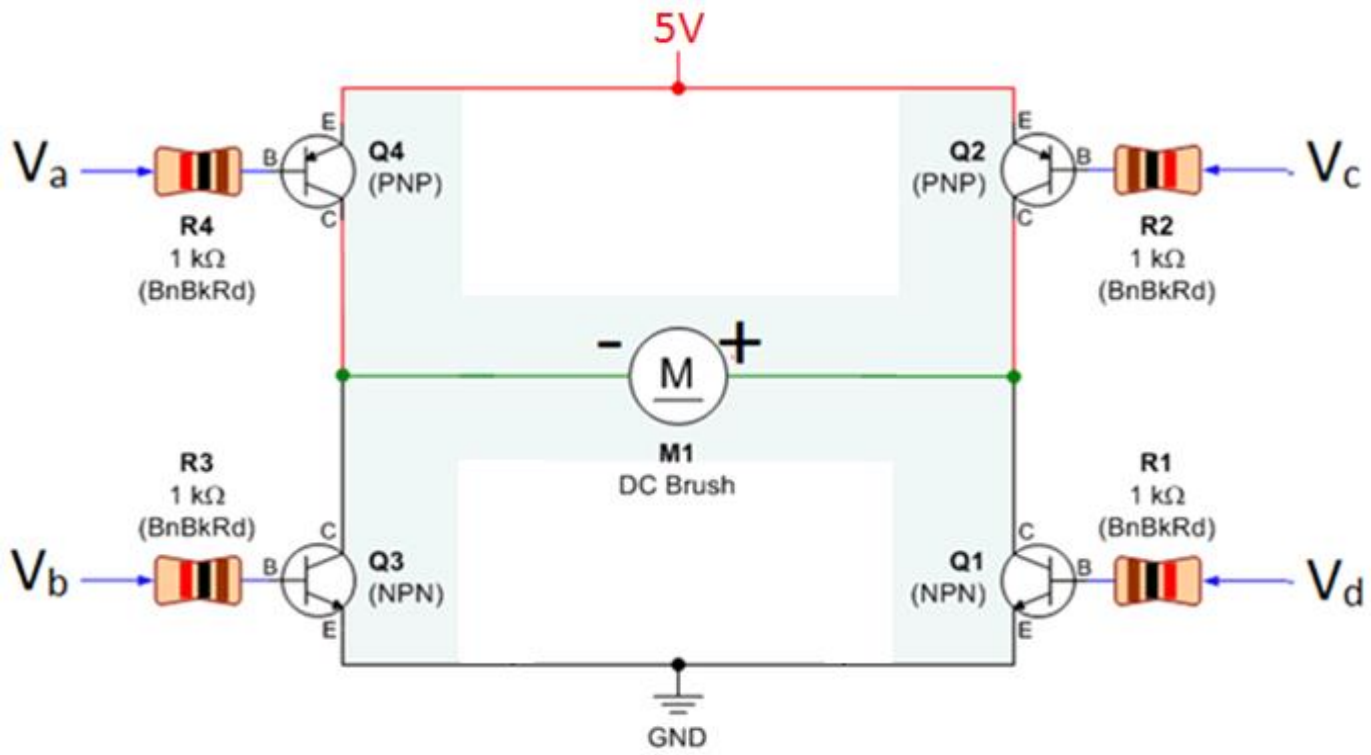






H-bridge

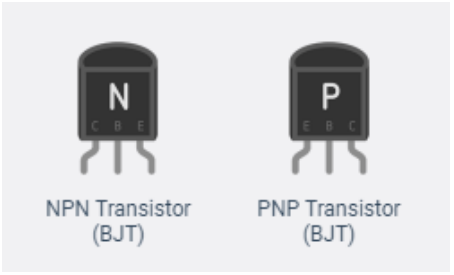
Lab#04: Simulation 2

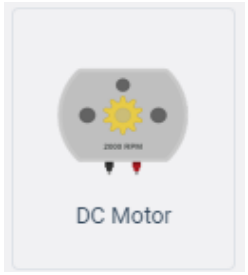


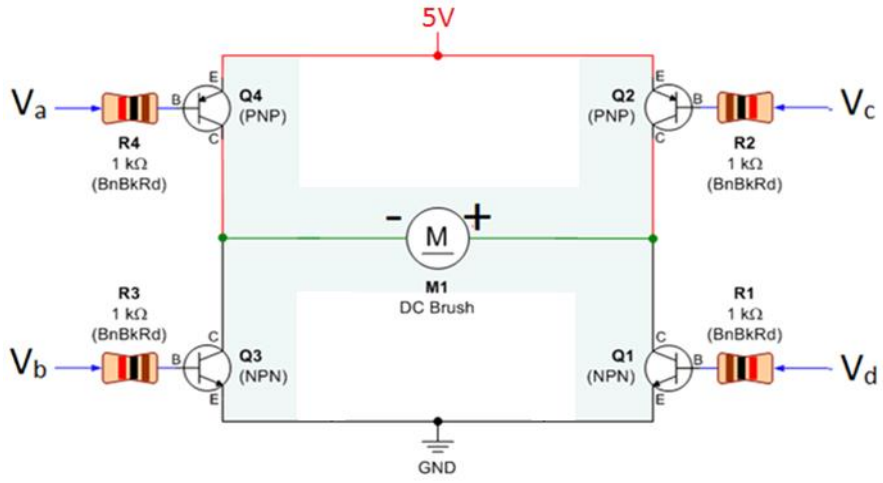
- Va = ? Vb = ? Vc = ? Vd = ?

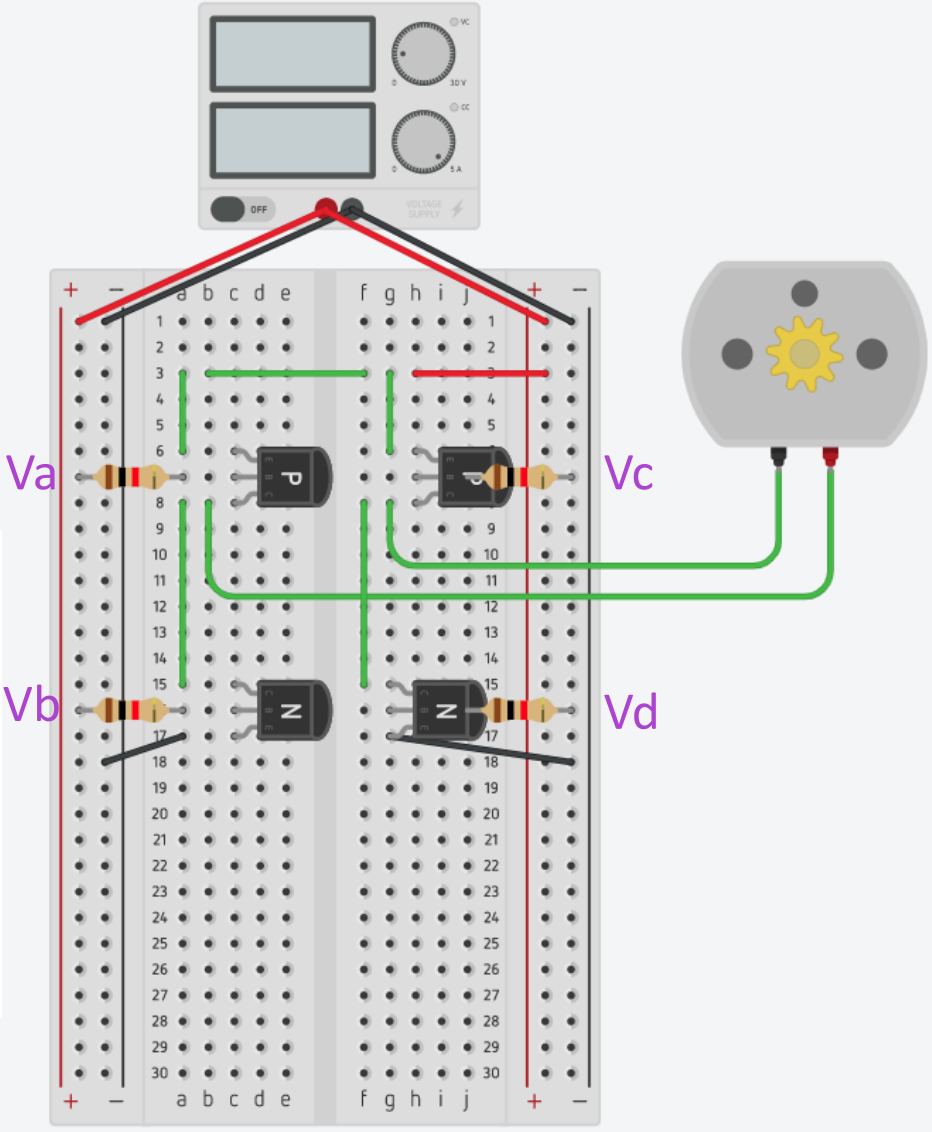
H-bridge Motor Driver

Lab#04: Simulation 2





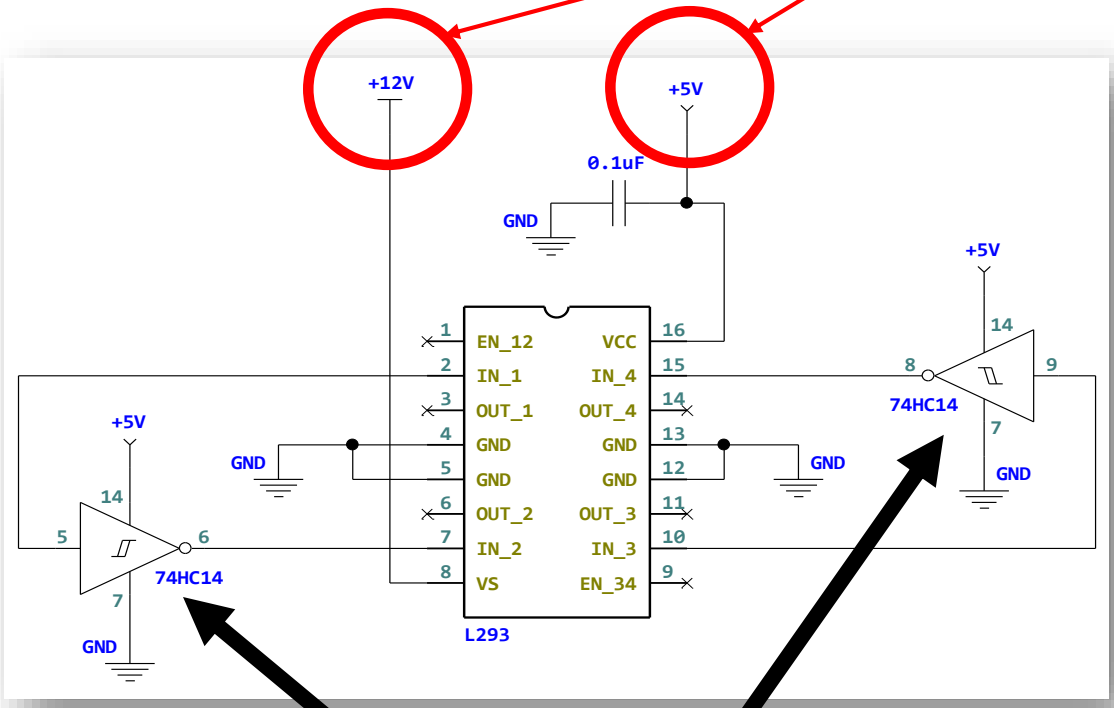




L293D Motor Driver Circuit

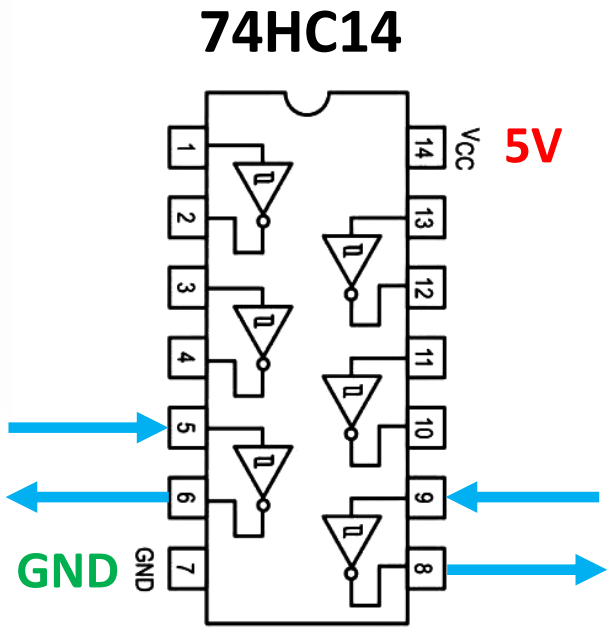
Lab#04: Simulation 3

LM7805 DC Regulator



74HC14

(Schmitt Trigger from Lab#03)



L293D Motor Driver Circuit

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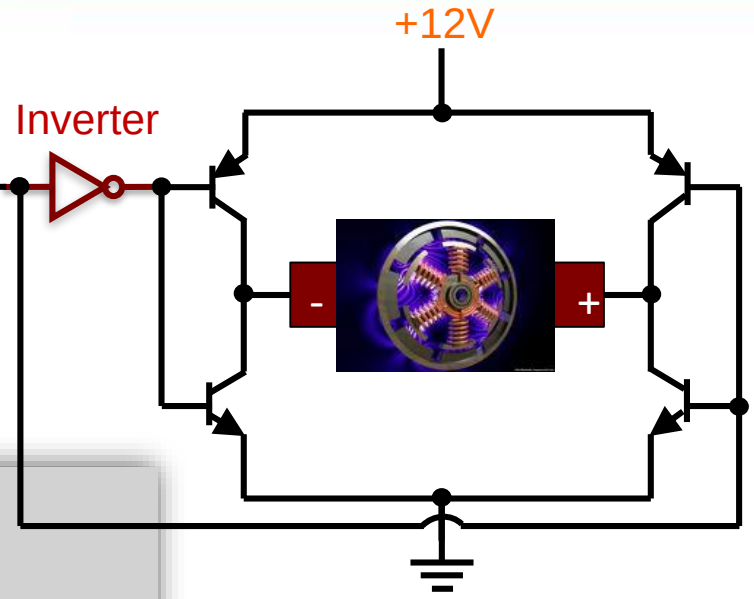

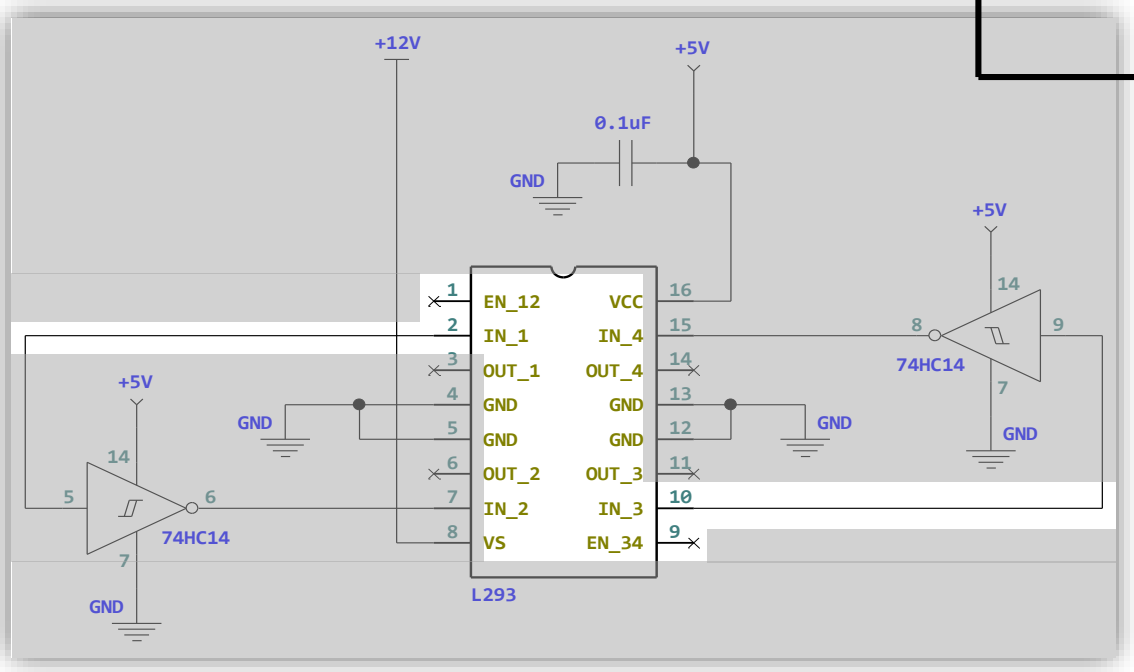

L293D Motor Driver Circuit

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