

**Physics 102-Rec**  
**Quiz # 7**  
**Chapter 28**

Date: 12 May 2002

Name: Key Id: \_\_\_\_\_ Sect: \_\_\_\_\_

1. A 750 pF capacitor has an initial charge of 6  $\mu\text{C}$ . It is then connected to a 150 M $\Omega$  resistor.  
(a) What is the potential difference across the resistor 2 ms after it is connected to the capacitor?

$$V(t) = \frac{q_0}{C} e^{-\frac{t}{RC}}$$

$$RC = 150 \times 10^6 \times 750 \times 10^{-12} = 0.1125 \text{ sec}$$

$$V = \frac{6 \times 10^{-6}}{750 \times 10^{-12}} e^{-\frac{2 \times 10^{-3}}{0.1125}} = \boxed{7859 \text{ V}}$$

- (b) What is the current through the resistor at the same time as in part (a)?

$$I = \frac{V}{R} = \frac{7859}{150 \times 10^6} = \boxed{5.2 \times 10^{-5} \text{ A}}$$

- (c) How long does it take for the voltage across the capacitor to decrease to half its initial value?

$$\frac{V_{\max}}{2} = V_{\max} e^{-\frac{t}{RC}}$$

$$-\ln 2 = -\frac{t}{RC}$$

$$t = RC \ln 2 = 0.1125 \ln 2 = \boxed{0.078 \text{ sec}}$$