

## **ANSWER: MISUSED TRANSFORMER**

The answer is: e. The transformer is apparently misused because it is intended for use with alternating current while the battery only puts out direct current. So how can anything happen? Steady current in a transformer produces a steady magnetic field inside the transformer iron. This field threads through the coil connected to the lamp. But if the field doesn't fluctuate or change in some way, no current will be induced in the secondary coil. When the key is first closed, current surges into the primary and the magnetic field in the iron builds up. The growing field induces a current flow in the secondary and through the lamp. When the magnetic field is full grown it no longer is changing. So there is no longer an induction of current through the lamp. Later when the key is opened (disconnecting the battery), the current dies in the primary and likewise the magnetic field must die. But a dying field is a changing field. So again a current flows through the lamp, but this time in the opposite direction. But the lamp does not care which way the current goes; if the current is strong enough, the lamp lights.

