

# Design & Technology

## Edexcel GCSE

# Technical Textiles

### 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
- For the multiple choice questions, circle your 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 technical textile?

- A** Brass
- B** Graphene
- C** Kevlar

**Q2.** Conductive textiles could be used to

- A** change colour
- B** illuminate light emitting diodes (LEDs)
- C** resist bullets

**Q3.** Microencapsulation is used to make fabric

- A** anti-bacterial
- B** conductive
- C** fire proof

**Q4.** Which technical textile is both waterproof and breathable?

- A** Nomex
- B** Kevlar
- C** Gore-Tex

**Q5.** Agro-textiles are mainly used in

- A** farming and horticulture
- B** space exploration
- C** hospital operating theatres

**Q6.** Which textile is flame resistant and used in firefighters' uniforms?

- A** Coolmax
- B** Nomex
- C** Elastane (Lycra)

**Q7.** A not-for-profit organisation has developed some agro-textiles that can be used by farmers.

**Q7a.** Explain two ways that agro-textiles can be used by farmers. **(4 marks)**

1

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2

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A farmer requires 420 m<sup>2</sup> of agro-textile to cover their field. The agro-textile is available in rolls 50 m long measuring 1.2 m wide.

**Q7b.** Calculate the number of rolls of agro-textile the farmer needs to cover their field. **(2 marks)**

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**Q8.** Kevlar is a technical textile used in body armour.

**Q8a.** Explain how Kevlar fibres are processed and arranged to give this material its unique properties. **(2 marks)**

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A blend of Nomex and Kevlar is used to manufacture the fabric of a firefighter's uniform.

**Q8b.** Explain the advantages of blending these fibres together. **(2 marks)**

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**Q9.** Geotextiles are used for outdoor building construction and maintenance.

**Q9a.** State whether each of the following statements is true or false. **(2 marks)**

|                                                                  |              |
|------------------------------------------------------------------|--------------|
| Geotextiles can be woven materials.                              | True / False |
| Geotextiles can be made from both synthetic and natural fabrics. | True / False |

**Q9b.** Discuss how geotextiles are benefiting the outdoor and construction industry. **(3 marks)**

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## Answers

Q1. C

Q2. B

Q3. A

Q4. C

Q5. A

Q6. B

### Q7a.

Any two explanations that reference the way agro-textiles can be used (1 mark each) and a linked justification of each way (1 mark each):

- They can be used to stop soil erosion (1), which means nutrients/soil will not be washed away (1)
- They can be used to warm the ground (1), which means crops may grow faster/increased yields (1)
- They can be used to help retain moisture in the soil (1), which means the amount of water needed to grow crops is reduced/saves water (1)
- They can be used to protect crops from birds/insects/pests (1), which means fewer crops are lost by being eaten (1)
- They can be used to protect against adverse weather such as wind/frost/hail/solar radiation (1), which means crops have a greater chance of surviving/growing (1)
- They can be used as a weed control membrane (1), which means time is saved by not having to remove weeds (1)

### Q7b.

A calculation that includes (award full marks for the correct answer without working):

- Correct area of one roll:  $50 \times 1.2 = 60 \text{ m}^2$  (1)
- Correct number of rolls:  $420 \div 60 = 7$  rolls (1)

### Q8a.

1 mark for each simple correct point of explanation, or 2 marks for one point explained in detail/with an example. "Strong" must be qualified for credit.

Indicative content:

- Arranged as a mat (non-woven) (1); arranged in layers (1); woven (1); spun into ropes (1); can be treated with chemicals (1)
- Woven for strength as a net/mat (2)
- Woven to create a net-like structure resistant to penetration, e.g. a knife attack (2)
- Woven as an interlocking net structure, e.g. to resist bullets in body armour (2)
- Chemically treated to make the fibres more flexible, e.g. easier to move in when worn as clothing

#### **Q8b.**

Answers must refer to the properties of both fibres and to the uniform for full marks. 1 mark for each complementary property related to the uniform; maximum 1 mark without explanation. For example:

- Nomex is a flame-resistant material needed to protect the user against a fire (1); Kevlar thermally protects the user from the fire (1)
- Nomex is a durable/tough material to withstand active use (1); Kevlar is tear resistant, adding to the durability of the product (1)
- Nomex is a flexible material and Kevlar is lightweight, so both help the user move quickly and easily (2)

#### **Q9a.**

Both statements are true (1 mark each). Only acceptable responses.

#### **Q9b.**

Maximum of two marks for two benefits; at least one benefit must be discussed for three marks. Example: geotextiles are permeable, which makes them suitable for soil protection (1). They help drain rainwater evenly (1) and restrict sunlight, preventing weed growth (1), which reduces maintenance time on roadside verges (1). They make poor soil more manageable, enabling construction in places that would otherwise be unsuitable (1). Some geotextiles are made from recycled materials (1). Examples of use:

- Separation, reinforcement, and filtration and drainage

- Paved and unpaved roads, airport runways, car parks, landfill sites
- Retaining walls and erosion control to increase the stability of earth
- Separating fine and coarse aggregates; sand drainage; roadside pipelines; pipe insulation
- Durable for up to 100 years; can be made waterproof