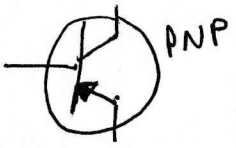
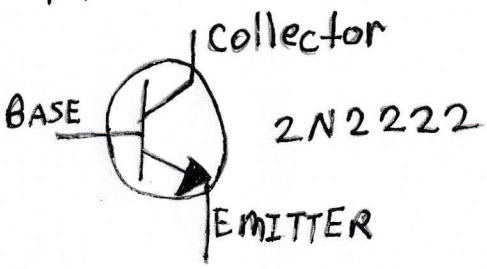
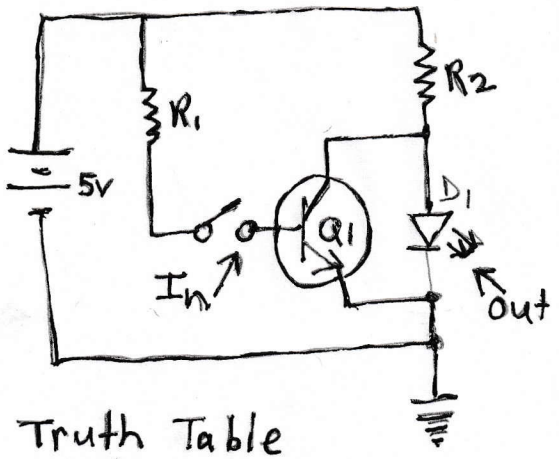



# Transistor Logic

NPN




## Inverter

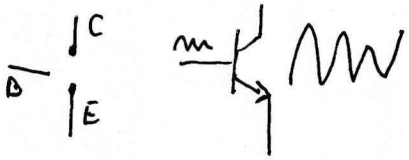



Truth Table

| In | Out |
|---|---|
| 0 | 1 |
| 1 | 0 |

0 = OFF
1 = ON

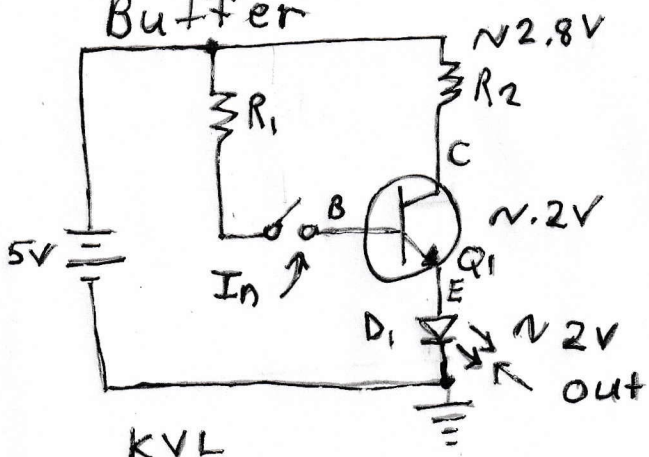
Cut off Active




Saturation


E B C

## Buffer




Truth Table

| In | out |
|---|---|
| 0 | 0 |
| 1 | 1 |

KVL

$5V = V_{R_2} + V_{Q_1} + V_{D_1}$

$V_{R_2} = 5V - V_{Q_1} - V_{D_1}$

$V_{R_2} = 5V - .2V - 2V = 2.8V$

$I_{D_1}$ should be 10 mA since 20 mA is the maximum I.

$V = IR$

$R_2 = \frac{V}{I} = \frac{V_{R_2}}{I_+} = \frac{2.8V}{10mA} = 280\Omega$

$R_1$ Calculation


$V_{BE} = .7V$

KVL

$V_{BE} = 5V - 0.7V = 4.3V$

since we decided we want 10mA

$I_C = 10mA$. $\beta$ is 100.

We'll pretend it to be 10.

$\frac{I_C}{I_B} = 10$, $I_B = \frac{I_C}{10} = \frac{10mA}{10} = 1mA$

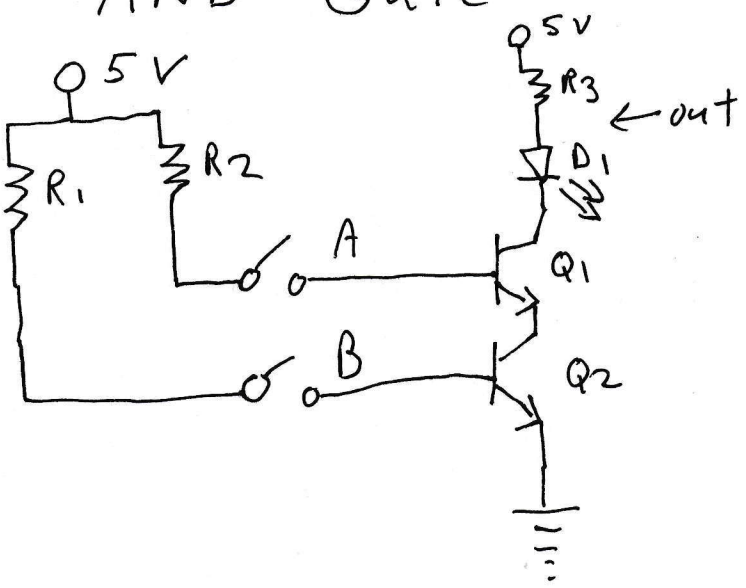
$R_1 = \frac{V}{I} = \frac{5 - .7V}{1mA} = 4.3k\Omega$

Reality $R_2 = 470\Omega$

$R_1 = 4.7K\Omega$

# Transistor Logic

## "AND" Gate

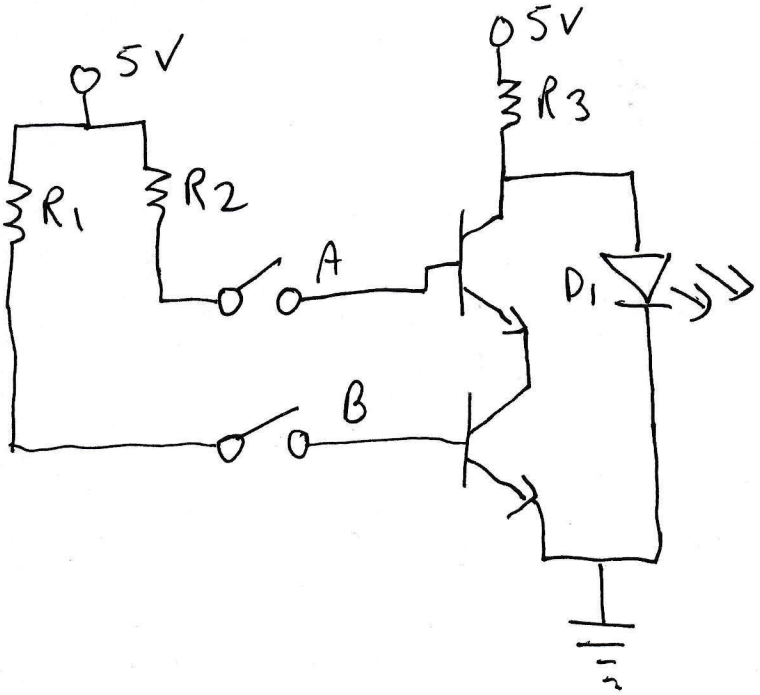



Truth Table

| A | B | out |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |


0 : OFF
1 : ON

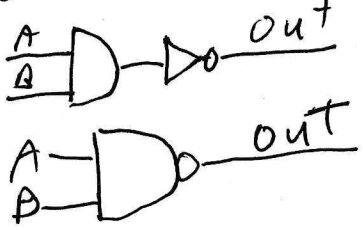
## "NAND" GATE




Truth Table

| A | B | out |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

0 : OFF
1 : ON



Psalm 23
King James Version
23 The Lord is my shepherd; I shall not want.

2 He maketh me to lie down in green pastures: he leadeth me beside the still waters.

3 He restoreth my soul: he leadeth me in the paths of righteousness for his name's sake.

4 Yea, though I walk through the valley of the shadow of death, I will fear no evil: for thou art with me; thy rod and thy staff they comfort me.

5 Thou preparest a table before me in the presence of mine enemies: thou anointest my head with oil; my cup runneth over.

6 Surely goodness and mercy shall follow me all the days of my life: and I will dwell in the house of the Lord for ever.