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Mathematics MM2B

(Specification 6360)

Mechanics 2B

Report on the Examination

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General

The early questions proved to be a pleasing introduction to the paper with most candidates achieving good marks for questions 1, 2, 3 and 5. Unfortunately, candidates found difficulty with questions which required resolving, so questions 7 and 8 (b)(i) were often answered badly.

A number of answers were given on the question paper to enable candidates to proceed on to the next part. Some of these printed answers were arrived at by candidates despite the answers bearing no real relation to the candidates' working. This was particularly so in question 6.

Question 1

Part (a) was usually answered correctly, but in part (b) a number of candidatures did not use 7 metres to be the difference in Kim's height. A few candidates did not add the 116 J (from part(a)) to find the new kinetic energy.

Question 2

This question was answered well by virtually all candidates.

Question 3

Most candidates showed that they knew the techniques involved in answering this question. Candidates generally answered part (a) correctly. Part (b)(i) was answered well, but in part (b)(ii) some candidates forgot to find the magnitude of $\mathbf{F}$, giving instead just the vector $\mathbf{F}$, $-40\mathbf{i} + 30\mathbf{j}$. Most candidates answered part (c) correctly. In part (d) the majority of candidates integrated to find the position vector, but a common error was to forget the $+\mathbf{c}$ term and thus to ignore the initial position vector. Some found the $+\ \mathbf{c}$ incorrectly, assuming that $\mathbf{c}$ was the initial position vector.

Question 4

Many candidates completed this question correctly. A common error occurring in part (a) was that some candidates in their diagram did not show that the two vertical upward reactions on the plank were different, or showed the two vertical gravitational forces acting at the same point. There were some interesting comments made in part (c), but most responses were correct.

Question 5

This question was usually answered well. In part (a), some just wrote down the result given, ignoring the requirement to 'show'. In part (b), a few left the power as $125\,000$ W instead of 125 kW.

Question 6

Most candidates started from $F = ma$ and answered part (a) correctly. Others were penalised for ignoring the m term or ignoring the minus sign. There were many good answers to part (b), although a significant number of candidates used 'inventive' algebra. A few candidates who integrated to find the equation in v and t forgot the $+c$ term.

Question 7

Many candidates answered this question well. Part (a) was usually correct but a few candidates only considered the component of one of the tensions to equate to mg. Most candidates answered part (b) well.

Question 8

In part (a), most candidates considered the kinetic energy at the lowest point and the potential energy at the highest point. Unfortunately many equated these energies and thus obtained $u = 2\sqrt{ag}$. Noticing the result required, these then just changed their results to $u > 2\sqrt{ag}$; this was not accepted.

In part (b)(i), many candidates attempted to find at least one of the two equations required. Common errors seen were in the conservation of energy equation, where the 'height' in $\frac{1}{2}mu^2 = \frac{1}{2}mv^2 + mga(1+\sin\theta)$ was often incorrect, and in the resolving equation $\pm R = -mg\sin\theta + \frac{mv^2}{r}$, where the $\sin\theta$ term was often incorrect. Few candidates obtained the correct value for R.

In part (b)(ii), virtually all candidates equated R to zero but rarely solved their resulting equation.

Question 9

Part (a) was answered well by most candidates. Most candidates answered part (b) correctly, although a few tried to use tension rather than elastic potential energy. In part (c), most candidates appreciated that they needed to consider kinetic energy, work done and elastic potential energy, although a few also tried to include gravitational potential energy. Many candidates did appreciate that the work done was force × distance but did not realise that this distance was not the extension of the string.

Mark Ranges and Award of Grades

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