Version : 1.0 0110

General Certificate of Education

Mathematics 6360

MM1B Mechanics 1B

Report on the Examination

2010 examination – January series

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Set and published by the Assessment and Qualifications Alliance.

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General

The candidates coped well with the first four questions and produced many good responses. The candidates found some of the material towards the end of the later questions more challenging. When drawing the force diagrams, some candidates did not include arrow heads or label their diagrams clearly. In the 'show that' questions, while there were many good solutions, some candidates did not show all of the working that was needed to gain full marks. It was noticeable that the final answer given on the examination paper often just appeared without the previous step.

Question 1

Almost all of the candidates produced correct solutions and gained full marks.

Question 2

Generally this question was answered very well. The most common difficulties were with part (c). One error that appeared here was to use the equation $s = \frac{1}{2}(u+v)t$ with either u or v taken as zero. Often candidates who made errors in part (c) were able to gain the follow through marks in part (d).

Question 3

This question was also done well by the majority of candidates. While most candidates were able to produce the printed answer for part (b), there were some issues with the force diagram and finding the tension in part (c). The two main problems with the force diagram were including extra forces, for example friction or simply poor diagrams without arrows or labels. In part (c) there were some confused responses and some candidates tried to resolve the normal reaction from part (b).

Question 4

Most candidates made good attempts at this question. In part (b) (ii) there were some solutions that did not contain enough working to justify the award of marks, for example $a = \frac{4}{0.5} = 8$ with no explanation of where the 4 came from. Some also simply found a way to get 8, for example from something like $9.8 - 2 \times 0.9 = 8$.

For part (b) (iii) there were many correct solutions, but some candidates took the acceleration as 9.8 instead of 8. The final part proved to be more difficult for the candidates. While there were many candidates who produced good answers, there were also quite a lot who could not give a clear or relevant explanation.

Question 5

Parts (a) and (b) of this question were done very well and many candidates gained all four marks.

Part (c) proved to be more challenging. In part (c)(i), many candidates did not show how they started their working. An equation based on $\mathbf{v} = \mathbf{u} + \mathbf{a}t$ was expected, but not always seen. Some candidates obtained the printed answer, but did not gain full marks as their starting point was not clear. Having both the acceleration and the initial velocity given in the question enabled

many candidates to write down a correct expression for the velocity of the particle. Part (c)(iii) was found to be very challenging. If candidates were able to write down an expression for the speed of the particle they would often go on to find the times correctly. It was this vital first step that many candidates were unable to take. A few candidates made errors solving the quadratic equation once they had obtained it correctly.

Question 6

The candidates found this question more difficult than expected and there were many candidates who could not give correct responses to parts (c) and (d). While there were many good diagrams, some candidates did not label them clearly or did not include the 300 N force explicitly. The vast majority of candidates were able to gain all of the marks in part (b), but some did obtain the printed answer without sufficient working.

Part (c) was the most difficult part, with many candidates unsure which part of the train to consider. When candidates did consider the first carriage they often failed to include the 550 N force. The candidates did a little better on part (d), with those who considered the whole train generally being successful. Those who considered only the engine tended to omit the 1100 N force or not to use their answer from part (c).

Question 7

The candidates seemed to be helped by the printed answer in part (a), but some obtained the printed result from the use of equations such as $5 = \frac{1}{2}(-9.8)\ t^2$. There were also some candidates who did not justify all of their working. There were a number of candidates who found it difficult to work with the two components of the velocity in parts (b), (c) and (d).

A reasonably common error was to use 5 instead of 15 in part (b) and then 15 instead of 5 in part (c). Some candidates also stopped after obtaining the vertical component in part (c) and did not go on to find the speed. Those who did find the components correctly were usually able to go on to find the angle correctly. Many candidates gained the two marks in part (e), sometimes without gaining any others in this question.

Question 8

In part (a) many candidates lost marks for not including arrow heads or due to poor labelling of the forces. Several candidates did not show the two tensions as being equal on their diagrams. There were quite a few good attempts at part (b), with attempts at resolving vertically. Part (c) proved to be very challenging, although there were a number of good solutions. A number of candidates gained an M1 mark for the use of the friction law. The most common errors were to omit one force in their equation or to not include the 'ma' term in their equation of motion.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.