## Design & Technology

# Wider issues of using cleaner technologies

### 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 one of the following is a biodegradable material?

**A** Silk

**B** Polythene

**C** Nylon

**Q2.** Which one of the following is a form of renewable energy?

**A** Coal

**B** Biomass

**C** Oil

**Q3.** Which of the following statements is true?

**A** Glass is biodegradable

**B** All hardwoods come from sustainable sources

**C** Plywood can be made from sustainable raw materials

**Q4.** How could you design a product to improve its carbon footprint?

**A** Source materials locally

**B** Order parts from abroad

**C** Use non-biodegradable materials

**Q5.** What does fair trade mean?

**A** It helps ensure farmers and workers are fairly paid

**B** It helps ensure that products are made from renewable sources

**C** The item contains no animal products

**Q6.** Evaluate the use of biofuels as a source of energy **(8 marks)**

**Q7.** Evaluate the use of water as a source of renewable energy. **(5 marks)**

**Q8.** A manufacturer is considering two design options for some wheels on an electric scooter

- Solid wheels which would need to be replaced when damaged
- Pneumatic air filled wheels which could be repaired when they get punctured

Discuss the factors that need to be considered before deciding which option to produce **(6 marks**)

**Answers**

**Q1. A**
**Q2. B**
**Q3. C**
**Q4. A**
**Q5. A**

**Q6.**
**Advantages**

- Renewable source of energy (1)
- Reduces the need to consume other finite resources (1)
- Environmentally friendly (1)
- Carbon neutral (1)
- 2nd 3rd and 4th generation bio-crops are more efficient for fuel production (1)
- Biofuel gives increased power over comparable vehicle fuel (1)
- Combined usage (1)

**Disadvantages**

- Ecological damage (1)
- Expensive to convert into fuels (1)
- Relatively low yield (1)
- Energy used in processing bio-fuels (1)
- Reduced land available for growing crops (1)
- Fewer MPG than normal fuels (1)
- Limited availability when refueling (1)
- Unsustainable burden on available supplies (1)
- Systems modifications needed to use fuel (1)
- Biofuels still not reached maximum potential yet (1)

(Maximum of 5 from either advantages and disadvantages otherwise 4 marks)

**Q7.**
**Advantages**

- Hydroelectric, tidal and wave power can be harnessed (1)
- Fossil fuels are not required/preserved for future generations (1)
- Does not produce carbon dioxide/greenhouse gases/air pollution (1)

- Hydroelectric plants are highly efficient (1)
- Hydroelectric plants have longer economic lives than fuel fired plants (1)
- High initial setup cost quickly recovered after a few years (1)
- Reservoirs used for leisure/tourism and recreation (1)
- Large dams protect towns down stream and control flooding (1)
- Can provide off grid power in isolated locations (1)
- Reliable/free source of energy/inexpensive in comparison to fossil fuels (1)
- Water can be pumped using off peak power (1)
- No start-up time/instant power (1)
- Water is in abundant/unlimited supply and readily available (1)
- Reduced risk of environmental accident (1)
- low running costs (1)

Disadvantages

- High set-up costs (1)
- Reservoirs use large land area/footprint (1)
- Communities may be displaced (1)
- Rivers maybe diverted / cause problems for people who rely on the river economically (1)
- Dam failures have the potential for disasters (1)
- Greenhouse gasses produced can be high in tropical regions due to decay of plant life in reservoirs producing methane (1)
- Disruptive to surrounding ecosystems (1)
- Cause changes to the downstream river environment (1)
- Visually intrusive (1)
- High maintenance costs (1)
- Difficult environment for maintenance (1)
- Not suitable for all locations (1)

Maximum 4 marks if all advantages or all disadvantages

**Q8.**

- Chair ability of materials and the potential frequency of need for a placement over power in relation to predicted lifespan of the scooter
- Expertise and access to tools and equipment required of each option
- Availability of and/or compatibility of generic replacement wheels

- Environmental impacts of each option
- Effects on the performance of the product
- How the design of the scooter/wheel will be affected by allowing for removal of the wheels by consumers
- The potential impact of frequent removal on connected elements/parts of the scooter wheels