

## Design & Technology

### A-Level

# Wider issues of using cleaner technologies

## Multiple Choice

### Materials required for questions

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- Pencil
- Rubber
- Calculator

### Instructions

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- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- Use a cross in the box to mark you answer



### Advice

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- 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 ☐

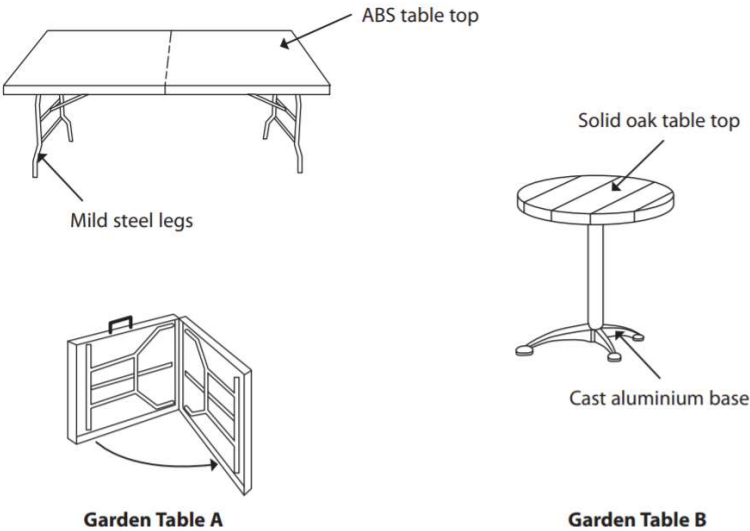
### Q5. What does fair trade mean?

- |          |  |                          |
|----------|--|--------------------------|
| <b>A</b> | it helps ensure farmers and workers<br>Are fairly paid           | <input type="checkbox"/> |
| <b>B</b> | it helps ensure that products are made<br>From renewable sources | <input type="checkbox"/> |
| <b>C</b> | the item contains no animal products                             | <input type="checkbox"/> |

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

[illegible]

**Q7.** The image below shows 2 different types of garden table



Evaluate garden table A compared with garden table B in terms of user requirements and sustainability **(6 marks)**

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**Q8.** State why the recycling symbol shown below is incorrect. **(1 marks)**



**Q9.** The figure below shows a clock made from recycled bicycle parts and a standard clock mechanism.



**9a.** Explain 2 reasons why the consumer might consider the clock to be an environmentally friendly product **(4 marks)**

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

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**Q9b.** With reference to the clock, explain the meaning of the following 3 terms **(4 marks)**

Secondary recycling

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maintenance

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Life cycle analysis :

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**Q9c.** the clock is designed to hang on a wall.

Use sketches and notes to design a stand to allow the clock to be free standing.

The stand must:

- Be made from recycled and/or sustainable materials
- Match the theme of the clock
- Be stable

A large, empty rectangular box with a thin black border, intended for students to draw sketches and take notes related to the design task.

**Q9d.** Discuss the environmental implications of packaging and transporting large, assembled products around the world **(6 marks)**

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Outline strategies an individual can employ to reduce their carbon footprint. **(6 marks)**

[illegible]

Explain the need for global sustainable development. **(3 marks)**

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**Q11b.** Outline the environmental impact caused by the widespread use of non organic polymers in today's "throw away" society **(5 marks)**

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**Q11c.** The demand for energy has increased dramatically over time. Discuss how industrialisation has changed the demand for energy. **(3 marks)**

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**Q11d.** Evaluate the use of water as a source of renewable energy. **(5 marks)**

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## **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 refuelling (1)
- Unsustainable burden on available supplies (1)
- Systems modifications needed to use fuel (1)
- Biofuels still not reached maximum potential yet (1)

8 points statements to get full marks

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

**Q7.**

**Evaluation to address the following issues:**

**User requirements**

What qualities make the product attractive to potential users?

| Table A   | Table B   |
|---|---|
| <ul style="list-style-type: none"><li>• Large flat surface area</li><li>• Large stable base</li><li>• Can be folded and stored away</li><li>• Handle for easy carrying</li><li>• Lighter and easy for carrying</li><li>• More hygienic/wipe clean</li></ul> | <ul style="list-style-type: none"><li>• Smaller and more intimate</li><li>• Café style</li><li>• More use of natural materials for table top</li><li>• Will naturally age/weather</li><li>• Can enhance appearance with stain/varnish</li></ul> |

**Sustainability**

How does the design allow for environmental considerations?

| Table A  | Table B   |
|--|---|
| <ul style="list-style-type: none"><li>• Oil based products required to make plastics</li><li>• Extraction and energy consumption in the production of the steel for the legs</li><li>• Recycled / reused</li><li>• Will last longer due to being stored away</li></ul> | <ul style="list-style-type: none"><li>• Wooden top can be reused or recycled</li><li>• Top will blend in better with natural environment</li><li>• Aluminium can also be recycled but requires lots of energy to make</li></ul> |

**Q8.**

- “1” represents PETE/PET OR HDPE is represented by “2”/
- The number is wrong
- HDPE is wrong

Any one of these

**Q9a.**

- Reuses scrap/old components(1) which would take energy to recycle/melt down(1)
- Reuses scrap components(1) so new resources needed(1)
- Clock mechanism does not use batteries/electrical power(1), so batteries not discarded(1)
- Components not specifically made for the clock(1), thus saving time and energy(1)
- Uses up bits of bike left over after upgrading(1) so they don't go to waste/landfill(1)
- Uses very little energy to make(1) and even less when working(1)
- Needs few bought components(1) which use little energy to make(1)

Two reasons + explanations for each 2 x 2

**Q9b.**

**Secondary recycling**

Reuses waste/scrap/unwanted bits from one product for a different purpose (1), for example the clock uses parts of a bike for the face, etc.(1),

**Maintenance**

Doing what is necessary to ensure the clock continues to work properly/accurately(1) for example lubricating mechanism/ changing battery/cleaning/setting time.(1)

**Life cycle analysis**

Assesses environmental aspects and potential impact associated with a product's life from cradle to grave(1), referencing ANY stage of LCA of the clock/bike (1) e.g. bike parts are reused rather than scrapped or reprocessed so saving energy/materials.

Three definitions + reference to the clock 3 x 2

**Q9c.**

- 1.Does it hold the clock in position(1)
- 2.Is it stable(1)
- 3.Does it match the theme – does it contain reused/recycled/sustainable materials(1) (no need to look for fixings)
4. Freestanding (allows pendulum to swing) (1)

Picture shows part of a typical response

Sketches but no notes – 3 marks max

Notes but no sketches – 3 marks max

**Q9d.**

This question is about packaging and transporting completed products, NOT about kits, flat-packs, self-assembly, energy of manufacture, or general pollution from transportation. Do not accept any discussion point UNLESS referenced specifically to the assembled product(s)

Answers may concentrate upon the advantages of buying completed items or the negative aspects of transporting large volumes of packaging and air. Some points which may arise could be:

- Product needs more packaging/cushioning than a kit would need
- Packages will probably be bigger than a kit would need, so will take up more space in any transport vehicle
- Large packages more wasteful when disposed of
- Large packages tend to be stronger, so may be able to be re-used
- Vehicles will need to be bigger to transport the same number of completed products as kit products
- Larger vehicles weigh more than small ones, even when carrying lightweight items, so use more fuel
- Labour will be employed to make the finished product, which will help lifestyle of inhabitants of LEDCs
- Product more likely to be made correctly, so less waste for the consumer
- Product more likely to be complete, so no loss of component parts in transit

**Q10.**

1. Food e.g. change in diet to more environmentally friendly/organic foods (1)
2. Purchasing / producing/ switching to green/ renewable energy e.g. solar panels / turbines (1)
3. Household energy efficiency e.g. insulation, double glazing, turning things off/ down (standby)/ closing windows/ shutting doors (1)
4. Energy and water efficient appliances e.g. dishwasher, washing machine, kettle, vacuum cleaner, light bulbs/ water heaters/full load washing/ dishwashing, eco-cycles used/ shower instead of bath (1)
5. Efficient transport e.g. walk, cycle, public transport, hybrid cars, drive efficiently/ shortest route/ avoid traffic/ car sharing (1)
6. Recycle, reuse, refill/ repair and avoid pointless purchases/ only buy products which are recyclable/ green rather than made of finite materials/only buy products with minimum/ recyclable packaging (1)
7. Telecommute and teleconferencing (1)
8. Buy local produce/ produce home grown/ allotment (1)
9. Offsetting e.g. planting a tree, financing offsetting measures (1)

(6 x 1)

**Q11a.**

Any three of the following statements in a sentence, up to a maximum of 3 marks.

- The environment should be seen as an asset that should be protected (1)
- The environment must meet present and future needs (1)
- Development must not compromise needs of future generation (1)
- Safeguarding the world's resources / minimising the depletion of resources / deforestation (1)
- Ensuring the quality of life for future generations (1)
- Finding better environmental ways of extraction / mining / manufacturing / producing energy (1)
- To ensure worldwide impact of environmental policies / all countries need to contribute (1)
- To allow developing countries to expand their economies and manufacturing base (1)
- Protection of wildlife, their habitats and environments (1)
- Reduces atmospheric pollution / CO<sup>2</sup> emissions / global warming (1)

(3 x 1)

Example:

The environment must meet present day demands (1) and safeguard resources (1) for future generations. (1)

**Q11b.**

Any five of the following statements in a sentence, up to a maximum of 5 marks.

- They take a long time to break down / decompose / they fill landfill sites (1)
- Polymers are a fire hazard (1)
- Burning polymers is not a good way to dispose of them as this causes air pollution (1)
- Polymers produce toxic materials / gases when burnt (1)
- Difficult to dispose of/recycle some non organic polymers (1)
- Increased demand for oil, consumes energy during transportation / utilises land at extraction facilities and refineries / produces pollution during transportation and extraction (1)
- Increased exploration of wilderness environments (1)
- Environmental issues / accidents / loss of wildlife habitat / other impacts on wildlife (1)
- Emissions resulting from polymer production/recycling (1)



- Visual/ground pollution of landfill sites (1)
  - Polymers are manufactured from non-renewable fossil fuels (1)
- (5 x 1)

**Q11c.**

Any three of the following statements in a sentence.

- Manufacturing on a much larger scale (1)
- Coal / natural gas is often in plentiful supply meeting the demand for increased energy (1)
- Increased demand for fossil fuels used in electricity production (1)
- Mechanisation/new manufacturing technologies use energy (1)
- Greater mobility / use of transport requires fuel and energy (1)
- More centralised production increases transportation to market (1)
- Factories operate 24/7 / mass production producing a continuous need for energy (1)
- Advanced technologies require industrial production (1)

(3 x 1)

**Q11d.**

**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

(5x1)