

3.6. Electric cars have been proposed as a method of easing air pollution in urban areas. One proposal to make cars more efficient is to use regenerative braking, in which the motor is turned into a generator and used to charge the batteries during braking. The kinetic energy of the car is thus converted to electrical energy and stored for later use. Consider a car with a mass of 1000 kg.

- (a) If the car is traveling at 30 m/s and regeneratively braked to a standstill, how much energy would be returned to the battery? Assume 100% efficiency.
- (b) If the battery voltage is regulated at 24 volts, how much charge expressed in ampere-hours is imparted to the battery?

a.  $E = \frac{1}{2} m v^2 = \frac{1}{2} 1000 (30)^2$

b.  $it$   $E = \int P(t) dt = \int V(t) i(t) dt$   
assume  $V, i$  constant

$$E = V i \int dt = V \underbrace{it}_{Ah}$$

$$\frac{1}{2} 1000 (30)^2 = V it = 24 it$$

$$it = \frac{1000 (30)^2}{2(24)}$$