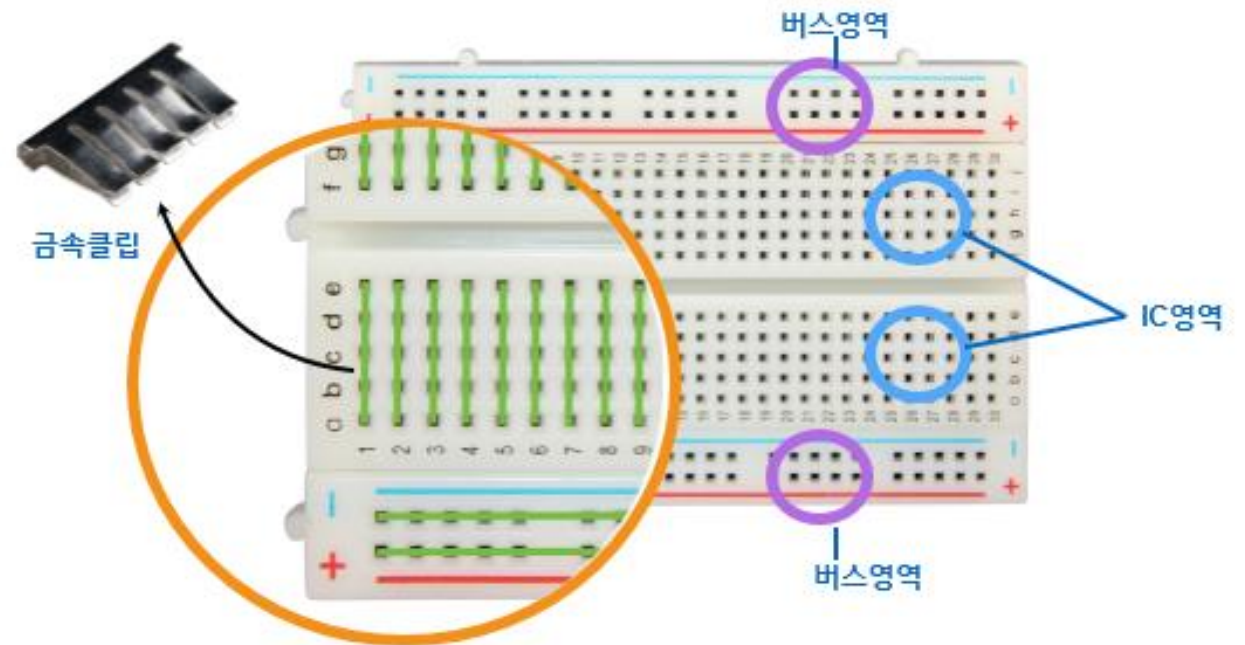
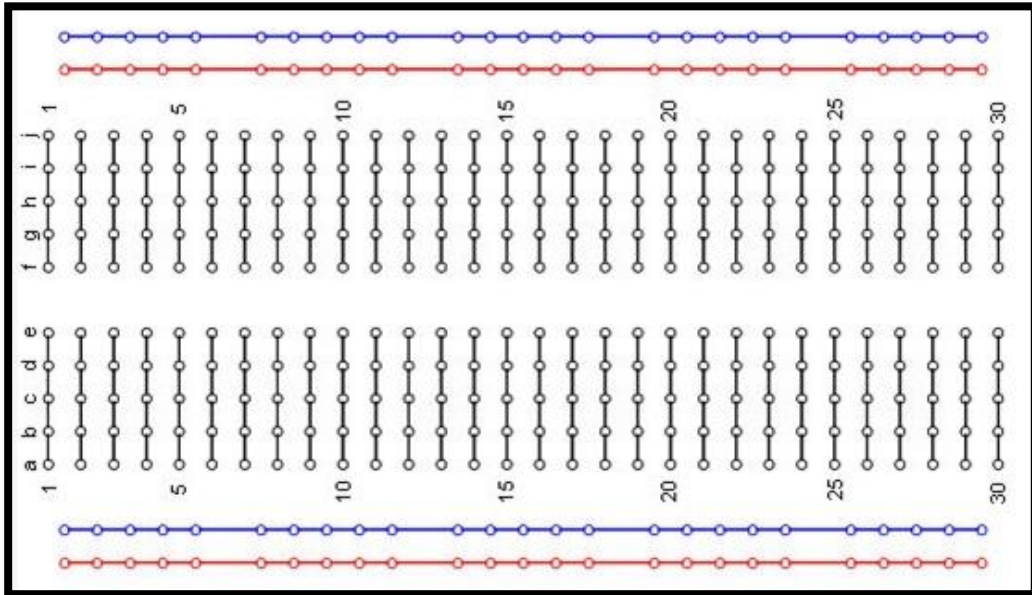


브레드보드 연결구조

<https://codedragon.tistory.com/2437?category=120760>



<이미지참고> <https://codedragon.tistory.com/2437?category=120760>

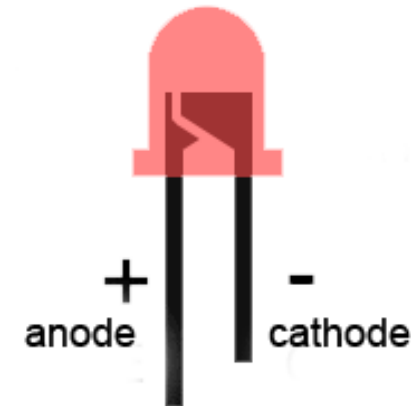
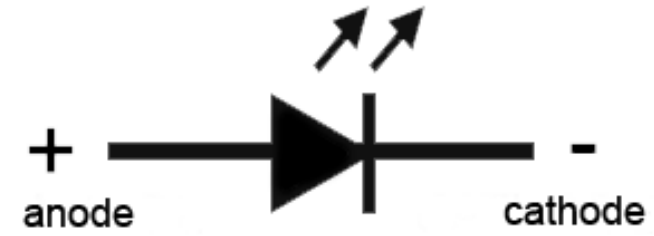
<이미지참고> <https://kocoafab.cc/data/150116115147.png>

LED Red DataSheet

<http://www.farnell.com/datasheets/2861524.pdf>

MCL053SRD

LED, Red, Through Hole, T-1 3/4 (5mm), 20 mA, 1.85 V, 643 nm



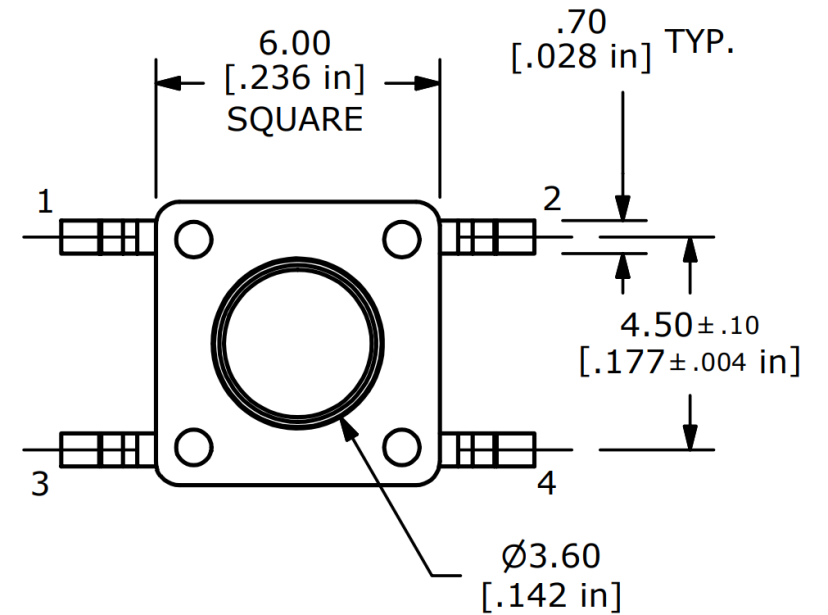
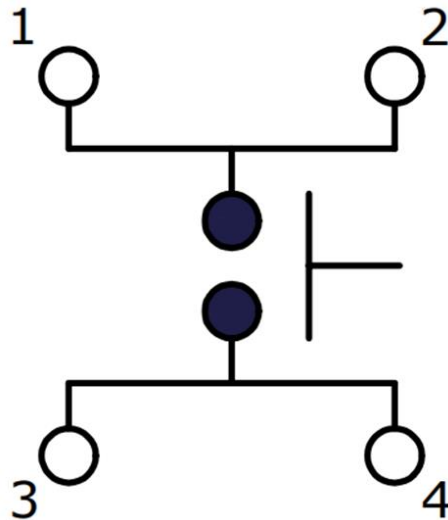
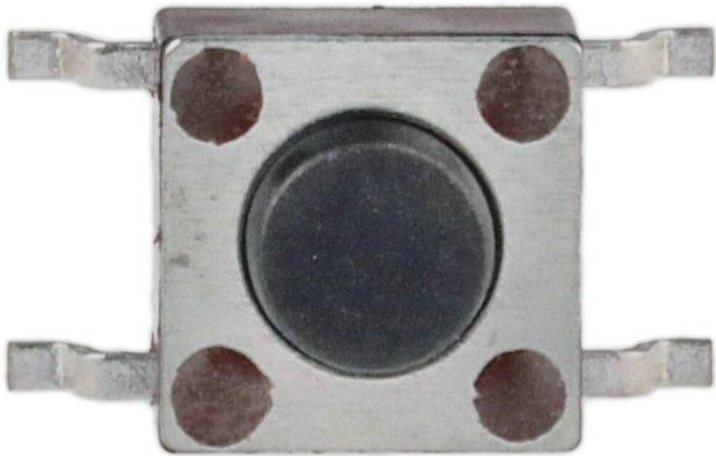
Parameter	Symbol	Minimum	Typical	Maximum	Unit	Test
Forward Voltage	VF	1.5	1.85	2.5	V	IF = 20mA

<이미지참고> <https://kr.element14.com/multicomp-pro/mcl053srd/led-5mm-36-super-red/dp/1581135?MER=sy-me-pd-mi-alte>

<이미지참고> https://cdn.shopify.com/s/files/1/2822/2674/products/led_pinout_3a06d668-5766-4192-9e54-d0ab3b8a0692_1024x1024.png?v=1571711100

E-Switch DataSheet

<https://kr.mouser.com/datasheet/2/140/P090002-267756.pdf>



AA 건전지 DataSheet

<https://data.energizer.com/pdfs/e91.pdf>

ENERGIZER E91



AA

Specifications

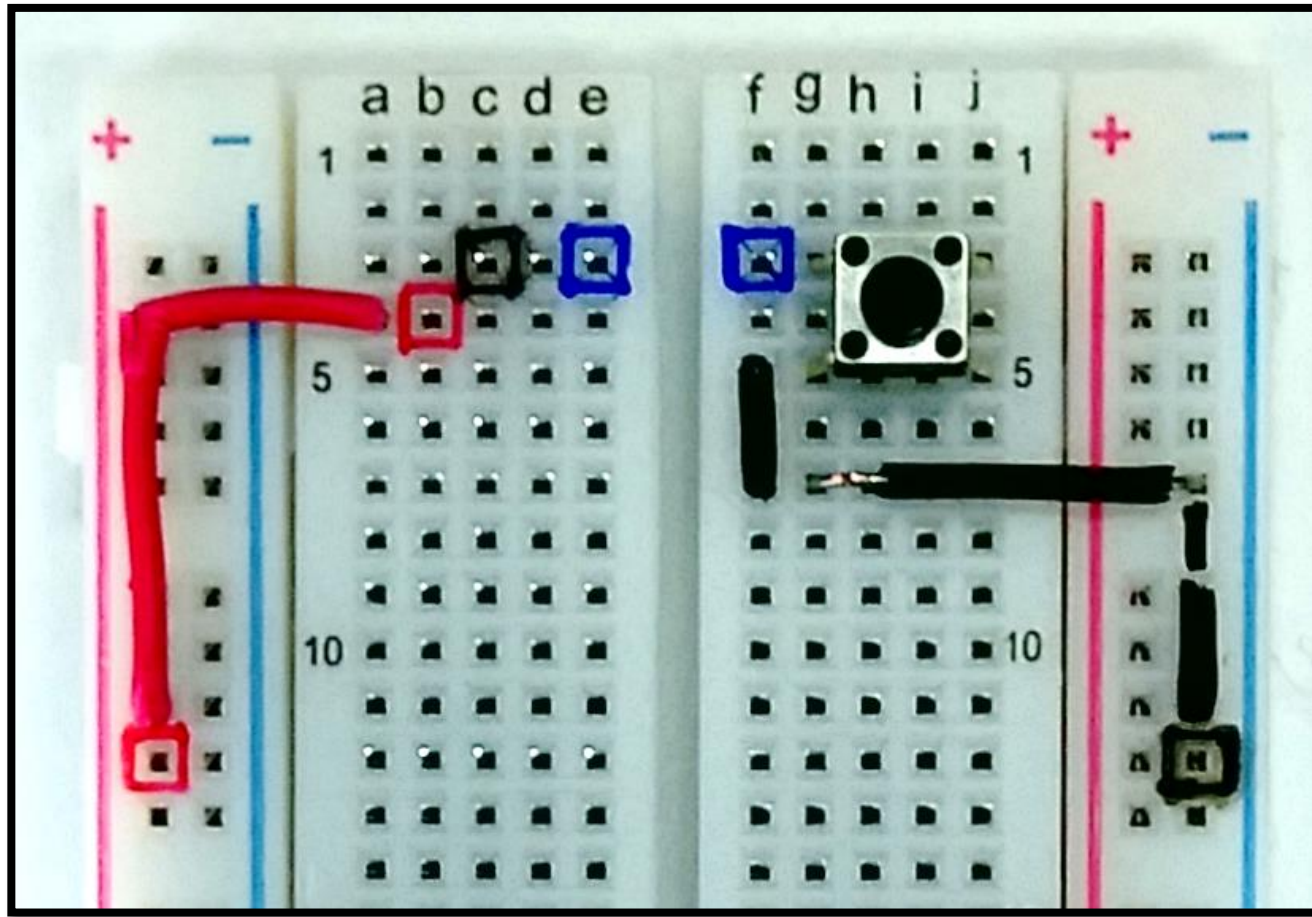
Classification:	Alkaline
Chemical System:	Zinc-Manganese Dioxide (Zn/MnO ₂) No added mercury or cadmium
Designation:	ANSI-15A, IEC-LR6
Nominal Voltage:	1.5 volts
Nominal IR:	150 to 300 milliohms (fresh)
Operating Temp:	-18°C to 55°C (0°F to 130°F)
Typical Weight:	23.0 grams (0.8 oz.)
Typical Volume:	8.1 cubic centimeters (0.5 cubic inch)
Jacket:	Plastic Label
Shelf Life:	10 years at 21°C
Terminal:	Flat Contact

1.5 volts

Nominal Voltage:

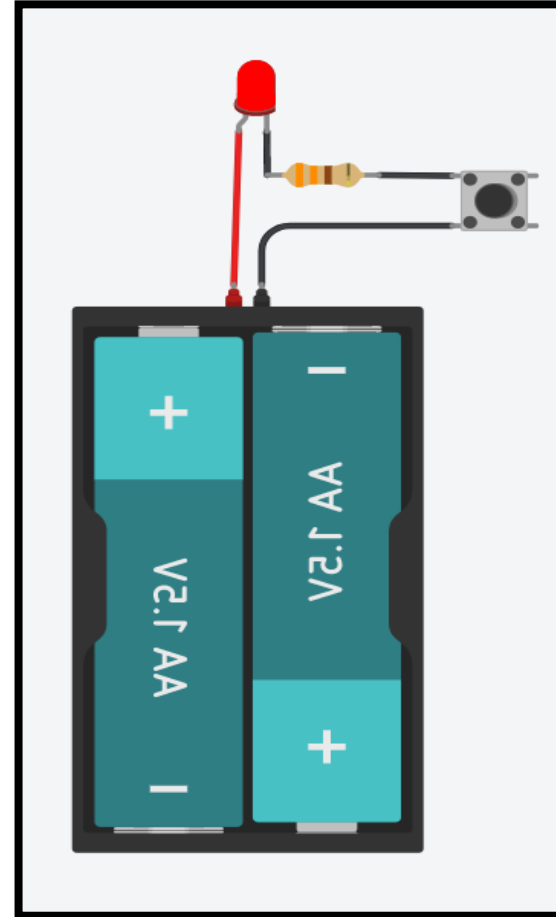
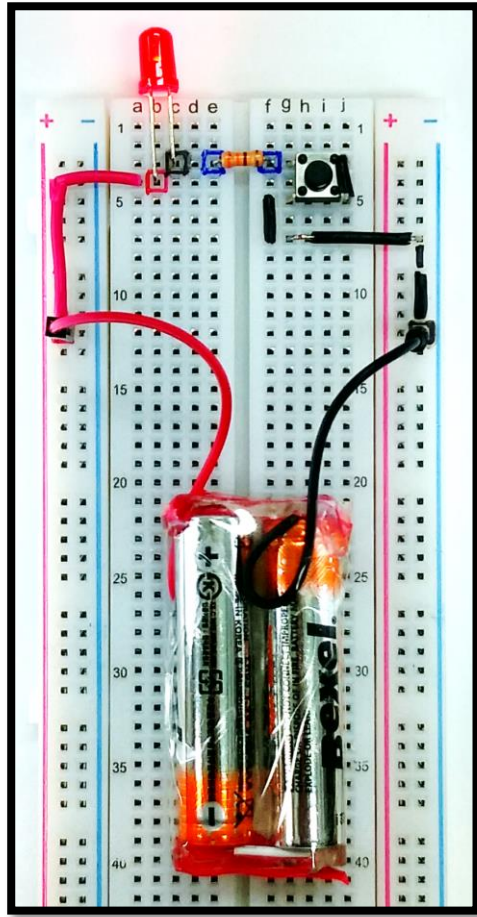
실험0

브레드보드 위치



실험1

건전지(AA) 1.5V 2개 버튼 스위치 330Ω 1개



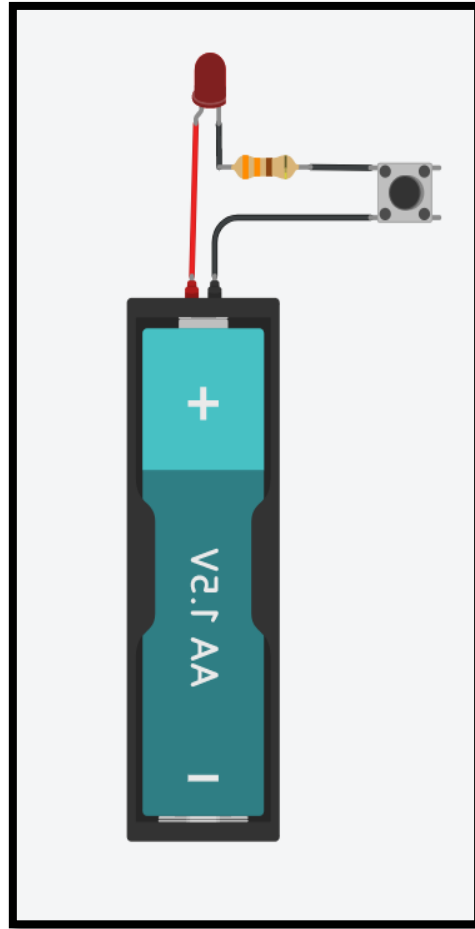
<이미지참고> <https://www.tinkercad.com/>

<이미지참고> <https://pixabay.com/vectors/balloon-birthday-balloon-25734/>

<https://pixabay.com/vectors/balloon-birthday-balloon-25739/>

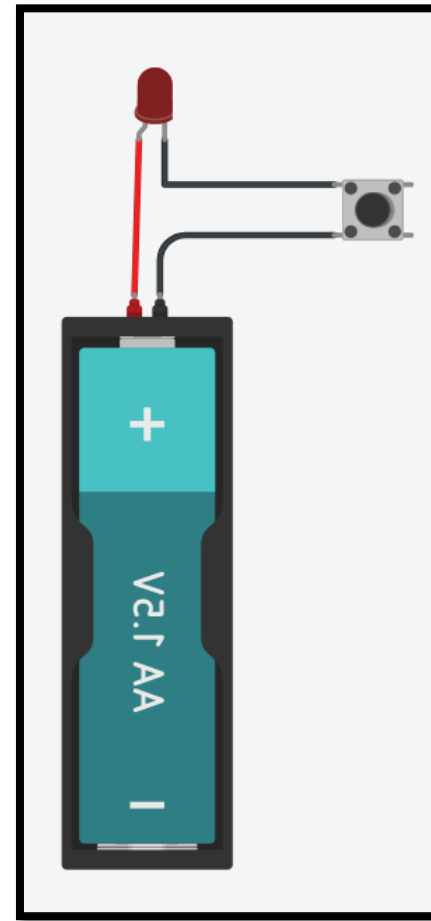
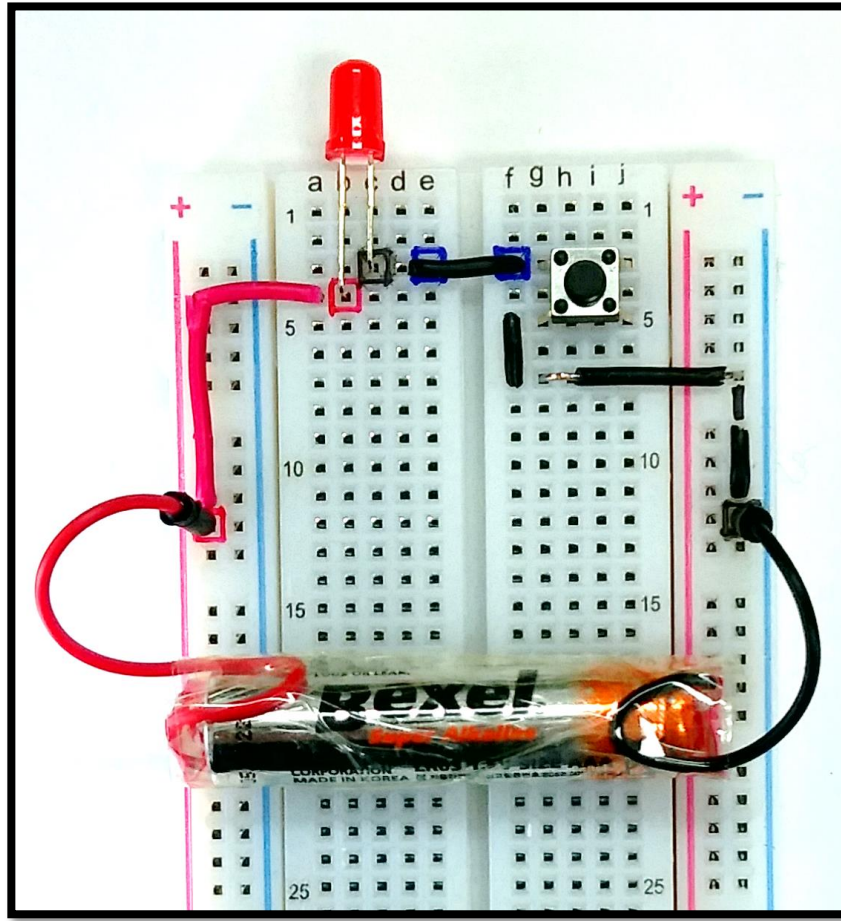
실험2

건전지(AA) 1.5V 1개 버튼 스위치 330Ω 1개



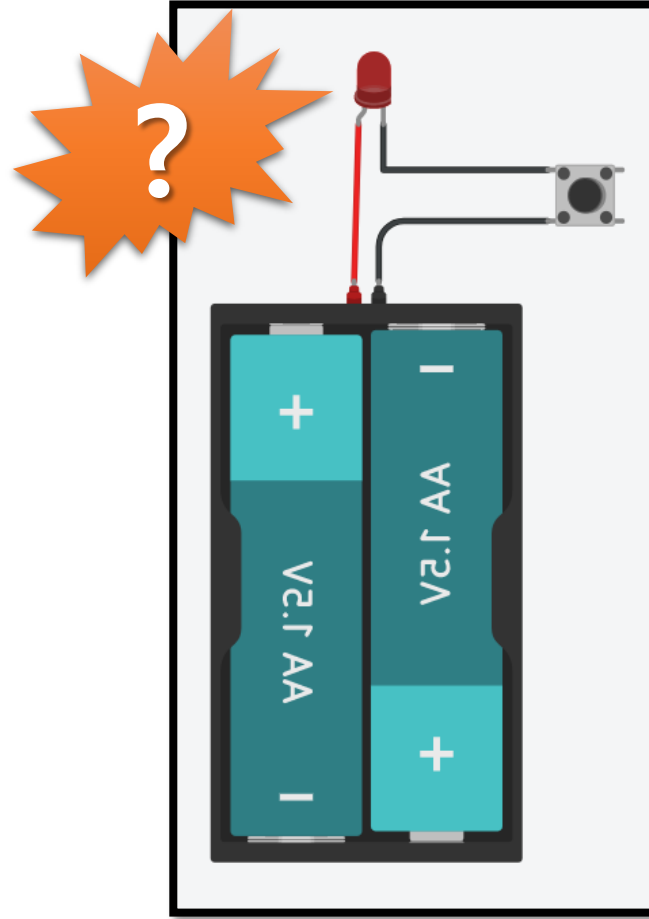
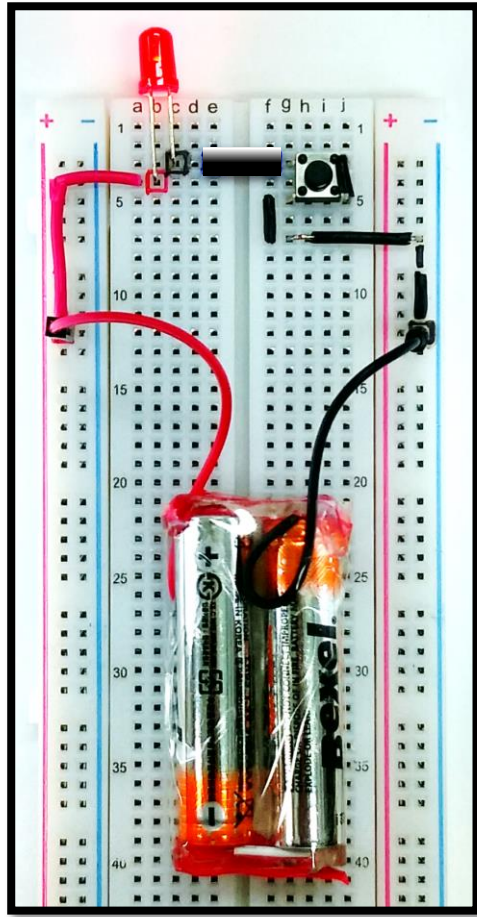
실험3

건전지(AA) 1.5V 1개 버튼 스위치 ~~330Ω 1개~~



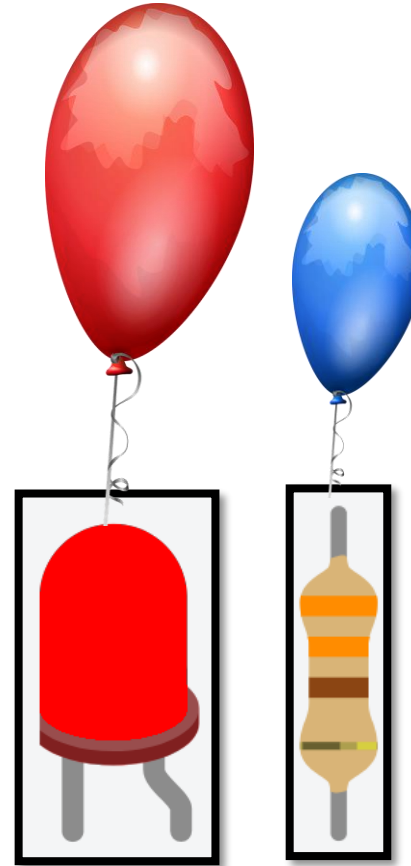
실험4

건전지(AA) 1.5V **2개** 버튼 스위치 ~~330Ω 1개~~



실험1

건전지(AA) 1.5V 2개 버튼 스위치 330Ω 1개



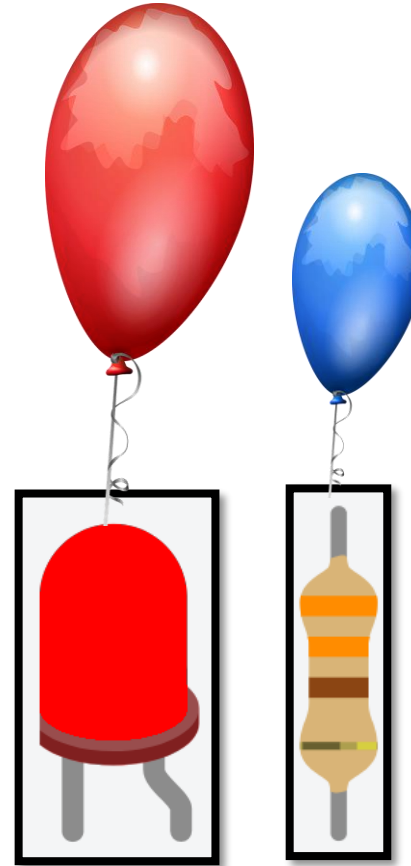
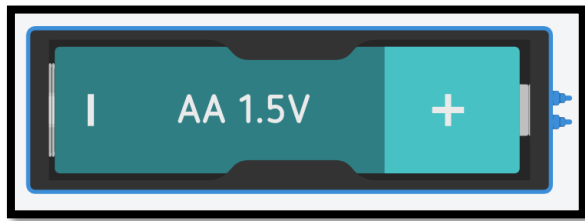
<이미지참고> <https://www.tinkercad.com/>

<이미지참고> <https://pixabay.com/vectors/balloon-birthday-balloon-25734/>

<https://pixabay.com/vectors/balloon-birthday-balloon-25739/>

실험2

건전지(AA) 1.5V 1개 버튼 스위치 330Ω 1개



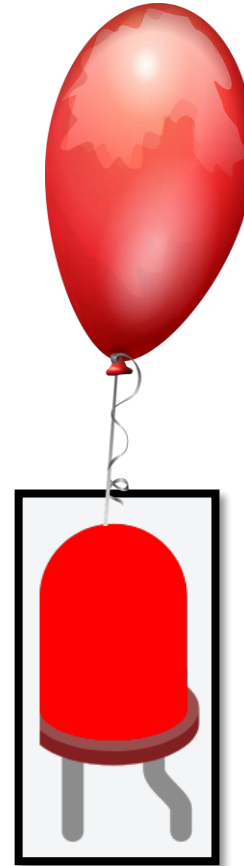
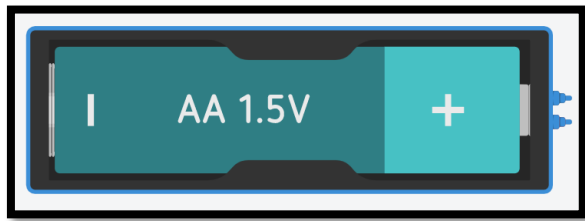
<이미지참고> <https://www.tinkercad.com/>

<이미지참고> <https://pixabay.com/vectors/balloon-birthday-balloon-25734/>

<https://pixabay.com/vectors/balloon-birthday-balloon-25739/>

실험3

건전지(AA) 1.5V 1개 버튼 스위치 ~~330Ω 1개~~



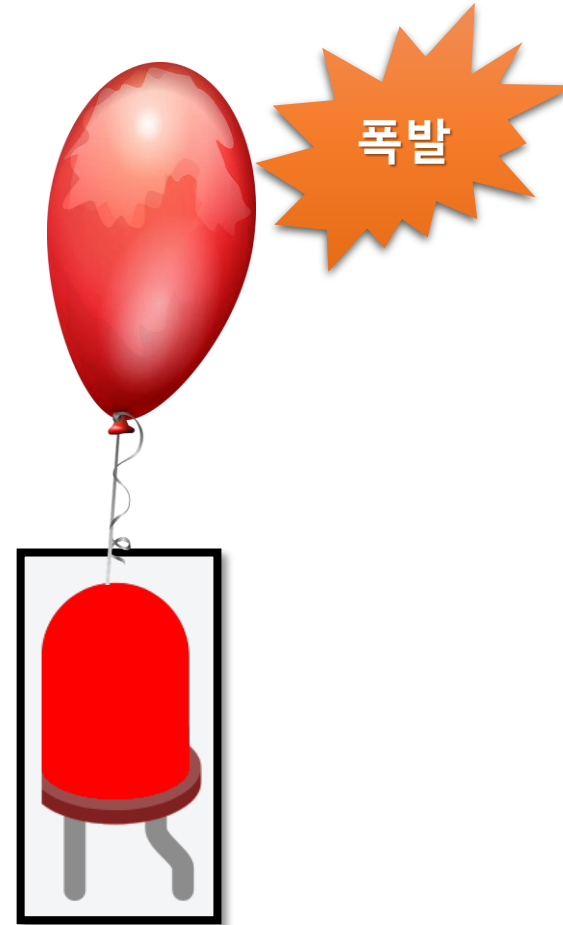
<이미지참고> <https://www.tinkercad.com/>

<이미지참고> <https://pixabay.com/vectors/balloon-birthday-balloon-25734/>

<https://pixabay.com/vectors/balloon-birthday-balloon-25739/>

실험4

건전지(AA) 1.5V 1개 버튼 스위치 ~~330Ω 1개~~

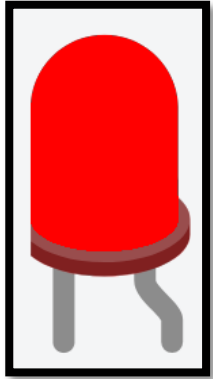


<이미지참고> <https://www.tinkercad.com/>

<이미지참고> <https://pixabay.com/vectors/balloon-birthday-balloon-25734/>

<https://pixabay.com/vectors/balloon-birthday-balloon-25739/>

실험 정리



$$20\text{mA} = 0.02\text{A}$$

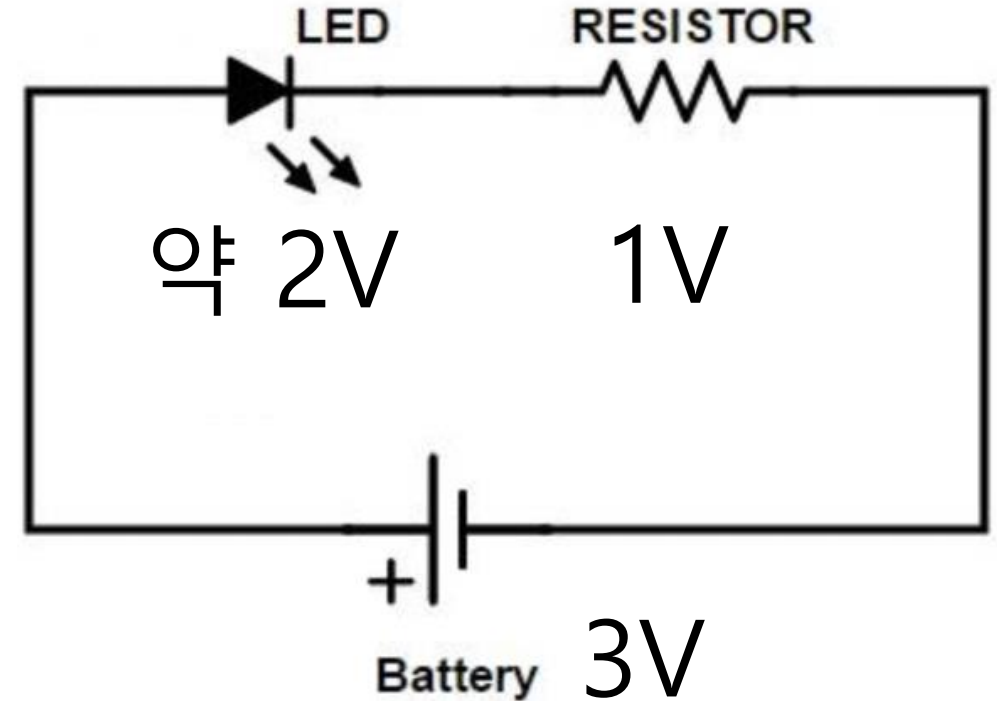
$$1.85\text{V} = \text{약 } 2\text{V}$$



$$20\text{mA} = 0.02\text{A}$$

$$1.15\text{V} = \text{약 } 1\text{V}$$

(? Ω)



실험 정리

$$V = I * R$$

$$1V = (0.02A) * (? \Omega)$$

$$1V / (0.02A) = * (? \Omega)$$



$$20mA = 0.02A$$

$$1.15V = \text{약 } 1V$$

(? Ω)

$$(? \Omega) = 1V / (0.02A)$$



$$= 1 / (2/100)$$

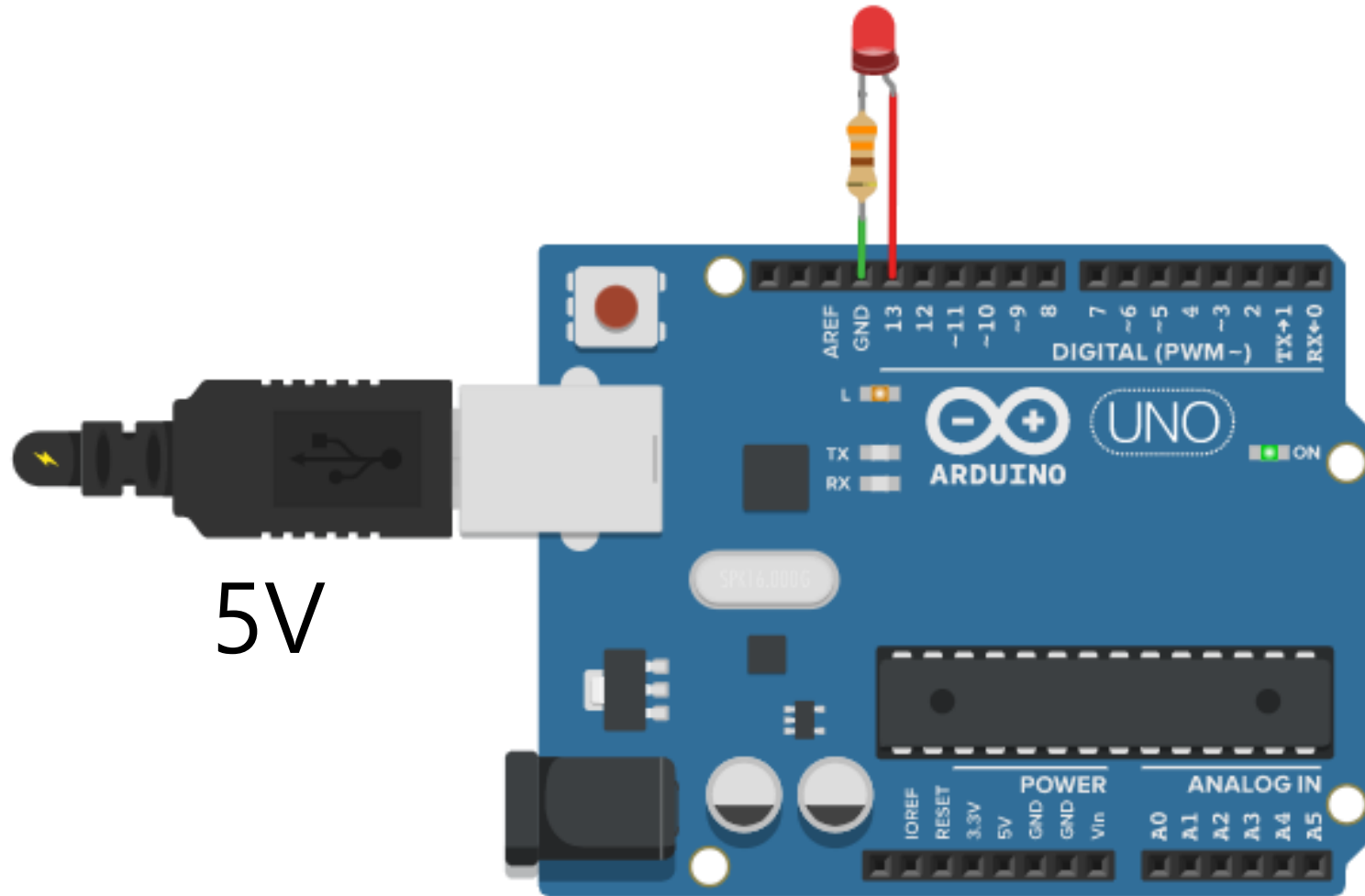
$$= 1 * (100/2)$$

$$= 50$$

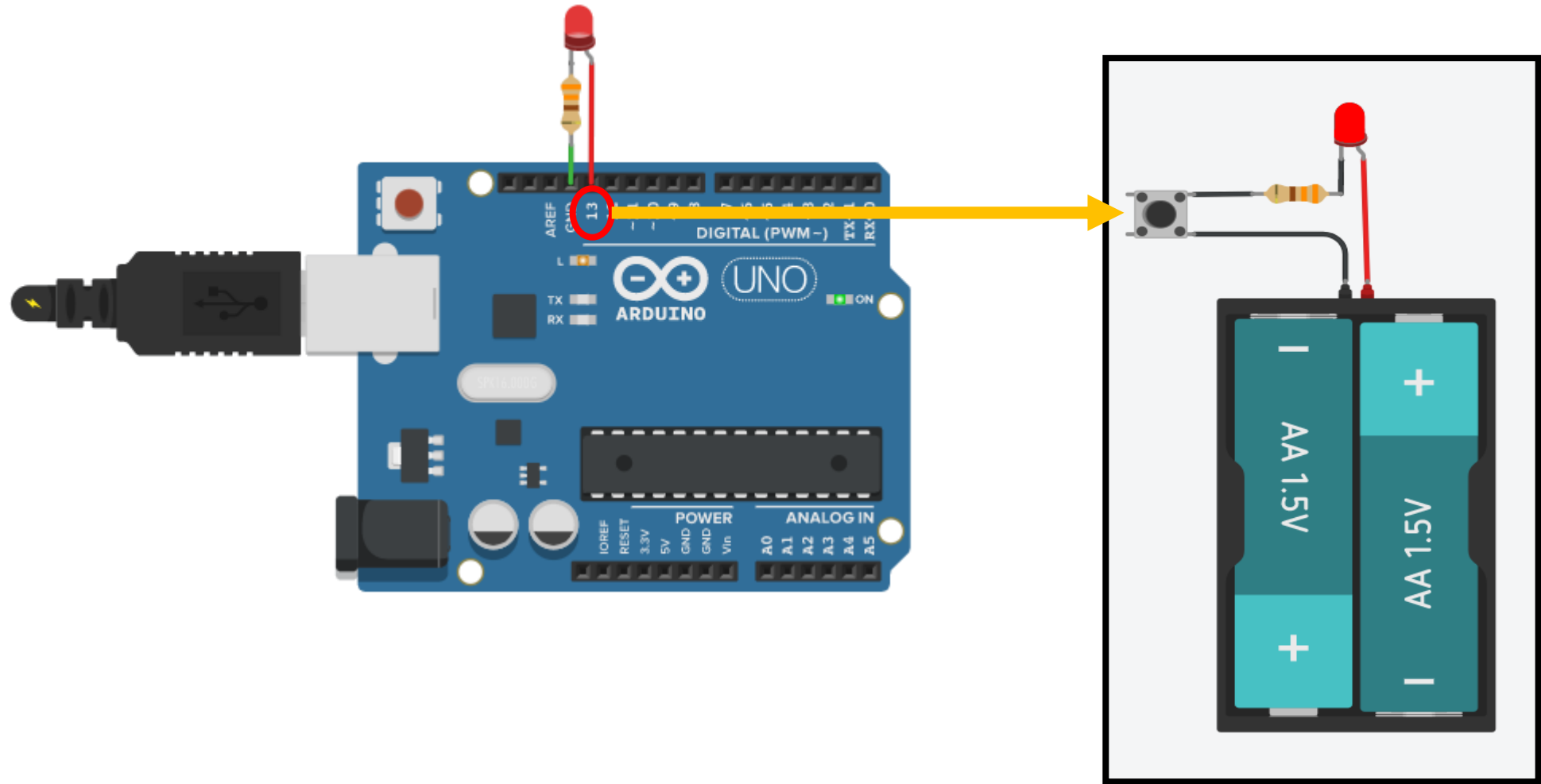


실습에선 330 Ω 을 사용했음

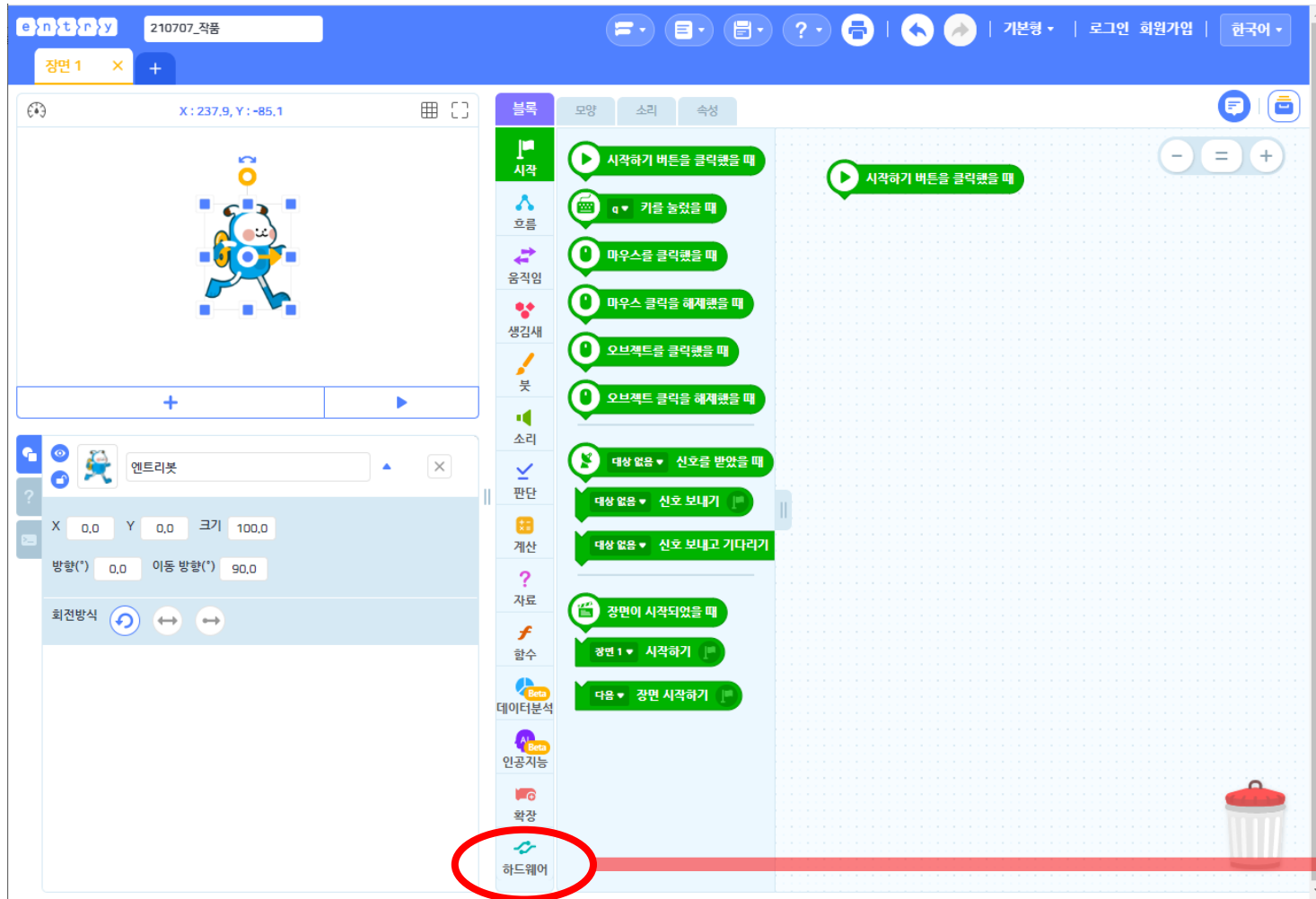
실험 5





실험 5




실험 5




실험 5




하드웨어 선택



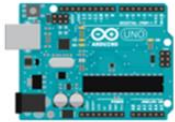


하드웨어 연결과 작동 시 예기치 못한 문제가 발생할 수 있습니다.
문제 발생 시 해당 하드웨어 업체에 문의해주세요.

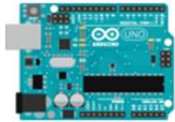
* 하드웨어 연결 프로그램에 등록된 하드웨어들은 각 업체가 제공하고 개발한 것이며, 엔트리교육연구소는 본 프로그램 이외에는 책임지지 않습니다.




아두이노 Nano




아두이노 Uno 정품보드




아두이노 Uno 호환보드




아두이노 Uno 확장모드




아이보드







알버트 스쿨 버전



알티노



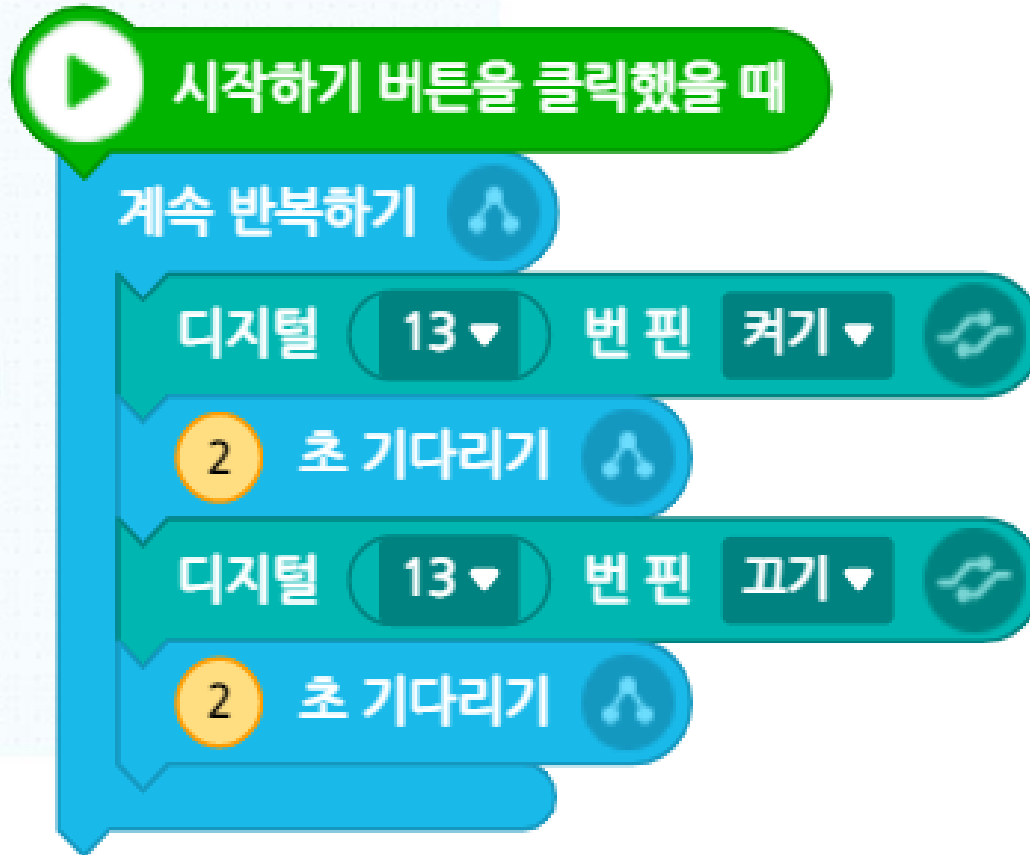
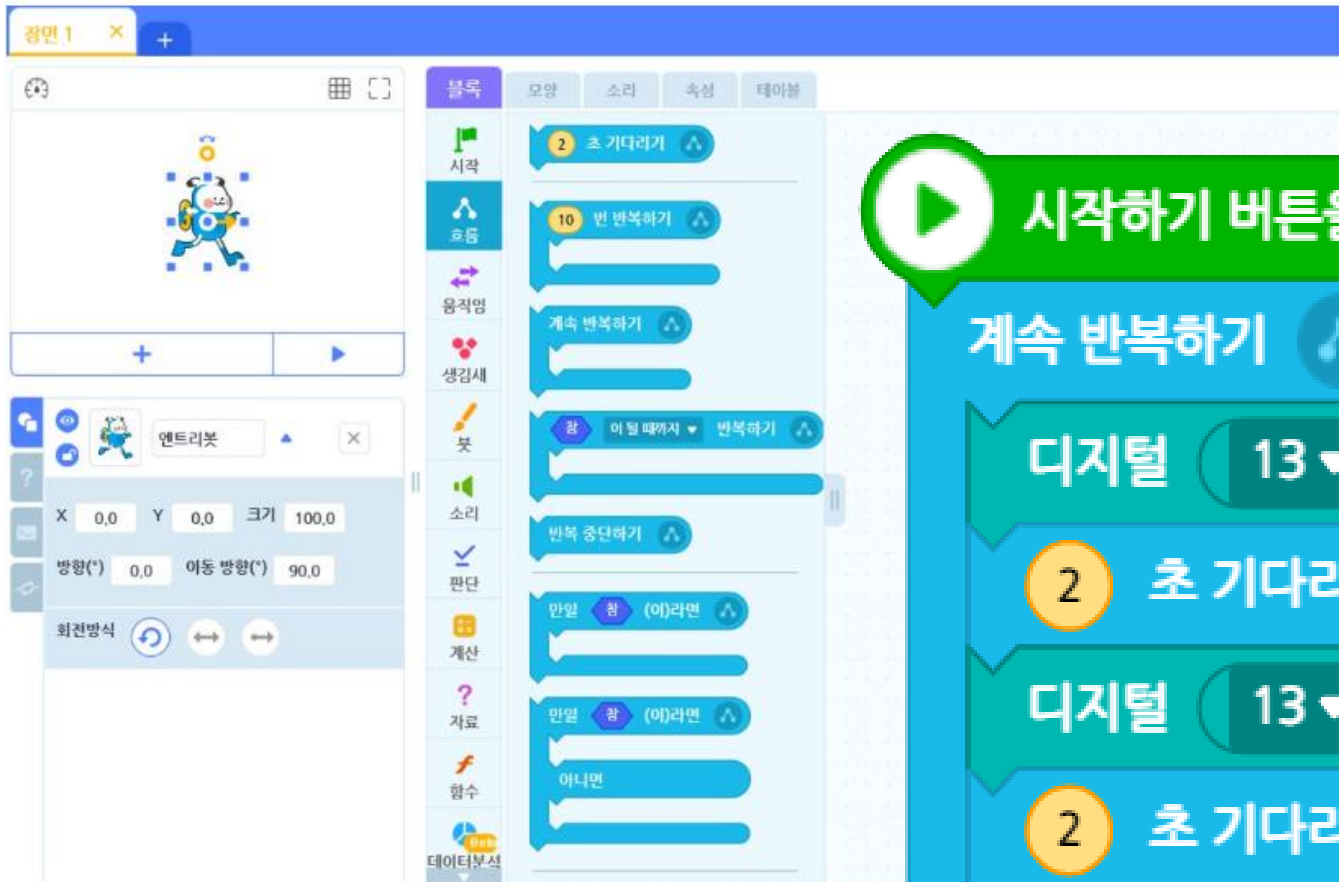
에듀메이커 보드



entry™

오픈소스 라이선스

실험 5



실험 5

엔트리 v2.0.36

파일 편집 도움말

entry 210707_작품

장면 1 X +

블록코딩

엔트리파이선

X: 236.8, Y: -123.0



+ ▶

엔트리봇

블록 모양 소리

시작

흐름

움직임

생김새

봇

def when_start():

def when_press_key(Q ▼):

def when_click_mouse_on():

def when_click_mouse_off():

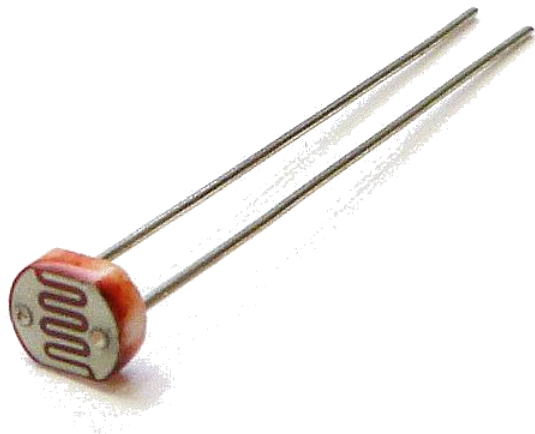
def when_click_object_on():

def when_click_object_off():

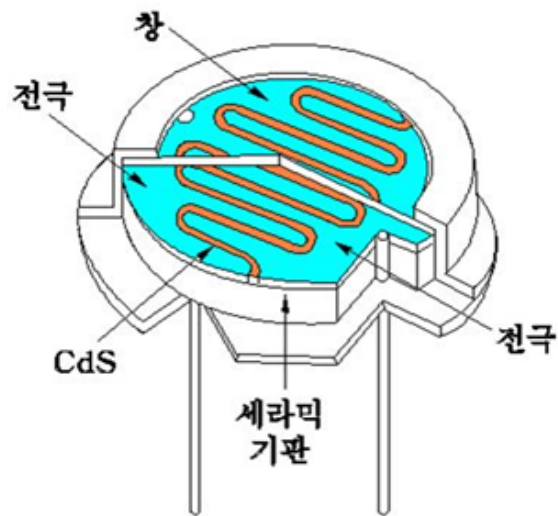
```
1 # 엔트리봇 오브젝트의 파이선 코드
2
3 import Entry
4
5 def when_start():
6     while True:
7         Arduino.pin_digital(13, "on")
8         Entry.wait_for_sec(2)
9         Arduino.pin_digital(13, "off")
10        Entry.wait_for_sec(2)
```

실험 6

조도센서



CDS특성



1. 감도

-빛의 파장에 따라 감도가 다름

2. 허용손실

-비교적 큰 전류를 흘릴 수 있음

3. 암 전류

-빛이 없어도 약간의 전류가 흐름

4. 명 전류

-빛을 비추면 흐르는 전류

5. 응답특성

-응답 시간 지연

-빛의 세기에 따라 응답시간 다름

6. 가변저항

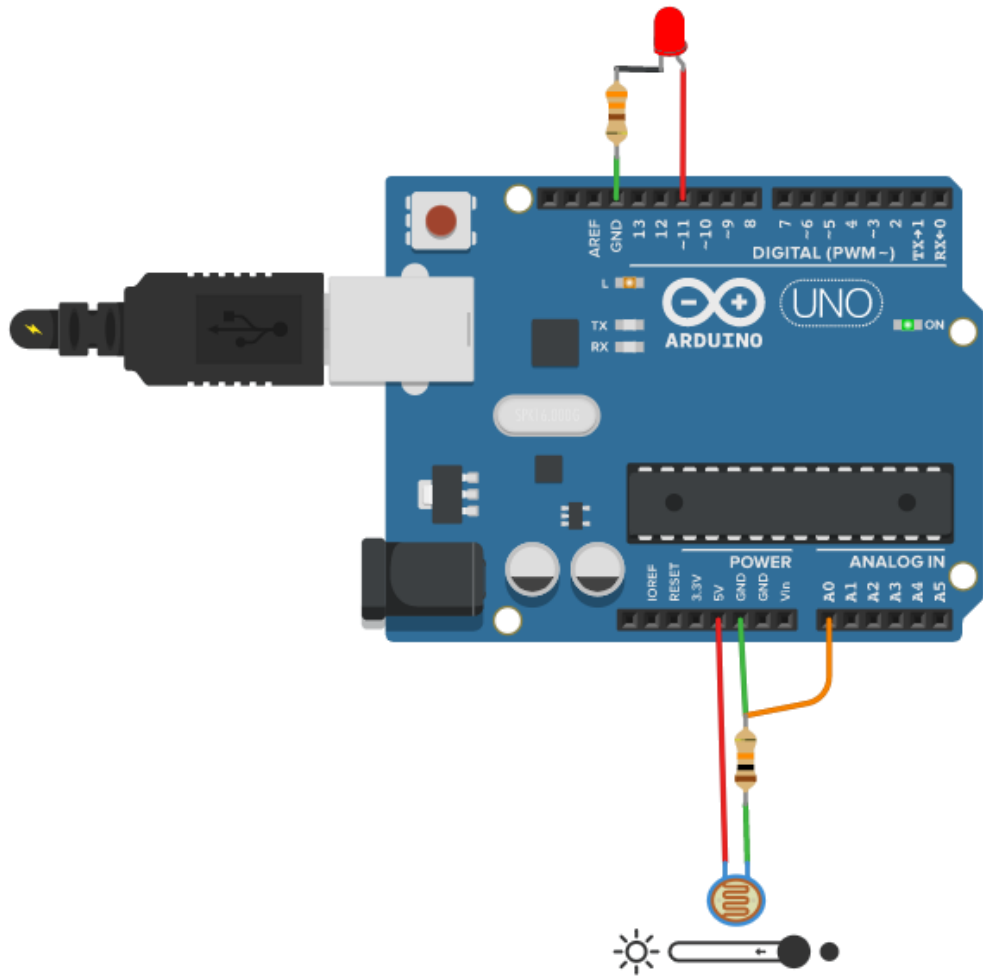
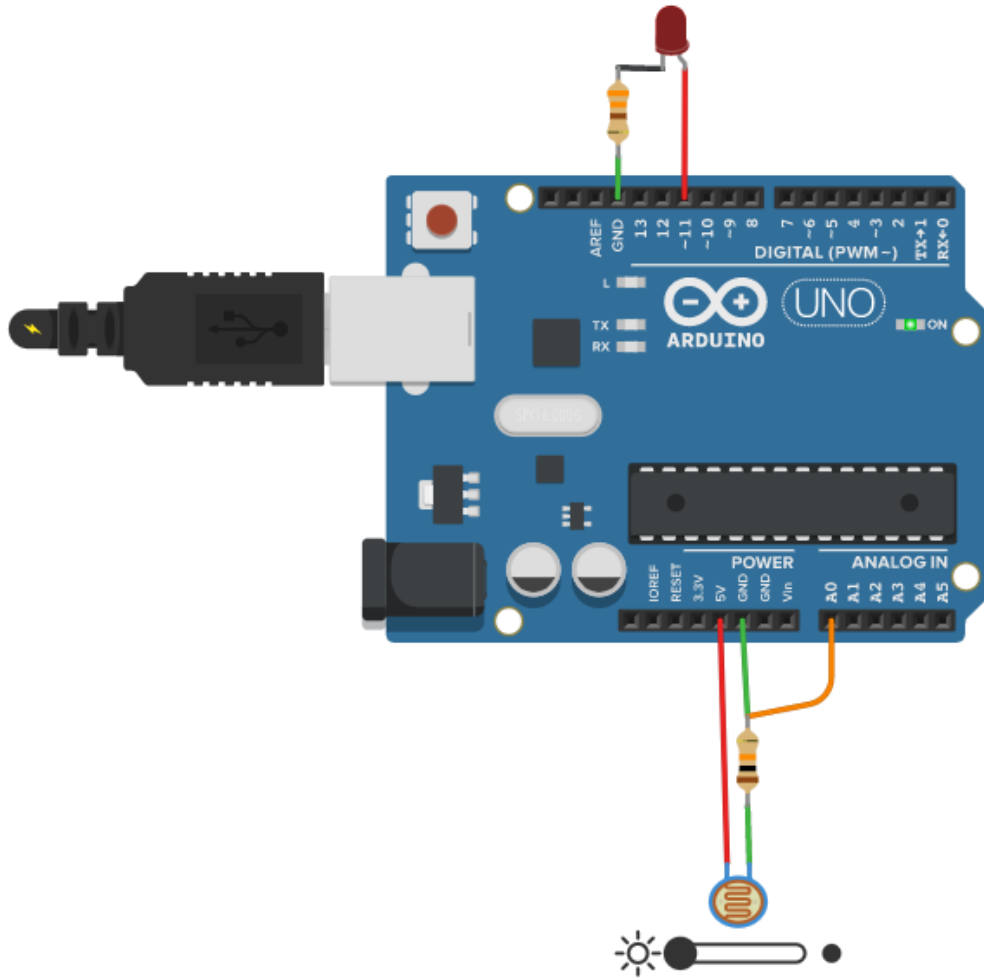
-빛에 따른 가변저항

<이미지참고> <https://2.bp.blogspot.com/-rM3AcVshwnw/Vpg0lqm74oI/AAAAAAAAASY/f0T9mbqAQtl/s1600/S-0200.jpg>

<이미지참고> <https://2.bp.blogspot.com/-s8StDQO9MAI/Vpg0zUrQd-I/AAAAAAAAASg/W11-hu9nqKw/s1600/cds2.png>

실험 6

조도센서



실험 6

조도센서

엔트리봇 오브젝트의 파이선 코드

```
import Entry
```

```
self.LED = 0
```

```
def when_start():
```

```
    self.LED = 0
```

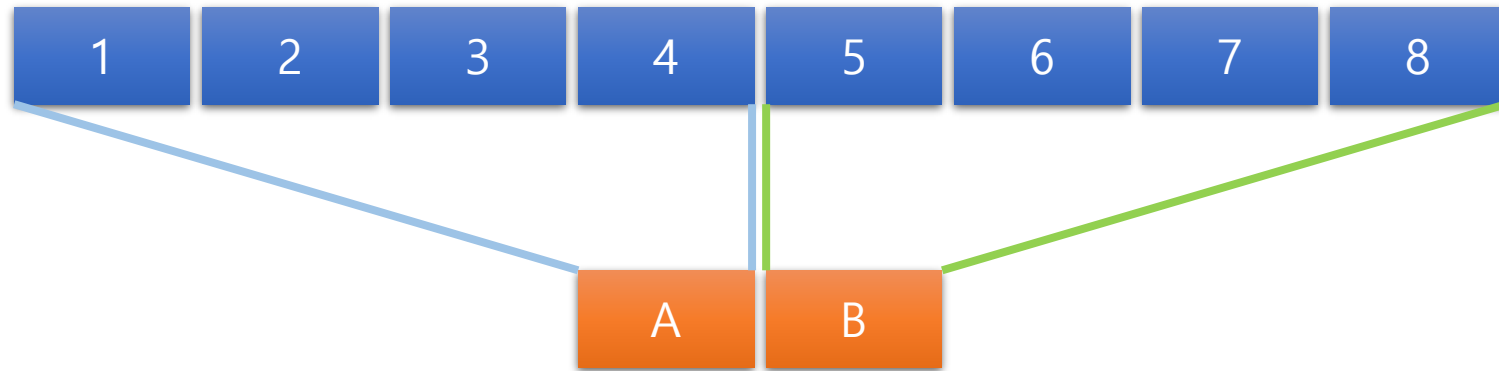
```
    while True:
```

```
        self.LED = 1023 - Arduino.sensor_value("A0") / 1023 * 255
```

```
        Arduino.set_pin_digital(11, self.LED)
```

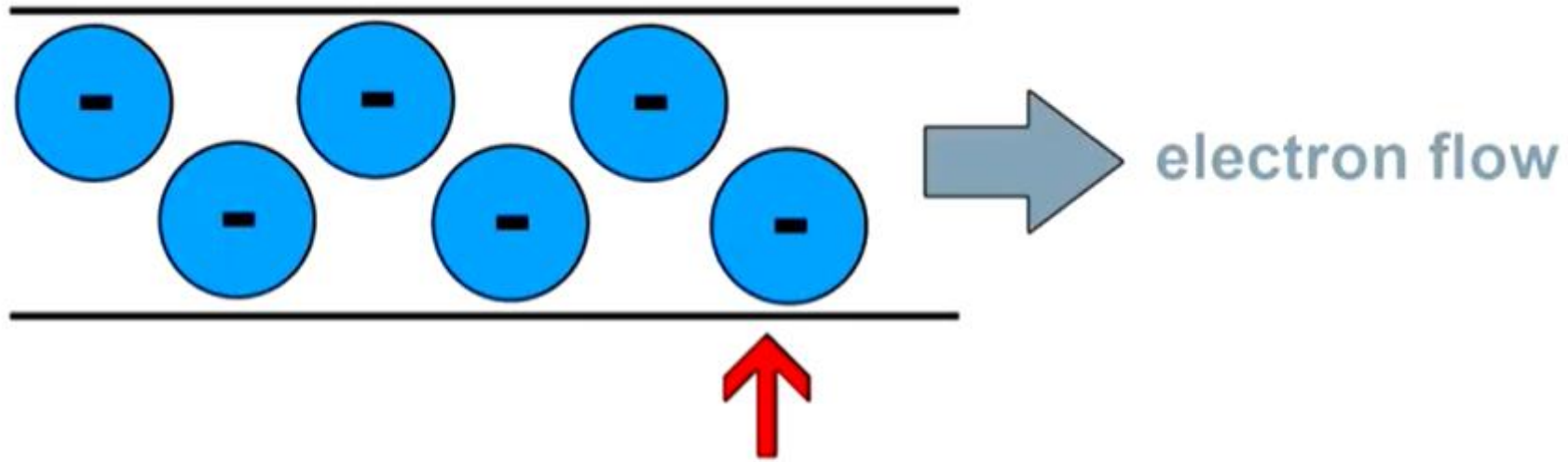


스케일링



전류

<https://youtu.be/cxkVxi9P0EA>



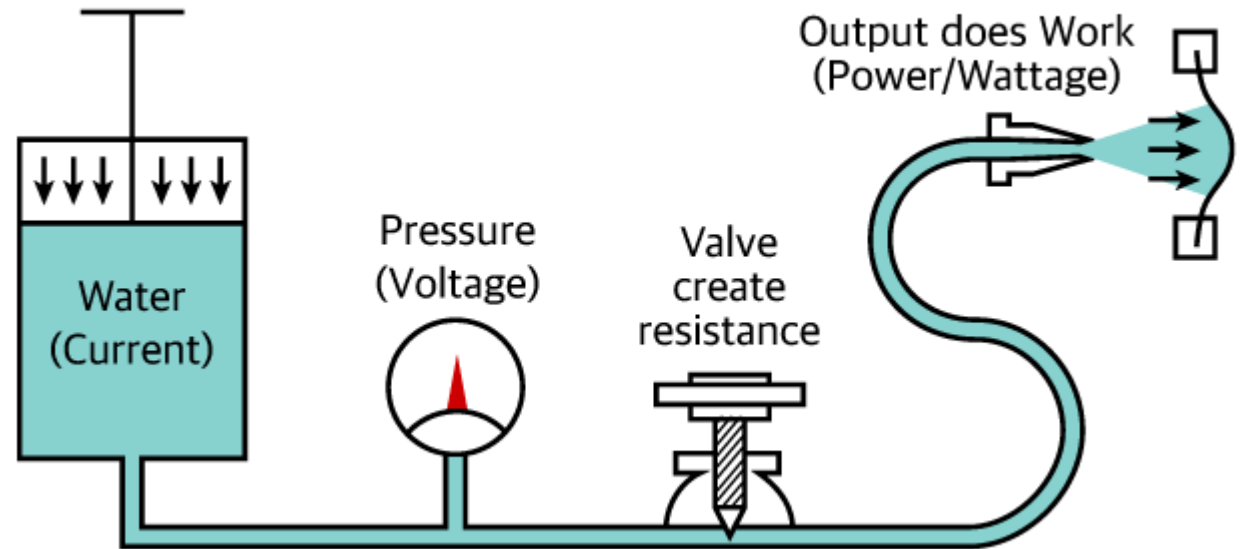
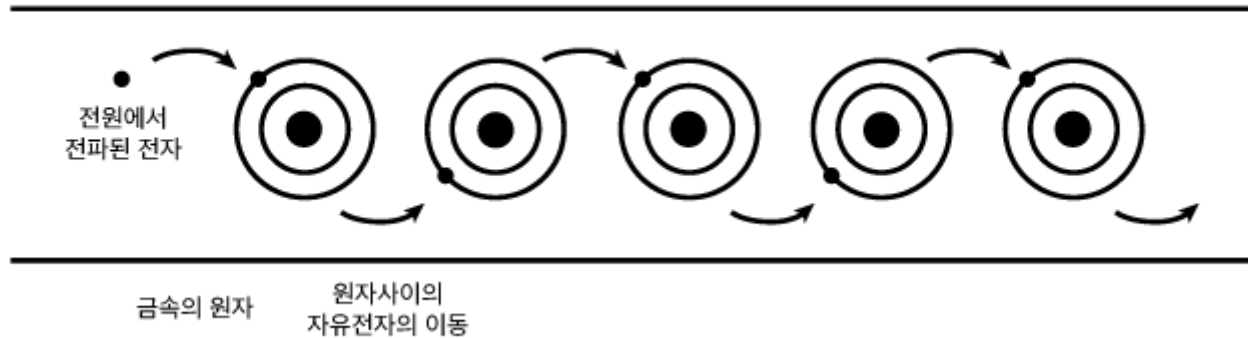
**1 ampere = 6.24×10^{18} electrons
flowing through a certain point
per second**

<참고> <https://youtu.be/cxkVxi9P0EA?t=66>

전류

<https://kocoafab.cc/tutorial/view/348>

도체 내에서 전기의 흐름 (흐름 →)

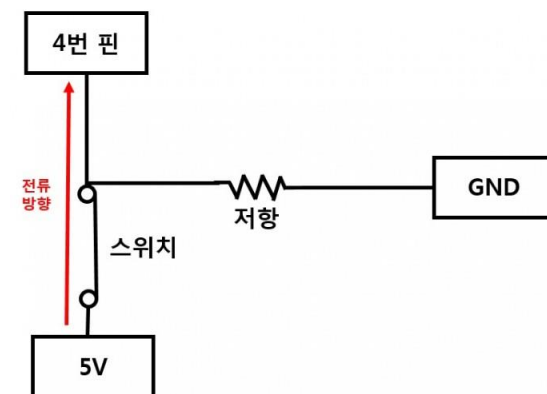
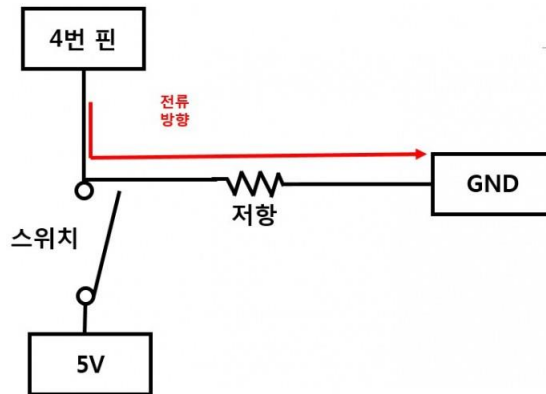
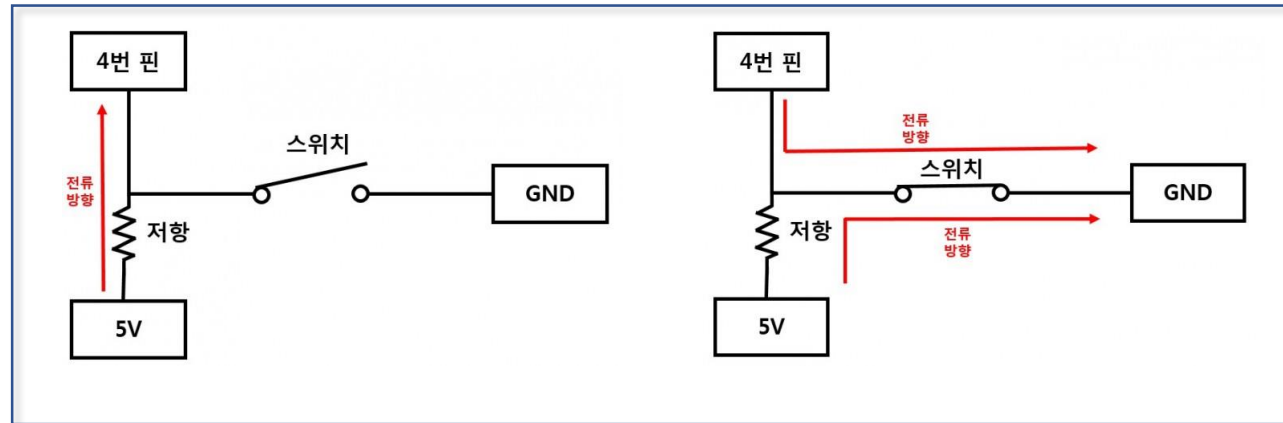
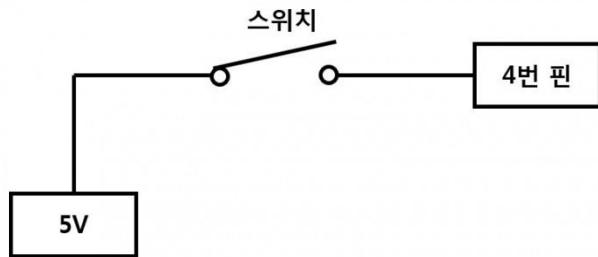


<이미지참고> <https://kocoafab.cc/data/150116043334.png>

<이미지참고> <https://kocoafab.cc/data/150116043355.png>

플로팅(Floating) 풀업(PULL-UP) 풀다운(PULL-DOWN)

<https://kocoafab.cc/tutorial/view/526>



<이미지참고> <http://kocoafab.cc/data/201510051442154704.jpg>

<이미지참고> <http://kocoafab.cc/data/201510051626173888.jpg>

<이미지참고> <http://kocoafab.cc/data/201510051724506543.jpg>

<http://kocoafab.cc/data/201510051641337951.jpg>

<http://kocoafab.cc/data/201510051729021246.jpg>