Answer #349

The answer is (a); the soda can will rotate clockwise, as can be seen by clicking your mouse on the photograph below. Just as a reminder, the magnet is rotating freely below the can a short distance away, and is not inside the cylinder.

As the magnet spins, eddy currents in the can develop as a result of the changing magnetic flux, by Faraday's Law. The direction of these currents is not arbitrary; on the contrary their direction is specifically induced so as to *oppose* the rotation of the horseshoe magnet, according to Lenz's law.

Since the magnet is rotating clockwise, any braking force to slow its motion must be directed *counter-clockwise*. Thus we conclude there must be a force (or more accurately a torque) of the-can-on-the-magnet in the counter-clockwise direction.

However Newton's 3rd Law reminds us that forces always exist in equal and opposite pairs: if there is a force of the-can-on-the-magnet in the counter-clockwise direction, then there must be a *reaction* force of the-magnet-on-the-can in the *clockwise* direction as well! Since the can is free to rotate, this reaction-force can be observed and is seen by the can rotating in the clockwise direction.

A curious observation is the noticeable difference in the speed with which the magnet and soda can rotate relative to each other. This difference is essential to the phenomena, for without the relative motion, there would be no change in magnetic flux (and no Lenz's Law)!

You can try a similar experiment yourself at home! An example of such an apparatus is provided in *100 Amazing First-Prize Science Fair Projects* by Glen Vecchione which is also available on the web courtesy of our good friend Google Books.

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