

# DT A Level Revision

## Sustainability

### Learning Objectives:

- ❑ To understand the environmental and sustainability issues that influence Product Design
- ❑ To be able to identify improvements to a product to minimise its impact on the environment.

# Sustainable Design

- Sustainability is providing the best for people and the environment both now and in the indefinite future.

- Sustainable design includes:

- Creating products from renewable resources
- Intending not to seriously impact the environment (when they are created or being used)
- Allowing users to feel more connected or can relate more closely to the natural environment

- Designs & manufacturers now have an

obligation to develop products that:

- Use fewer materials & components in manufacture
- Consume less energy
- Recover & reuse materials & components after their disposal



# The 6 Rs

Reduce



Reducing the amount of material & energy used in manufacturing of a product & the amount of energy it will consume in its life

Recycle



Making products that can be recycled – materials can be separated, cleaned & used again

Reuse



Materials can be used again in a new product, e.g. reusable cartridges in printers and copiers

Rethink



Take an existing product that becomes waste, and use the materials or parts for another purpose without changing its original form

Repair



Ask whether we can sustain our current way of life and the way we design and make

Refuse



Take an existing product that has become waste and reprocess the material to use in a new product

# Case Study – Mobile Phone

- Electronic gadgets are made from non-biodegradable plastics & electronic components.
- Components may contain toxic substances such as lead & mercury which makes recycling hazardous and difficult.
- Recently the RoHS (Restriction of Hazardous Substances Directive) has banned such materials in the EU.



# Case Study – Mobile Phone

How can a mobile phone be improved to minimise its impact on the environments?

Design Strategy	Ideas for Improvement
Use low-impact products	<ul style="list-style-type: none"><li>• Use recycled polymers for casing</li><li>• Use recycled copper for electronic components</li><li>• Do not use aluminium in casing or internal parts (uses energy in its production)</li><li>• Do not use materials banned under RoHS</li></ul>
Reduction of materials used	<ul style="list-style-type: none"><li>• Make the phone smaller to reduce materials needed</li><li>• Reduce functions on the phone to reduce number of components needed</li></ul>
Reduce impact of distribution	<ul style="list-style-type: none"><li>• Provide human powered or solar powered charger</li><li>• Use recycled materials in packaging</li></ul>
Reduce energy consumption in use	<ul style="list-style-type: none"><li>• Provide human powered or solar powered charger</li><li>• Provide device that switches off charger when battery is charged/when phone is unplugged from charger</li></ul>
Optimisation of product life time	<ul style="list-style-type: none"><li>• Design phone with classic styling what will not 'date' too quickly</li><li>• Provide downloadable software upgrades to update functions</li><li>• Provide interchangeable casings to refresh appearance</li><li>• Make the phone repairable</li></ul>
Optimisation of end of life	<ul style="list-style-type: none"><li>• Make phone using smart shape memory alloy fastenings what will loosen &amp; pop the casing open when heated to aid separation of parts for recycling &amp; reuse</li></ul>

# Sustainability Task

Answer the questions and then check your answers using the mark scheme on the next slide.

0 1

Explain why 'potatopak' is a suitable material for the manufacture of disposable cutlery.

[3 marks]

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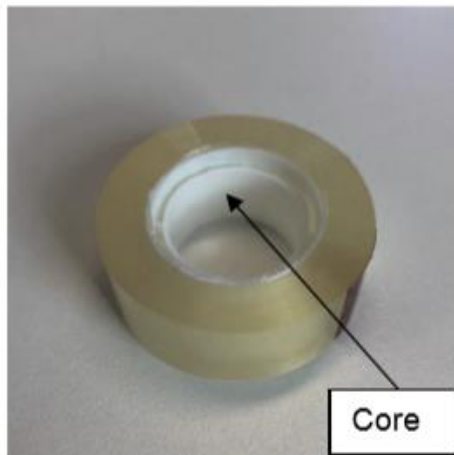
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0 7

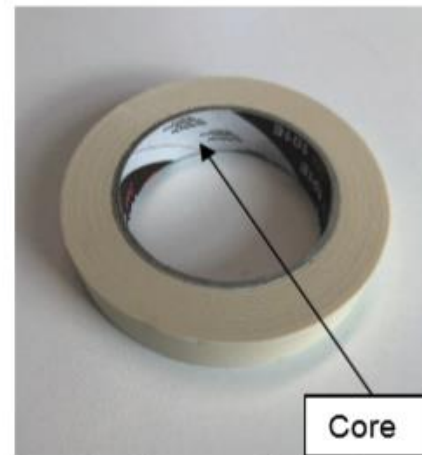
Figures 2 and 3 show rolls of adhesive tape.

Figure 2



A roll with an ABS core

Figure 3



A roll with a cardboard core

Compare the environmental impact of the materials used to manufacture the cores of the adhesive tapes shown.

[6 marks]

Qu	Part	Marking Guidance	Total marks	AO
1		<p>Explain why 'potatopak' is a suitable material for the manufacture of disposable cutlery.</p> <p>One mark per correct appropriate reason.</p> <p><b>Indicative content:</b></p> <ul style="list-style-type: none"> <li>• 'Potatopak' can be easily formed into the shape of cutlery using a heated compression mould</li> <li>• 'Potatopak' is a bio-polymer that will naturally decompose when disposed of</li> <li>• 'Potatopak' is a starch based material that is food safe</li> <li>• Disposable cutlery is a single use product and wont contribute to landfill waste when disposed of.</li> <li>• The use of 'Potatopak' reduces the demand for oil based polymers</li> </ul> <p><b>Note:</b> This indicative content is not exhaustive: any other valid points should be credited.</p>	3 marks	AO41b

		<p><b>ABS core</b></p> <ul style="list-style-type: none"> <li>• ABS comes from crude oil which is a non-renewable resource, once used it cannot be replaced or regrown.</li> <li>• Risk of environmental damage to marine life when sourcing and transporting the crude oil to a refinery.</li> <li>• At the end of its use the spool will be disposed of and may end up in landfill where it will take a considerable length of time to decompose.</li> <li>• ABS is a thermoplastic and can be recycled depending on local recycling facilities.</li> <li>• The core is injection moulded so minimal waste material is produced.</li> </ul> <p><b>Cardboard core</b></p> <ul style="list-style-type: none"> <li>• Cardboard is manufactured from renewable and sustainable materials.</li> <li>• The trees used for corrugated cardboard come from managed woodland with some reference to FSC.</li> <li>• Consideration of NAPM guidelines.</li> <li>• Can be manufactured from 100% recycled material, but more</li> </ul>		
			<p>commonly has a 70% – 90% recycled content.</p> <ul style="list-style-type: none"> <li>• Water and air pollution is greater when producing cardboard than when manufacturing a polymer.</li> </ul> <p><b>Note:</b> This indicative content is not exhaustive: other creditworthy responses should be awarded marks as appropriate.</p>	



# Watch these videos for a better understanding of Sustainability in Design

How product design can change the world

[https://www.youtube.com/watch?v=ZqeA\\_psKn2E](https://www.youtube.com/watch?v=ZqeA_psKn2E)

12 sustainable design ideas from nature | Janine Benyus

<https://www.youtube.com/watch?v=n77BfxnVlyc>

Sustainable Product Design: every gram counts

<https://www.youtube.com/watch?v=Gt-EpA8vwgk>