Exercise walk-through

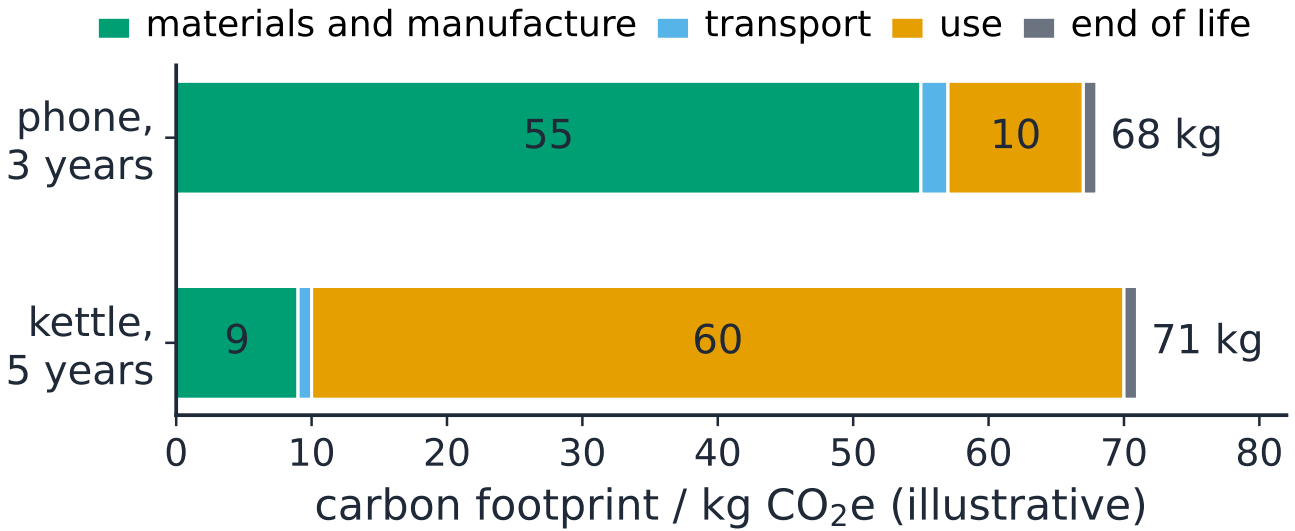
10.2
Life cycle assessment and recycling (4.10.2.1–4.10.2.2)

AQA · GCSE · Chemistry

Life cycle assessment

- A **life cycle assessment** (LCA) looks at the environmental impact of a product at every stage of its life:
- 1. extracting and processing the raw materials; 2. manufacturing and packaging; 3. use and operation during its lifetime; 4. disposal at the end of its life.
- Transport between stages is included too.
- The use of water, energy and resources, and the amount of some wastes, can be measured fairly easily.

Figure: Life cycle assessment



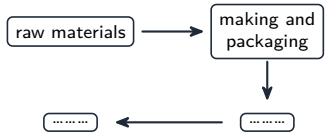
- Where the footprint comes from depends on the product (round numbers for teaching)
- Match each part of the diagram to the text.

Reduce, reuse and recycle

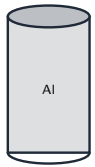
- Using less material reduces the energy needed to extract and process it and the waste produced.
- Glass bottles can be reused after washing; or the glass can be crushed and melted to make new bottles.
- Metals can be melted and recycled; scrap steel is added to iron from the blast furnace, which reduces the amount of iron ore that must be mined.
- Recycling aluminium uses only about 5% of the energy needed to extract new aluminium from its ore.

Exercises 2.1·2.2

2.1 Complete the stages of a life cycle assessment. [2]

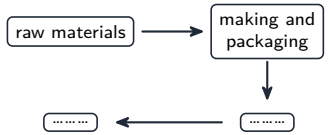


2.2 Explain why recycling aluminium cans saves resources. [2]



Exercises 2.1·2.2

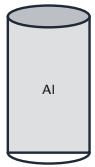
2.1 Complete the stages of a life cycle assessment. [2]



2.1

- use; disposal

2.2 Explain why recycling aluminium cans saves resources. [2]

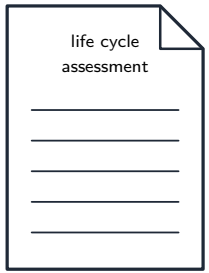


2.2

- less aluminium ore needs to be mined; melting cans uses less energy than extracting aluminium from its ore

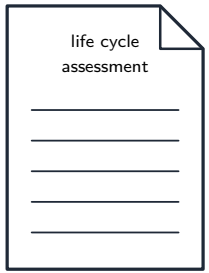
Exercise 3.1

3.1 A company says its LCA shows its product is the best for the environment. Explain why an LCA may not give a fair result. [3]



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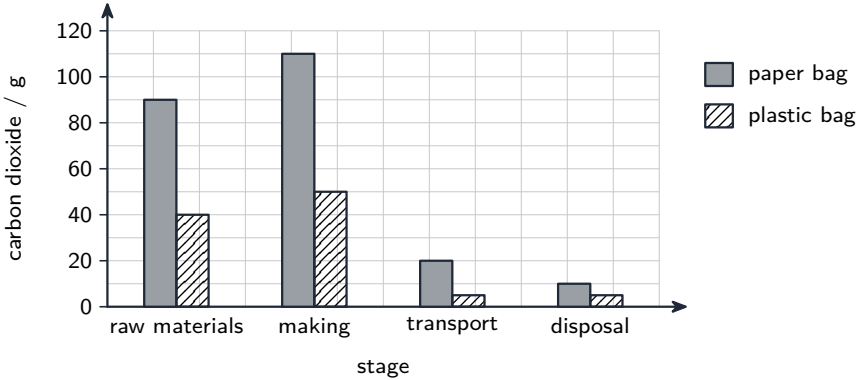
3.1

- the harm from some pollutants is hard to give a number to
- so the people doing the LCA must make judgements
- a company may choose only the data that make its product look good

Exercise 3.2 (a)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

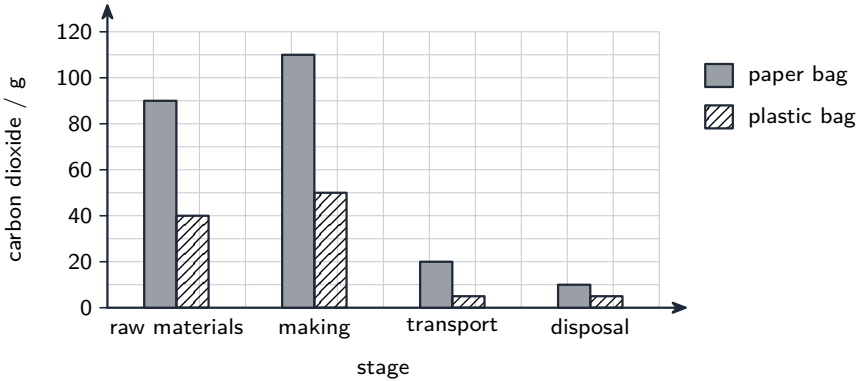
(a) Use the chart to find the total mass of carbon dioxide for the paper bag. [2]



Exercise 3.2 (a)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(a) Use the chart to find the total mass of carbon dioxide for the paper bag. [2]



(a) $90 + 110 + 20 + 10 = \mathbf{230}$ g

Exercise 3.2 (b)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(b) How many times more carbon dioxide does the paper bag give out than the plastic bag? [3]

Exercise 3.2 (b)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(b) How many times more carbon dioxide does the paper bag give out than the plastic bag? [3]

(b) plastic bag $40 + 50 + 5 + 5 = 100$ g; $230 \div 100 = \mathbf{2.3}$ times

Exercise 3.2 (c)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(c) Give **two** pieces of information that are not in the chart but that a full LCA should include. [2]

Exercise 3.2 (c)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(c) Give **two** pieces of information that are not in the chart but that a full LCA should include. [2]

(c) any two: how many times each bag is reused; the water or energy used; whether it is recycled or how long it takes to break down

Exercise 3.2 (d)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(d) Evaluate the use of paper bags and plastic bags. Use the chart and your own knowledge. [6]

Exercise 3.2 (d)

3.2 The chart shows the mass of carbon dioxide given out at each stage of the life of a paper bag and a plastic bag.

(d) Evaluate the use of paper bags and plastic bags. Use the chart and your own knowledge. [6]

(d) points to include:

- the paper bag gives out more carbon dioxide at every stage
- paper is made from trees, which are renewable; plastic is made from crude oil, which is not
- paper bags break down quickly and are easily recycled
- plastic bags do not break down; as litter they harm wildlife
- plastic bags are stronger and can be reused many times, which lowers their impact
- a conclusion that weighs these points

Levels: **5–6** a full, logical answer with correct chemistry and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.