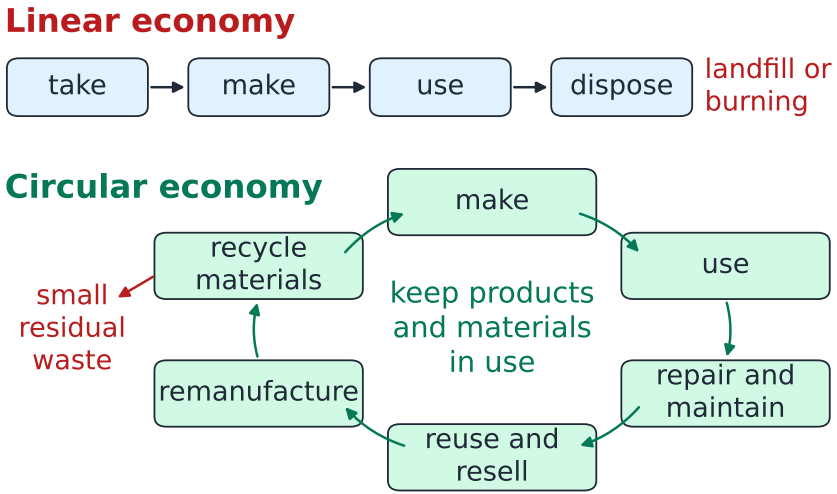
Exercise walk-through

3.2
Designing for a circular economy

International Baccalaureate · IB Diploma · Design Technology · HL

Linear and circular



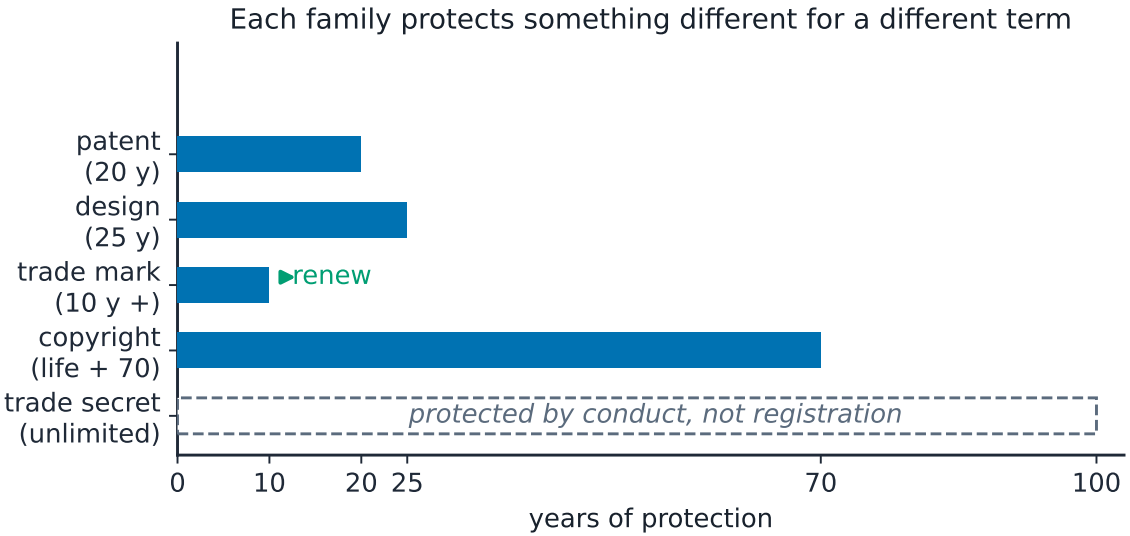
- Repair keeps all the **embodied energy**.
- Recycling saves only the material.

The six Rs



> Work through the six Rs as a checklist for every redesign.

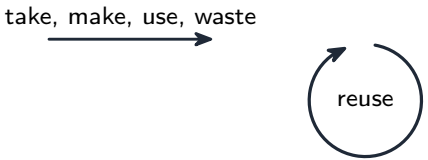
How long protection lasts



> Trade secret: as long as it stays secret

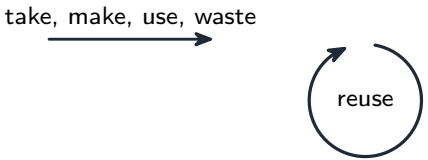
Exercise 2.1

2.1 Distinguish between a **linear** and a **circular** economy. [2]



Exercise 2.1

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2.1

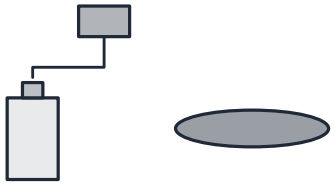
linear: materials flow one way: take, make, use, throw away; circular: products and materials are kept in use as long as possible and waste is designed out

Exercise 2.2

2.2 Identify which of the six Rs each action shows:

(a) a shop sells shampoo in bottles that customers bring back and refill; [1]

(b) a firm stops wrapping its cucumbers in plastic film. [1]

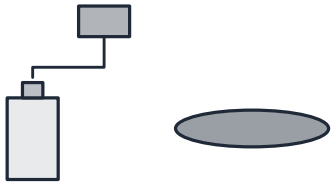


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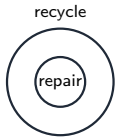
2.2

(a) reuse

(b) refuse

Exercises 2.3·2.4

2.3 Explain why repairing a product saves more resources than recycling it. [2]

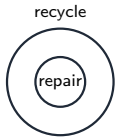


2.4 Toaster A costs ¥150 and lasts 3 years. Toaster B costs ¥320, needs one ¥40 repair and lasts 9 years. Calculate the cost per year of service of each and state which is better value. [3]



Exercises 2.3·2.4

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2.3

repair keeps the product and all its embodied energy in use; recycling saves only the material, and needs energy to collect and reprocess it

2.4 Toaster A costs ¥150 and lasts 3 years. Toaster B costs ¥320, needs one ¥40 repair and lasts 9 years. Calculate the cost per year of service of each and state which is better value. [3]



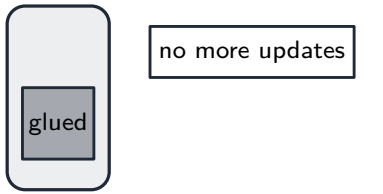
2.4

A: $150 \div 3 = ¥50$ per year; B: $(320 + 40) \div 9 = ¥40$ per year; B is better value, and creates less waste

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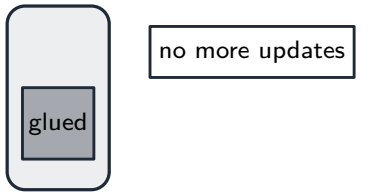
Exercise 2.5

2.5 Explain **two** kinds of planned obsolescence, with an example of each. [4]



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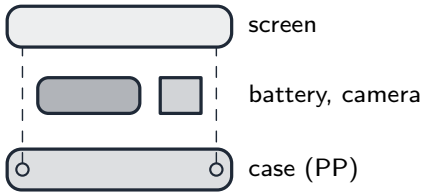
2.5

any two, explained: functional: parts wear out or cannot be replaced, e.g. a glued-in phone battery; technological: newer technology or software makes it less useful, e.g. a phone that no longer gets updates; style: fashion makes a working product look old, e.g. a new colour every year

Exercise 3.1 (a)

3.1 FixPhone is designing a smartphone that users can repair themselves. An exploded view is shown.

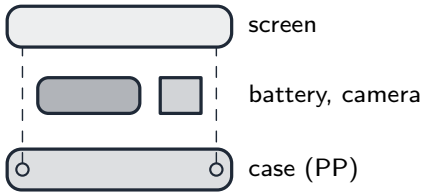
(a) Outline **two** features of design for disassembly shown in the diagram. [4]



Exercise 3.1 (a)

3.1 FixPhone is designing a smartphone that users can repair themselves. An exploded view is shown.

(a) Outline **two** features of design for disassembly shown in the diagram. [4]



(a) any two, outlined: standard screws instead of glue, so parts come apart with a common screwdriver; separate modules (battery, screen, camera), so one part can be replaced without the others; parts marked with their material, so they can be sorted for recycling

Exercise 3.1 (b)

3.1 FixPhone is designing a smartphone that users can repair themselves. An exploded view is shown.

(b) Explain **one** benefit to the user and **one** benefit to the environment of a battery that users can replace. [4]

Exercise 3.1 (b)

3.1 FixPhone is designing a smartphone that users can repair themselves. An exploded view is shown.

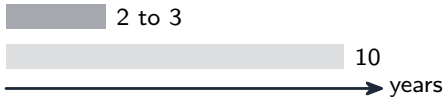
(b) Explain **one** benefit to the user and **one** benefit to the environment of a battery that users can replace. [4]

(b) user: a worn battery can be replaced cheaply instead of buying a new phone; environment: the phone stays in use for longer, so its embodied energy and materials are not wasted / less e-waste

Exercise 3.2

3.2 Some firms design products to be replaced every two or three years.

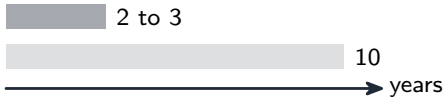
Discuss whether planned obsolescence can ever be justified. [9]



Exercise 3.2

3.2 Some firms design products to be replaced every two or three years.

Discuss whether planned obsolescence can ever be justified. [9]



3.2

award up to [9]: for: lower prices, since parts need not last long; regular sales keep firms profitable and pay for jobs; drives innovation, as users move to newer, often more efficient products; some products would be unsafe or out of date if used for too long, e.g. old safety standards; against: wastes raw materials and the embodied energy of products that still work; more e-waste, often sent to poorer countries; costs users more over time; right-to-repair laws show that society is turning against it; judgement: hard to justify for products such as phones and appliances; a better model is long-lived, repairable products with upgrades