**Chapter 27. Current and Resistance**

St. ID: , Name:

1. (a) In the Bohr model of the hydrogen atom (which will be covered in detail in Chapter 41), an electron in the lowest energy state moves at a speed of 2.19 × 106 m/s in a circular path of radius 5.29 × 10-11 m. What is the effective current associated with this orbiting electron?

Ans: 1.05 mA

The period of the electron in its orbit is *T* = 2*πr*/*v*, and the current represented by the orbiting electron is



2. The quantity of charge *q* (in coulombs) that has passed through a surface of area 2.00 cm2 varies with time according to the equation, where *t* is in seconds. (a) What is the instantaneous current through the surface at *t* =1.00 s? (b) What is the value of the current density?

Ans: (a) 17.0 A (b) 85.0 kA/m2

We are given *q* = 4*t*3 + 5*t* + 6. The area is



(a) 

(b) 

3. An electric current in a conductor varies with time according to the expression, where *I* is in amperes and *t* is in seconds. What is the total charge passing a given point in the conductor from to?

Ans: 0.265C

To find the total charge passing a point in a given amount of time, we use , from which we can write



4. A wire 50.0 m long and 2.00 mm in diameter is connected to a source with a potential difference of 9.11 V, and the current is found to be 36.0 A. Assume a temperature of 20.08C and, using Table 26.2, identify the metal out of which the wire is made.

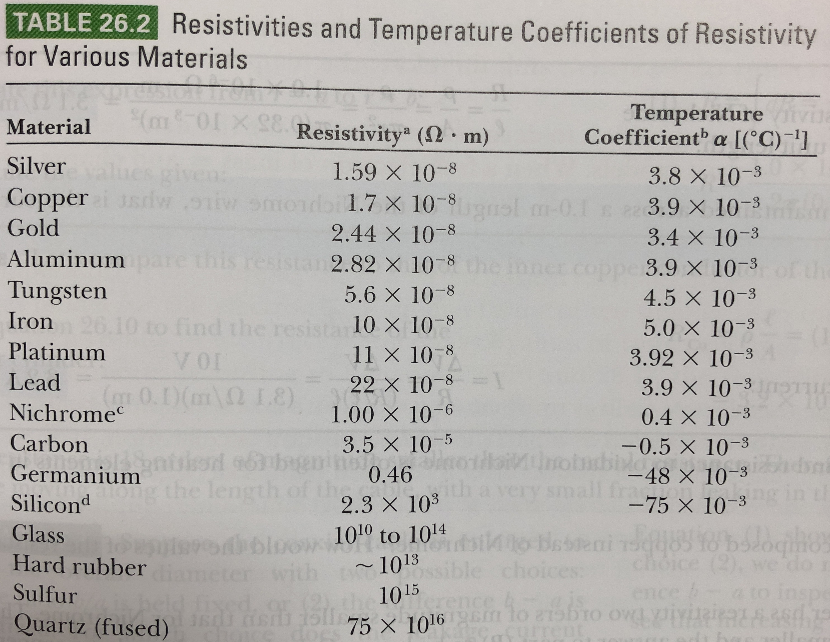
Ans: Silver

From Ohm’s law, and from Equation 26.10,



Solving for the resistivity gives



Then, from Table 26.2, we see that the wire is made of 