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Design & Technology
AQA GCSE

Ecological issues in the design and manufacture of products

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. Which of the following is a major cause of deforestation?

A Solar energy production

B Farming

C Wind turbine construction

Q2. What does the "mileage" of a product's lifecycle include?

A Only the distance from manufacture to user location

B Only the raw material extraction process

C The entire journey from raw material source to final disposal

Q3. What is a key environmental impact of drilling and mining?

A Increased oxygen levels

B Habitat destruction

C Reduced carbon footprint

Q4. How does long-distance product distribution affect the environment?

A Reduces carbon emissions

B Increases fuel consumption and pollution

C Has no impact on ecosystems

Q5. Carbon dioxide is released as a result of making, transporting and using a product during its lifetime. This is called a 'carbon footprint'. Analyse and evaluate what factors contribute to carbon release or 'carbon footprint' from raw material source to final disposal. Give examples in your answer **(8 marks)**

Q6. The design and manufacture of products has an effect on our planet and environment. Analyse and evaluate the issues a consumer may consider before deciding to purchase products. Give examples in your answer **(8 marks)**

Answers

Q1. B
Q2. C
Q3. B
Q4. B

Q5.

Raw material extraction

- Fuel and energy used to harvest, fell, mine and drill for raw materials.
- Reference to use of fossil fuels, eg petrol, oil, diesel etc.
- Reference to recycled or reused materials to significantly reduce the CO2 footprint at this stage.

Transport

- Fuel and energy used to transport raw materials for primary processing and modification into standard, stock and refined forms.
- Transport by trucks, trains and boats.
- Recycling and reusing waste material in house.
- Local sourcing of materials.
- More direct travel routes, eg Suez Canal for products from the Far East.

Packaging, shipping and distribution

- CO2 produced in the manufacture of both primary and secondary packaging of products.
- Manufacturers are currently striving to find ways to reduce and simplify packaging to avoid excessive material consumption as well as reducing CO2 produced in manufacturing, using and disposing of packaging.

Product use and operation

- How much energy does a particular product use in use, eg energy efficiency rating.
- Does the product contribute to CO2 emissions, eg product left on stand-by.
- Aftercare for textile products use of washing machine/driers requires energy. End of life/disposal
- How much energy will be required to separate materials and components?
- Can the product be upcycled reducing CO2 emissions?

Accept other valid responses.

Q6.

Raw material sourcing:

- Deforestation, e.g. damage to the rainforests and increases in CO2
- Habitat/ ecosystem destruction, e.g. Great Barrier Reef
- Mining, e.g. metal ores
- Drilling, e.g. oil production
- Farming
- Consumers may choose sustainable fibres such as organic cotton as produced without pesticides/insecticides or PET polyester as recycled plastic bottles and finite oil is not used.

Transportation:

- Mileage of product from raw material source, manufacture,
- distribution, user location and final disposal
- Carbon footprint – carbon produced during the manufacture and use of products

The six Rs:

(in relation to their impact on the ecology of the planet)

- RECYCLE e.g. break down a part or materials and separate into same materials and use to make a new part/product
- REDUCE e.g. use less energy, materials and resources to manufacture a product or part
- REUSE e.g. repurpose/upcycle and use for something new
- RETHINK e.g. is there a better way of manufacturing /using materials to have less of an impact on the planet etc.
- REFUSE e.g. customers choose to not buy products that are unsustainable to make/consume
- REPAIR e.g. replace a part or component when defective to extend life and delay throwing away/end of life disposal.

Pollution:

- Pollution of the oceans e.g. polymers in the ocean
- Atmospheric pollution including acid rain
- Consumers may choose unbleached/undyed cotton as no bleach or harmful dyes used