

GCSE Physics B (Twenty First Century Science)
J259/04 Depth in physics (Higher Tier)

Question Set 5

1

Alex is investigating how the initial kinetic energy of a trolley will affect the distance it travels before it stops.

Fig. 5.1 shows his apparatus.

Each time, the trolley starts at the same marked point and Alex measures how far it goes along the test surface before it stops. The centre of the trolley is marked with a dot.

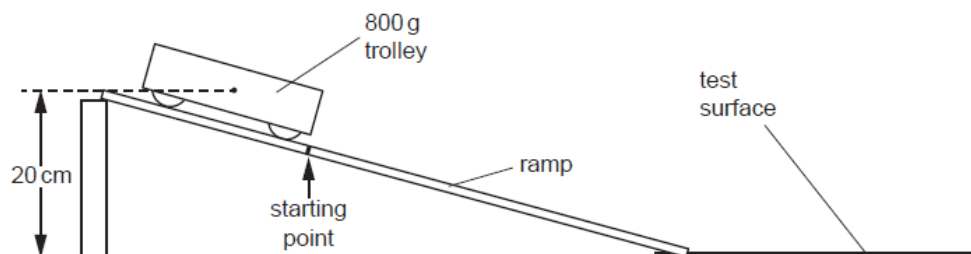


Fig. 5.1

Alex makes this calculation to find the energy.

$$\begin{aligned} \text{Kinetic energy gained by the trolley} &= \text{gravitational potential energy store it had} \\ &\quad \text{at the top of the slope.} \\ &= \text{mass} \times g \times \text{height} \\ &= 800 \text{ g} \times 10 \text{ N/kg} \times 20 \text{ cm} \\ &= 160 \text{ J} \end{aligned}$$

The value for the energy calculated by Alex is too large

- (a) (i) Identify mistakes that Alex has made in his measurements and in his calculation. [2]
- (ii) Describe how Alex should have done this experiment to get a more accurate value for the kinetic energy of the trolley. [3]
- (b) Alex carries out this experiment for a range of kinetic energy values.

Table 5.1 shows his results.

Initial kinetic energy (J)	0.8	1.6	2.4	3.2	3.9	4.8
Mean distance travelled (m)	0.80	1.35	1.60	1.85	1.90	1.95

Table 5.1

Some of these data are plotted on the graph in Fig. 5.2.

- (i) State the reason why Alex was right to plot a point at the origin, (0,0).

[1]

- (ii) Plot the three remaining points on the graph in **Fig. 5.2** and draw an appropriate best fit curve.

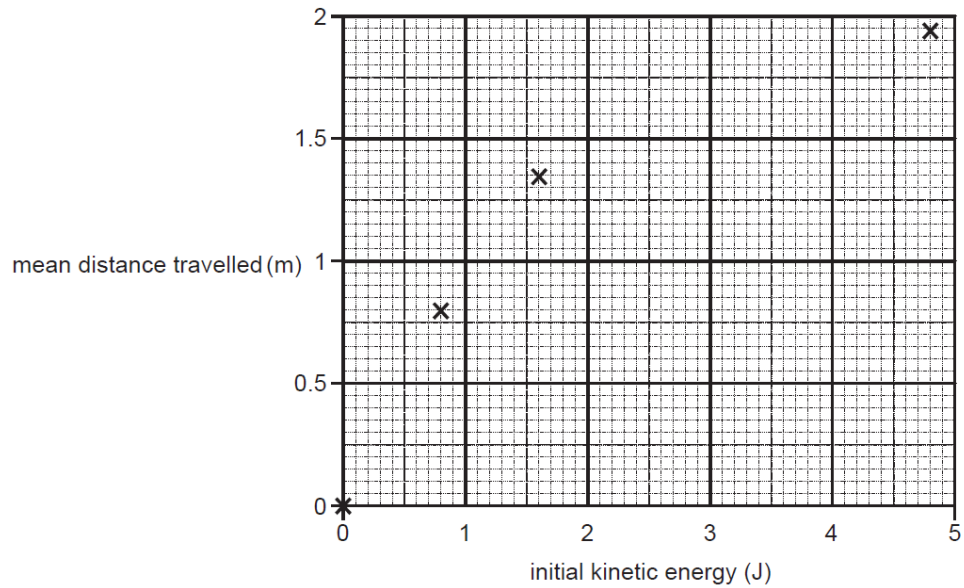


Fig. 5.2

[2]

- (c) Two of Alex's friends make comments about the graph in **Fig. 5.2**.

Mia
The graph seems to show that the trolley will never go further than about two metres. I don't think Alex has enough data to be sure about this.

Kai
I expect that the friction force on the test surface will be greater when the trolley moves faster. As energy transfer = force x distance, this greater force would result in a smaller distance travelled.

Discuss the statements made by Mia and Kai.

[4]

Total Marks for Question Set 5: 12

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