Name of the Student:_____

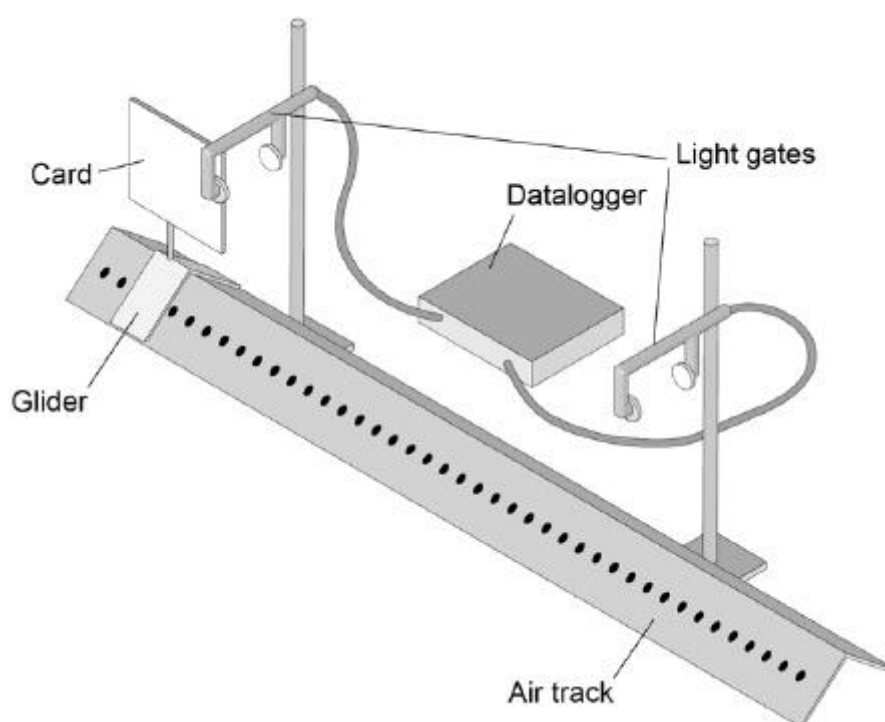**Max. Marks : 25 Marks**   **Time : 25 Minutes**

Q1.

A student investigated the motion of a glider on an air track.

Figure 1 shows the apparatus.

Figure 1

(a)   The speed of the glider is the same at both ends of the air track.

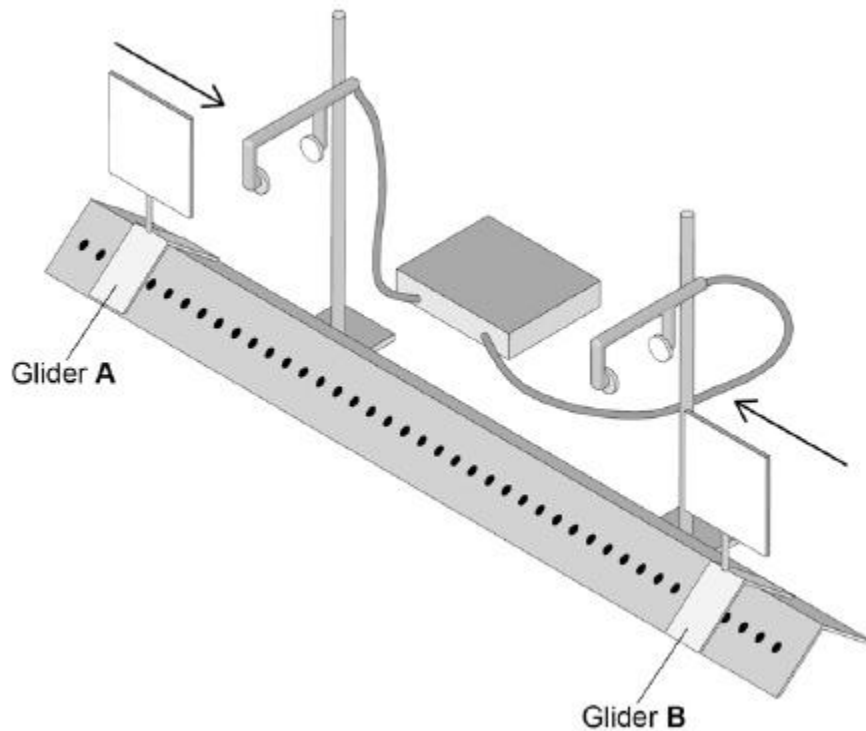What is the tendency for objects to continue at the same speed in the same direction called?

_____

(1)

(b)   The glider has a mass of 0.14 kg and a velocity of 17 cm/s

Calculate the momentum of the glider.

_____

_____

_____

Momentum = _____ kg m/s

(3)

(c)   **Figure 2** shows two identical gliders travelling at the same speed in opposite directions.

Figure 2

Glider A

Glider B

The gliders collide and stick together.

Explain what happens to the momentum and speed of the gliders.

_____

_____

_____

_____

_____

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_____

(4)

(d)   The light gate on the air track shown in **Figure 3** aims a beam of light at a sensor.

A datalogger calculates the speed of the glider.

The datalogger divides the length of card by the time for which the card breaks the beam of light.
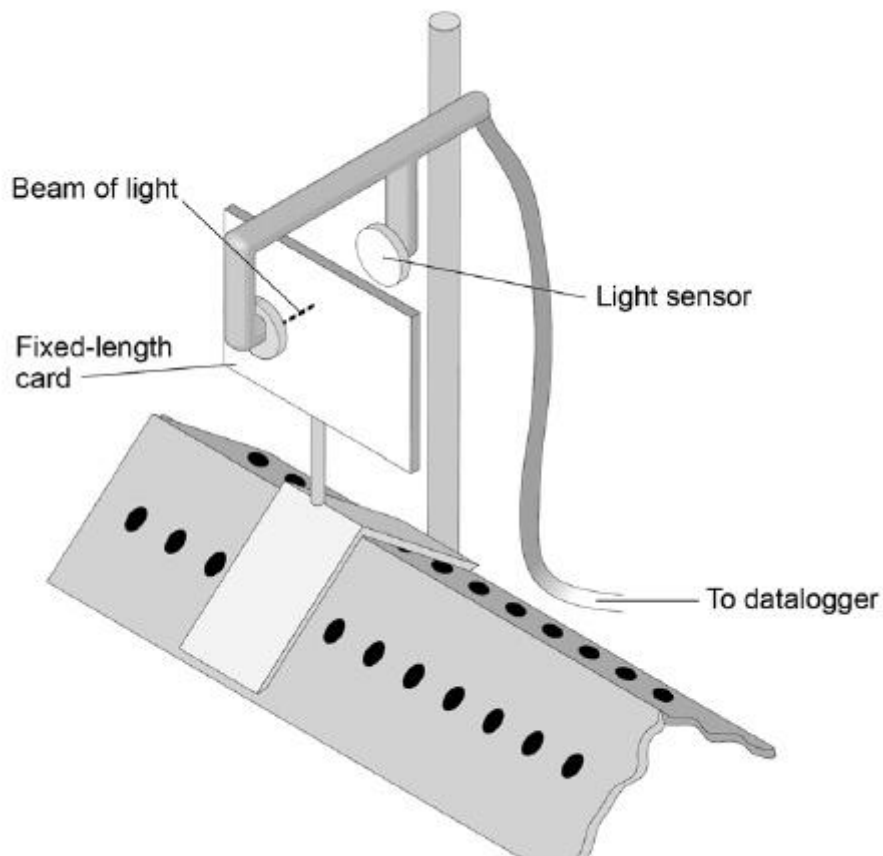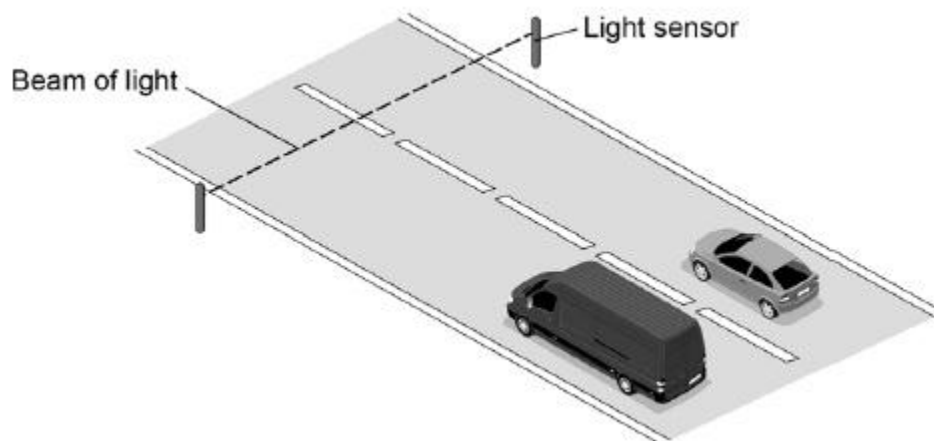
Figure 3

Figure 4 shows two vehicles on a road.

Figure 4

The beam of light and light sensor shown in **Figure 4** are not suitable for determining the speed of vehicles on the road.

Give **two** reasons why they are **not** suitable.

Give an explanation for each reason.
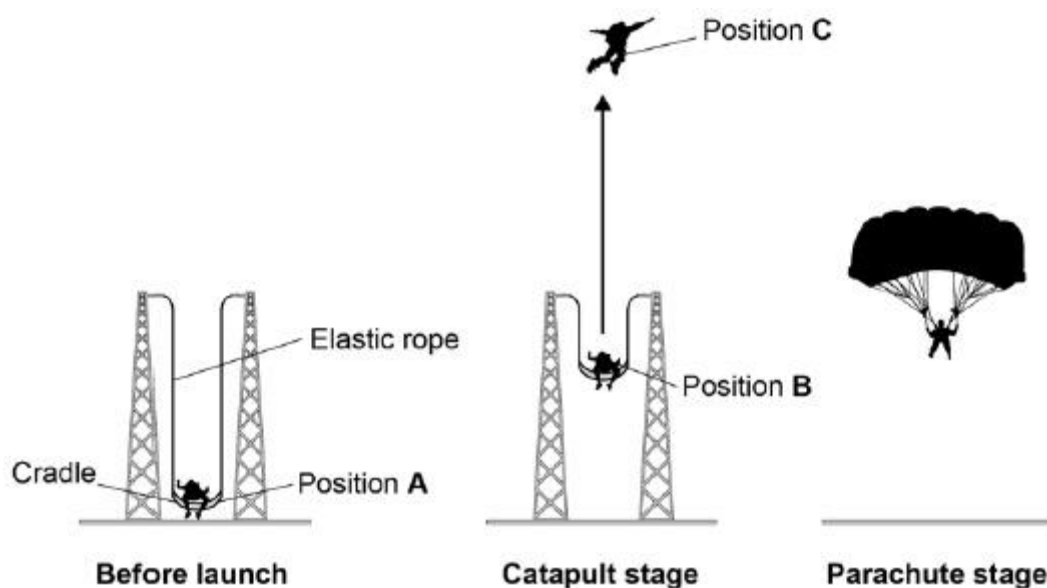
Reason 1 _____

_____

Explanation _____

_____

Reason 2 _____

_____

Explanation _____

_____

(4)
(Total 12 marks)

Q2.

The diagram shows the stages of an extreme sport called 'human catapult'.

•   A person lies in a cradle which is held to the ground.
•   The cradle is released.
•   The person is launched vertically into the air by an elastic rope.
•   The person then parachutes back to the ground.

(a)   In position **A** there is a store of elastic energy.

Position **C** is the person's maximum height.

Describe the energy transfers from position **A**, through position **B**, to position **C**.

_____

_____

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_____

_____

_____

(3)

(b)   In the last few metres of his descent during the parachute stage, the person travels at a

terminal velocity.

Explain why.

_____

_____

_____

_____

(2)

(c)   When stretched in position **A**, the elastic rope stores 25 000 joules.

The elastic rope behaves like a spring, with a spring constant of 125 N/m

Calculate the extension of the elastic rope.

Use the Physics Equations Sheet.

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_____

_____

Extension of elastic rope = _____ m

(4)

(d)   The vertical velocity of the person at position **B** in the diagram is 26 m/s

The vertical velocity at position **C** is 0 m/s

Calculate the distance between position **B** and position **C**. Ignore the effect of air resistance.

Use the Physics Equations Sheet.

_____

_____

_____

_____

_____

_____

_____

_____

Distance = _____ m

(4)

(Total 13 marks)