

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Total 5 marks)

Q1



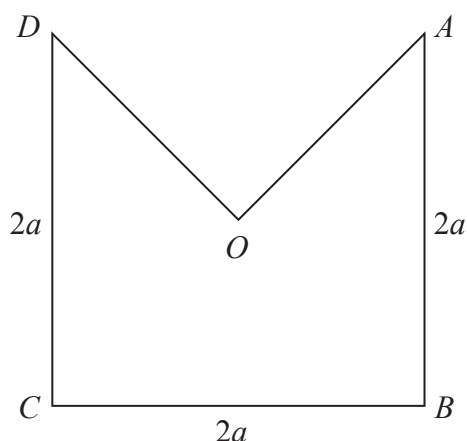


Figure 1

(a) Show that the centre of mass of $OABCD$ is $\frac{2}{9}a$ from O . (4)

(b) Find the value of k . (4)



[illegible]

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(Total 8 marks)

Q2



(a) the value of θ ,

(5)

(b) the kinetic energy gained by P as a result of the impulse.

(3)

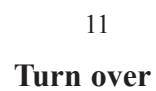
[illegible]

This image shows a full page of blank, lined paper. It features approximately 28 horizontal grey lines spaced evenly apart, typical of standard notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings present.

Question 3 continued



(Total 8 marks)



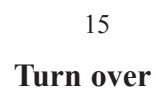
(9)

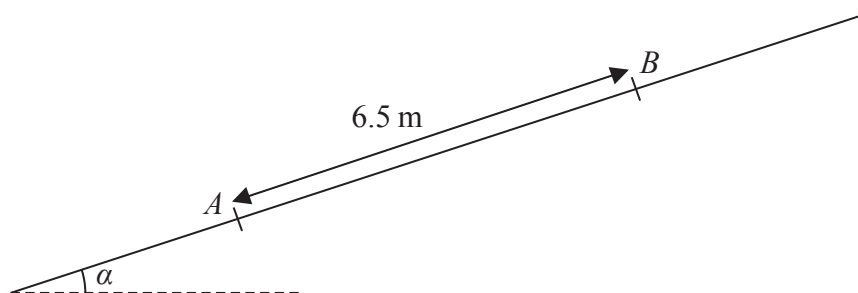


Question 4 continued

This image shows a full page of blank, lined paper. It features approximately 28 horizontal gray lines spaced evenly across the page, typical of notebook paper. The lines are thin and light gray, set against a plain white background. There is no handwriting or other markings on the page.

(Total 9 marks)





A particle P of mass 10 kg is projected from a point A up a line of greatest slope AB of a fixed rough plane. The plane is inclined at angle α to the horizontal, where $\tan \alpha = \frac{5}{12}$ and $AB = 6.5$ m, as shown in Figure 2. The coefficient of friction between P and the plane is μ . The work done against friction as P moves from A to B is 245 J.

- The particle is projected from A with speed 11.5 m s^{-1} . By using the work-energy principle,

- (b) find the speed of the particle as it passes through B . (4)

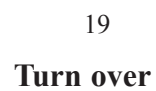


[illegible]

Question 5 continued



(Total 9 marks)



(a) the values of t when P is instantaneously at rest,

(3)

(b) the acceleration of P when $t = 5$

(3)

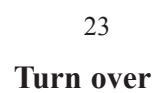
(c) the total distance travelled by P in the interval $0 \leq t \leq 5$

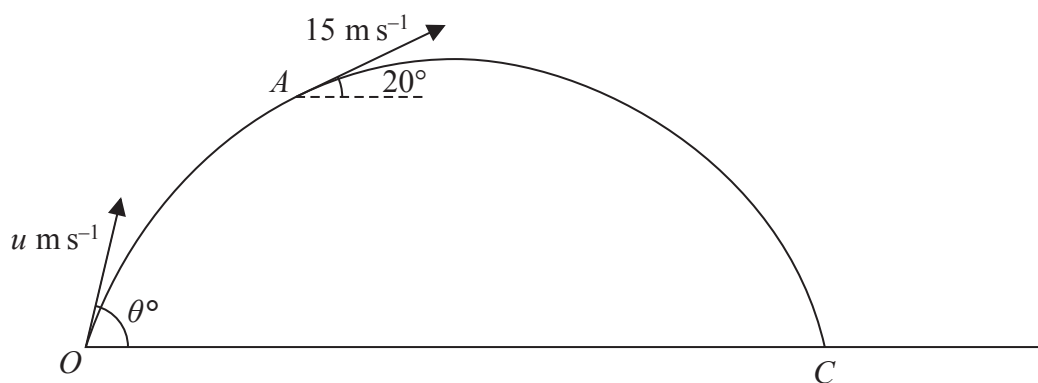
(5)

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(Total 11 marks)





At time $t = 0$, a particle is projected from a fixed point O on horizontal ground with speed $u \text{ m s}^{-1}$ at an angle θ° to the horizontal. The particle moves freely under gravity and passes through the point A when $t = 4 \text{ s}$. As it passes through A , the particle is moving upwards at 20° to the horizontal with speed 15 m s^{-1} , as shown in Figure 3.

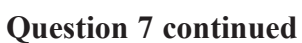
- At the point B on its path the particle is moving downwards at 20° to the horizontal with speed 15 m s^{-1} .

- The particle reaches the ground at the point C.

- (c) Find the distance OC . (3)







Q7

- It is given that $e = \frac{3}{4}$

- (b) Show that there will not be a further collision between P and Q . (6)





Question 8 continued





Question 8 continued

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(Total 13 marks)

Q8

TOTAL FOR PAPER: 75 MARKS

END

