

How changing flux creates an emf

Physics grades 11-12 (A Level · IB · Class 11-12) · Lab answers

The sample data show emf rising in proportion to the speed of the magnet. The gradient has the unit volt second per metre. Your results may differ in size because they depend on your coil and magnet, but the proportionality should appear.

Level: Physics grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** IB D.4

Question 1 Plotting

The points (0.99, 34), (1.40, 48), (1.98, 67), (2.43, 84), (2.80, 95) lie close to a straight line through the origin, so **emf rises in step with speed**.

Question 2 Pattern

The peak emf is **directly proportional to the speed** of the magnet.

Question 3 Gradient

gradient = $\Sigma vE / \Sigma v^2 = 34 \text{ mV per m/s}$, i.e. 0.034 V s/m.

Question 4 Explanation

Faster motion means the flux linked with the coil changes in a shorter time, so $\Delta\Phi/\Delta t$ and the emf are larger. **Emf is proportional to the rate of change of flux.**

Question 5 Sign of the pulse

When the magnet enters, the flux through the coil increases; when it leaves, it decreases. The induced emf reverses direction, giving **opposite signs**. The second pulse is larger because the magnet is moving faster.

Question 6 Evaluation

Air resistance and eddy currents in the former reduce the speed; the tube may rub the magnet. **Improve it** by using timing gates to measure the actual speed at the coil.