

How changing flux creates an emf

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

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test covers flux, Faraday's and Lenz's laws, moving conductors and generators. Show formulas, substitutions and units. Calculators are allowed. Use $g = 9.81 \text{ N/kg}$ where needed.

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

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Defining flux (2 marks)

Define magnetic flux and give its unit.

Question 2 Tilted coil (2 marks)

A coil of area 0.030 m^2 is in a 0.25 T field. The normal to the coil makes an angle of 40° with the field. Calculate the flux through the coil.

Question 3 Faraday's law (3 marks)

The flux through each turn of a 400-turn coil falls from 3.0 mWb to zero in 0.15 s .

- State Faraday's law. (1 mark)
- Calculate the average emf induced in the coil. (2 marks)

Question 4 Lenz's law (3 marks)

The north pole of a bar magnet is pulled away from a coil.

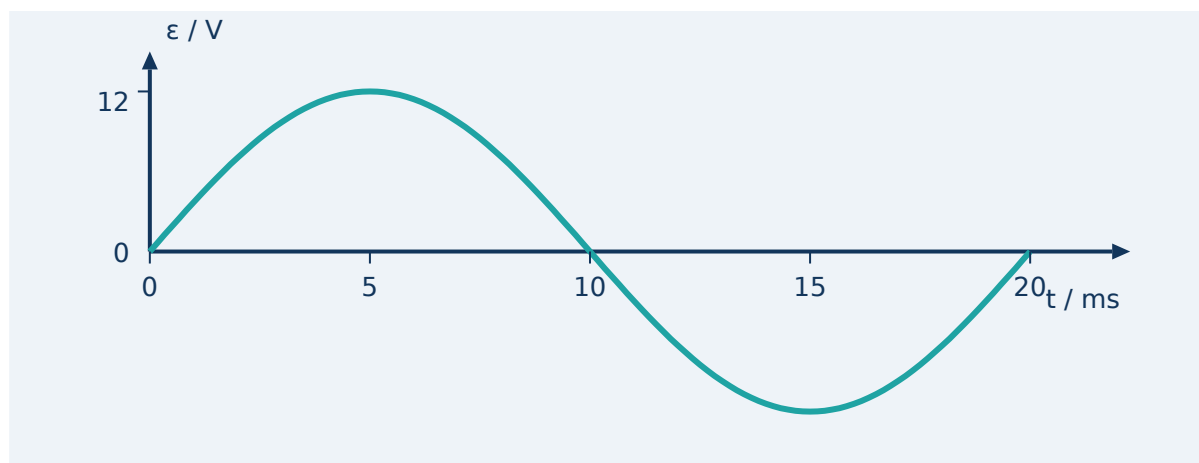
- State the polarity of the end of the coil nearest the magnet. (1 mark)
- Explain this using conservation of energy. (2 marks)

Question 5 Sliding rod (3 marks)

A rod 0.45 m long moves at 1.8 m/s perpendicular to a 0.35 T field in a circuit of resistance 0.20Ω . Calculate the emf and the current.

Question 6 Reading a generator graph (3 marks)

The graph shows the emf from a small generator.



Emf of a generator against time.

- State the peak emf and the period. (1 mark)
- Calculate the frequency and the angular speed. (2 marks)

Question 7 Open and closed coil (2 marks)

Explain why it is harder to push a magnet into a closed coil than into an open one.

Question 8 Falling magnet (2 marks)

A magnet falls through a coil and a larger pulse is recorded as it leaves than as it enters. Explain this.