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Design & Technology
AQA GCSE

Smart materials

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. A smart material is one which?

A Conducts electricity

B Protects against fire

C Reacts to a stimulus

Q2. Identify the smart material used to darken windows in bright sunlight.

A Photochromic pigment

B Shape memory alloy

C Thermochromic pigment

Q3. What material is used to make dental braces?

A Nitinol

B Zinc

C Aluminium

Q4. Identify the smart material used in temperature-sensitive baby spoons.

A Photochromic pigment

B Shape memory alloy

C Thermochromic pigment

Q5. Shape Memory Alloys (SMA) are often used in fire alarms and air-conditioning units.

Explain the smart property of a Shape Memory Alloy (SMA) that makes it suitable for these applications **(2 marks)**

Q6. Photo-chromic lenses are popular for people who wear glasses to help with their eyesight. Explain three advantages to of purchasing glasses with photo-chromic lenses rather than standard lenses **(9 marks)**

Answers

Q1. C
Q2. A
Q3. A
Q4. C

Q5.

- A change in stimulus (temperature / electricity) (1)
- produces a change in shape / movement (1)

Q6.

- The lenses will darken in sunlight (1) which means a second pair is not required (1) thus reducing the cost to the consumer (1)
- No need to change glasses as the user moves between environments (1) because the glasses will always have the correct level of tint (1) minimising eye strain (1)
- The user is likely to wear them all the time (1) so there is less chance of them being lost (1) reducing the need for costly replacements (1)
- Improved safety when driving (1) because the driver does not have to change glasses (1) when light levels change (1)