Solutions

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

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

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

2.2

(a) reuse

(b) refuse

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

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

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

3.1

(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

(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

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for jobs; drives innovation, as users move to newer, often more efficient products; some products would be unsafe or out of date if used for too long, e.g. old safety standards; against: wastes raw materials and the embodied energy of products that still work; more e-waste, often sent to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

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