

13 Faraday's and Lenz's laws – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
Faraday's law	法拉第定律	_____
Lenz's law	楞次定律	_____

Recall

In Part A you saw that a changing magnetic flux drives a current. Now the two laws that describe it:

- One law gives the **size** of the induced voltage.
- The other gives its **direction**.

Each idea has a worked example before the Practice.

New ideas

■ 1 Faraday's law

Faraday's law 法拉第定律 says the induced voltage equals how fast the flux changes:

$$\varepsilon = \frac{\Delta\Phi}{\Delta t}.$$

A coil of N turns gives N times as much.

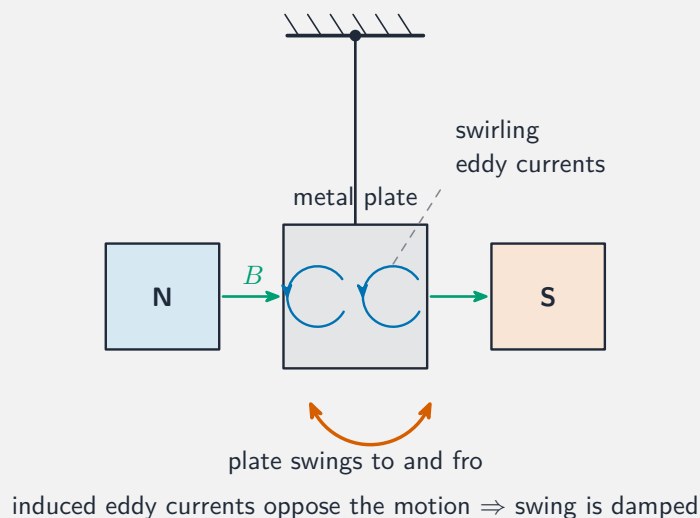
Worked example. If one turn would give 0.40 V, a 50-turn coil gives $50 \times 0.40 = 20$ V.

■ 2 Lenz's law

Lenz's law 楞次定律 gives the direction: the induced current flows so as to **oppose** the change that caused it.

■ 3 It is energy conservation

Lenz's law is really energy conservation –you must do work to push the magnet against this opposing effect, and that work becomes the electrical energy.



■ 4 Generators

Spinning a coil in a magnetic field constantly changes the flux, inducing a current – this is how a **generator** turns motion into electricity.

Watch out: the induced current always **opposes** the change (Lenz's law). If it helped the change instead, you would get energy for free –which is impossible.

Practice

Try these in order. The methods are all above.

2.1 State what Faraday's law says the induced voltage depends on. [2]

2.2 A coil has 20 turns; one turn would give 0.30 V. Find the coil's voltage. [2]

2.3 State what Lenz's law tells you about the direction of an induced current. [2]

2.4 Explain why Lenz's law is really a statement of energy conservation. [2]

2.5 State how a generator produces electricity. [2]
