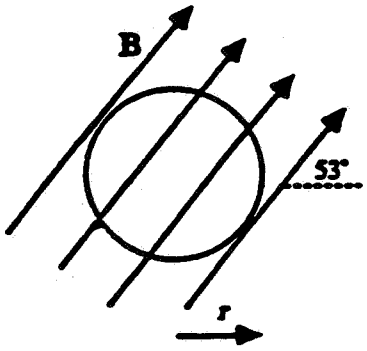
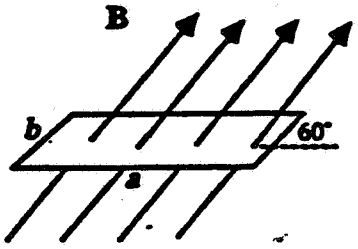
The Magnetic Flux

For each situation shown below, write an expression for the magnitude of the magnetic flux through the loop.

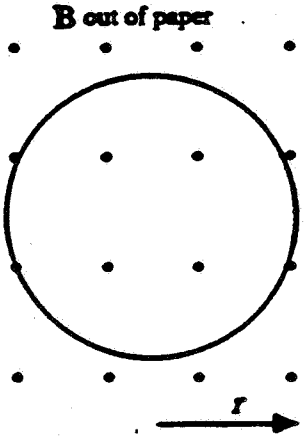
(a) The loop and the magnetic field are both in the plane of the paper.



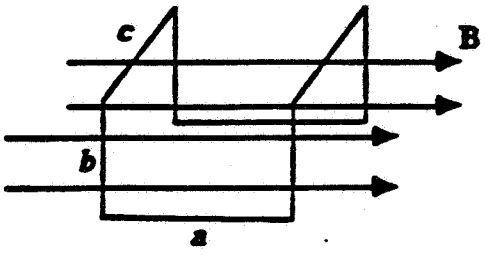
(b) The rectangular loop is perpendicular to the page and the magnetic field is in the plane of the paper.



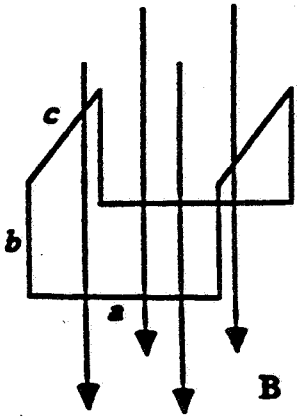
(c) The loop is in the plane of the paper and the field is perpendicular to the paper.



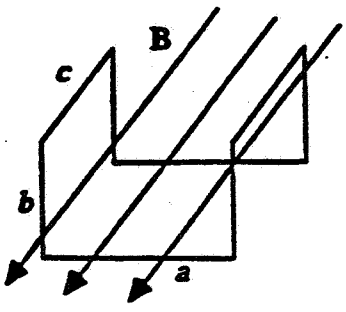
(d) The field is parallel to side a.



(e) The field is parallel to side b.



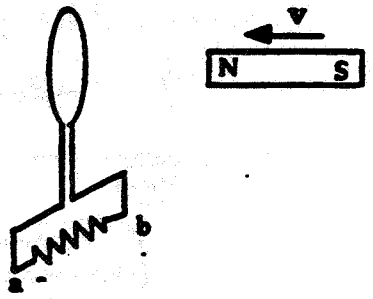
(f) The field is parallel to side c.



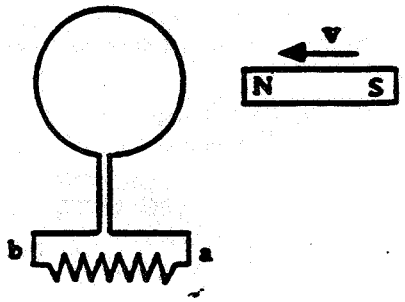
Polarity of Induced Voltage—1

For each situation described below, indicate whether a voltage is induced across the resistor. If so, indicate the side of the resistor at the higher voltage and the direction of the induced current.

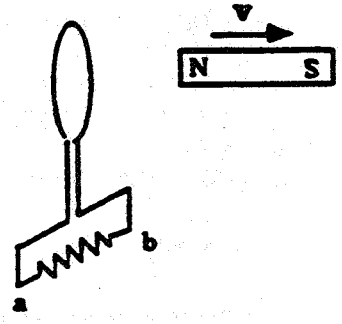
(a) A magnet in the plane of the paper moves toward the fixed loop that is perpendicular to the paper.



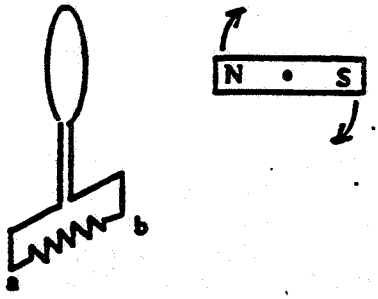
(b) A magnet in the plane of the paper moves toward a fixed loop that is also in the plane of the paper.



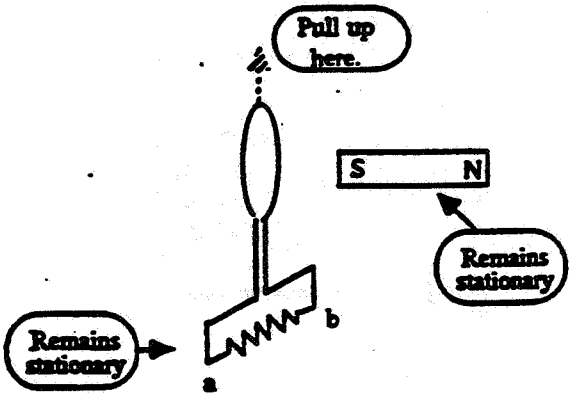
(c) A magnet in the plane of the paper moves away from a fixed loop that is perpendicular to the plane of the paper.



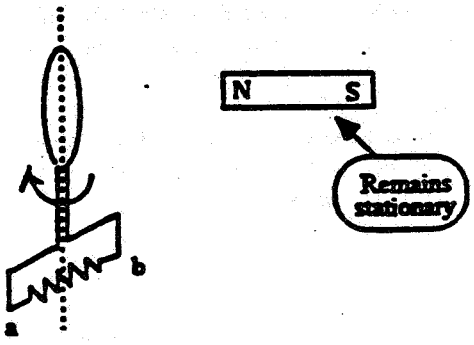
(d) A magnet in the plane of the paper is rotated about its center so that the North pole and South pole exchange positions relative to a fixed loop that is perpendicular to the plane of the paper.



(e) A magnet in the plane of the paper is held fixed as a loop perpendicular to the plane and originally open is stretched vertically so its opposite sides come together.



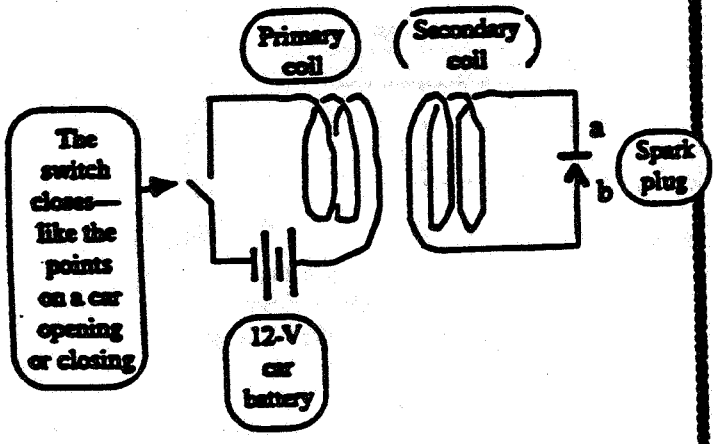
(f) A magnet in the plane of the paper is held fixed as a loop originally perpendicular to the plane of the paper, is rotated clockwise into the plane of the paper.



Induced Voltage—3

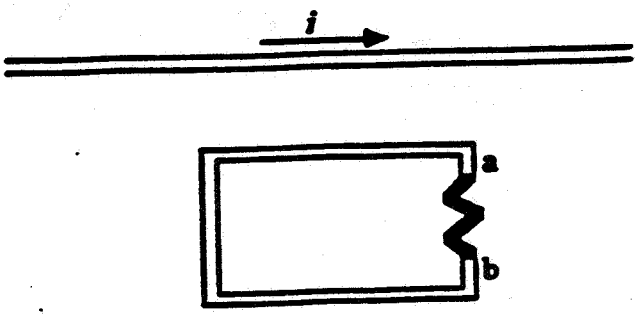
For each situation below, determine whether position a or position b is at a higher potential as a result of the change shown in the sketch.

(a) Automobile Ignition System



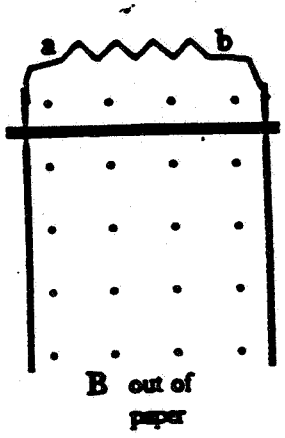
(c) Alternating Current Inductor

The current in the long straight wire, initially toward the right, reverses direction.



(b) Falling Bar Inductor

Determine the polarity of voltage across the resistor as the horizontal bar falls along the vertical side bars.



(d) "Eyeglasses" Inductor

The eyeglasses, initially in the plane of the magnetic field, are rotated 90° so that the rims now face in the direction of the magnetic field.