

## 2.1 Introduction

$$I = \frac{dq}{dt}$$

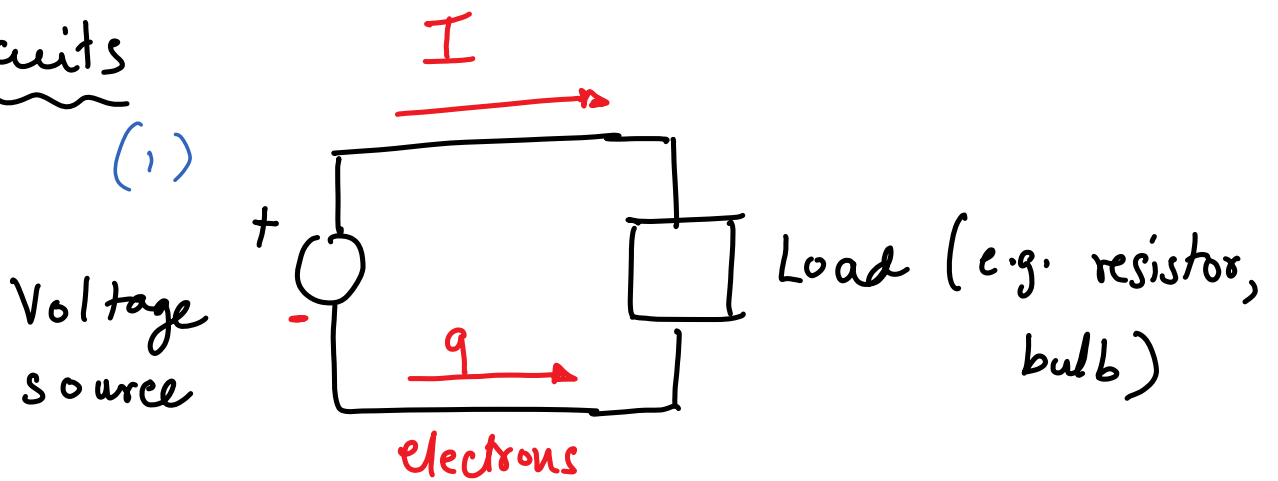
$I$  = current

$q$  = charge

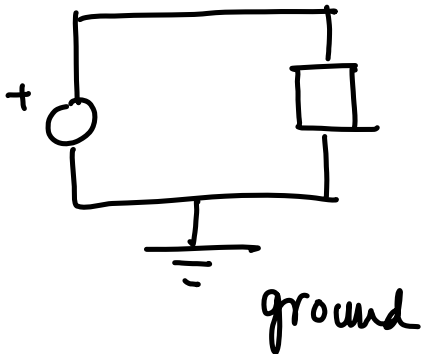
$t$  = time

### Circuits

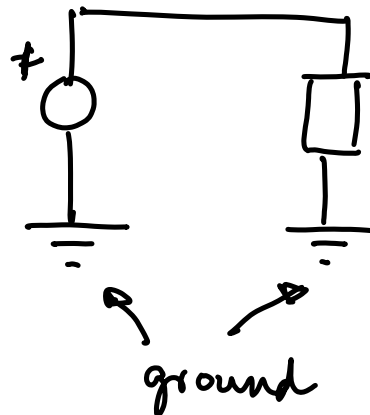
(1)



(2)



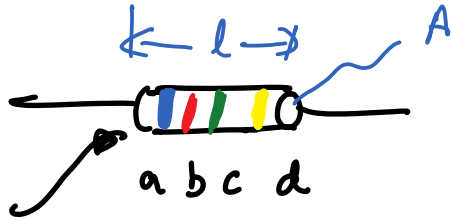
(3)



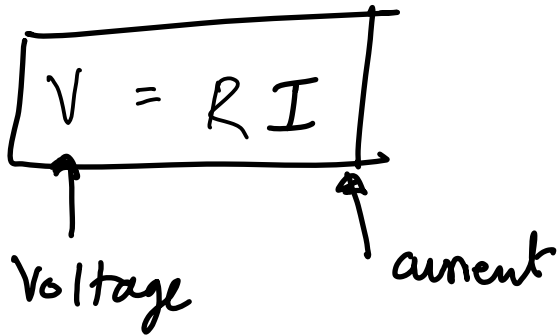
(1), (2), (3) Equivalent

## 2.2 Basic electric elements

### 1.) Resistor



$\rho$   $\underbrace{\hspace{2cm}}$   
Bands



R (resistance)

$$R = \frac{\rho l}{A}$$

A = cross-section

l = length

$\rho$  - resistivity

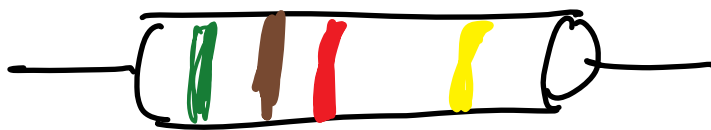
$$R = ab \cdot 10^c \pm tol d$$

- 0 Black
- 1 Brown
- 2 Red
- 3 Orange
- 4 Yellow
- 5 Green
- 6 Blue
- 7 Violet
- 8 Gray
- 9 White

tol band (d)

Gold  $\pm 5\%$   
 Silver  $\pm 10\%$   
 Nothing  $\pm 20\%$ .

Circuits



5 1 2  $\pm 5\%$

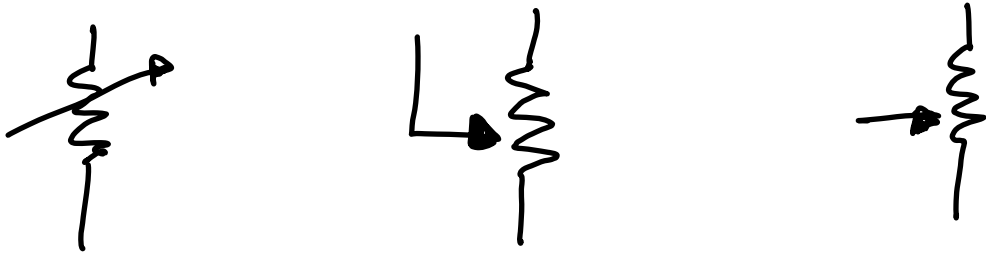
51  $10^2$   $\pm 5\%$

5100  $\pm 5\%$

Potentiometers — Variable resistor

Trim pot — " "

Symbols for potentiometer



Units of resistance (Ohm)  $\Omega$

50  $\Omega$  (50 Ohms)

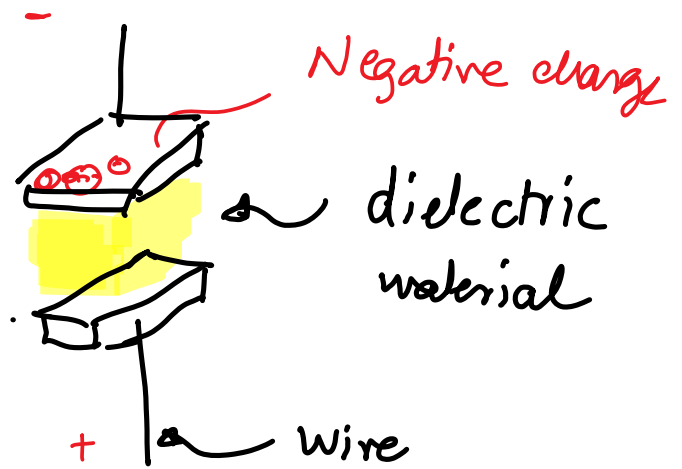
## Capacitor

$$q = CV$$

$q$  = charge

$V$  = voltage

$C$  = capacitance



## Units

Either in pF (picofarad)  $10^{-12}$  F  
 $\mu$ F (microfarad)  $10^{-6}$  F



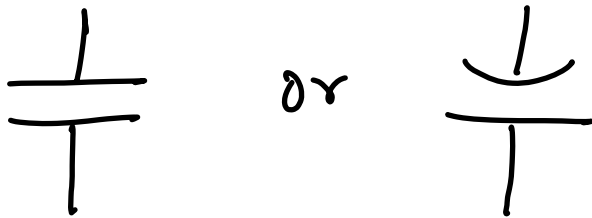
Capacitors — 3 values written on them

e.g. 102  $\Rightarrow 10 \times 10^2$  pF

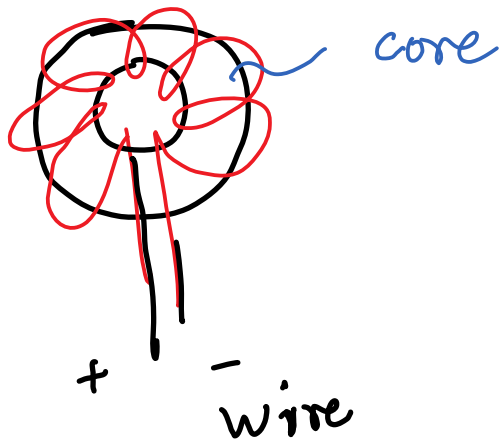
Sometimes capacitors have only 2 numbers.  
Assume 3<sup>rd</sup> number is zero.

e.g.  $22 \Rightarrow 220 \Rightarrow 22 \times (10^0) = 22 \text{ pF}$

Symbol



# Inductor (stores energy)



$$V = L \frac{dI}{dt}$$

V = Voltage

I = current

L = inductance (henry (H))  
↑  
lower case

NOTE: If  $I = 0$  then  $\frac{dI}{dt} = 0 \Rightarrow V = 0$

Symbol :

Voltage source:

e.g. battery



Current Source

