Design & Technology

Performance characteristics of materials

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try to 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
- Don’t spend too much time on one question

Good luck!

Q1. What word describes a material that can be drawn out into long thin wires?

A Malleable

B Ductile

C Brittle

Q2. What is a unique property of shape memory alloy (SMA)?

A Resistant to spectacle damage

B Flexible

C Lightweight

Q3. Which property describes the ability of a material to withstand sudden and shock loading without fracturing?

A Toughness

B Hardness

C Malleability

Q4. A material that resists abrasive wear and indentation has which one of the following properties?

A Elasticity

B Plasticity

C Hardness

Q5. Shear strength is defined as:

A The ability of a material to return to its original shape once a deforming force is removed

B The ability of a material or joint to withstand being pulled apart

C The ability of a material to withstand being squashed

Q6. Which one of the following is not a property of mild steel?

A Malleable

B Tough

C Plasticity

Q7. A tough material is commonly described as:

A A material that can withstand repeated impacts

B A material that is hard to scratch

C A material that takes a long time to decompose

Q8. Which of the statements below is the definition of the physical property 'elasticity'?

A The ability of a material to stand up to forces being applied without it bending, breaking, shattering or deforming

B The ability of a material to absorb force and flex in different directions, returning to its original position

C The ability of a material to stretch without breaking or snapping

Q9. Describe two properties of metal foams, that make them more suitable than solid sections, in the manufacture of some products/components
(2 marks)

Property 1:

Property 2:

Q10. List **two advantages** and **two disadvantages** of materials that are biodegradable? **(4 marks)**

Q11a. Give **two** properties of carbon steel that make it suitable for the blade of a pencil sharpener **(2 marks)**

(b) Describe **one** reason why carbon steel is a better choice of metal for the blade rather than aluminium **(2 marks)**

Answers

Q1. B
Q2. A
Q3. A
Q4. C
Q5. B
Q6. C
Q7. A
Q8. B

Q9.

- Lightweight in comparison to solid form
- Low conductivity
- Compressive strength
- Absorption of a force

Q10.

Advantages:

- Reduction on Carbon cycle/emissions
- Eco friendly, won't damage environment
- Renewable materials help with sustainability

Disadvantages:

- More expensive to produce this type of material
- Need for composters, biodegradable materials require specific conditions to decompose

Q11a.

Any **two** properties given from:

- Hard
- Ductile
- Malleable
- Toughness

Q11b.

One reason described from:

- Carbon steel is harder, which means its wears better/lasts longer
- Carbon steel can have an edge ground on it, which means it will be able to cut/shave/sharpen the pencil

- Carbon steel can be hardened, unlike aluminium which can only be work hardened/alloyed