7.3 Solid waste

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS solid domestic waste • waste hierarchy • landfill • incineration • leachate • e-waste

Objective

Build the skills to answer exam questions on **solid domestic waste** : types and amounts of waste, the **waste hierarchy** , landfill and incineration, and electronic waste.

You must be able to:

- describe the types of solid domestic waste and why amounts change
- explain the waste hierarchy and calculate from waste data
- evaluate landfill, incineration, recycling and composting
- explain the environmental and social issues of electronic waste

1 Key knowledge and worked examples

■ Solid waste

Solid domestic waste (SDW) includes food and garden waste, paper and card, plastics, glass, metals, textiles and electronic waste (**e-waste**). Richer people and cities usually make more waste per person: more packaging, more goods, shorter product life.

Waste hierarchy (best first):

1. **reduce** – make and buy less (less packaging, longer-lasting goods)
2. **reuse** – use again (refill bottles, repair, second-hand)
3. **recycle** – process into new materials; **compost** food and garden waste
4. **recover** – burn waste to make energy (incineration with energy recovery)
5. **dispose** – landfill, as the last choice

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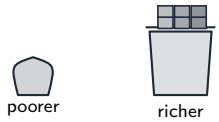
method	for	against
landfill	cheap; can capture methane for energy	uses land; methane (greenhouse gas); **leachate** can pollute groundwater
incineration	cuts volume by about 90%; makes electricity	air pollution (dioxins), ash; CO_2; discourages recycling
recycling	saves resources and energy	needs sorting; quality falls; markets for material vary
composting	returns nutrients to soil; less methane	needs space; only organic waste

E-waste contains toxic metals (lead, mercury, cadmium) and valuable metals (gold, copper). Much is shipped to low-income countries and taken apart by hand, often by burning, which harms workers' health.

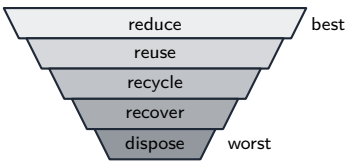
Answer shapes: place the strategy in the hierarchy and give one environmental and one economic or social point.

2 Practice

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]



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3 Exam-style questions

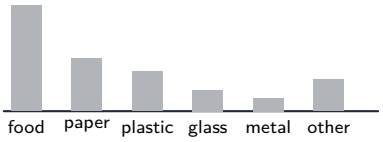
3.1 A city produces 400 000 tonnes of solid domestic waste a year.

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

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

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

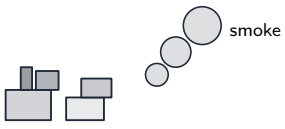
(c) Explain **two** environmental problems of sending this waste to landfill. [2]



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

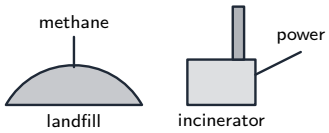
(a) Explain why e-waste is hazardous. [2]

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



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3.3 A city must choose between a new landfill site and an incinerator with energy recovery. Discuss the two options. [6]



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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

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

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

3.1

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

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

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

3.2

(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

(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

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

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