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Examiners' Report

Summer 2014

Pearson Edexcel International Advanced Level in Mechanics M1 (WME01/01)

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Mathematics Unit Mechanics 1

Specification WME01/01

The students for this paper seemed to be well-prepared and confident in tackling all of the questions. There were accessible marks in all questions for all students. The best work was accompanied by clear diagrams, with the student stating what they were doing at each step.

Students need to be reminded to read the rubric and the questions very carefully. In all cases, where a value for g is substituted, the value should be 9.8 m s^{-2}. The use of 9.81 will be penalised as an accuracy error. The rubric on the paper gives students a very clear reminder about the accuracy expected after the use of 9.8, but many students lost marks for giving too many significant figures in their final answers. If the question asks for the magnitude of a quantity, then a positive answer will be expected.

Question 1

Most students were able to form an equation equating the total momentum before and after the collision, or making the impulses equal in magnitude and opposite in direction. There were many sign errors at this stage. Clear diagrams would assist students in taking care over the direction of motion of the balls.

Most students knew how to find the impulse on A, but again there were many sign errors and some students gave a negative value for the magnitude.

Question 2

In Q02(a) most students demonstrated a knowledge of the *suvat* equations, but they did not always find the most efficient route through the task. Many students chose to work via the highest point on the path of the ball. This introduced rounding errors, so it often led to an incorrect answer. Students need to be reminded of the importance of taking care over the directions - sign errors were common.

In Q02(b) many students found a correct method to obtain a value for w, but some made the incorrect assumption that the second ball also took 5 seconds to reach the ground.

Question 3

In Q03(a) almost all students found the component of the weight of P acting parallel to the plane, and the magnitude of the maximum force due to friction, but only a minority used this information correctly to conclude that P would rest in equilibrium. It was quite common for a student to argue that P would rest in equilibrium because their two values were "approximately equal".

Some students mistakenly believed that the diagram, with the additional force X N applied to Q03(a). They were able to gain credit for valid work in Q03(b) if they continued.

In Q03(b) a few students chose to resolve horizontally and vertically, but the majority worked parallel and perpendicular to the plane. There were very few errors in signs or in the trigonometry, and several fully correct answers.

Question 4

In Q04(a) there are many correct routes through this question, with most students opting to take moments about C or D, and to resolve vertically. A lot of correct work was seen. Apart from sign errors, the most common problem was students not taking into account the weight of the plank.

In Q04(b) many students reached a correct conclusion. Most errors were due to sign errors in the moments equation(s), or errors in their notation or algebra.

Question 5

In Q05(a) most students were confident in working with information in vector form and had no difficulty in finding the speed of *B*.

In Q05(b) the majority of students understood that the angle $\tan^{-1}\left(\frac{2}{3}\right)$ was important, but they were not always confident in expressing the direction as a bearing.

In Q05(c) most students started by finding the position vectors of B and G at time t. They should then go on to compare the coefficients of **i** or of **j -** it is not necessary to do both. By considering both, some students confused themselves by making errors and getting two different answers for t and for the position vector of P.

Question 6

Q06(a) was intended to assist students in finding the values they needed for their sketch in Q06(b), but there was often no link between the answer provided. There were some correct solutions in Q06(a), but many students did not see it as a problem with two stages to it, the most common errors were to average the accelerations, or to use one of the given values for the whole interval.

In Q06(b) the majority of the sketches drawn had the correct basic shape, although some showed the car still moving at B, and some showed the same acceleration for the whole of the first 28 seconds. Some students with incorrect answers in Q06(a) showed the correct values on their sketch.

In Q06(c) some students used *suvat* equations to find the distance travelled, but the majority used their graph and found the area for the first 28 seconds. A lot of correct work was seen.

Q06(d) proved to be more challenging. Students needed to remember that they had been told the magnitude of the deceleration, so they could find the time taken for the last stage of the journey. The simplest approach was to find the area of the triangle, but correct work using the trapezium was also seen.

Question 7

In Q07(a) most students understood how to form the equations of motion for P and for Q and started this part well. Students need to be reminded that if the given answer is in an exact form then they need to show exact working in their solution. If they substitute 9.8 for g in their working then they cannot claim to have reached the exact value $\frac{2g}{5}$ at the end. Similarly, it was quite common to see the tension given as 17.64 N, which is not appropriate after the use of 9.8.

In Q07(b) many correct answers were seen. Most errors were due to using an incorrect value for the acceleration - when a value has been given in the question, the students are expected to use that value rather than a value which they might have found through incorrect working.

In order to reach a correct answer in Q07(c), the students needed to understand that the acceleration of P changes at the instant when the string breaks. Many assumed incorrectly that it continued to move up the plane with acceleration $\pm\frac{2g}{5}$, others took the deceleration to be g. Having found how much further the particle travels before it stops, they then needed to find the total distance moved - this last step was often overlooked.

Q07(d) proved to be a challenge to the students' understanding of the model - only a minority had a correct strategy for finding the required time.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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