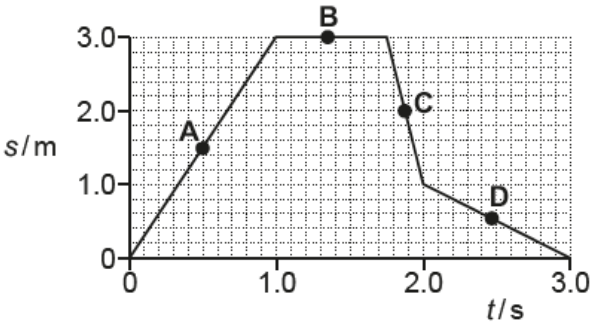
Motion – 2021/20 GCE Physics A Component 01

1. Nov/2021/Paper_H556_01/No.1

An object is moving in a straight line.

The displacement *s* against time *t* graph for this object is shown below.



At which point **A**, **B**, **C** or **D**, does the object have the **greatest** speed?

Your answer ☐ **[1]**

2. Nov/2021/Paper_H556_01/No.3

The table shows some data for a car travelling on a straight road with an initial speed of $13\,m\,s^{-1}$.

Thinking distance / m	**9.0**
Braking distance / m	**14**
Stopping distance / m	**23**

The car has a constant deceleration when the brakes are applied.

What is the magnitude of the deceleration of the car during braking?

A $0.46\,m\,s^{-2}$

B $3.7\,m\,s^{-2}$

C $6.0\,m\,s^{-2}$

D $9.4\,m\,s^{-2}$

Your answer ☐ **[1]**

3. Nov/2020/Paper_H556_01/No.3

A tennis ball is hit with a racket. The force applied by the racket on the ball is *F*. The ball has a vertical path through the air.

Which statement is correct when the ball is at its **maximum** height?

A The ball has a downward acceleration.

B The force acting on the ball is *F*.

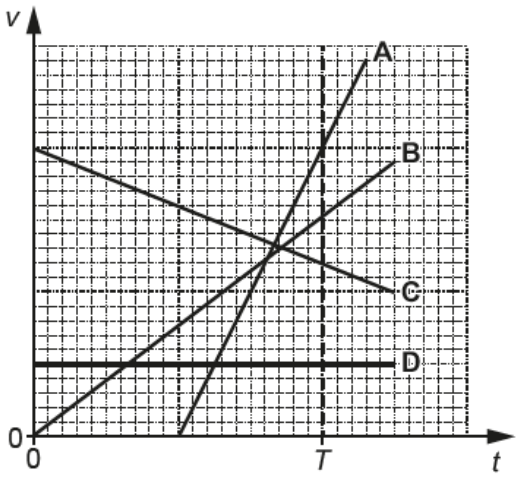
C The ball experiences greatest drag.

D The weight of the ball is equal to the drag.

Your answer ☐ **[1]**

4. Nov/2020/Paper_H556_01/No.14

The velocity *v* against time *t* graphs for four objects **A**, **B**, **C** and **D** are shown below.

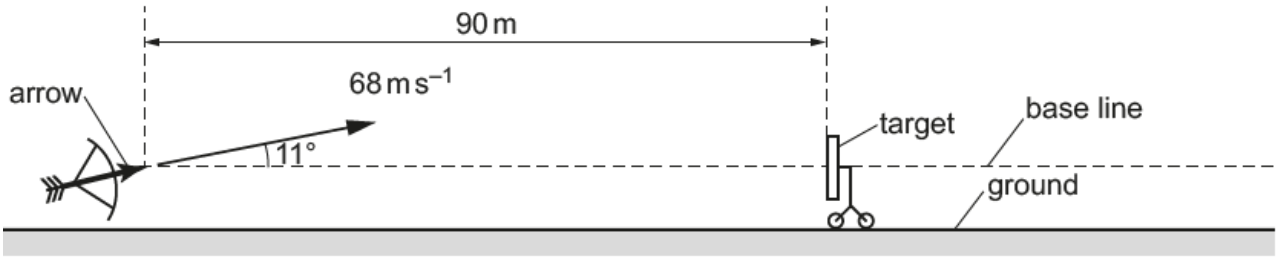


Which object travels the greatest distance between $t = 0$ and $t = T$?

Your answer ☐ **[1]**

5. Nov/2020/Paper_H556_01/No.18

An archer fires an arrow towards a target as shown below.



The diagram is **not** drawn to scale.

The centre of the target is at the same height as the initial position of the arrow.
The target is a distance of 90 m from the arrow.
The arrow has an initial velocity of 68 m s^{-1} and is fired at an angle of 11° to the horizontal.

Air resistance has negligible effect on the motion of the arrow.

(a) Describe how the kinetic energy of the arrow changes during its journey from when it is fired until it reaches its maximum height.

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..... **[2]**

(b) Show that the time taken for the arrow to reach its maximum height is about 1.3 s.

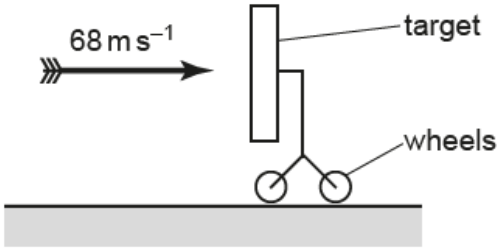
[2]

(c) The arrow misses the target.

Calculate the horizontal distance, measured along the base line, by which the arrow misses the target.

horizontal distance = ... m **[3]**

(d) The arrow is now fired horizontally at $68\,m\,s^{-1}$ into the target at very close range.



The arrow sticks into the target. The collision between the arrow and the target is inelastic.

(i) Explain what is meant by an **inelastic collision**.

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(ii) The target is mounted on wheels. The target has a much larger mass than the mass of the arrow.

Using ideas of momentum, explain the velocity of the target immediately after the arrow sticks into the target.

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