

Design & Technology A-Level

‘Cleaner’ design and technology- a product’s life cycle Multiple Choice

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
- Use a cross in the box to mark you 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 these statements about product life cycles is true?

- A** A product will be withdrawn once it enters maturity ☐
- B** The length of every product's life cycle is the same ☐
- C** The length of each phase in a product's life cycle can be different ☐

Q2. During which phase of the product life cycle are sales expected to be highest?

- A** Maturity ☐
- B** Growth ☐
- C** Decline ☐

Q3. In which phase of the product life cycle is a product launched?

- A** Growth ☐
- B** Introduction ☐
- C** Decline ☐

Q4. The combination of aesthetics, function and cost relating to a product is referred to as what?

A The product life cycle

☐

B The design mix

☐

C The marketing mix

☐

Q5. Which of these extension strategies would be most likely to succeed in extending the life cycle of a breakfast cereal?

A Stopping all advertising of the breakfast cereal

☐

B Making the breakfast cereal available in a new flavour

☐

C Increasing the price of the breakfast cereal

☐

Q6. What is a vanishing point?

A A coordinate in CAM

☐

B A point on the horizon where all lines meet

☐

C A symbol on a circuit diagram

☐

Q7. Which of the following is the process called etching?

- A** A process whereby paint is sprayed onto the Surface of a material ☐
- B** A process that creates a long-lasting protective Coating on a metal ☐
- C** Acid is used to remove the unprotected surface Of a metal for a decorative finish ☐

Q8. Which one of the following processes involves dipping a metal into molten zinc?

- A** Galvanising ☐
- B** Cathodic protection ☐
- C** Electroplating ☐

Q9. Explain two ways how just in time (JIT) production can help manufacturers improve efficiency **(4 marks)**

1. _____

2. _____

Q10a. Explain the purpose of 'quality control'. **(2 marks)**

Q10b. Describe one method of 'quality control' that is used when making prototype products. **(2 marks)**

Give examples in your answer. (8 marks)

[illegible]

Q12. It is said that we live in a ‘throwaway’ culture.
Discuss the ways in which built-in product obsolescence contributes to a ‘throwaway’ culture. **(6 marks)**

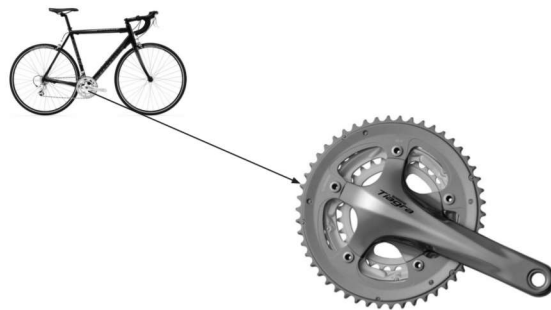
Q13. Companies try to reduce the environmental impact of a product at all stages of its life cycle.
Give two environmental considerations for each stage.
An example answer is already given for raw materials. **(10 marks)**

Life cycle stage	Environmental considerations
Raw materials	Example answer: Use a smaller quantity of material in the production of a product.
	1. <hr/>
	2. <hr/>

	<hr/> <hr/>
Manufacture	<div>1.</div> <hr/> <div></div> <hr/> <div>2.</div> <hr/> <div></div> <hr/>
Distribution	<div>1.</div> <hr/> <div></div> <hr/> <div>2.</div> <hr/> <div></div> <hr/>
Use	<div>1.</div> <hr/> <div></div> <hr/> <div>2.</div> <hr/> <div></div> <hr/>
End of life	<div>1.</div> <hr/> <div></div>

	2.

Q14. One quality control test that would be used during volume production of the sprocket and crank arm is to check dimensional accuracy (shown below).



Outline three further quality control checks that could be carried out on the assembled sprocket and crank arm. **(3 marks)**

1.
2.
3.

Q15. Recycling materials plays an important role in preserving the world's natural resources.

Outline how products can be designed for recycling. **(4 marks)**

Q16a. Discuss the issue of 'repair versus replacement' from a consumer's point of view. **(6 marks)**

Q16b. Explain how a company may benefit from carrying out a life cycle assessment on its products. **(4 marks)**

Answers

Q1. C

Q2. A

Q3. B

Q4. B

Q5. A

Q6. A

Q7. C

Q8. C

Q9.

1 mark for each point of explanation appropriate to improve efficiency.

One point explained and clarified in more detail, e.g. with example is worth 2 marks

Indicative content:

- No need for factory space to be used to store materials = 1
- More factory space can be allocated to production/output = 1
- Materials/components do not become old/ out of date = 1
- Money is not invested in unused stock = 1
- More factory space can be allocated to production/output = 1
- Improved manufacturing competitiveness through reduced time waste and resources i.e. no ordering resources and needed or moving and storing of unused resources = 2
- No need for large storage facilities so reducing construction/maintenance costs = 2
- Materials/ components do not become old/ out of date so reducing costs and wastage = 2

NB No mark for repeating 'just in time' or 'improve efficiency' as they are in the question stem.

Accept all other valid responses

Q10a.

1 mark for each explanation point up to a maximum of 2 marks.

This question is about explaining QC

Indicative content:

- Check or test = 1
- Make sure a product meets a specific standard = 1
- To ensure a manufactured product meets agreed specification criteria = 1
- Guarantees the accuracy of a part or component = 1
- Manufactured to an agreed tolerance = 1
- Fit for purpose
- Suitable/good enough for selling =1

NB NOT TO PREVENT MISTAKES/STOP MISTAKES FROM HAPPENING

Accept all other valid responses

Q10b.

1 mark for a simple point with a second mark for a well explained point.

Looking for a specific method described. This is not a repeat of Qu18.1

Indicative content:

1 mark responses:

- Visual check/test
- Use a ruler
- Use of a multimeter
- Use a jig/fixture or template
- Use of a go/no go jig
- Testing against a specification
- Check seam strength
- Check seams are neatened
- Check within tolerances
- Testing product to see if it works

2 mark responses:

- Dimensional accuracy, e.g. use of micrometer, Vernier calipers
- Use of jigs and fixtures, e.g. go/no go jigs and depth stops
- Registration mark e.g. CMYB
- Alignment of printing plates, hinges, catches, other interlocking parts, e.g. cross lines
- Material quality e.g. surface inspections for defects
- Electrical continuity, e.g. visual inspection of PCB tracks, use of multimeter
- Safety e.g. loose parts, sharp edges

- Flammability e.g. textiles
- Check zips and fastenings are inserted correctly and work

Accept all other valid responses

Q11.

Indicative content:

The question is looking for responses giving ecological issues a consumer might consider in the purchase of products.

A DESCRIPTIVE LIST OF POINTS WITH NO EVALUATION IS 4 MARKS MAX.

Expect responses to consider any of the following topics:

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

Q12.

Indicative content

Discussion to address the following issues:

- Once a product stops working it is thrown away
- It is often cheaper to replace a product than to repair it
- New and improved models/products are released by companies to entice new sales
- Often some of the new models are cheaper than the older models
- Replacement parts are often withdrawn by companies meaning that you cannot get spare parts
- Some parts are designed to break/wear out before other parts so the product becomes unusable
- New and developing technology and features mean people want the latest/newest products and gadgets
- Generally acceptable amongst a large section of society / lazy / lack of knowledge to fix / repair things
- Reliance on built in obsolescence to generate / perpetuate consumer cycle

Q13.

Use any ten of the following answers.

Raw materials

1. Use less material (example answer) (no marks to be awarded)
2. Use materials/extraction methods which cause less environmental impact/easier to extract (1)
3. Use recyclable/ recycled /renewable /sustainable /biodegradable /degradable materials (1)
4. Follow relevant legislation (1)
5. Use materials which are in close supply (1)
6. Use materials from managed stock (1)

Manufacture

7. Reduce energy use/emissions wherever possible (1)
8. Simplify process if possible/reduced wasted time (1)
9. Reduce/reuse/safe disposal of waste (1)
10. Use natural resources as efficiently as possible (1)
- 11.Reduce the number of components/range of materials needed (1)
- 12.Reduce weight (1)
13. Improve workflow (1)

Distribution

- 14.Reduced/lightened/efficient packaging (1)
- 15.Reduce mileage to suppliers / customers (1)
- 16. Use most efficient modes/types/routes/times of transport (1)
- 17. Improve driving attitude/style of staff (1)
- 18.Bulk methods for distribution (1)

Use

- 19. Increase durability/length of life of products (1)
- 20. Encourage use of refillable products (1)
- 21. Use 'green' credentials as a positive marketing strategy (1)
- 22. Promote efficient use of a product/energy efficient products (1)
- 23. Encourage/facilitate repair / Replaceable components (1)

End of life

- 24.Can be reused (1)
- 25.Can be recycled / recyclable (1)
- 26.Reduce waste to landfill (1)
- 27.Can biodegrade/degrade (1)

Q14.

Any three of the following checks:

- 1. Check material quality (with destructive / non destructive tests), eg . strength /toughness/ hardness /durability /corrosion resistant / weight (1)
- 2. Check function / does it work (freely rotate/smooth running chain) (1)
- 3. Check that parts fit together (1)
- 4. Check surface finish (scratches /dents/dirt/blemishes) (1)
- 5. Check sharp corners/edges (1)
- 6. Check casting quality (flaws / cracks / flashing / holes / bubbles /miss-forms / broken parts) (1)
- 7. Check for correct assembly (location/missing components tightness of screws) (1)
- 8. Check threads are fully cut /formed (1)
- 9. Check quality of decals/printing / position (1)

Do not accept simplistic statements such as 'do a visual check' or 'test it' or 'check it'.

(3 x 1)

Q15.

- 1. Use materials that can be/have been recycled/use as few nonrecyclable materials as possible (1)
- 2. Products are easy to dismantle / easy to separate different materials (1)

3. Use as few different materials as possible (1)
 4. Use as few parts/little material as possible (1)
 5. Coding/markings materials so they can easily be identified (1)
 6. Avoid surface treatments which will need to be removed before recycling (1)
 7. Make products from materials which require low energy for recycling (1)
- (4 x 1)

Q16a.

Positives of repair

1. Product has an extended life time increasing its appeal (1)
2. Less cost to repair than replace (1)
3. Plentiful supply of spares (1)
4. Some products are designed for consumer (DIY) repair (1)
5. Some companies provide strong after-sales backup/support/repair (1)
6. Some people prefer/want to stick/keep with what they have/are familiar with/sentimentality (1)
7. Environmentally aware customers may prefer sustainability/avoid waste/disposal (1)
8. Saved data/info (1)

Positives of replacement

9. New features / upgrades / styles/trends / fashions available (1)
10. Sometimes cheaper to buy new (repair difficult/expensive / time consuming/regular) (1)
11. New products readily available/convenient, whereas replacement parts are not (1)
12. Generally quicker to replace than repair (1)
13. Reliability of a new product (1)

Each bullet point can be stated as a positive or negative but can only be used once.

(6 x 1)

Q16b.

1. Determine/investigate cradle to grave (mention of any stage of life) carbon footprint/energy use/environmental impact/materials used (1)
2. Reduce a carbon footprint/emissions/meet emission targets/environmentally friendly (1)
3. Reduce the volume / range / amount of materials required (1)
4. Reduce manufacturing/material costs/waste/errors (1)
5. Savings made/increased profit (1)

6. Reduce the amount of energy required to manufacture /distribute the product / reduce energy costs. (1)
7. Promote the product as being environmentally friendly/green/avoid fines (1)
8. Setup production nearer to suppliers / markets (1)
9. Reduce transportation costs (1)
- 10.Reduce the amount of time required to manufacture the product / Improve manufacturing speed (1)
- 11.Get the product onto the market more quickly (1)
- 12.Predict product lifespan/failure (1)
- 13.Plan/provide improved/longer lasting product/replacement (1)
- 14.Choose/change materials for future products (1)