DTBase©

Design & Technology
Eduqas GCSE

Investigating challenges

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 is ergonomics?

A The study of the sizes of the human body

B Designing products to fit the way people use them, so they are comfortable, safe and efficient

C Choosing sustainable materials

Q2. What is anthropometrics?

A The study of the sizes of the human body

B The study of how products are recycled

C The study of fair wages for workers

Q3. Designers usually design for the 5th to 95th percentile. What percentage of users does this cater for?

A 50%

B 95%

C 90%

Q4. Which percentile should be used to set the height of a doorway (clearance)?

A 5th percentile

B 50th percentile

C 95th percentile

Q5. Which of these is a social factor?

A Is the product inclusive for elderly and disabled users?

B Can it be made at a profit?

C How much energy does it use?

Q6. What does fair trade ensure?

A Products are made from recycled materials

B Fair wages and safe working conditions

C Products are sold at the lowest price

Q7. Explain what is meant by the term 'anthropometrics' and why it is important for designers to consider. **(4 marks)**

Q8. An exercise bike has hand grips, a padded saddle that adjusts up and down, pedals and a control panel with buttons.

Q8a. The 5th to 95th percentile range is used when applying anthropometric data to the design of the exercise bike. Explain why. **(3 marks)**

Q8b. What problems might arise for a user of the exercise bike outside the 5th to 95th percentile range? **(2 marks)**

Q9. Playground equipment is designed for children aged 4 to 12. The table gives anthropometric data in millimetres. Height: 4 years 1040, 8 years 1270, 12 years 1480. Arm length: 4 years 420, 8 years 545, 12 years 650. Hand width: 4 years 55, 8 years 60, 12 years 65. Analyse and evaluate how a designer would use this anthropometric data to design the playground equipment. **(4 marks)**

Q10. An auxiliary handle has been designed to clip onto existing garden tools such as spades, rakes and brushes, giving the user a second handle to hold.

Q10a. Anthropometrics involves studying human sizes. Explain two anthropometric considerations that the designer would need to include for the auxiliary handle to be successful. **(4 marks)**

Q10b. The auxiliary handle retails at £4.00. Explain both the economic and social benefits that this brings the user. **(4 marks)**

Q11. Garden furniture (a table and chairs) is made from timber and sold flat-packed in cardboard packaging. Analyse and evaluate how the design and manufacture of garden furniture may cause deforestation and what steps can be taken to address this. **(6 marks)**

Q12. Explain how increasing carbon dioxide levels in the atmosphere impact on the design and manufacture of products. **(3 marks)**

Q13. When products are manufactured overseas there can be social and ethical issues. Explain two social or ethical issues that manufacturers should consider. **(4 marks)**

Answers

Q1. B
Q2. A
Q3. C
Q4. C
Q5. A
Q6. B

Q7. (4 marks)

Marks	Descriptor
3 to 4	Clear knowledge of what anthropometrics is and good understanding of why it is important for designers to consider, with relevant points to illustrate this.
1 to 2	Knowledge of what anthropometrics is, but limited understanding of its importance; illustrating points may not be given.
0	Nothing worthy of credit.

Indicative content: anthropometrics is the study of human measurements. Designers need to consider anthropometric data to:

- Make sure wearable items fit
- Make sure products are comfortable
- Make sure products are easy to use
- Make sure products are suitable for their intended user
- Allow products to be adjusted within a range

Q8a.

1 mark per valid point. Two points with at least one explained = 3 marks. For example:

- It lets the manufacturer cater for the greatest range of users
- The manufacturer can sell more products, as it can be used by more people
- The product can be used by lots of different sized and shaped users
- It avoids excluding as many people as possible from exercise, which is good for you

Q8b.

1 mark per problem identified, or 2 marks for one problem identified and explained. For example: unable to use the exercise bike comfortably; might not be able to use it safely; unable to exercise and so become unhealthy; have to spend more on a specially made exercise bike.

Q9. (4 marks)

Answers may consider both positive and negative points.

Marks	Descriptor
3 to 4	A well described and justified analysis of the data with full evaluation, drawing conclusions after considering a range of factors.
1 to 2	Brief points that are not fully explained. Analysis present but limited evaluation or conclusions.
0	No attempt or nothing worthy of credit.

Indicative content:

- Design the equipment to a suitable size for the intended user, e.g. hands 55 mm to 65 mm wide
- Identify the smallest and largest dimensions of the user group, e.g. 1040 mm to 1480 mm tall
- Use the children's body dimensions so features are the correct size, e.g. step spacing, height of archways, width of the slide
- Designed to suit most children, e.g. 90% of the percentile range
- May not cater for all possible users, e.g. the top and bottom 5%
- Anthropometric data helps with the design of ergonomic features in the equipment

Q10a.

Up to 2 marks for each of two different anthropometric considerations. Do not credit repeated statements.

- 1 mark for a basic response, e.g. the distance across the knuckles
- 2 marks for a more detailed response, e.g. the width of the user's hand, so the handle is the correct width to grasp comfortably
- Other likely answers: the circumference of the user's grip, so the diameter or radius of the handle is correct

Q10b.

Up to 4 marks. Answers for 4 marks must include both economic and social benefits. Do not credit repeated statements.

Marks	Descriptor
4	A highly detailed explanation of both, e.g. £4 is very reasonable and it can be used with any existing tools such as a spade, rake or sweeping brush. It lets users with limited physical mobility do outdoor activities themselves, increasing social possibilities.
3	A detailed explanation covering social and economic benefits, e.g. £4 is very reasonable and it fits existing tools, and it lets users stay independent and continue gardening when it could be difficult.
2	One benefit covered in detail, or both covered briefly.
1	A simple response, e.g. it is a cheap product to buy, or it lets users continue gardening.
0	No answer or no relevant information.

Guidance:

- Economic: far cheaper than buying a new garden tool; a cost effective, multi-purpose product that fits lots of existing tool handles
- Social: lets users work in the garden or at allotments, be outdoors, improve health and wellbeing, and meet and work with others

Q11. (6 marks)

Marks	Descriptor
5 to 6	A detailed analysis and evaluation of how the design and manufacture of garden furniture may cause deforestation through the use of timber. Evaluation considers a range of things that can be done, e.g. alternative materials.
3 to 4	A good analysis of how the design of garden furniture may cause deforestation, with some evaluation of what can be done.
1 to 2	Brief points showing a basic grasp of deforestation, not linked to garden furniture.
0	No response or nothing worthy of credit.

Indicative content:

- Much garden furniture uses hardwoods that may not come from sustainable sources, leading to deforestation and a lack of hardwoods in future
- Hardwoods take longer to grow than softwoods, so they may be felled faster than they grow, reducing supply and increasing costs for the manufacturer and consumer
- Furniture could be made from sustainable sources of faster growing timber
- Designs could use reclaimed or upcycled timber
- Designs could use less material, e.g. bracing to reduce the timber sections needed
- Designs may switch to polymers or metals, but these use finite resources (e.g. iron ore, crude oil) and add to global warming; mining and drilling can also cause deforestation
- Unsustainable products make it hard for manufacturers to justify the ethics of their products
- Excessive timber-based packaging, e.g. corrugated card, could increase deforestation

Q12.

Marks	Descriptor
3	A detailed explanation of how increasing CO_2 levels impact on the design and manufacture of products.
2	A good explanation.
1	A basic explanation.
0	Nothing worthy of credit.

Indicative content:

- Using materials from sustainable sources, e.g. FSC timber, so supplies are replenished and CO_2 is removed from the atmosphere
- Reducing CO_2 (carbon footprint) by using fewer materials or sourcing materials closer to home
- Designing products that can be repaired, upgraded and maintained
- Considering the 6Rs

- Designing products that use less power or energy
- Manufacturing using renewable energy and fewer fossil fuels
- Consumers are more aware of the impact of their choices, e.g. upgrading phones or cars less often, upcycling clothing, which reduces the extraction of raw materials

Q13.

1 mark for each social or ethical issue identified (up to 2), plus 1 mark for a justified explanation of each. Issues could include: low standards of staff welfare; sweat shops; child labour; low wages; poor sourcing of materials (sustainability and working conditions); poor health and safety and long hours; the carbon footprint of transporting products around the world. For example:

- A company might use the Fairtrade mark (1), as it shows consumers they provide good working conditions, fair pay and safe working practices for farmers and workers (1)
- Companies need to consider how to transport products sustainably (1), reducing their carbon footprint (1)
- Companies need to trace the source of all their cotton (1), as child labour has been reported in all the major cotton-growing countries (1)