

Name of the Student: \_\_\_\_\_

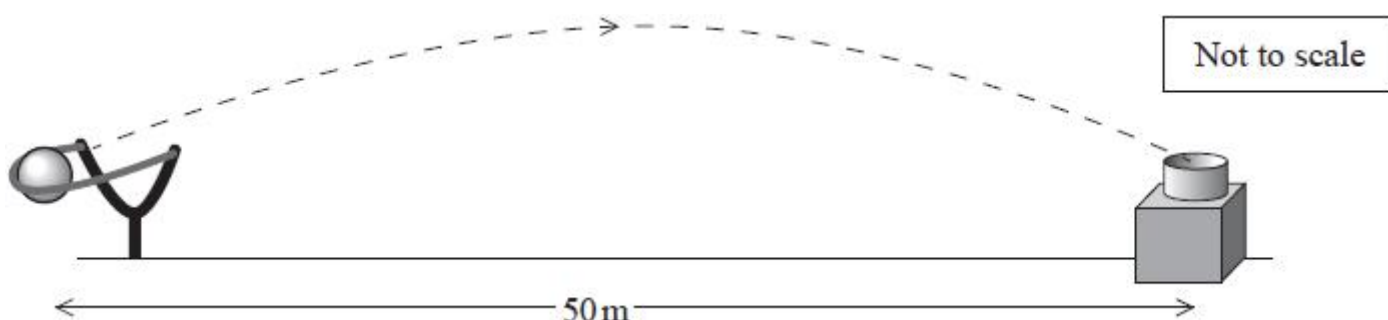
Max. Marks : 22 Marks

Time : 22 Minutes

Q1.

A fairground game requires the player to catapult a ball towards a target to score points.

The ball is required to reach a target a horizontal distance of 50 m away, at the same vertical height, as shown.



The time taken for the ball to reach the target is 2.0 s.

Calculate the angle to the horizontal at which the ball is launched.

(4)

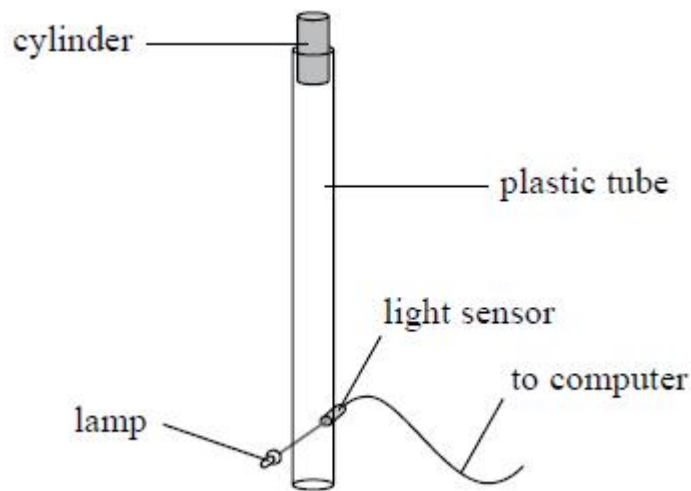
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Angle to the horizontal = .....

**(Total for question = 4 marks)**

Q2.

A student uses a lamp and a light sensor as a light gate connected to a data logger and computer to determine the speed of a falling object. He drops a small cylinder through a clear plastic tube. The light gate and data logger measure the time of fall of the cylinder and the speed is calculated.



The student repeats the experiment five times and records the results in a table.

Speed/ $\text{m s}^{-1}$	Mean speed/ $\text{m s}^{-1}$
4.52 4.59 4.43 4.63 4.58	4.55

The student incorrectly includes all the values when calculating the mean speed. A second student thinks that the true value of the mean speed is different.

Explain whether the second student is correct.

(2)

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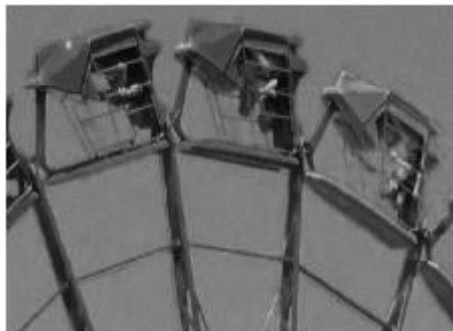
**(Total for question = 2 marks)**

**Q3.**

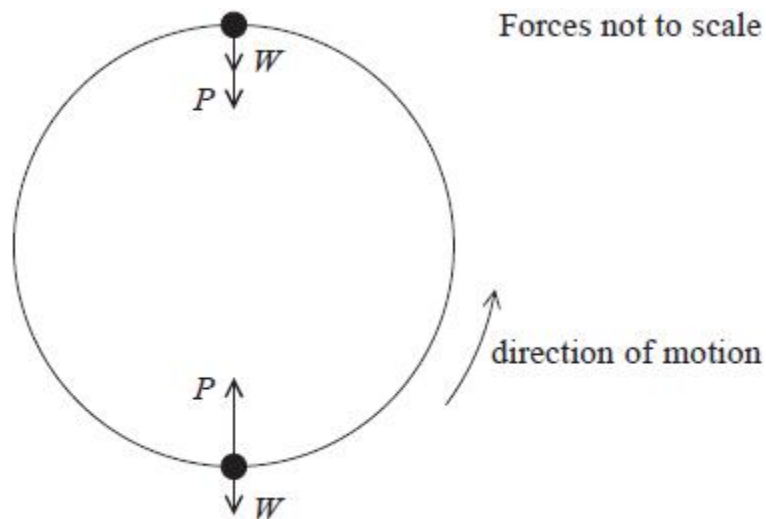
The Enterprise is an amusement park ride. Riders sit in cars that are made to rotate in a vertical circle. The ride starts by moving in a horizontal circle. The speed of rotation increases, and the frame tilts until the ride is rotating vertically as shown.



The photograph below shows riders at the top of the vertical circle. The riders are in contact with their seats at all times during the ride.



The diagram shows the weight  $W$  of a rider and the push  $P$  from the seat on the rider at the top and bottom of the circular path.



\* The rider moves from the bottom to the top of the circular path.  
 Explain how the apparent weight experienced by the rider would change.

(6)

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**(Total for question = 6 marks)**

**Q4.**

\* A stationary radium nucleus decays by emitting an alpha particle. The speed of the recoiling nucleus is small compared to the speed of the alpha particle.

Explain why the nucleus recoils and why its speed is small compared to that of the alpha particle.

**(4)**

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**(Total for question = 4 marks)**

**Q5.**

Two small identical solid metal spheres, A and B, are suspended by light inextensible threads from a frame.

\* Sphere A is pulled to one side as shown and released. Sphere A collides with sphere B and stops and sphere B swings upwards. The time intervals between the photographs below are the same.

