# 3.2 Designing for a circular economy

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

**KEY WORDS** circular economy • cradle to cradle • design for disassembly • durability • planned obsolescence • right to repair

## Objective

Build the skills to answer exam questions on the **circular economy** : linear and circular flows, cradle to cradle, the six Rs, **design for disassembly** and durability, planned obsolescence and the right to repair.

**You must be able to:**

- distinguish a linear and a circular economy, and explain why inner loops (repair, reuse) save most
- apply the six Rs: rethink, refuse, reduce, reuse, repair, recycle
- describe features of design for disassembly and durability

## 1 Key knowledge and worked examples

### Linear and circular

- **Linear economy:** take, make, use, throw away.
- **Circular economy:** keep products and materials in use as long as possible, at their highest value, and design waste out. **Cradle to cradle:** every material becomes the raw material for something new.
- The inner loops save most: **repair** keeps all the embodied energy; **recycling** saves only the material and needs energy to reprocess.

**The six Rs:** rethink (a better way to meet the need, e.g. a shared tool library), refuse (avoid harmful materials or packaging), reduce (less material and energy), reuse (refillable bottles), repair (spare parts and instructions), recycle (reprocess the material).

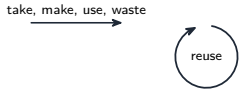
### Design for disassembly and durability

- screws and clips instead of glue and welding; few, standard fasteners;
- fewer different materials, each marked (e.g. PP, ABS); no coatings that cannot be separated;
- **durability**: tough materials, protected weak points, a style that does not date quickly.

**Worked example.** Kettle A costs ¥120 and lasts 2 years: ¥60 per year. Kettle B costs ¥200, lasts 8 years with one ¥40 repair: $(200+40)\div 8 = ¥30$ per year. B costs more in the shop but half as much per year, and sends a quarter as many kettles to waste.

## 2 Practice

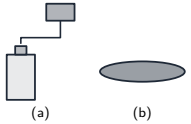
**2.1** Distinguish between a **linear** and a **circular** economy. [2]



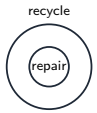

**2.2** Identify which of the six Rs each action shows:

(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]




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





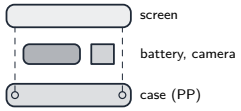



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## 3 Exam-style questions

**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]




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



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