Sec 4 N(A) Combined Physics Share

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D.C. Circuits

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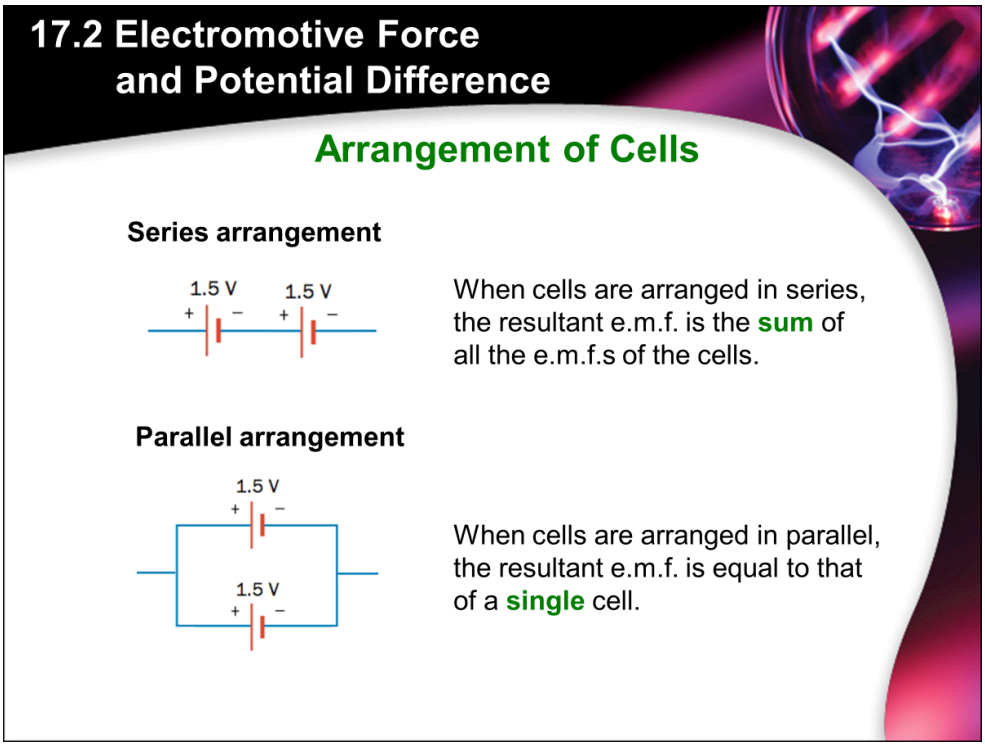
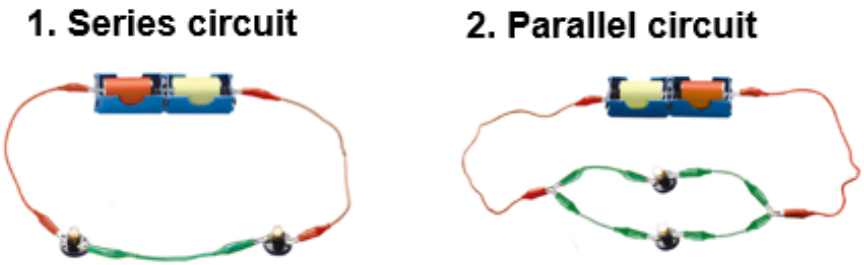
RECAP: What is Series and Parallel Circuits?





Series Circuits

In a series circuit,

- the components are connected **one after another** in a single loop;
- there is only one path through which **electric current** can flow.

If a resistor is added to the circuit, the current will decrease as a resistor **resists**.

The ammeter **will not** affect the circuit, it only measures the current in Ampere (A), hence, they will give the same current reading.

In a series circuit, the current will be the same.

In a series circuit, the effective resistance is always **greater** than the largest of the individual resistances.

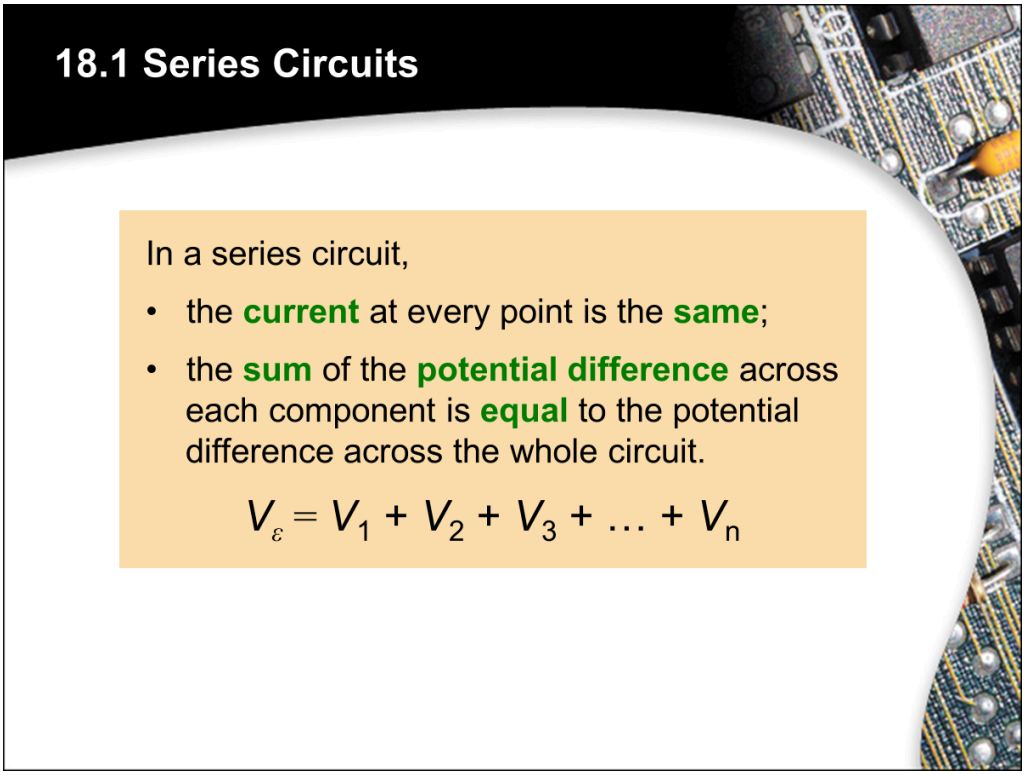
Ohm's law

V = IR

Where:

- V = Voltage
- I = Current
- R = Resistance (Ω)

Potential Difference in a Series Circuit



- SI Unit of e.m.f and voltage is Volt (V)

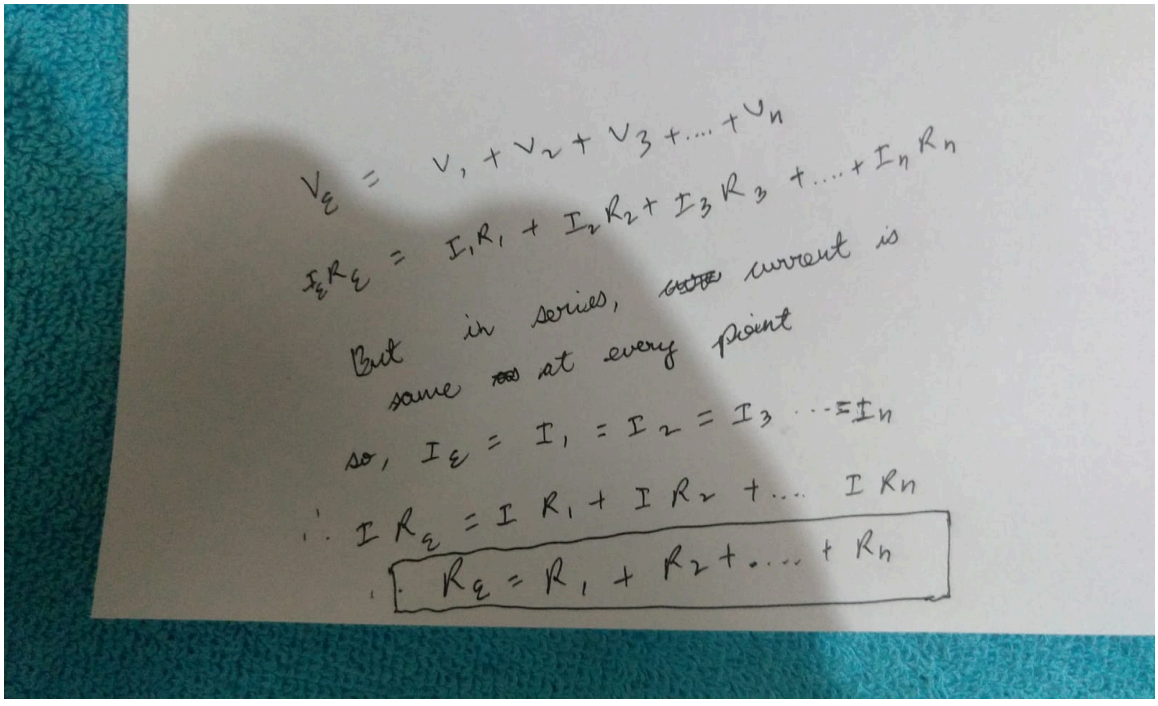
RECAP: Resistance of different apparatuses

Voltmeter —> Infinite resistance

Ammeter —> Very negligible resistance that we assume it to be zero

in an ideal situation, the potential difference across the whole circuit is equal to the e.m.f. of the electrical source. (This is based on the Principle of Conservation of Energy; chemical potential energy from the source is converted to heat in the two resistors.)

In reality, the e.m.f. of the electrical source is not equal to the p.d. across the whole circuit. The p.d. across the circuit will be lower than the e.m.f. of the electrical source. This is because the electrical source has internal resistance.



Example question

r1 = 1 ohm

r2 = 5 ohms

r3 = 10 ohms

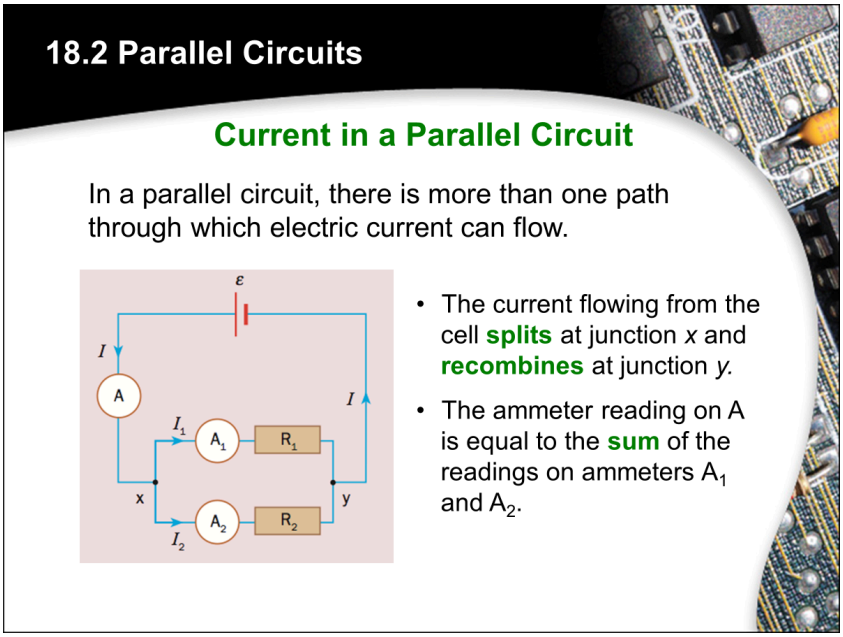
r4 = 2 ohms

Total resistance = 18 ohms

Resistor with the most resistance = 10

(Add table here)

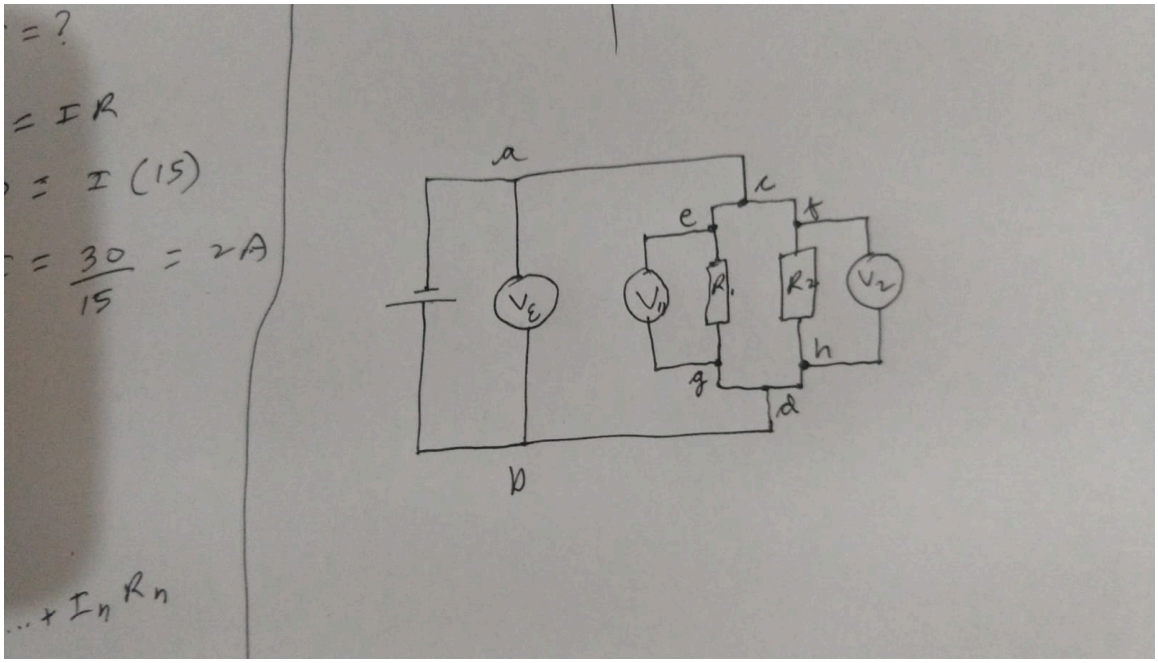
Parallel Circuits



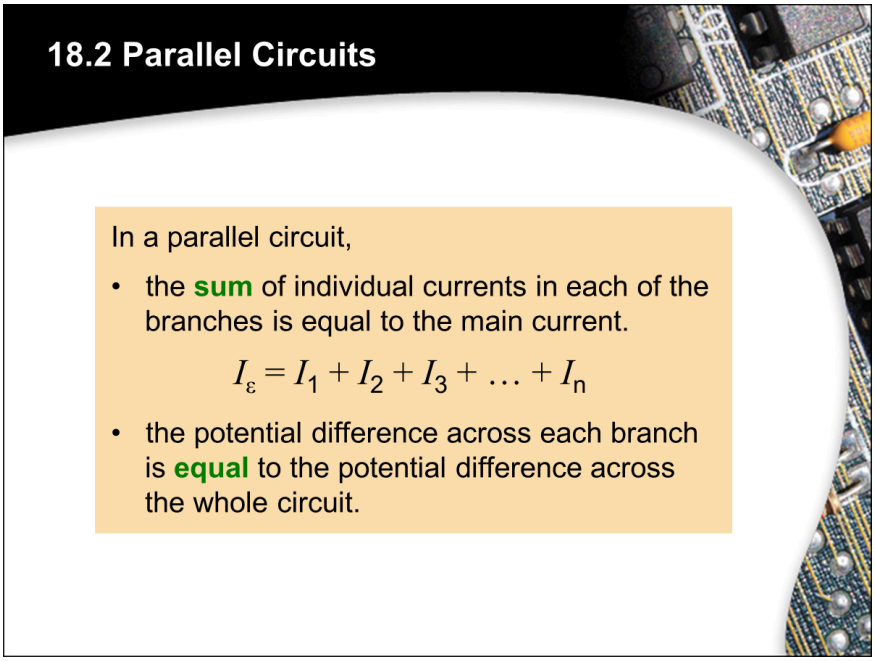
V = IR

V (Potential Difference) between points X and Y is constant

I1 is passing through R1 and I2 is passing through R2, which depends on the resistance



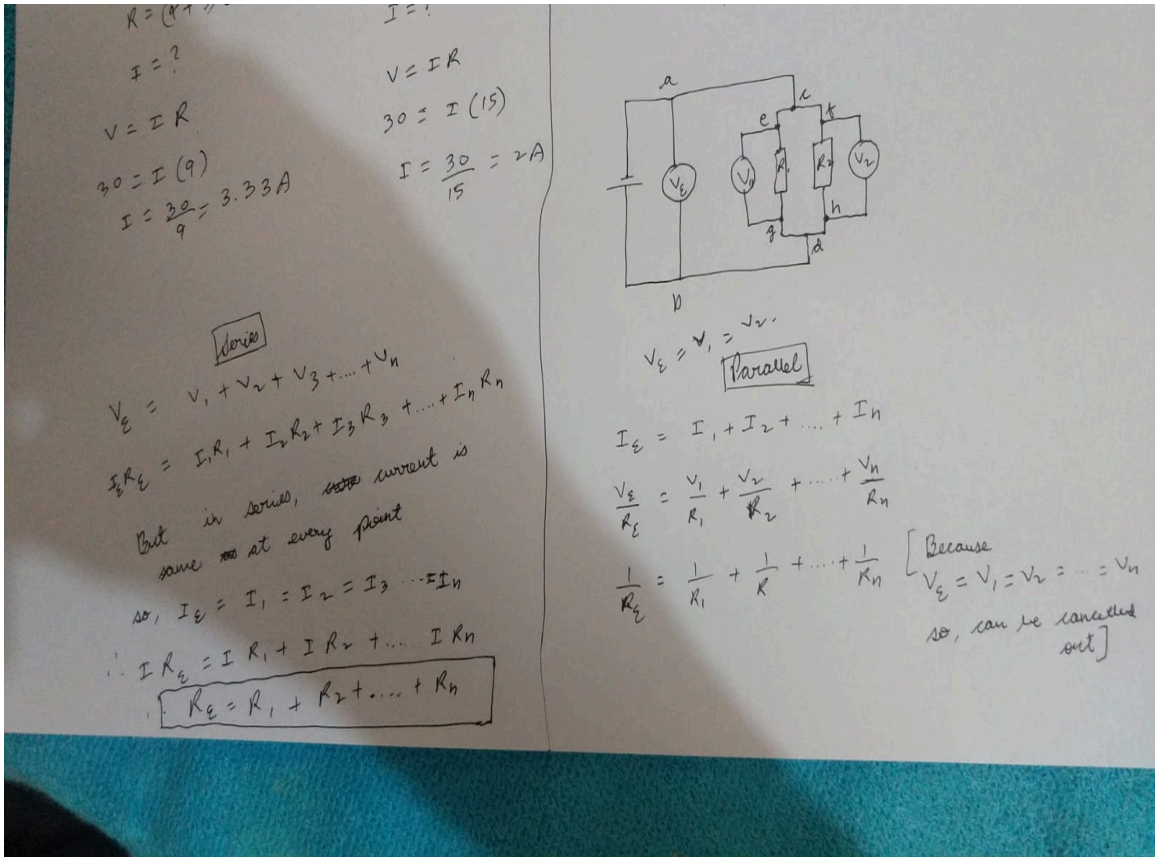
- Point A and B only have Vε between them
- The potential difference between point C and D is the same, which is Vε
- Point D and Point H also have Vε between them
- Point G and Point D's Potential Difference can also be considered as Vε



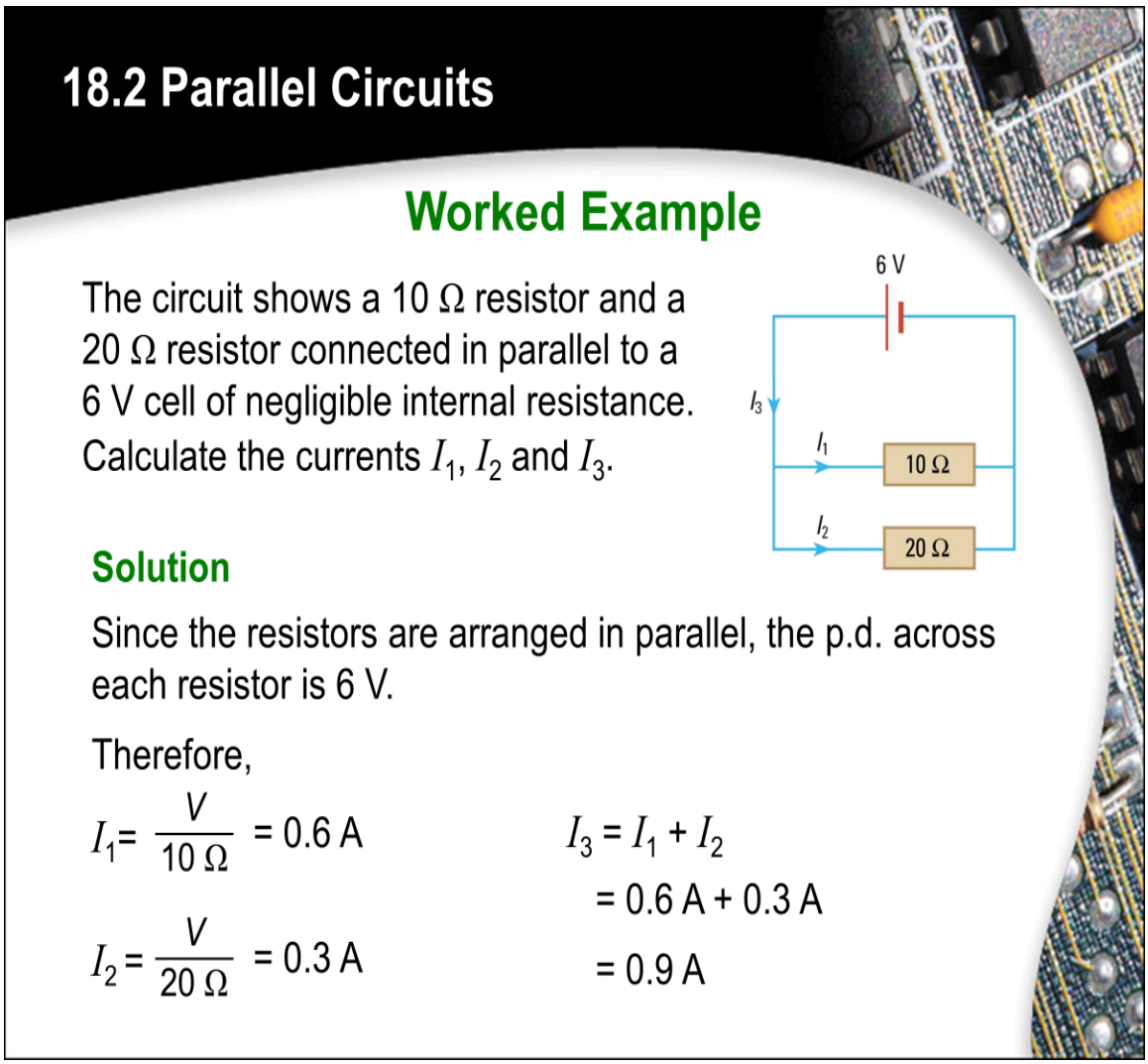
Ie = Ve / Re

I1 = V1 / R1

Ve / Re = V1 / R1 + V2 / R2 + V3 / R3 ... + Vn / Rn



Effective resistance is always than the smallest resistance.



The relationship between I1, I2 and I3 is that I1 = I3 + I2