

SURNAME: Harvey

FORENAME(S): Alexander James.

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either read more illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	2222202
2	Title of Examination Paper	Physics OME.
3	Module Code	ACDB 4007.
4	Date and Time of Examination	07/05/2025 09:04.
5	Examination Venue	UWTSO Room: 112
6	Seat Number	N/A.

7	Number of Answer Books handed in	
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[illegible]

38%

(Gweler yr ochr arall am y fersiwn Cymraeg)

Q1)

- a) cylindrical explosive
 case mass = 4kg
 Charge mass = 10kg
 $2E = 3100 \text{ ms}^{-1}$

$$\frac{v}{\sqrt{2E}} = \left[\frac{m}{c} + \frac{1}{2} \right]^{-1/2}$$

$$v = \sqrt{3100} \cdot \left[\frac{4}{10} + \frac{1}{2} \right]^{-1/2}$$

$$v = \sqrt{3100} \cdot [0.4 + 0.5]^{-0.5}$$

$$v = \sqrt{3100} \times 0.9^{-0.5}$$

$$v = \underline{58.69 \text{ ms}^{-1}}$$

Ideal correct
 error 14%

- b) i) mass = 2kg
 $v = 15 \text{ ms}^{-1}$
 $u = 0 \text{ ms}^{-1}$

$$F_t = m(v - u)$$

$$F_t = 2(15 - 0)$$

$$F_t = \underline{30 \text{ N}}$$

units NS required.

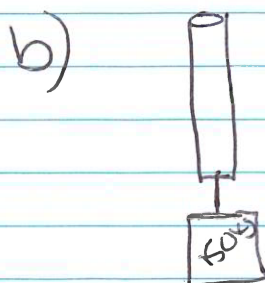
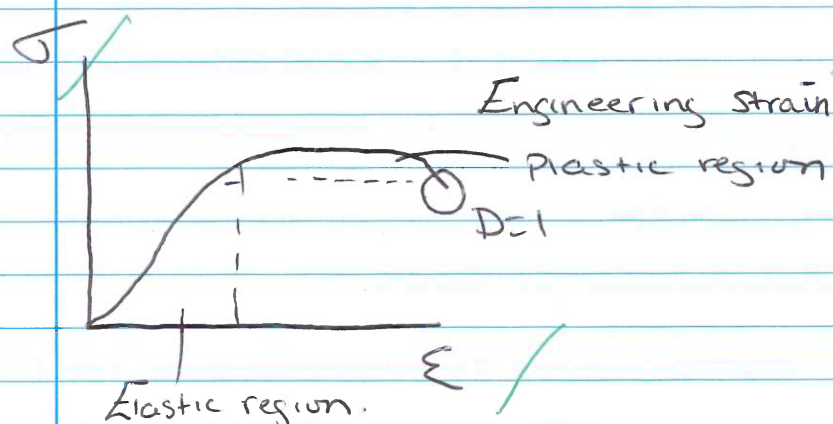
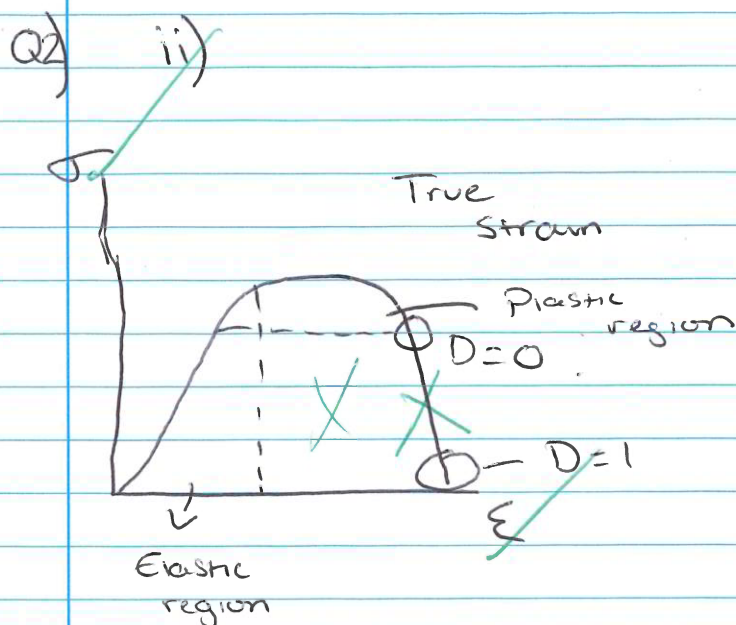
- ii) Event? $T = 0.05 \text{ s}$

$$30 \times 0.05 = \underline{1.5 \text{ N}}$$

$$\frac{30}{0.05} = F$$

$$\underline{600 \text{ N} = F}$$

total (13)



$$E = 200 \text{ GPa}$$

$$\alpha = 5 \times 10^{-2}$$

$$L = 0.3 \text{ m}$$

$$200 \text{ GPa} \times 0.3$$

$$\text{Stress} = \frac{F}{A}$$

$$F = \frac{150 \times 9.81}{5 \times 10^{-2} \times 0.3} = 98,100$$

$$E = \frac{\sigma}{\epsilon}$$

$$\sigma = E \epsilon$$

$$\frac{98,100}{200 \text{ GPa}} = 4.905 \times 10^{-4}$$

Q3)

$$a) Q = mc\Delta T$$

$$Q = 2 \cdot 400 \cdot 30 = 24000 \text{ Joules.}$$

8

$$b) \begin{array}{l} 600\text{J} \quad 700\text{g} \quad c = 150 \text{ kg}^{-1} \text{K}^{-1} \\ \text{work } 350\text{J} \end{array}$$

$$\Delta U = mc\Delta T \quad 700 \times 150 \times \Delta T$$

$$\Delta Q = \Delta U + \Delta W \text{ needed.}$$

100%

8

Q4)

$$a) T = I \ddot{\theta}$$

$$200 = 200 \text{ kg}$$

$$\ddot{\theta} = \frac{200}{200} = 1 \text{ r/s}^2$$

8

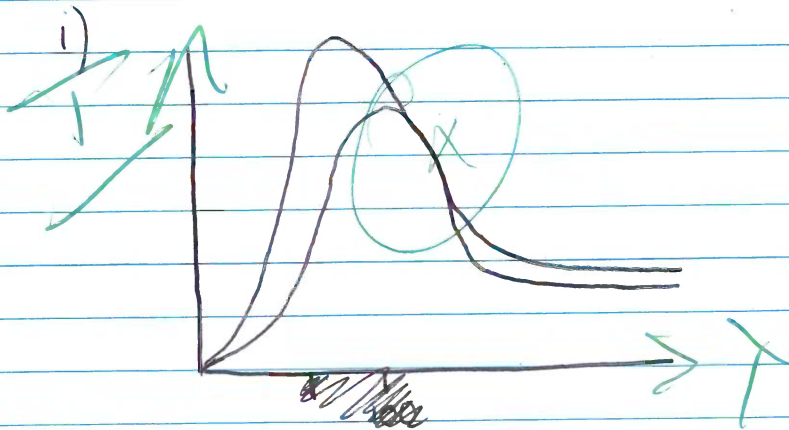
$$b) \begin{array}{l} \text{electron} \quad 9.108 \times 10^{-31} \\ \text{Speed} \quad 1.6 \times 10^6 \end{array}$$

100%

8

Q5)

a)



ii) Wien = $\lambda_{\text{peak}} = \frac{2.898 \times 10^{-3}}{T}$ ✓

$$\frac{2.898 \times 10^{-3}}{1500 + 273.15} = \frac{1.932 \times 10^{-6}}{X}$$

b) Stefan's law = $\dot{q} = A \epsilon \sigma T^4$ ✓

$$A = 0.7 \text{ m}^2$$

$$\epsilon = 0.8$$

$$T^4 = 500^\circ\text{C}$$

$$\sigma = 5.67 \times 10^{-8}$$

$$(1273.15 \text{ K})^4$$

$$0.7 \cdot 0.8 \cdot 5.67 \times 10^{-8} \cdot 500 = 1.59 \times 10^{-5}$$

total = 6

Q2)

- a) Engineering Strain is the amount a material can become plastic and still be workable, usually much lower. True strain is the amount of plasticity a material can undergo before complete failure and is no longer usable in its current form.

X

C

