

Exercise walk-through

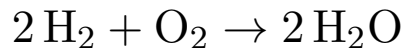
6.13

Energy Conservation

AP Environmental Science

Biomass, hydrogen, conservation

Biomass burns stored chemical energy; ferment crops to **ethanol**. A **hydrogen fuel cell** makes only water:

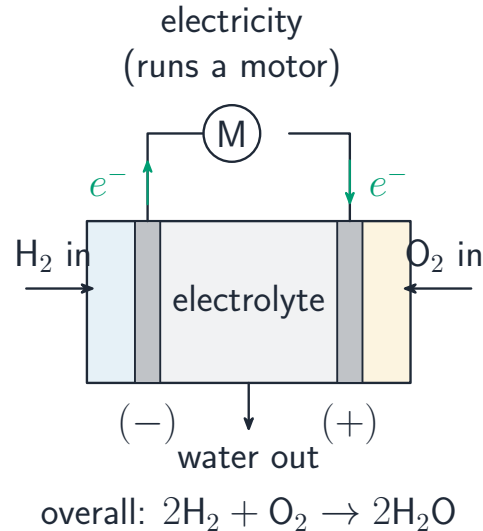


The cleanest energy is the energy we never use – **energy conservation**.



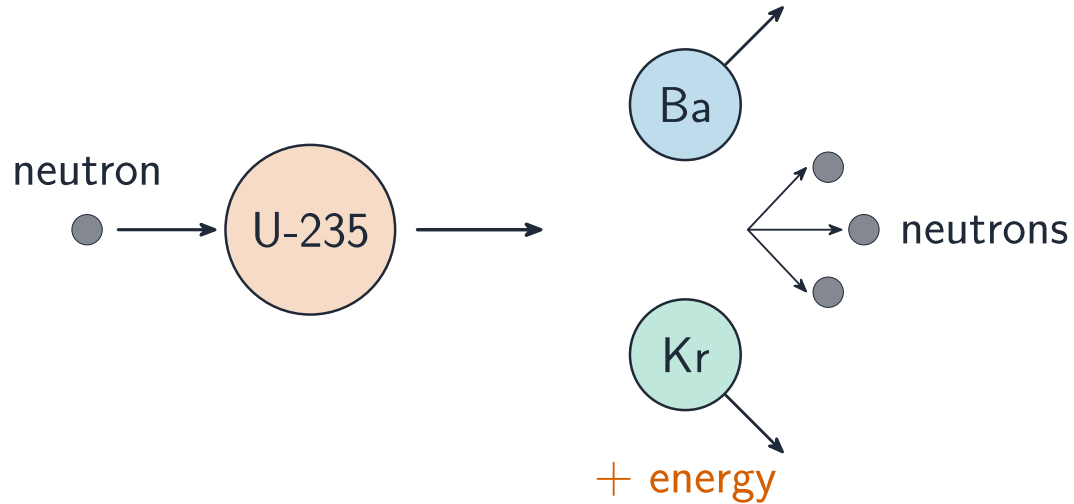
Conservation + renewables: efficiency first

A hydrogen-oxygen fuel cell makes electricity



A hydrogen-oxygen fuel cell makes electricity, with water as the only product

Nuclear Power, continued



Nuclear fission of a uranium-235 nucleus releases energy

Exam tips

- Separate **renewable** (sun, wind, water) from **non-renewable** (fossil fuels, nuclear) and weigh each source's trade-offs.
- Fossil fuels are energy-dense but emit CO_2 ; **nuclear** emits no CO_2 but leaves long-lived waste.
- Do **half-life** math: after n half-lives a fraction $(\frac{1}{2})^n$ remains.
- Note that solar and wind are **intermittent** and need storage or backup.

Exam tips (continued)

- **Conservation** (efficiency) is often the cheapest, cleanest option – the energy not used needs no fuel.
- Know the **coal ranks** (peat → lignite → bituminous → anthracite; more heat/pressure/burial → higher energy) and the unconventional fuels **fracking** (shale oil/gas; groundwater + VOC pollution) and **tar sands** (bitumen, energy-intensive).
- **Ethanol** adds no net CO₂ but has a **low EROEI**; **cogeneration** (combined heat and power) captures waste heat so one fuel gives both electricity and heat.

Exercises 2.1-2.3

2.1 What is energy conservation?

[1]

2.2 Give one example of energy efficiency.

[1]

2.3 Why does reducing energy demand help the environment?

[1]

Exercises 2.1-2.3

2.1 What is energy conservation?

[1]

2.1

- Using less energy
-

2.2 Give one example of energy efficiency.

[1]

2.2

- Any one: LED bulbs, insulation, efficient appliances, hybrid cars
-

2.3 Why does reducing energy demand help the environment?

[1]

2.3

- It reduces fossil-fuel use and the CO₂ and pollution that go with it

Exercise 3.1

3.1 Installing better home insulation is an example of energy

[1]

☐

A conservation (using less service)

B efficiency (same service, less energy)

C production

D extraction

Exercise 3.1

3.1 Installing better home insulation is an example of energy

[1]

☐

A conservation (using less service)

B efficiency (same service, less energy)

C production

D extraction

3.1 B

- efficiency (same service, less energy)

Exercise 3.2 (a)

3.2 A household wants to cut its energy use.

(a) Give one conservation action and one efficiency measure.

[2]

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[2]

(a)

- Conservation: e.g. turn off lights / drive less; efficiency: e.g. LED bulbs / insulation

Exercise 3.2 (b)

3.2 A household wants to cut its energy use.

(b) Explain how these reduce environmental impact.

[2]

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[2]

(b)

- Using less energy lowers fossil-fuel demand, cutting CO₂ emissions and pollution

Exercise 3.3

3.3 Explain why energy efficiency is often described as the cheapest way to cut emissions. [2]

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3.3

- Saving energy avoids the cost of generating it, and efficiency measures often pay for themselves through lower bills, so they cut emissions at negative or low net cost