1.1 Material properties and selection: 10-minute Pack

AQA 8552 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions.

1 A school designs a reusable lunch box. A steel sample resists a sharp point scratching its surface, but a similar steel sample with greater toughness absorbs more energy before fracturing. State the property that describes resistance to scratching and explain what toughness describes.

(a) Name the property measured by resistance to scratching. **(1)**

(b) Explain what the toughness result tells the designer. **(2)**

(Total for Question 1 is 3 marks)

2 A lightweight camera support has a maximum permitted mass of 1.5 kg. A solid component has volume 800 cm^3. Material R has density 1.8 g/cm^3; material S has density 2.1 g/cm^3.

(a) Calculate the mass of the component made from R in grams. **(2)**

(b) Convert this mass to kilograms and decide whether R meets the limit. **(2)**

(c) State whether S would meet the limit, showing a calculation. **(2)**

(Total for Question 2 is 6 marks)

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Mark scheme · 1.1 Material properties and selection: 10-minute Pack

Question 1

(a) hardness **B1**

(a) Answer: Hardness

(b) toughness is the ability to absorb energy (or resist fracture) before breaking **B1**

(b) greater toughness means the lunch box is less likely to crack or shatter on impact **B1**

(b) Answer: Toughness is the ability to absorb energy before fracturing; a tougher box is less likely to crack if dropped

Question 2

(a) mass = density x volume = 1.8 x 800 **M1**

(a) 1440 g **A1**

(a) Answer: 1440 g

(b) 1440 g / 1000 = 1.44 kg **M1**

(b) yes, since 1.44 kg is below 1.5 kg **A1**

(b) Answer: 1.44 kg; yes

(c) 2.1 x 800 = 1680 g **M1**

(c) 1.68 kg, which exceeds 1.5 kg **A1**

(c) Answer: No; 1.68 kg

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