Design & Technology
(Product Design)

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OCR A-Level

Processes That Ensure Structural Integrity: Triangulation & Reinforcing (6.1b)

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 the main reason triangles are used in structural frameworks?

A They are strong and prevent distortion

B They are easier to manufacture

C They reduce material costs

Q2. What does reinforcing achieve in building materials?

A Reduces overall cost

B Increases strength and durability

C Improves appearance

Q3. Which of these uses fabric reinforcement?

A Steel beam

B Fibreglass canoe

C Brick wall

Q4. Which reinforcing method makes skateboards stronger and less likely to snap?

A Triangular bracing

B Laminating layers of wood

C Adding screws

Q5. The image shows a waste paper basket where the sides are manufactured from expanded metal mesh.

Q5a. Identify two advantages of using expanded metal mesh rather than solid sheet for the waste paper basket shown in the image. **(2 marks)**

Q5b. Explain how the design of the waste paper basket ensures structural integrity. **(3 marks)**

Q6. Explain the technique used here to ensure structural integrity for the structure **(2 mark)**

Q7. Explain the technique used here to ensure structural integrity for the structure **(2 mark)**

Answers

Q1. A
Q2. B
Q3. B
Q4. B

Q5a.
Possible advantages may include:

- Reduces cost as less material is needed in manufacture (1).
- Reduces weight as less material is needed in manufacture (1).
- Reduces impact on the environment as less material is needed (1).
- Allows the user to see into the waste paper bin so they know it is full (1).
- Any other valid suggestion.

Q5b.
Possible explanations if how structural integrity is secured may include:

- The top rim and the bottom of the waste paper bin are solid metal (1) to help stiffen the structure and maintain the shape (1) ensuring it can take impact from objects that are thrown in (1).
- The use of the diamond pattern allows for less material to be used (1) without losing too much strength (1) because of the triangulation. (1)
- There could be ribs or webs (1) underneath the base of the bin which stiffen the material (1) without increasing the material quantity (1).
- Any other valid suggestion.

Q7.

- The tower uses **triangulation** (1 mark) to make the lattice framework strong and stable, spreading loads and resisting wind forces (1 mark).

Q8.

- The technique is **reinforcing** (reinforced concrete with steel rebar) (1 mark), which improves strength and prevents cracking, ensuring the foundation is strong and durable (1 mark).