

Induction · supported focus

International Baccalaureate · IB Diploma · Physics · HL

Scope and prerequisites

Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

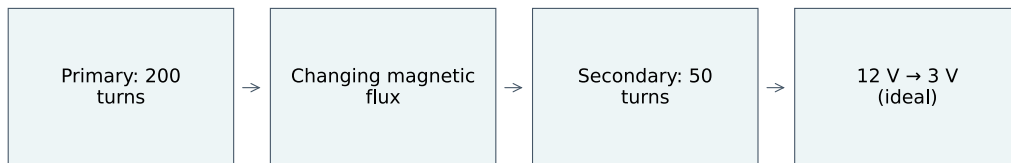
Fields, motors and induction

■ What would explain this observation?

- A magnet beside a wire does not always produce a current. An induced electromotive force depends on changing magnetic flux linkage.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ Build the model

- A field describes a force effect at positions in space. A current-carrying conductor in a magnetic field can experience a force. Electromagnetic **induction** occurs when magnetic flux linkage changes.
- induction: Creation of emf by changing flux linkage; **transformer** : A device transferring energy between coils through changing flux.



■ Choose evidence that can test it

- Changing field strength, coil area, orientation or relative motion can change flux linkage. Lenz law describes an induced effect opposing the change producing it, consistent with energy conservation.
- Use a coil and sensitive meter to compare magnet motion in each direction. Record that a stationary arrangement gives no induced signal. Use approved low-voltage supplies for motor demonstrations.

■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: a transformer has 200 primary turns, 50 secondary turns and 12 V primary voltage. For an ideal transformer, $V_s/V_p = N_s/N_p$. $V_s = V_p N_s/N_p = 12 \times 50/200 = 3.0$ V. Real transformers also dissipate energy.

Example:

An ideal transformer has $N_p=400$, $N_s=100$ and $V_p=20$ V. Find V_s . Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

■ Check the conclusion and its limits

- A transformer needs changing magnetic flux; a steady DC input does not provide continuous transformer action. Magnetic field direction is not automatically the direction of force.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

A steady DC input produces continuous ideal transformer action. This claim is false: A transformer needs changing magnetic flux; a steady DC input does not provide continuous transformer action. Magnetic field direction is not automatically the direction of force.

Key:

Fields, motors and induction: Changing field strength, coil area, orientation or relative motion can change flux linkage. Lenz law describes an induced effect opposing the change producing it, consistent with energy conservation.