# Filament lamps and diodes: non-ohmic graphs

Teacher / technician

YEAR 10 / LESSON 46 / PHYSICS + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Component ratings determine the permitted range. No measured results are supplied, and no reverse-breakdown experiment is included.

## Coverage and delivery

Shared Physics / Double Award: 2.9, 2.13. Component current–voltage characteristics.

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

## Requisition • class of 30, ten groups of three plus staff diode demonstration

| Item | Per pair / setup | Class total |
|---|---|---|
| 3 V lamp, source, switch and meters | 1 set per group | 10 sets |
| Leads | 7 per group | 70 |
| Diode, 1 kΩ resistor ≥0.25 W, source and meters | Staff demonstration | 1 checked set |
| Booklets and graph paper | 1 each per learner | 30 of each |

## Immediate safety

Never exceed the lamp rating. Staff set a current limit appropriate to that lamp. Disconnect before reversing polarity; let lamps cool before handling. Keep the diode’s 1 kΩ resistor in series and source at or below 3 V. No diode breakdown test is performed.

# Preparation and delivery

Read alongside the student method

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**1.** Select ten 3 V lamps with known current ratings and pilot suitable source limits. Check all pupil circuits.

**2.** For the staff diode circuit, verify forward-current and reverse-voltage ratings from its datasheet. Use the permanent 1 kΩ resistor and 5 mA source limit; maximum resistor power at 3 V is below 0.01 W. Prepare an extra diode table and demonstrate its distinct scale.

## Close of lesson

• Switch off, disconnect and let lamps cool before collection.

## 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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- Filament temperature and resistance rise.
- It limits current as forward conduction increases.
- Across the diode itself.
- It passes very little reverse current below breakdown.
- No; V/I changes with operating point.
- The diode currents may be much smaller than the lamp currents.

## References and provenance

Pearson Physics specification

IOP: component characteristics

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.