

Design & Technology

AQA A-Level

Composites

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 composite is widely used in aerospace due to its exceptional strength-to-weight ratio and mouldability into complex shapes?

- A** Glass Reinforced Plastic (GRP)
- B** Carbon Fibre Reinforced Plastic (CFRP)
- C** Fibre Cement

Q2. What property makes GRP (glass reinforced plastic) suitable for boat hulls and swimming pools?

- A** High thermal conductivity
- B** Corrosion resistance and water impermeability
- C** Magnetic properties

Q3. Reinforced concrete is preferred over plain concrete for structural columns because it:

- A** Enhances tensile strength with steel reinforcement
- B** Reduces material costs
- C** Improves thermal insulation

Q4. Engineered wood like glulam (glued laminated timber) is used for curved beams in buildings because it:

- A** Is cheaper than solid wood
- B** Degrades faster than traditional timber
- C** Combines layers for increased strength and flexibility

Q5. Explain why tungsten carbide is an appropriate material for the manufacture of a centre lathe cutting tool **(6 marks)**

Q6. Define the term 'composite' **(2 marks)**

Q7. Name a specific application for each of the following composites **(3 marks)**

Aluminium composite board

Glass reinforced polymer (GRP)

Glulam

Q8. Explain why concrete is a suitable material for the manufacture of the outdoor table tennis table shown **(6 marks)**



Answers

Q1. B

Q2. B

Q3. A

Q4. C

Q5.

- The combination of tungsten and carbon produces a hard material which will allow the cutting tool to resist the wear associated with cutting a rotating material.
- Tungsten carbide can maintain a sharp tool edge for longer while producing a better-quality finish.
- Tungsten carbide is an extremely hard material so is suitable for use on a wide range of softer metals.
- Tungsten carbide has good corrosion resistance which enables it to be used with a range of lubricants and coolants.
- Tungsten carbide can be formed by sintering into an appropriate shape for the cutting tool tip.
- The porous nature of sintered product can assist cutting when using a lubricant.
- Tungsten carbide is dimensionally stable at high temperatures associated with friction involved with cutting and shaping materials.

Q6.

One mark for a simple definition:

- A composite is a material comprised of two or more different materials.

Two marks for a detailed definition:

- The material formed makes use of the properties of the two original materials to produce a new material with enhanced properties.

Q7.

Aluminium composite board:

- indoor and outdoor signage
- applications that use their sound absorbing properties such as panels in vehicles
- architectural cladding.

Glass Reinforced Polymer (GRP):

- boats, canoes, jet skis
- vehicle body work
- coatings on sports equipment such as hockey sticks.

Glulam:

- engineered beams
- bridges
- architectural timber framework.

Q8.

- Concrete is a hard material that can be polished to provide a smooth, hardwearing playing surface.
- Concrete can be reinforced with a high tensile steel frame to provide additional strength for the unsupported table.
- Concrete can be easily poured into a simple mould to create the shape of the table.
- Concrete can be moulded on site removing the need to transport and lift the table.
- Concrete is a stable material that can withstand weathering and changes in temperature making it suitable for outdoor use.
- Concrete is hard and rigid providing an appropriate surface with no flex.
 - Concrete requires little maintenance.
- Concrete is a durable material that will withstand potential inappropriate use or vandalism.
- The use of concrete provides a flat playing surface.