Homework（First time）

1. The charge entering a certain element is shown in Fig.1. Find the current at: (a) t=1ms (b) t=6ms (c) t=10ms

2. Determine whether the voltage and current are Passive sign convention or not for the element in Figure 2(a) and 2(b).

3. Determine whether the voltage and current are Passive sign convention or not for the element in Figure 3.
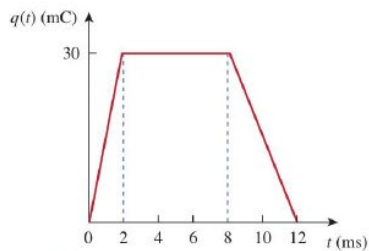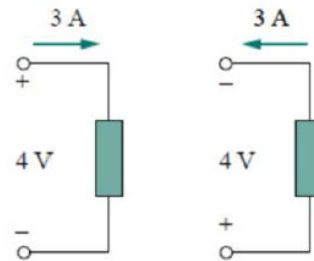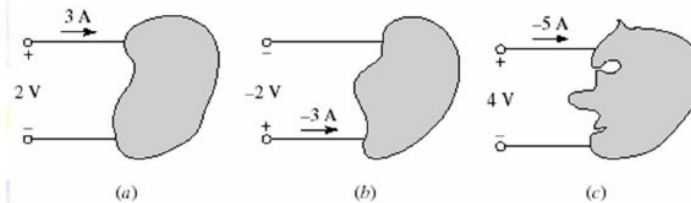

Figure 1

(a) Figure 2 (b)

(a)　　　　(b)　　　　(c)

Figure 3

1. The charge entering a certain element is shown in Fig.1. Find the current at: (a) t=1ms (b) t=6ms (c) t=10ms
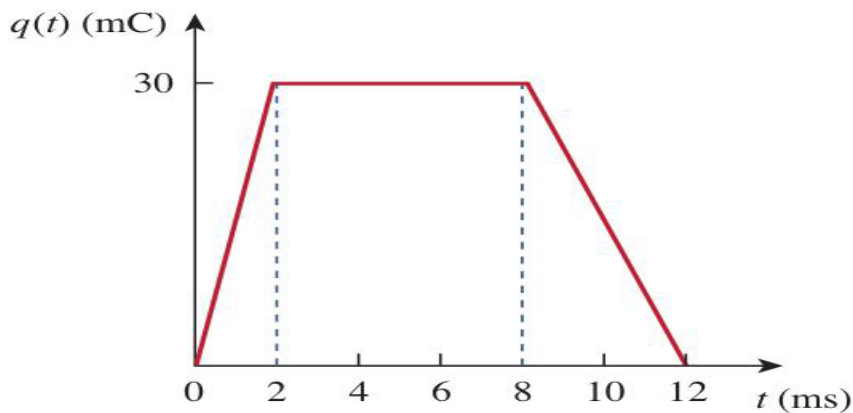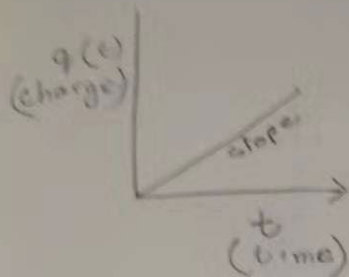

Figure 1

Answer:

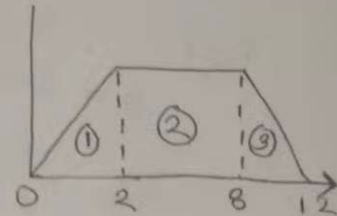$\dfrac{dq(t)}{dt} = current$

(a)

$\Rightarrow \dfrac{rise}{run} = \dfrac{30}{2} = 15A$

(Ans)

(b)

$\dfrac{rise}{run} = \dfrac{0}{run} = 0A$ (Ans)

(c)

$\dfrac{rise}{run} = \dfrac{-30}{(12-8)} = \dfrac{-30}{4} = -7.5A$

(Ans)

Alternate way

(a) $t = 1\ ms$

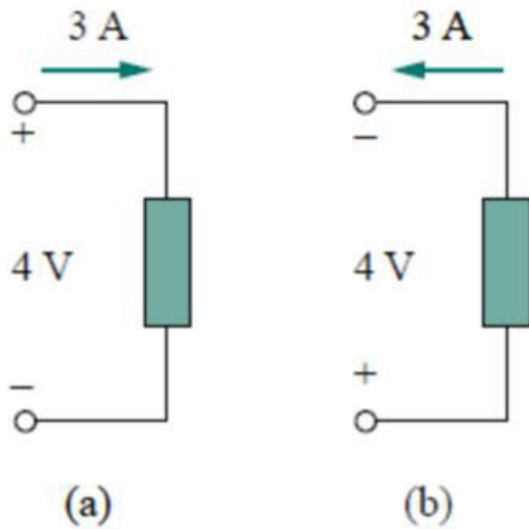$$i = \frac{dq}{dt} = \frac{(30-0)}{(2-0)} = 15\ A \quad (Ans)$$

(b)

$t = 6\ ms$

$$i = \frac{dq}{dt} = \frac{0}{8-2} = 0\ A \quad (Ans)$$

(c)

$t = 10\ ms$

$$i = \frac{dq}{dt} = \frac{(0-30)}{12-8} = 7.5\ A \quad (Ans)$$

2. Determine whether the voltage and current are Passive sign convention or not for the element in Figure 2(a) and 2(b).

(a)   (b)

Answer:

The cases of an element with an absorbing power of 12 W

(a) p = 4 × 3 = 12 W

(b) p = 4 × 3 = 12 W

3. Determine whether the voltage and current are Passive sign convention or not for the element in Figure 3.

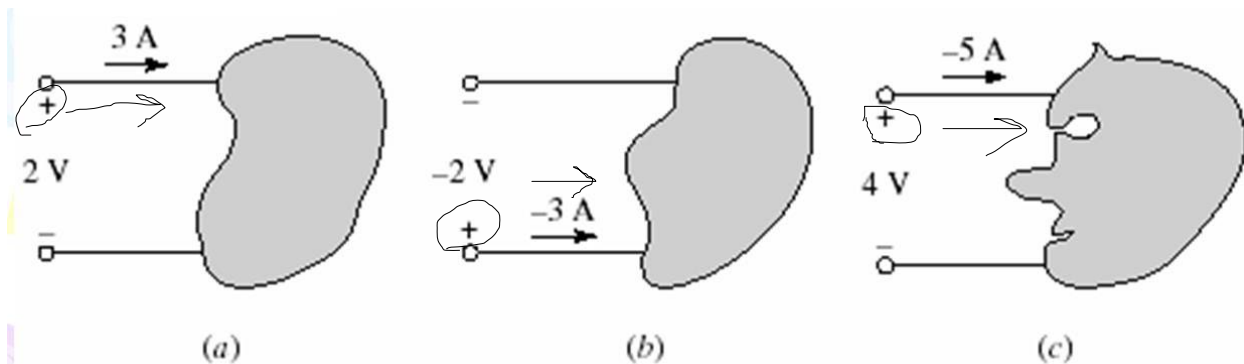
Figure 3

Answer:

In Figure a, with +3 A flowing into the positive reference terminal, we compute

Passive sign convention, $P = (2\ V)(3\ A) = 6\ W > 0$ of the power absorbed by the element.

Voltage and current are Passive sign convention.

In Figure b, shows a slightly different picture. Now we have a current of -3 A flowing into the positive reference terminal. However, the voltage as defined is negative. This gives us an absorbed power

Passive sign convention, $P = (-2\ V)(-3\ A) = 6\ W > 0$ Absorb energy

Voltage and current are Passive sign convention.

In Figure c, we again apply the passive sign convention rulers and compute an absorbed power

Passive sign convention, $P = (4\ V)(-5\ A) = -20\ W < 0$ supply energy

Since we computed a negative absorbed power, this tells us that the element in Figure c is actually supplying +20 W (i.e., it's a source of energy).

Voltage and current are Passive sign convention.