

# task\_I9hubowt6x00b2h5\_with\_calculation

## Student Group

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### Exercise E21 Determining the Current from Charge per Time

Two objects experience a charge increase over time, as shown in [figure 1](#). One object has a non-linear increase in the charge per time.

#### Result

A non-linear charge increase leads to a non-constant current.  
 For a non-constant current, one has to use the time derivative of the charge  $Q$  to get the current  $I$ .  
 So, the formula  $I = \frac{dQ}{dt}$  has to be used instead of  $I = \frac{\Delta Q}{\Delta t}$ .

Fig. 1: Time course of the charge ...

1. Determine the currents  $I_1$  and  $I_2$  for the two objects from the  $Q$ - $t$ -diagram [figure 1](#) and plot the currents into a new diagram.

#### Solution

- Have a look how much increase  $\Delta Q$  per time duration  $\Delta t$  is there for each object.
- For this choose a distinct time period, e.g. between  $0 \text{ s}$  and  $20 \text{ s}$ .
- The current is then given as the change in charge per time:  $I = \frac{\Delta Q}{\Delta t}$

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