

Exercise walk-through

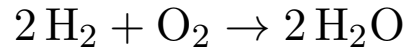
6.1

Renewable and Nonrenewable Resources

AP Environmental Science

Biomass, hydrogen, conservation

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

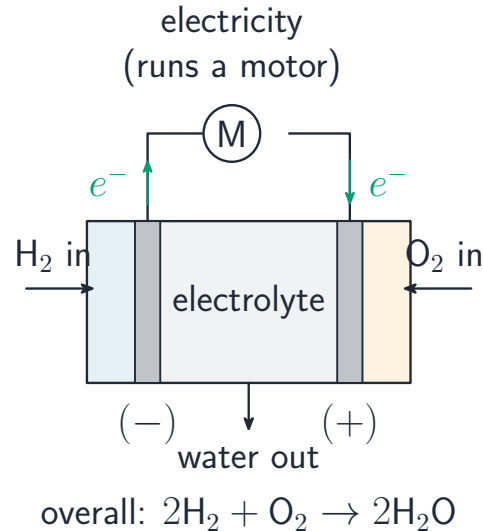


The cleanest energy is the
energy we never use – **energy**
conservation .



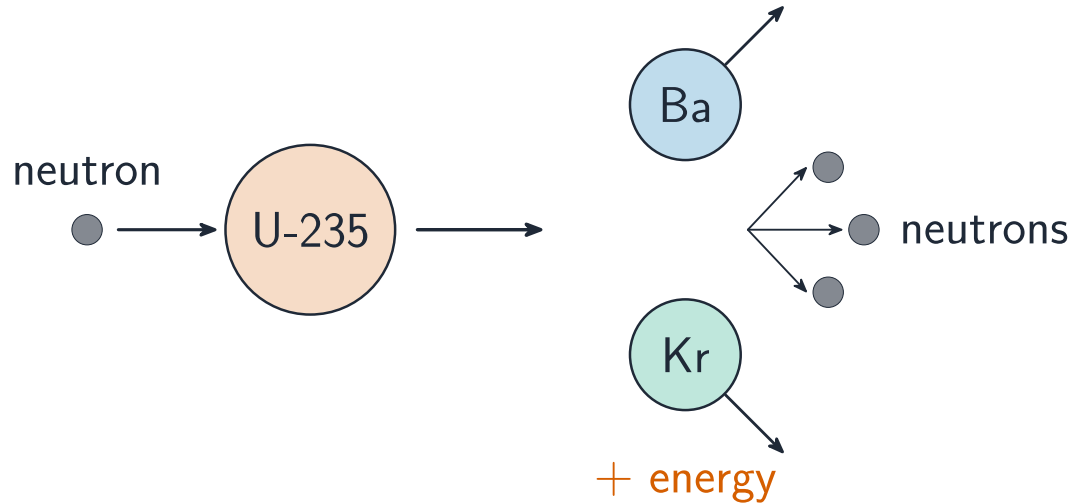
Conservation + renewables: efficiency first

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 CO₂; **nuclear** emits no CO₂ 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 Classify solar energy.

[1]

2.2 Classify coal.

[1]

2.3 Name two renewable energy sources.

[2]

Exercises 2.1-2.3

2.1 Classify solar energy.

[1]

2.1

- Renewable
-

2.2 Classify coal.

[1]

2.2

- Nonrenewable
-

2.3 Name two renewable energy sources.

[2]

2.3

- Any two: solar, wind, hydro, geothermal, biomass

Exercise 3.1

3.1 Which is a nonrenewable energy source?

[1]

☐

A wind

B solar

C natural gas

D geothermal

Exercise 3.1

3.1 Which is a nonrenewable energy source?

[1]

☐

A wind

B solar

C natural gas

D geothermal

3.1 C

- natural gas

Exercise 3.2 (a)

3.2 A country relies mostly on coal and oil.

(a) Classify these sources.

[1]

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(a) Classify these sources.

[1]

(a)

- Nonrenewable

Exercise 3.2 (b)

3.2 A country relies mostly on coal and oil.

(b) Explain why this reliance is a long-term problem.

[2]

Exercise 3.2 (b)

3.2 A country relies mostly on coal and oil.

(b) Explain why this reliance is a long-term problem.

[2]

(b)

- These finite sources will eventually run out and cannot be replaced on a human timescale, so the energy supply is not secure long-term

Exercise 3.3

3.3 Explain why biomass can be either renewable or unsustainable, depending on use.[2]

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3.3

- If trees/crops are replanted as fast as they are burned, biomass is renewable; if harvested faster than they regrow, it is depleted and unsustainable