

4.5 Electromagnetic effects

Name: _____ Class: _____ Date: _____

Total: 11 marks

Objective

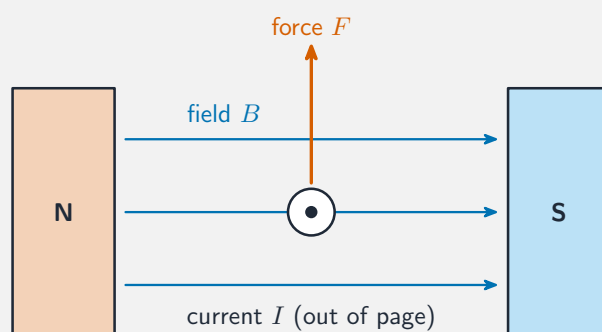
Build the skills to answer exam questions on **electromagnetic effects** 电磁效应—the **motor effect** 电动机效应, **electromagnetic induction** 电磁感应, the a.c. generator, and **transformers** 变压器.

You must be able to:

- describe the force on a current-carrying wire (and how to reverse it)
- describe electromagnetic induction and the a.c. generator
- use $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ for a transformer

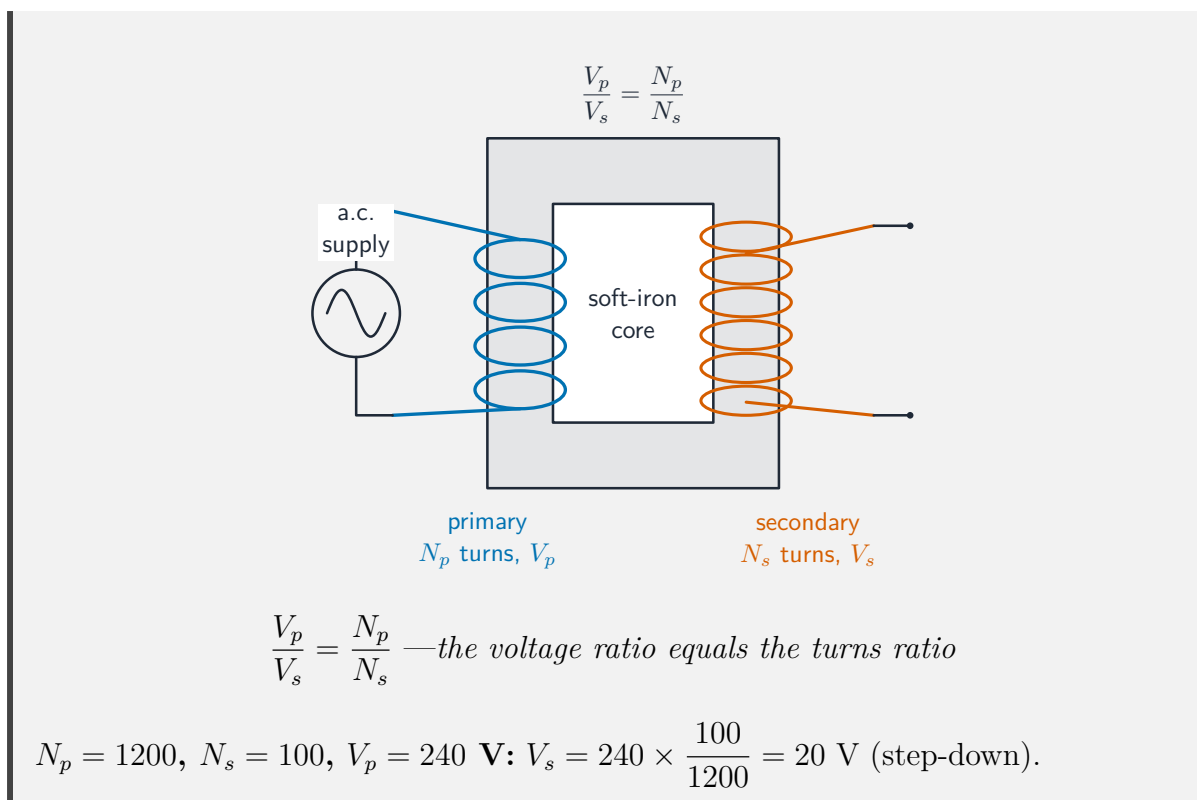
1 Worked examples

■ Motor effect & transformer



F , B and I are all at 90° (Fleming's left-hand rule)

A current-carrying wire in a magnetic field feels a force; reverse the current or field to reverse the force



2 Practice

2.1 State two ways to increase the force on a current-carrying wire in a magnetic field.[2]

2.2 State what a step-up transformer does to the voltage. [1]

3 Exam-style questions

3.1 Reversing the current in a wire in a magnetic field: [1]

- **A** removes the force
- **B** reverses the force
- **C** doubles the force
- **D** has no effect

3.2 A transformer has 200 turns on the primary and 1000 turns on the secondary. The primary voltage is 12 V.

(a) Find the secondary voltage. [3]

(b) State whether this is a step-up or step-down transformer. [1]

3.3 Describe how an e.m.f. is induced when a magnet is moved into a coil, and state two ways to make the induced e.m.f. larger. [3]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **4.5 Electromagnetic effects** past-paper sheet in the Library, or try these in **Practice mode**:

- 0625/21 N25 —Q30 (generator / induction)
- 0625/21 N25 —Q31 (motor effect)
- 0625/21 N25 —Q32 (transformer)

Solutions

2.1 increase the current; use a stronger magnetic field.

2.2 it increases (steps up) the voltage.

3.1 B. Reversing the current reverses the direction of the force.

3.2 (a) $\frac{V_p}{V_s} = \frac{N_p}{N_s}$: $\frac{12}{V_s} = \frac{200}{1000}$; $V_s = 12 \times 5; = 60 \text{ V}$.

(b) step-up (more turns on the secondary).

3.3 moving the magnet changes the magnetic field through the coil, which induces an e.m.f.; make it larger by moving the magnet faster; use a stronger magnet or more turns on the coil.