ANSWER: ELECTRON SPEED

The answer is: e. Although the electrical signal travels through the closed circuit at about the speed of light, the actual speed of electron migration (drift velocity) is much less. Although electrons in the open circuit (key in OFF position) at normal temperatures have an average velocity of some millions of kilometers per hour, they produce no current because they are moving in all possible directions. There is no net flow in any preferred direction. But when the key is turned to the ON position the circuit is completed and the electric field between the battery terminals is directed through the connecting circuit. It is this electric field that is established in the circuit at about the speed of light. The electrons all along the circuit continue their random motion, but are also accelerated by the impressed electric field in a direction toward the end of the circuit connected to the positive battery terminal. The accelerated electrons cannot gain appreciable speeds because of collisions with anchored atoms in their paths. These collisions continually interrupt the motion of the electrons so that their net average speed is extremely slow—less than a tiny fraction of a centimeter per second. So some hours are required for the electrons to migrate from one battery terminal through the circuit to the other terminal.