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|---|---|---|---|
| 6a | GPE lost | M1 | Need all terms. Condone sign errors and sin/cos confusion |
| | $=3g\times 2-2g\times 2\sin\theta$<br>$\left(=6g-4g\times\frac{5}{13}\right)$ | A1 | Correct unsimplified. Accept $\pm$ |
| | $=\frac{58}{13}g=43.7\,(44)\,(\text{J})$ | A1 | Must be positive.<br>Exact multiple of $g$ or 3 sf or 2 sf |
| | | **(3)** | |
| 6b | Normal reaction $=2g\cos\theta\left(=\frac{24}{13}g\right)$ | B1 | Condone $\frac{1176}{65}$ |
| | $F_{\max}=\frac{3}{8}\times R\left(=\frac{9g}{13}\right)$ | M1 | Use $F=\mu R$ with their $R$<br>$\left(\frac{441}{65}\right)$ |
| | Work done $=2\times F_{\max}$ | M1 | Their $F_{\max}$ |
| | $\left(=\frac{18g}{13}\right)=13.6(\text{J})$ 14(J) | A1 | Exact multiple of $g$<br>or 3 sf or 2 sf . Not $\frac{882}{65}$ |
| | | **(4)** | |
| 6c | Total KE gained<br>= GPE lost - total WD against friction | M1 | Must be using work-energy.<br>Dimensionally correct.<br>Required terms and no extras.<br>Condone sign errors. |
| | $\frac{1}{2}(2+3)v^2=(their(a))-(their(b))$<br>$\left(\frac{5}{2}v^2=\frac{58}{13}g-\frac{18}{13}g=\frac{40}{13}g\right)$ | A2ft | Follow their (a) and (b)<br>-1 each error |
| | $v=\sqrt{\frac{16}{13}g}=3.47\left(\text{m s}^{-1}\right)$ or $3.5\left(\text{m s}^{-1}\right)$ | A1 | 3 sf or 2 sf (need to substitute for $g$) |
| | | **(4)** | |
| 6d | KE lost<br>= GPE gained + WD against friction | M1 | Must be using work-energy.<br>Dimensionally correct.<br>Required terms and no extras.<br>Condone sign errors. |
| | $\frac{1}{2}\times 2\times\frac{16}{13}g=2g\times d\sin\theta+\frac{3}{8}\times 2g\times\frac{12}{13}d$<br>$\frac{1}{2}\times 2\times v^2=2g\times d\sin\theta+d\times F_{\max}$<br>$\frac{16}{13}g=\left(\frac{10}{13}g+\frac{9}{13}g\right)d$ | A2ft | Follow their (c) and their $F_{\max}$<br>-1 each error |
| | $d=\frac{16}{19}$ | A1 | $g$ cancels. 0.84 or better $(0.8421....)$ |
| | | **[15]** | |
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