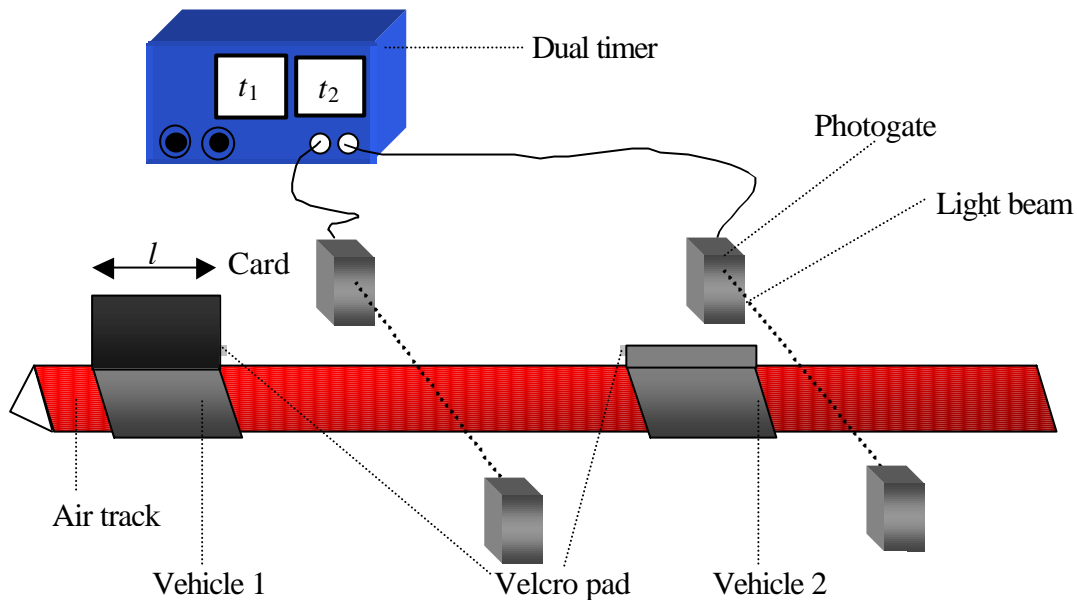


VERIFICATION OF THE PRINCIPLE OF CONSERVATION OF MOMENTUM

Apparatus

Linear air-track, two vehicles with velcro pads attached, blower, two photogates, two retort stands, dual timer, metre-stick, black card.



Procedure

1. Set up apparatus as in the diagram.
2. Connect air-track to blower.
3. Level the air-track.
4. Measure the mass of each vehicle m_1 and m_2 respectively, including attachments, using a balance.
5. Measure the length l of the black card in metres.
6. With vehicle 2 stationary, give vehicle 1 a gentle push. After collision the two vehicles coalesce and move off together.
7. Read the transit times t_1 and t_2 for the card through the two beams.
8. Calculate the velocity before the collision, $u = \frac{l}{t_1}$.
9. Calculate the velocity after the collision, $v = \frac{l}{t_2}$.
10. Calculate the momentum before the collision, $p_{\text{before}} = m_1 u$ and the momentum after the collision, $p_{\text{after}} = (m_1 + m_2) v$.
11. Repeat several times, with different velocities and different masses.
12. Record results as shown.

Results

Mass of vehicle 1, $m_1 = \dots\dots\dots$ kg.

Mass of vehicle 2, $m_2 = \dots\dots\dots$ kg.

s_1/m	t_1/s	$u/\text{m s}^{-1}$	$p_{\text{before}}/\text{kg m s}^{-1}$	s_2/m	t_2/s	$v/\text{m s}^{-1}$	$p_{\text{after}}/\text{kg m s}^{-1}$

Notes

To see if the track is level carry out these tests:

- a) A vehicle placed on a level track should not drift toward either end.
- b) When a vehicle is travelling freely along a level track, the times recorded on both timers should be equal. This holds for travel in either direction.

Adding small weights, magnets or putty will change the masses of the vehicles.

Block the ten pairs of air holes nearest the buffer end of the track with cellotape. This part of the track will now act as a brake on the vehicle.

Occasionally check the air holes on the linear air-track with a pin, to clear any blockages due to grit or dust.

This experiment may be performed using trolleys on a friction-compensated ramp.