Transformers: turns and alternating voltage

Teacher / technician

YEAR 11 / LESSON 87 / PHYSICS ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Record actual measurements separately from labelled practice examples.

Coverage and delivery

Physics only: 6.17P–6.18P. Transformer structure and transmission applications.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30 observing one staff setup

Item	Per pair / setup	Class total
Transformer coil/core kit	Shared staff setup	1 kit
A.c. source and voltmeters	Shared staff setup	1 source; 2 meters
Booklets and calculators	1 each per learner	30 of each

Immediate safety

Staff operation only. No mains-connected coils, high-turn secondaries or d.c. connection. Secure the core against falling and pinching. Switch off before changes; stop on warming or unexpected readings. Keep input at 2.0 V RMS, output below 6 V RMS and current at or below 0.10 A and manufacturer ratings.

Preparation and delivery

Read alongside the student method

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1. Check actual coil labels, ratings, source isolation and meter suitability. If the stated turns or operating limits are unavailable, use a labelled diagram/data route; do not improvise high-turn coils.

2. Pilot current and output at all three configurations. Keep the core secured and secondary unloaded. Explain that real results can differ from the ideal ratio.

Close of lesson

- Turn off the source, disconnect and store coils and core securely.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- Alternating input in this transformer.
- The shared changing magnetic field, guided by the core.
- Ideally 1.0 V RMS.
- Ideally 4.0 V RMS.
- No; ideal power is conserved and real transformers have losses.
- Current is lower, reducing cable heating loss.

References and provenance

Pearson Physics specification

IOP: electromagnetism

IOP: transformer action

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.