



# Cambridge International AS & A Level

CANDIDATE  
NAME

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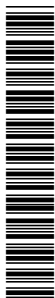
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**MATHEMATICS**

**9709/42**

Paper 4 Mechanics

**May/June 2022**

**1 hour 15 minutes**

You must answer on the question paper.

You will need: List of formulae (MF19)

## INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- Where a numerical value for the acceleration due to gravity ( $g$ ) is needed, use  $10 \text{ m s}^{-2}$ .

## INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

- 1** Small smooth spheres  $A$  and  $B$ , of equal radii and of masses  $5\text{ kg}$  and  $3\text{ kg}$  respectively, lie on a smooth horizontal plane. Initially  $B$  is at rest and  $A$  is moving towards  $B$  with speed  $8.5\text{ m s}^{-1}$ . The spheres collide and after the collision  $A$  continues to move in the same direction but with a quarter of the speed of  $B$ .

- (a)** Find the speed of  $B$  after the collision. [3]

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- (b)** Find the loss of kinetic energy of the system due to the collision. [2]

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(b) Find the greatest height of  $B$  above the plane. [3]

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- (b) Find the values of  $t$  when the particles are the same distance from  $O$ . [3]

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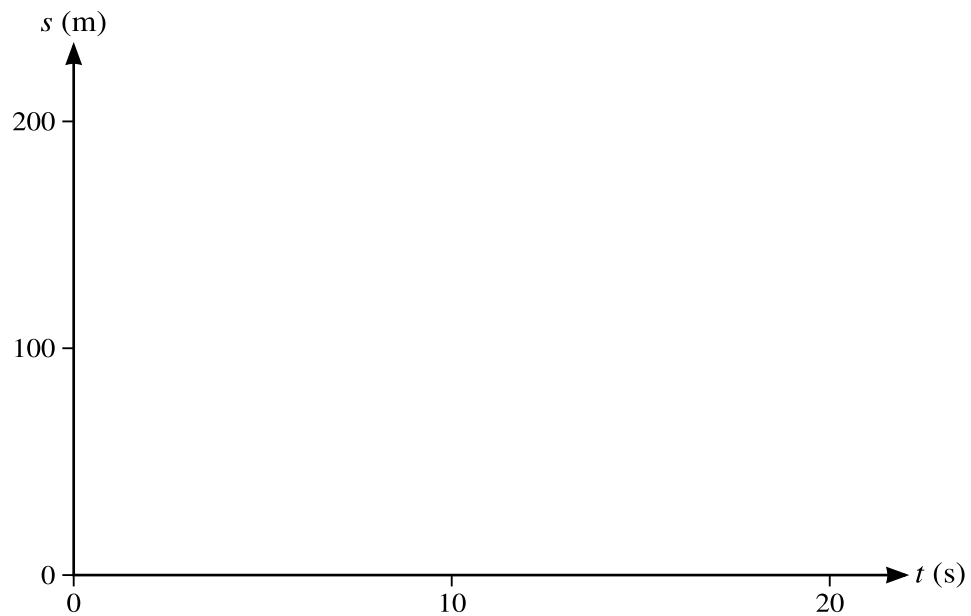
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- (c) On the given axes, sketch the displacement-time graphs for both particles, for values of  $t$  from 0 to 20. [3]





















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