

**SECTION A**

**A1.** (a) both error bars of  $\pm 5 \text{ m s}^{-1}$  drawn correctly; [1]

(b) a straight line cannot be drawn through the error bars; [2]  
 that goes through the origin; [2]

*Accept the error bar comment with a straight line drawn on graph.*

(c) (i)  $\pm 500 (\text{m}^2 \text{ s}^{-2})$ ; [1]

(ii)  $\frac{\Delta v^2}{v^2} = 2 \frac{\Delta v}{v}$ ;  
 $\Delta v^2 = 27^2 \times 2 \times \frac{5}{27}$ ;  
 $\Delta v^2 \approx (\pm) 300 (\text{m}^2 \text{ s}^{-2})$  **or**  $\approx (\pm) 270 (\text{m}^2 \text{ s}^{-2})$ ; [3]

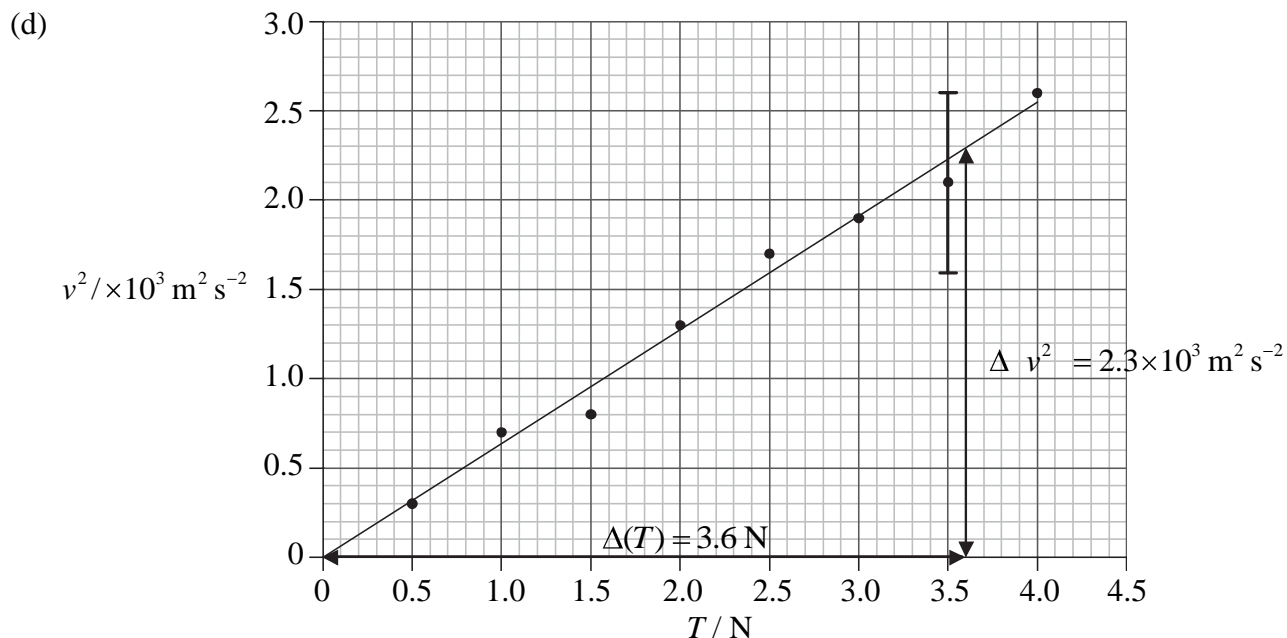
**or**

percentage error/uncertainty in  $v = (18.5) = 19\%$ ;

percentage of error/uncertainty in  $v^2 = 37\%$ ;

absolute error  $\approx (\pm) 300 (\text{m}^2 \text{ s}^{-2})$  **or**  $\approx (\pm) 270 (\text{m}^2 \text{ s}^{-2})$ ;

*Answer must be to one or two significant figures.*



use of gradient triangle over at least half of line;

gradient =  $640 (\pm 40)$ ;

$= k^2$  to give  $k = \sqrt{640} = 25 (\pm 1)$ ;

unit of  $k$  is  $\text{kg}^{-\frac{1}{2}} \text{ m}^{\frac{1}{2}}$  **or**  $\text{ms}^{-1} \text{ N}^{-\frac{1}{2}}$ ; [4]

*Do not penalize omission of factor of 1000 for missing y-axis label if already penalized in (c). Treat as ecf.*