<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>3(a)</td><td>EITHER
$\ln P = \ln P_0 - bh$ (1)
Compares to $y = c + mx$ where the gradient is $-b$ is the gradient (which is constant) (1)

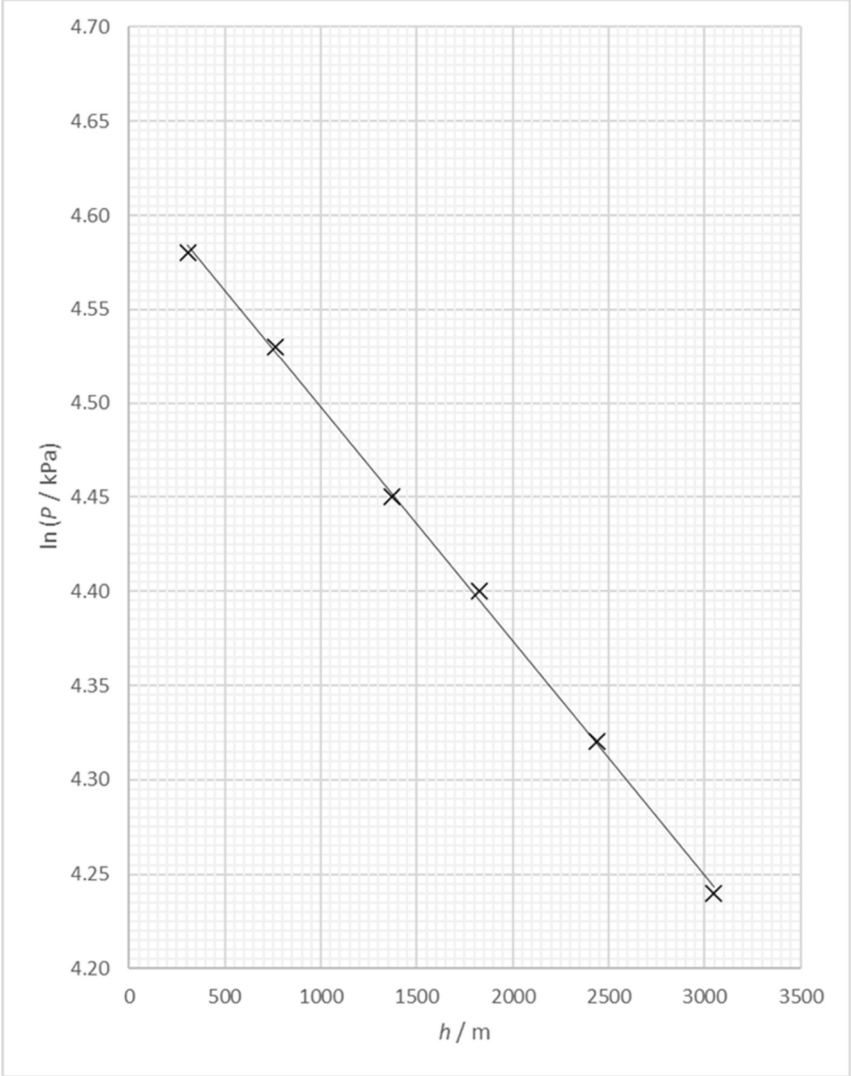
MP2 dependent on MP1

OR
$\ln P = -bh + \ln P_0$ (1)
Compares to $y = mx + c$ where the gradient is $-b$ is the gradient (which is constant) (1)

MP2 dependent on MP1</td><td>2</td></tr>
<tr><td>3(b)(i)</td><td>Values of ln P correct and consistent to 3 d.p. Accept consistent to 2 d.p. (1)
Axes labelled: y as ln (P / kPa) and x as h / m (1)
Appropriate scales chosen (1)
Processed data plotted accurately (1)
Best fit line drawn (1)

[Accept graph with values of ln P in Pa, log values only credit MP3,4,5]
[ANNOTATE WITH MPs AWARDED, TICK CHECKED PLOTS]

<table>
<tr><th>h / m</th><th>P / kPa</th><th>ln (P / kPa)</th></tr>
<tr><td>305</td><td>97.7</td><td>4.582</td></tr>
<tr><td>762</td><td>92.5</td><td>4.527</td></tr>
<tr><td>1372</td><td>85.9</td><td>4.453</td></tr>
<tr><td>1829</td><td>81.2</td><td>4.397</td></tr>
<tr><td>2438</td><td>75.3</td><td>4.321</td></tr>
<tr><td>3048</td><td>69.7</td><td>4.244</td></tr>
</table></td><td>5</td></tr>
</table>



3(b)(ii)	Uses large triangle to calculate gradient	**(1)**	**3**
	Value of gradient in range (–)1.20 × 10^{-4} to (–)1.30 × 10^{4}	**(1)**	
	Value of gradient given to 2 or 3 s.f., and negative	**(1)**	
	[Allow unit of m^{-1}]		
	Example of calculation gradient = $\frac{4.56 - 4.25}{500 - 3000} = \frac{0.31}{-250} = -1.24 \times 10^{-4}$		

3(b)(iii)	Uses gradient = $(-)\frac{Mg}{kT}$ Correct value of M e.c.f. 3(b)(ii) Value of M given to 2 or 3 s.f., correct unit Example of calculation $M = -\frac{-1.24 \times 10^{-4} \times 1.38 \times 10^{-2}\ \text{JK}^{-1} \times 288\text{K}}{9.81\text{ms}^{-2}} = 5.02 \times 10^{-26}$ kg	**(1)** **(1)** **(1)**	**3**
3(b)(iv)	Reads ln P_0 from y-intercept **Or** Calculates (ln) P_0 using gradient and data point from best fit line **Or** Substitutes for (ln) P_0 using gradient and data point from best fit line Calculates P at h = (−)414 m Value of P in range 105 kPa to 108 kPa [accept 2,3,4 SF] MP3 dependent on MP2 Example of calculation ln P_0 = 4.62 ln P = 4.62 + ($-1.24 \times 10^{-4} \times -414$) = 4.67 $P = e^{4.67}$ = 107 kPa	**(1)** **(1)** **(1)**	**3**
	Total for question 3		**16**