GCSE Physics A (Gateway)

J249/03 Physics A P1-P4 and P9 (Higher Tier)

Question Set 14

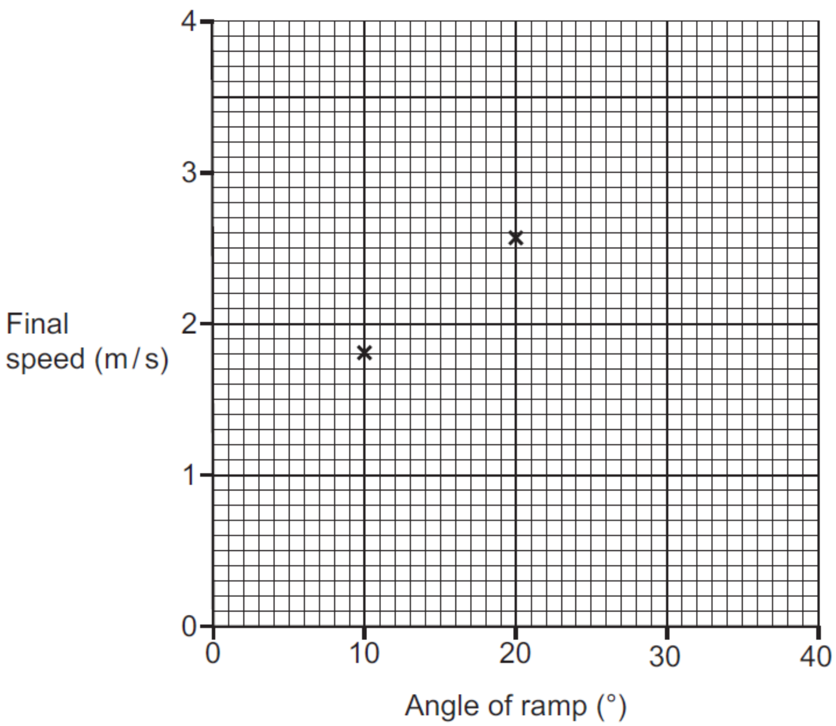
1 A student investigates how the angle of a ramp affects the final speed of a trolley.

He uses light gates to record the speed of the trolley at the bottom of the ramp. The student releases the trolley from rest at the same point on the ramp each time. Look at his results.

Angle of ramp (°)	**Final speed (m / s)**			
	Attempt 1	**Attempt 2**	**Attempt 3**	**Mean**
10	1.81	1.80	1.81	1.81
20	2.58	2.56	2.57	2.57
30	3.1	3.11	3.11	3.11
40	3.52	3.51	3.50	3.51

(a) **(i)** Plot the results on the graph and draw a line of best fit.

Two results have been plotted for you.



[2]

(ii) Describe the pattern shown by the results.

Use data from the table or graph in your answer.

[3]

(iii) Explain why the final speed changes when the angle of the ramp increases.

In your answer use ideas about energy.

[2]

(iv) The student made a mistake when recording one of his results.

Identify the mistake **and** explain what he should have done.

[2]

(v) The student thinks this data shows that his results are **reproducible**.

He is **not** correct.

Explain why.

[2]

(b) **(i)** The mean final velocity for the ramp at a 40° angle is 3.51 m/s. The distance from the top of the ramp to the light gate at the bottom is 1.0 m.

Calculate the acceleration of the trolley when the ramp is at a 40° angle.

Give your answer to **2** decimal places

Acceleration = ... m/s^2

[5]

(ii) The trolley has a mass of 2.0 kg.

Calculate the kinetic energy of the trolley at a speed of 3.0 m / s.

Kinetic energy = ... J

[3]

Total Marks for Question Set 14: 19

Equations in physics

$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$

change in thermal energy = mass × specific heat capacity × change in temperature

thermal energy for a change in state = mass × specific latent heat

$\text{energy transferred in stretching} = 0.5 \times \text{spring constant} \times (\text{extension})^2$

potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil

Higher tier only –

force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length