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Design & Technology
AQA A-Level

Modern 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. Which modern material is renowned for its high tensile strength and is commonly used in bulletproof vests and cut-resistant gloves?

A Polymorph

B Kevlar

C High-density modelling foam

Q2. High-density modelling foam is ideal for prototyping and sculpting due to its:

A Ability to dissolve in water

B High thermal conductivity

C Lightweight nature and ease of carving

Q3. What is the primary component of Precious Metal Clay (PMC)?

A Recycled plastic particles

B Fine particles of silver or gold suspended in organic binder

C Ceramic fibres

Q4. Polymorph is often used for creating custom tool handles or ergonomic grips because it:

A Hardens permanently upon cooling

B Conducts heat efficiently

C Can be moulded by hand when heated

Q5. State three reasons why Precious Metal Clay (PMC) may be used in the manufacture of a decorative pendant for a necklace **(3 marks)**

Q6. Give three reasons why polymorph may be used in the modelling of an ergonomic grip **(3 marks)**

Q7. Evaluate the impact of Kevlar fibres on the development of sporting products **(6 marks)**

Answers

Q1. B
Q2. C
Q3. B
Q4. C

Q5.

- is malleable and easy to mould and shape into an appropriate form
- has an attractive aesthetic appearance
- can be polished once fired
- is less expensive than using a traditional metal such as gold and silver
- it is able to be hallmarked to provide authenticity
- will set to become hard and durable when fired

Q6.

- Polymorph is a thermoplastic that can be easily shaped and formed when softened by heating in water to 62C. The low temperature allows it to be moulded by hand.
- It can be reheated and remoulded enabling the shape of the grip to be refined.
- It can be machined and shaped with hand tools when cooled.
- It can be formed around an existing handle.
- It comes in a range of colours or can be painted in order to enhance the aesthetics of the grip.

Q7.

- Kevlar fibres are used in bicycle tyres to replace standard rubber. These fibres prevent punctures due to the resistance to sharp objects, thus reducing risk for cyclists when travelling at high speed. This also reduces the time lost from punctures during races for cyclists who see the added cost of the tyres as worthwhile.
- Kevlar fibres are used in personal protection equipment for motorcyclists and others as it protects against abrasion and cuts. It is much lighter than alternative materials, such as steel inserts and due to its thermal insulation properties the wearer is not at risk of burns through conduction.
- Kevlar fibres are used in high end trainers as a replacement for nylon due to the reduced elasticity. This means the laces will remain tight as Kevlar fibres stretch by 1% in comparison to 30% associated with Nylon