Estimating energy transferred from food

Teacher / technician

YEAR 10 / LESSON 51 / BIOLOGY ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Original learning tasks; no supplied numerical example represents class measurements.

Coverage and delivery

Biology only: 2.33B. Energy content of food.

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

Requisition • class of 30, five groups of six

Item	Per pair / setup	Class total
Booklets	1 per learner	30
Calorimeter / clamp / mat / holder	1 set per group of six	5 sets
Thermometer / measuring cylinder	1 each per station	5 each
Balances	shared, 0.01 g resolution	at least 2
Water / selected food	25 cm^3 and one pilot-sized sample per run	750 cm^3 water plus spare; 15 samples of each food plus spares
Eye protection / ignition	per learner / supervised station	30 goggles; supervised ignition provision

Immediate safety

Wear eye protection; tie back hair and secure loose clothing. Check ingredient allergies, avoid nuts and do not eat laboratory food. Keep flames away from combustibles, ventilate the room, avoid smoke exposure and let metal cool before touching or weighing. Staff supervise ignition and select samples that do not drip burning material.

Preparation and delivery

Read alongside the student method

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1. Prepare five supervised stations for groups of six. Pilot two labelled dry foods, choosing small portions that burn steadily without excessive smoke or dripping. Do not use high-protein smoky samples in this open classroom setup.

2. Use 25 cm^3 water per run and a fixed supported gap. Pilot sample size to give a measurable rise while remaining well below boiling. Record the chosen sample range; do not present an untried mass as validated.

3. Plan three runs per food at each station, thirty runs total. Supply 750 cm^3 water plus spare and thirty selected samples plus pilot/spares. Share balances readable to 0.01 g and check thermometer range.

4. Prepare heatproof cooling areas and safe residue disposal. Do not place hot equipment on a balance. Keep food ingredient labels available.

Close of lesson

- Allow all equipment and residues to cool before disposal or washing.
- Staff isolate ignition sources; clear cooled solid residues and wash hands.

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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- Water mass.
- To estimate sample mass lost without heating or damaging the balance.
- 1260 J.
- 3.15 kJ g^{-1}.
- It would add energy not supplied by the food.
- Heat loss to surroundings/container and incomplete combustion; mass loss may also include water.

References and provenance

Pearson Biology specification

RSC: food-energy investigation

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.