Objectives of Class Session

- Review of Voltage, Current, Power
- KCL
- KVL
- Conservation of Power
- Series and Parallel Connection of Elements

1.2 Voltage

Voltage is the energy per unit charge created by the separation, which can be expressed as

$$v = \frac{dw}{dq} \qquad \text{Volt (joule/coulumb)}$$

where

v = the voltage in volts

w = the energy in joules

q = the charge in coulombs

1.3 The Current

The rate of flow of charges is called the current which is expressed as

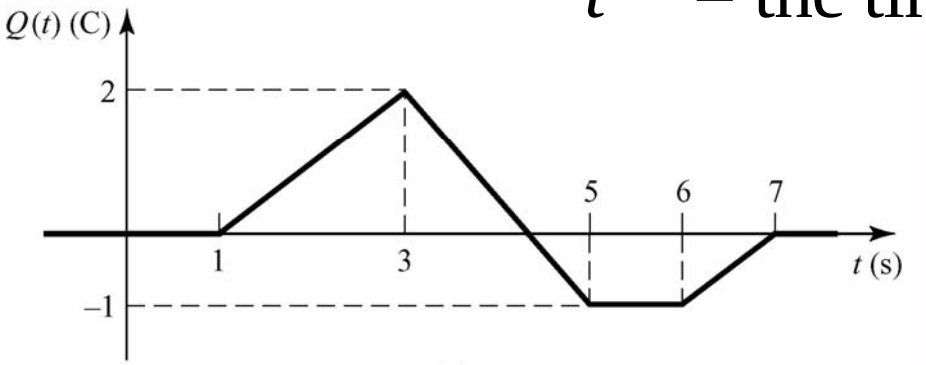
$$i = \frac{dq}{dt}$$ Ampere (coulumb/second)

where

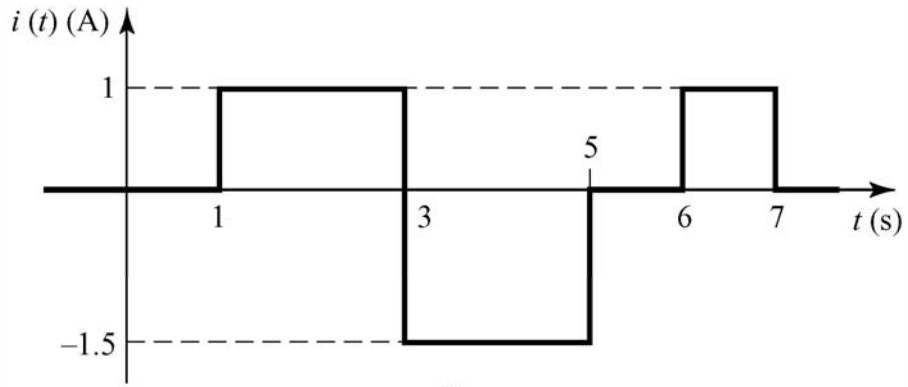
i = the current in amperes

q = the charge in coulombs

t = the time in seconds



(a)



(b)

Power

Power is defined as the time rate of expanding or absorbing energy

$$P = \frac{dw}{dt} \quad \text{W} \qquad 1\ \text{W} = \frac{1\ \text{J}}{1\ s}$$

where

P – power in Wattts

w – Energy in Joules

t – Time in Seconds

$$P = \frac{dw}{dt} = \left(\frac{dw}{dq}\right)\left(\frac{dq}{dt}\right) = vi$$

This shows that the power is simply the product of the current in the element and the voltage across the element

Passive Sign Convention

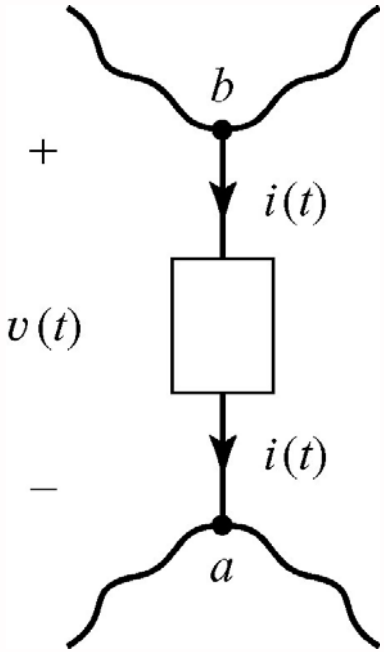
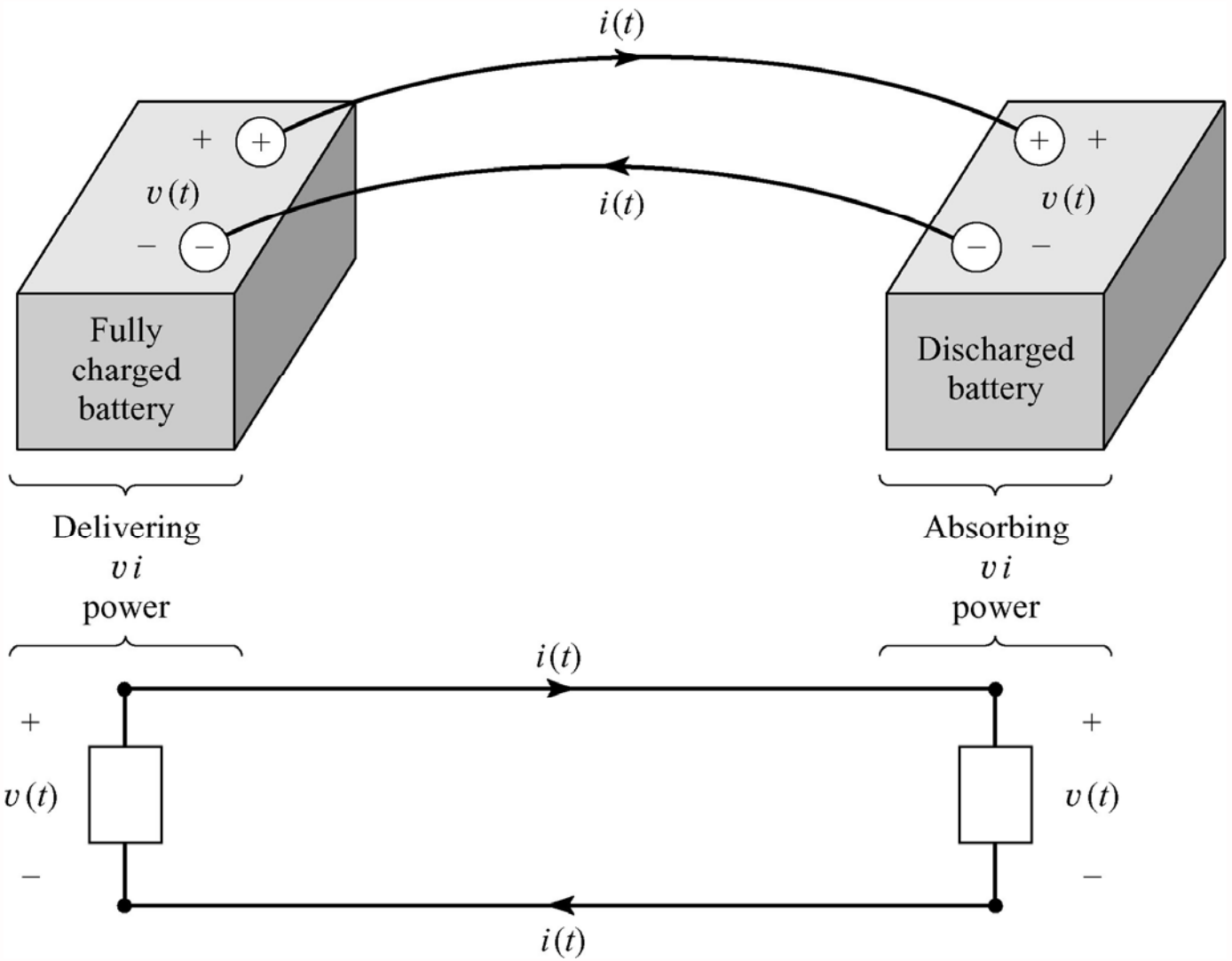


Figure 1.10
Charging a discharged automobile battery to illustrate the concept of power delivered to or absorbed by an element and the passive sign convention.



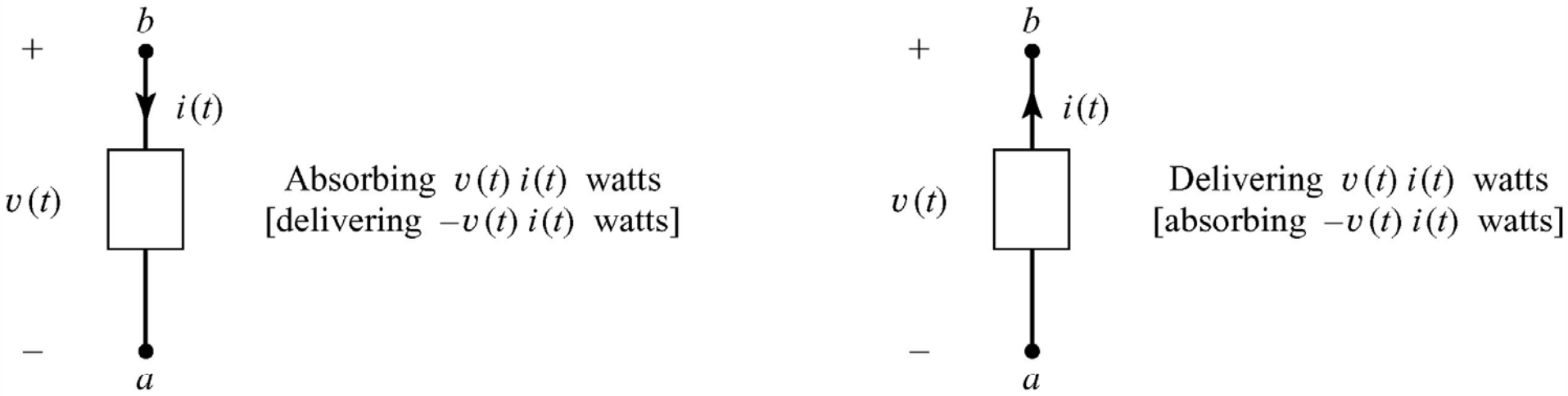


Figure 1.11 Illustration of the power delivered to (absorbed by) an element and the power delivered by the element.

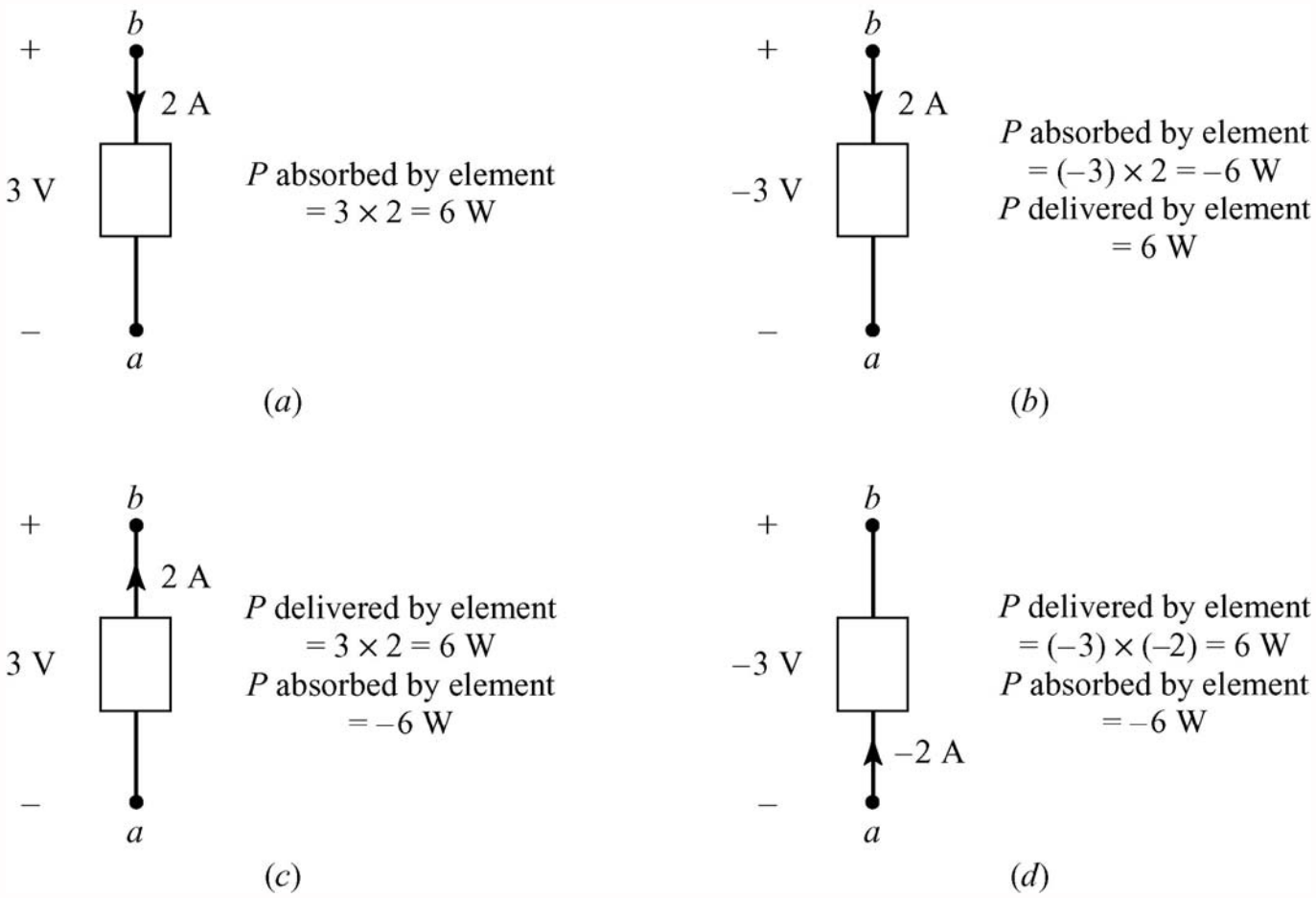


Figure 1.12 Examples of the computation of power delivered to or by an element.

Electric Circuit

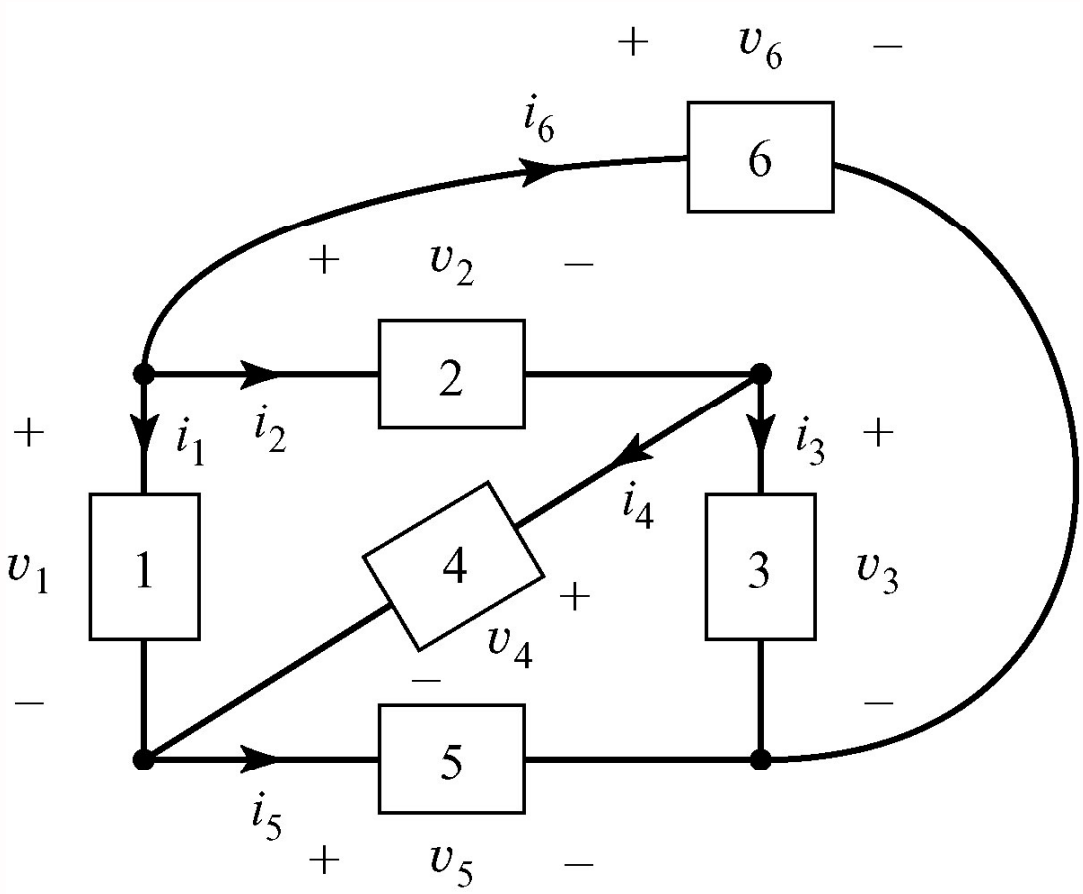


Figure 1.13

Illustration of an electric circuit as a particular interconnection of circuit elements.