

Chapter 11 Past Paper Questions - Answers

1. (a) Hooke's law: the extension is proportional to the force applied **(1)**
up to the limit of proportionality or elastic limit 2
[or for small extensions] **(1)**

(b) (i) (use of $E = \frac{F l}{A e}$ gives) $e_s = \frac{80 \times 0.8}{2.0 \times 10^{11} \times 2.4 \times 10^{-6}}$ **(1)**
 $= 1.3 \times 10^{-4} \text{ (m) (1) } (1.33 \times 10^{-4} \text{ (m)})$

$e_b = \frac{80 \times 1.4}{1.0 \times 10^{11} \times 2.4 \times 10^{-6}} = 4.7 \times 10^{-4} \text{ (m) (1) } (4.66 \times 10^{-4} \text{ (m)})$

total extension = $6.0 \times 10^{-4} \text{ m (1)}$

(ii) $m = \rho \times V$ **(1)**

$m_s = 7.9 \times 10^3 \times 2.4 \times 10^{-6} \times 0.8 = 15.2 \times 10^{-3} \text{ (kg) (1)}$

$m_b = 8.5 \times 10^3 \times 2.4 \times 10^{-6} \times 1.4 = 28.6 \times 10^{-3} \text{ (kg) (1)}$

(to give total mass of 44 or $43.8 \times 10^{-3} \text{ kg}$) 7

(c) (use of $m = \rho A l$ gives) $l = \frac{44 \times 10^{-3}}{8.5 \times 10^3 \times 2.4 \times 10^{-6}}$ **(1)**
 $= 2.2 \text{ m (1) } (2.16 \text{ m})$

(use of mass = $43.8 \times 10^{-3} \text{ kg}$ gives 2.14 m) 2

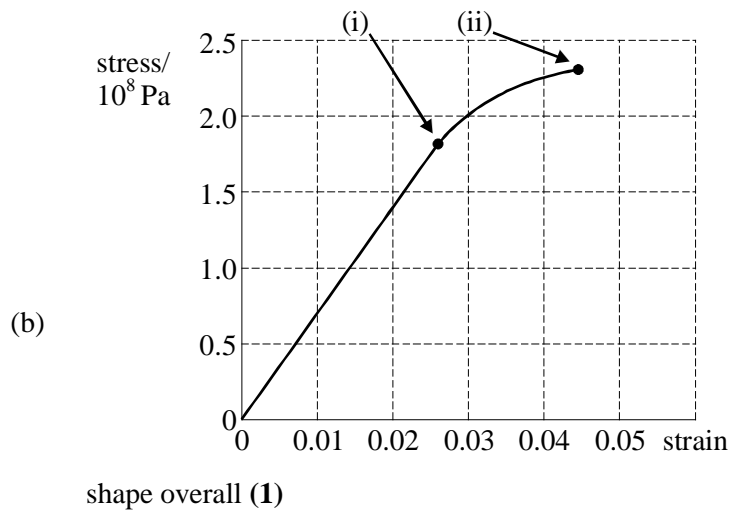
[11]

2. (a) (i) strain = 0.026 **(1)**
 $E = 6.92 \times 10^9 \text{ Pa (1)}$

(ii) $A = 1.96 \times 10^{-7} \text{ (m}^2\text{) (1)}$

stress = $230 \times 10^8 \text{ Pa (1)}$

(iii) breaking strain = 0.044 **(1)** 5



- (i) straight line (1)
0 to (0.026, 1.8) (1)

- (ii) curve (1)
to (0.044, 2.3) (1)

Max 4

[9]

3. (i) appropriate discussion of energy conservation (1)
 $\Delta \text{p.e.} = 2.5 \times 10^{-2} \times 9.8 \times 1.2$ (1) (= 0.29 J)

(ii) $F = \frac{2E_p}{e}$ (1) = 590N (1)

(iii) $A = 3.1 \times 10^{-6} \text{ (m}^2\text{)}$ (1)
stress = $1.9 \times 10^8 \text{ Pa}$ (1)

(iv) strain = $\frac{e}{L} = \frac{0.001}{1.2} = 8.3 \times 10^{-4}$ (1)

(v) $E = \frac{\text{stress}}{\text{strain}} = \frac{1.9 \times 10^8}{8.3 \times 10^{-4}}$ (1) = $2.3 \times 10^{11} \text{ Pa}$ (1)

[9]

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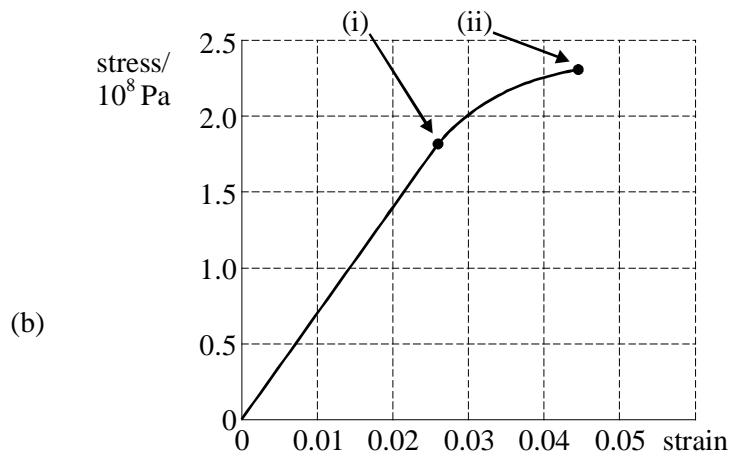
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shape overall (1)

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