**Design & Technology**

**AQA GCSE** Logo

Description automatically generated with low confidence

**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)