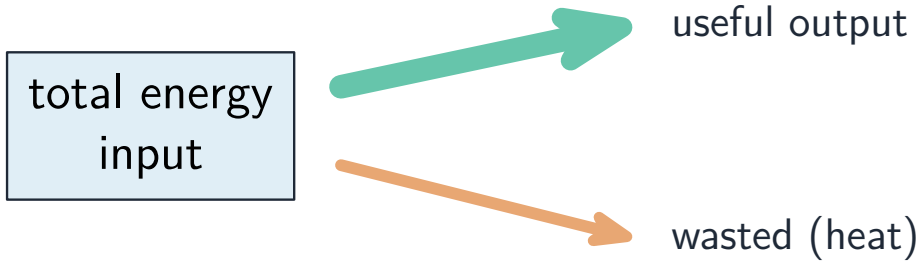
Exercise walk-through

7.3
Solid waste

International Baccalaureate · IB Diploma · Environmental Systems and Societies · HL

Energy efficiency



$$\text{efficiency} = \frac{\text{useful output}}{\text{total input}} \times 100\%$$

> Waste heat cannot be avoided entirely

Plastic persistence and exposure

Physical effects

Entanglement, ingestion, habitat effects and fragmentation.

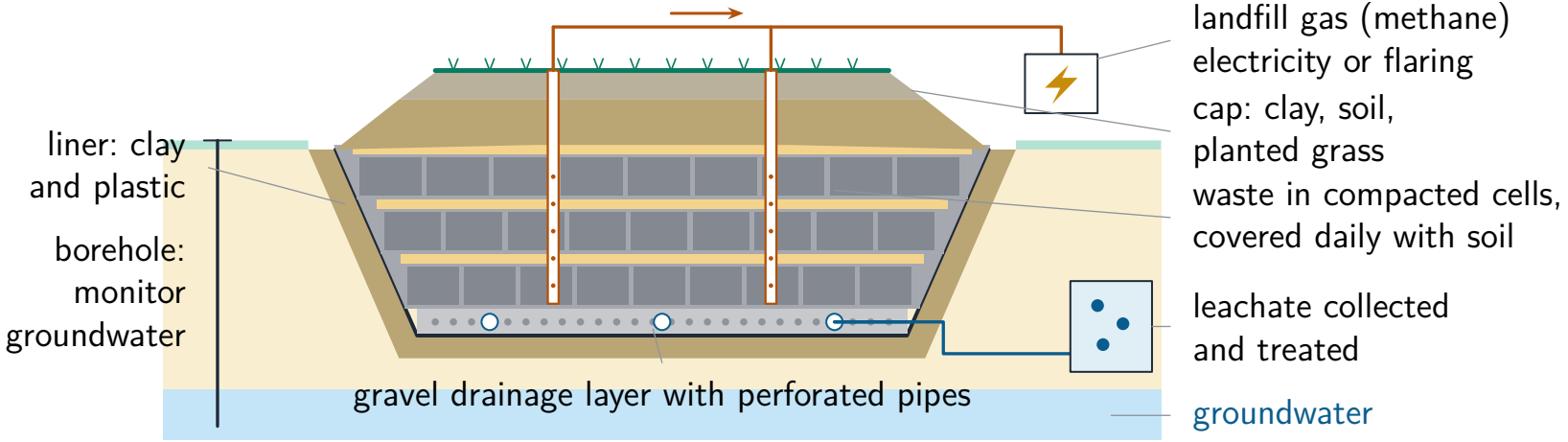
No universal lifetime; a garbage patch is not a solid island.

Read the denominator

OECD: 9% of 2019 plastic waste ultimately recycled after losses.

Microplastic detection establishes exposure, not by itself a particular disease.

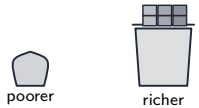
Engineered landfill reduces rather than eliminates risk



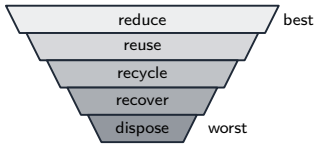
Keep drainage above the liner; collect **leachate** and gas; monitor after closure.

Exercises 2.1·2.2

2.1 Outline **two** reasons why the amount of solid domestic waste per person usually rises as a country becomes richer. [2]

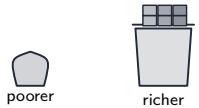


2.2 Explain why reducing waste is placed above recycling in the waste hierarchy. [3]



Exercises 2.1·2.2

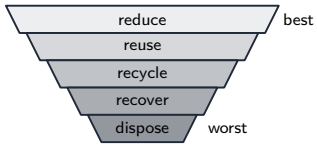
2.1 Outline **two** reasons why the amount of solid domestic waste per person usually rises as a country becomes richer. [2]



2.1

any two: people buy more goods; more packaged and processed food; products replaced more often (short life, fashion); more single-use items

2.2 Explain why reducing waste is placed above recycling in the waste hierarchy. [3]



2.2

reducing means the item is never made, so no raw materials or energy are used to make it; recycling still needs collection, transport, sorting and energy to process; recycled material is often lower quality, and not everything can be recycled, so some still becomes waste

exercises.lol exercises.com.cn

Exercise 3.1 (a)

3.1 A city produces 400 000 tonnes of solid domestic waste a year.

material	food	paper	plastics	glass	metal	other
share	40%	20%	15%	8%	5%	12%

(a) Calculate the mass of plastic waste. [1]

Exercise 3.1 (a)

3.1 A city produces 400 000 tonnes of solid domestic waste a year.

material	food	paper	plastics	glass	metal	other
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(a) Calculate the mass of plastic waste. [1]

(a) $0.15 \times 400\,000 = \mathbf{60\,000}$ t

Exercise 3.1 (b)

3.1 A city produces 400 000 tonnes of solid domestic waste a year.

material	food	paper	plastics	glass	metal	other
share	40%	20%	15%	8%	5%	12%

(b) Identify the material that could be composted, and calculate its mass. [1]

Exercise 3.1 (b)

3.1 A city produces 400 000 tonnes of solid domestic waste a year.

material	food	paper	plastics	glass	metal	other
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(b) Identify the material that could be composted, and calculate its mass. [1]

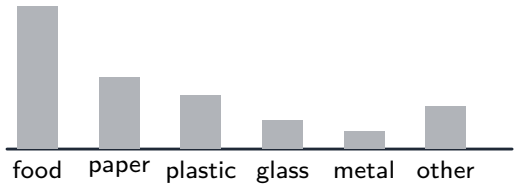
(b) food: $0.40 \times 400\,000 = \mathbf{160\,000}$ t

Exercise 3.1 (c)

3.1 A city produces 400 000 tonnes of solid domestic waste a year.

material	food	paper	plastics	glass	metal	other
share	40%	20%	15%	8%	5%	12%

(c) Explain **two** environmental problems of sending this waste to landfill. [2]

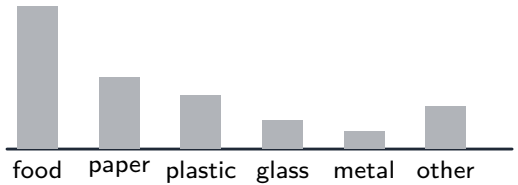


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(c) Explain **two** environmental problems of sending this waste to landfill. [2]



(c) food decomposes without oxygen and releases methane, a greenhouse gas; leachate (polluted liquid) can seep into groundwater and soil

Exercise 3.2 (a)

3.2 Old phones and computers from rich countries are often exported to low-income countries.

(a) Explain why e-waste is hazardous. [2]

Exercise 3.2 (a)

3.2 Old phones and computers from rich countries are often exported to low-income countries.

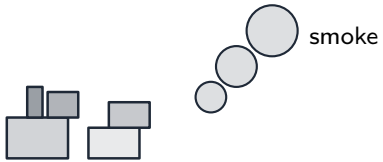
(a) Explain why e-waste is hazardous. [2]

(a) it contains toxic metals such as lead, mercury and cadmium; when burned or dumped, these enter the air, soil and water and harm health

Exercise 3.2 (b)

3.2 Old phones and computers from rich countries are often exported to low-income countries.

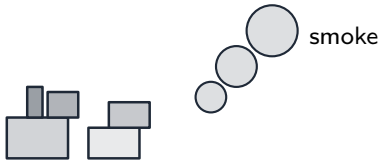
(b) Evaluate the recycling of e-waste. [3]



Exercise 3.2 (b)

3.2 Old phones and computers from rich countries are often exported to low-income countries.

(b) Evaluate the recycling of e-waste. [3]

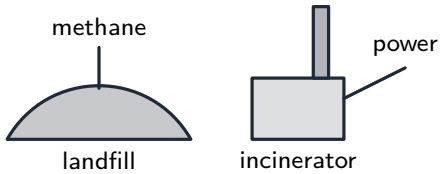


(b) strength: recovers valuable metals (gold, copper, rare metals), reducing mining; limitation: informal recycling by hand or burning harms workers' health and the environment; judgement: worthwhile only with safe, regulated recycling plants and producer take-back schemes

Exercise 3.3

3.3 A city must choose between a new landfill site and an incinerator with energy recovery.

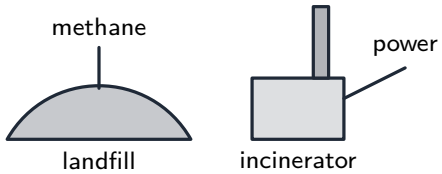
Discuss the two options. [6]



Exercise 3.3

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Discuss the two options. [6]



3.3

award up to [6]: landfill: cheap to run; methane can be captured for energy; but uses land, releases methane and leachate, and the site fills up; incineration: cuts volume by about 90% and makes electricity; but high building cost, air pollution and toxic ash, CO_2 from plastics; both are low in the waste hierarchy; incinerators need a steady flow of waste, which can discourage recycling; conclusion: incineration may be better where land is scarce, but reduce, reuse and recycle first, with justification