A Electrical charge

1. Atomic source
   a) electron — negative
   b) proton — positive

2. Symbol — $q(t)$

3. Unit of measure — coulomb (C)
   a) 1 electron = -1.602×10^{-19} C.
   b) ∴ there are 6.242×10^{18} electrons / C.

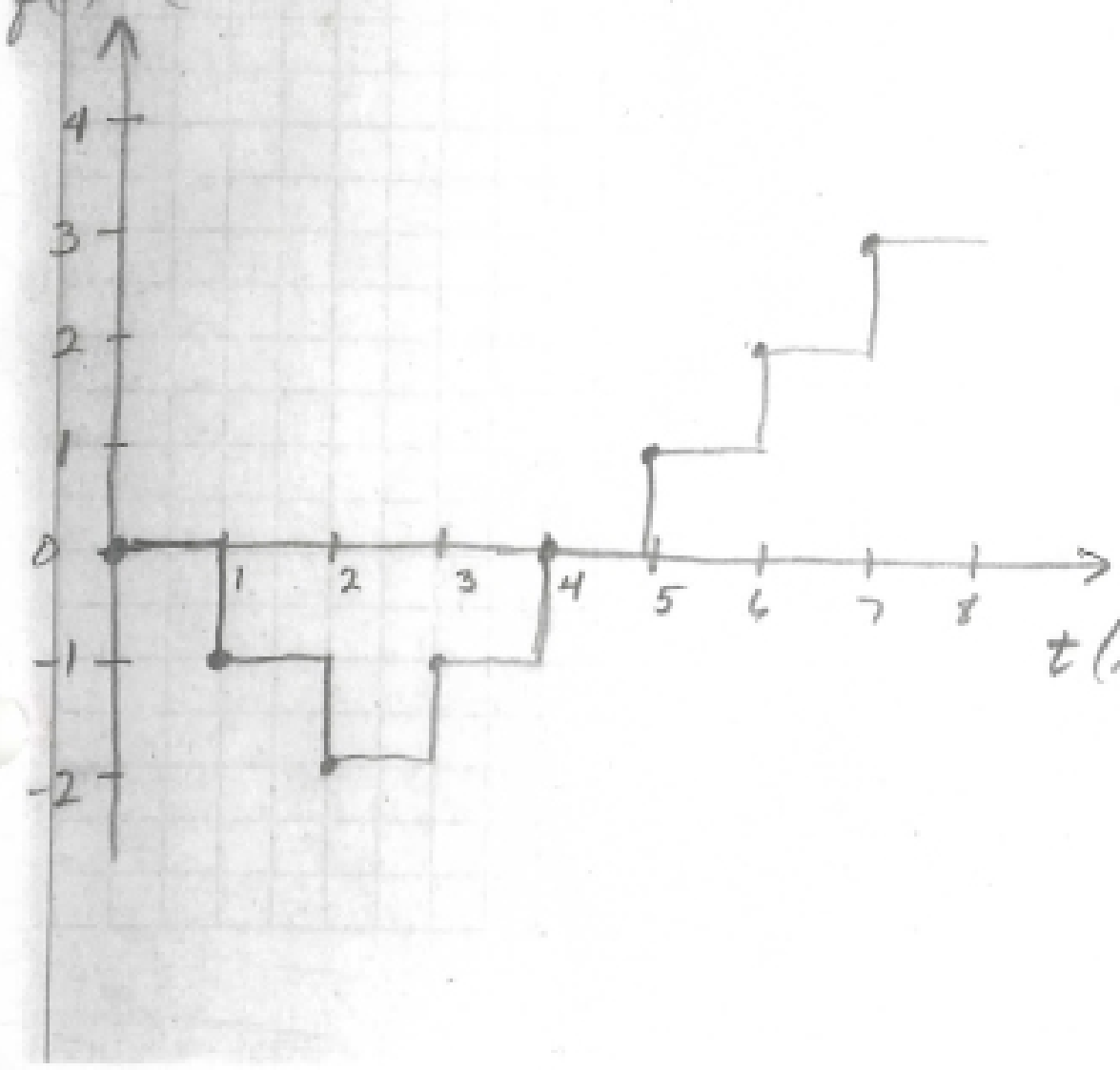
4. Stationary charge — static charge

5. Moving charge — current
   a) requires an energy expenditure

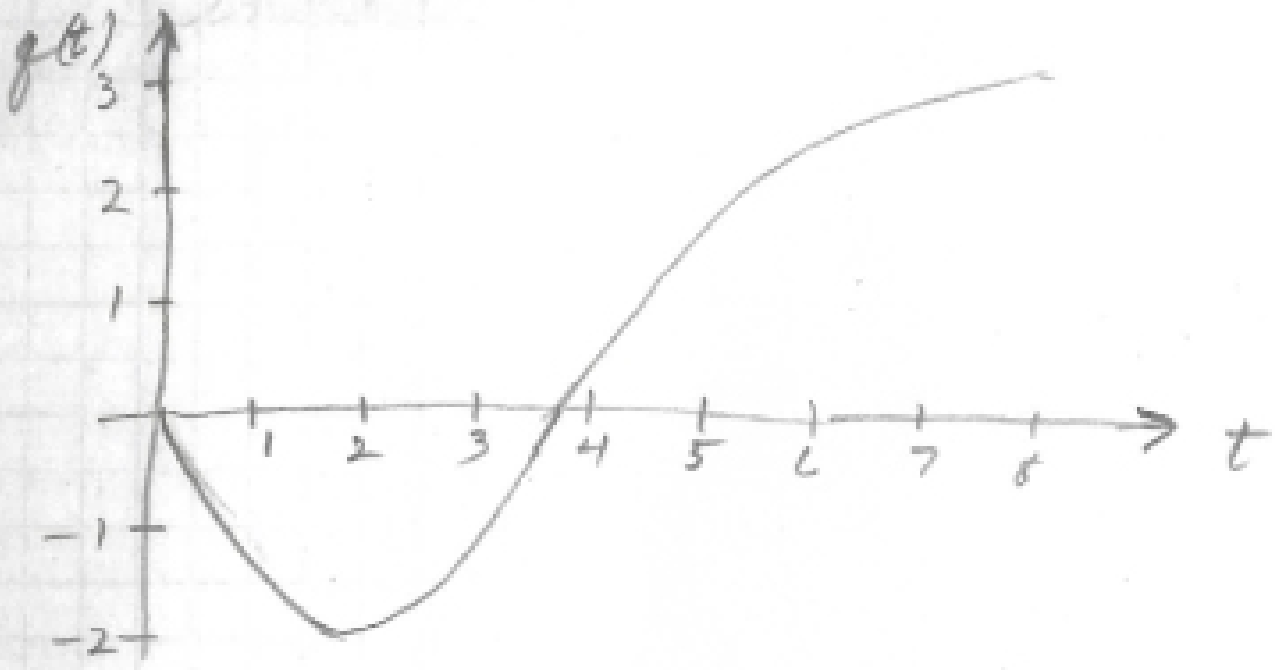
6. Measuring charge

$$\frac{}{1}$$

a) measure charge passing a point
b) positive direction is to the right
c) + charge to right, add to total
d) + charge to left, subtract from total
e) opposite for negative charge
f) value recorded at 1 second intervals



7. Increase observations to get $q(t)$ at every instant



a) gives a smooth curve

8. Rate of charge transfer

a) $\frac{\Delta q}{\Delta t}$

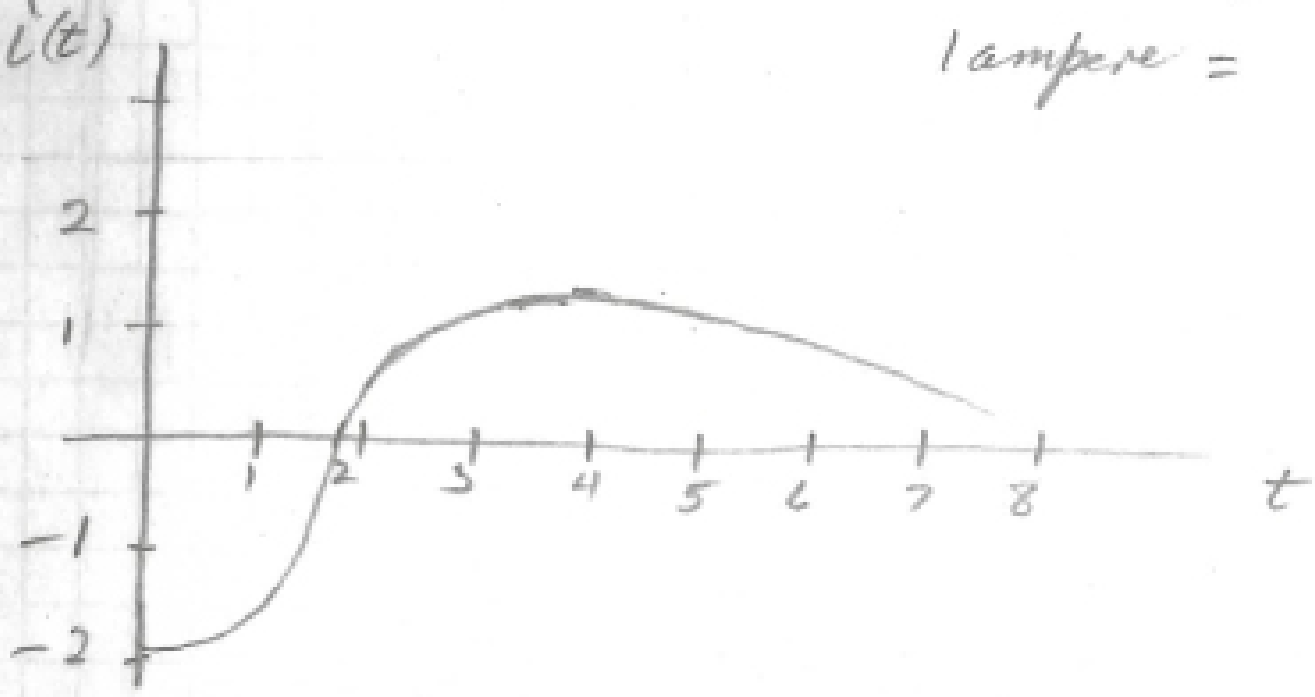
the instantaneous rate of charge transfer

$\lim_{\Delta t \to 0} \frac{\Delta q}{\Delta t} = \frac{dq}{dt} = i(t)$ The instantaneous current

b) Symbol for current $i(t)$

c) Unit of measure — ampere (A)

1 ampere = 1 C/s



the slope of graph at top of page

9. Charge transferred between t_0 and t

a) $i(t) = \frac{dq}{dt}$

b) $\int_{q(t_0)}^{q(t)} dq = \int_{t_0}^{t} i(t)\, dt$

$\therefore \quad q(t) - q(t_0) = \int_{t_0}^{t} i(t)\, dt$

or $\quad q(t) = \int_{t_0}^{t} i(t)\, dt + q(t_0)$

c) at $t_0 = -\infty$, $q(t_0) = 0$

$\therefore \quad q(t) = \int_{-\infty}^{t} i(t)\, dt$

10. Representing current flow in a wire

a) must have magnitude and direction

b) 3 C/s to right or −3 C/s to left

c) same as

d) must change both sign and arrow

11. Conventional charge — flow of positive charge