# Design & Technology
(Product Design)

DTBase©

## OCR A-Level

# Social, Ethical & Environmental Issues in Design (3.1a)

### Materials required for questions

- Pencil
- Rubber
- Calculator

### Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- For the multiple choice questions, circle your answer

### Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don’t spend too much time on one question

# Good luck!

**Q1.** What does a Lifecycle Assessment (LCA) evaluate?

**A** Only the manufacturing costs of a product

**B** Environmental impacts throughout a product's entire life

**C** Just the disposal phase of a product

**Q2.** Which stage is NOT typically included in a product's LCA?

**A** Raw material extraction

**B** Marketing and advertising

**C** End-of-life disposal

**Q3.** What is meant by 'cradle to grave' in LCA terminology?

**A** From design sketch to prototype

**B** From product sale to customer complaint

**C** From raw material extraction to disposal

**Q4.** Which certification ensures timber comes from responsibly managed forests?

**A** FSC (Forest Stewardship Council)

**B** ISO 9001

**C** CE marking

**Q5.** Describe how one of the raw materials for the metal alloy would be extracted from its origin **(2 marks)**

**Q6.** Developments in design practice and thinking have been influenced by the consideration of a wide range of factors.

**(a)** Identify and explain two effects of using depleting raw materials in design. (4 marks)

**(b)** Discuss the implications and opportunities of considering planned obsolescence when designing products. Use specific examples of products in your answer. **(8 marks)**

**Q7a)** The global demand for energy is constantly rising. Fossil fuels account for the majority of energy consumption. (a) Explain three problems with the widespread use of fossil fuels. **(6 marks)**

**Q7b)** Discuss the implications of increasing the use of alternative renewable energy sources. Refer to specific examples in your response **(8 marks)**

**Q8a)** The understanding and use of lifecycle assessment (LCA) is important in the design and manufacture of products. (a) Describe what is meant by the term LCA. **(4 marks)**

**Q8b)** Discuss the importance of LCA and its influence on design practice and product development. Use specific examples to support your response **(8 marks)**

**Answers**

**Q1**. B
**Q2**. B
**Q3**. C
**Q4**. A

**Q5**.

- Iron ore is mined from earth (1) It is refined/ with smelting in a blast furnace to remove impurities/ separate impurities (1).
- Bauxite ore/ Ore is mined from earth. (1) It is refined using Electrolysis/ smelting/ heat to separate impurities to extract the aluminium (1).

**Q6a**.

Possible effects of using depleting raw materials in design could include:

- The cost of the product increase, as the material is harder to obtain e.g. lithium or oil (1) so this would result in lower profit margins or higher priced products/ services/ energy. (1)
- It could put off some consumers (1) as they will be looking for more environmentally/ fare traded conscious brands and will not buy the product due to awareness of environmental, social or ethical issues (1)
- It is using up materials that may be vital for products to run (1) e.g. lithium, copper and iron – it's important that we try to source materials from recycling sources and save resources/ supplies (1)
- Increased carbon footprint and environmental or social/ethical issues when vital materials become harder to source (1) e.g. Lithium mining causes soil contamination/ harmful extraction or CT/ gold mining for electronic products has led to conflicts and violence (1)
- Any other suitable response.

**Q6b.**

Indicative Content: Possible discussions of the implications and opportunities of planned obsolescence in products: Implications could include:

- Products when thrown away often end up in landfill, electronic products often end up being received for recycling in low wage economies and the burning of polymers to extract the components or precious metal

can result in pollution/ toxins and health hazards. The creation of waste at end of life "throwaway society" which contributes to landfill or ocean waste e.g. coffee cups/ plastic/ polymer bottles etc.
- Emissions created from the continuous supply of products and use of finite resources.
- Products can't be repaired, parts are unavailable and its easier and cheaper to dispose and buy a new one than repair, this can lead to waste.
- Lack of social awareness of implications of creating waste as it is seen as "normal" and people want the latest technologies and products.
- Any other suitable response.

Opportunities could include:
- Maintain consumer interest in a product as they are looking to the "next model" therefore the life is extended. e.g. games consoles or mobile phones.
- Designers can plan for the end of life and create the disposable products with more environmentally friendly materials. e.g. Lego made from PLA or bamboo toothbrushes.
- Companies can take trade old products for new e.g. Ikea's circular hub or car manufacturers part exchange, recycling schemes for mobile phones so they can be repurposed/ refurbished or recycled.
- The use of packaging within a product e.g. plant pots that can be used to plant in the ground and decompose.
- Subscriptions offered for products rather than owning so upgrades are provided and older models returned – circular economy e.g. Gerrard street headphones
- Popularity of 'preloved' clothing and items and platforms such as 'Vinted" to sell items to others or 'reskinned' to send clothing to be recycled or refurbished.
- Any other suitable response.

**Q7a.**

- Fossil fuels are finite resources (1) which means that are running out (1).
- They cannot be replaced (1) therefore the more we use them the quicker they will run out (1).
- Fossil fuels are burned to create energy and this creates pollution (1). The pollution then builds up in the atmosphere and affects the ozone layer/ leads to global warming/ greenhouse gases (1).

- Fossil fuels are extracted from the ground (1) which can cause damage to the environment/wildlife around the site of extraction (1).
- Fossil fuels are more readily available in some countries than others (1), therefore increasing the power of that country where it is abundant (1).
- Where other countries are reliant on that supply (1) the abundant country can control the cost/supply of the fossil fuel (1).
- Any other valid suggestion.

**Q7b.**

- By increasing the use of alternative energy sources the UK will slowly reduce their carbon footprint and work towards directives from the EU- Renewable Energy Directive (RED) which requires 15% of all the UK energy will be generated from renewable sources by 2020 and emission reduction targets which mean that the UK will have to cut emissions by 80% by 2050. This will take time to put in place and be costly to implement.
- Renewable energy sources that are powered by the weather, for example solar power and wind turbines produce an unpredictable quantity of energy as they are affected by conditions outside of human control.
- Wind farms can create noise and "eye-sore" which makes them less popular in areas that are densely populated. They can also have a negative impact on animals and wildlife in more rural areas.
- Crops grown to fuel biomass in Countries where they should be using their land to grow food for the communities has caused ethical issues and had an impact on nature and wildlife.
- Hydro power produces a very steady flow of power and it very reliable. It can also have a positive impact on the environment creating large reservoirs of water that wildlife can thrive by.

**Q8a.**

Possible responses may include:

- Life Cycle Assessment (LCA) is used as a tool to assess the environmental impacts of a product at each stage, from the extraction of raw material and disposal (cradle to grave) (1) the impact of the product while it is being manufactured (1) transported/distributed (1) and disposal at the end of life (1).

- Any other valid suggestion for given context.

**Q8b.**

Indicative content: The importance of the LCA and its influence on design practice may include:

Increases designer's awareness of environmental impact of their product as they have to consider every stage of its life. As concerns about global warming are rising it gives them the responsibility of reducing the carbon footprint of their product.

- Finite resources will eventually run out so designers are encouraged to select materials that can be sustainable or recycled. Example: FSC wood.
- Raw Materials need to be processed and that uses energy which contributes to global warming, so designers are encouraged to use recycled materials, or select ones that need less processing Example: Car tyres being used for artificial turf.
- Waste from products are polluting the planet. The pollution from the use of the product is highlighted in the LCA and designers can build in features to reduce the impact of that pollution. Example: Electric car.
- Manufacturing processes create pollution and waste, which contributes to climate change. Alternative manufacturing processes would be considered and selected to reduce waste or reduce stages in manufacture.
- Transporting materials uses finite resources and increases the carbon emissions. To reduce this designers/manufacturers could produce the product with local materials or relocate the factory to near the material source. Similarly, move assembly plant / factory near to where most sales take place, and where many components are manufactured. Example: JLR building an assembly plant for their cars in China.
- Energy used during the products life, some products use electricity and energy during their use.
- When a product is obsolete it is thrown away and can end up in landfill or in the oceans. It is then harmful to wildlife and takes a long time to degrade. The number of parts and different materials of the design could be reduced and clearly labelled to aid recycling. The materials that are used could be ones that naturally breakdown in the environment. Example: creating bamboo toothbrushes rather than plastic ones.

- Reference might be made to the circular economy and design for disassembly.
- Any other valid suggestion for given context.