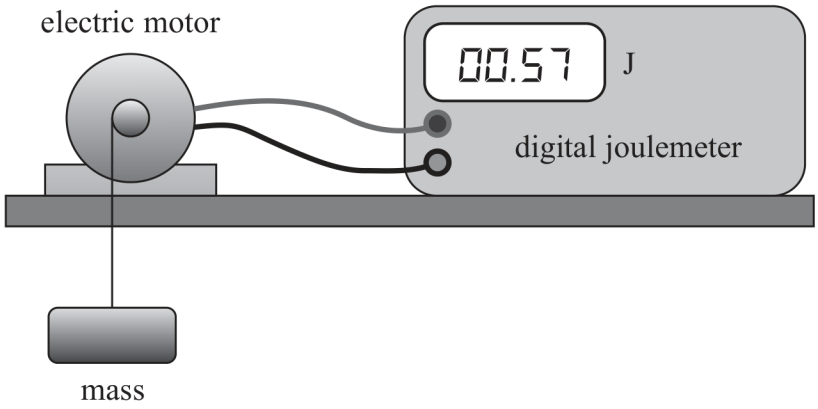
4 A group of students investigated the efficiency of an electric motor when lifting a mass.



The students used a joulemeter to measure the energy supplied to the motor to lift a mass a distance of 75 cm. They repeated the experiment twice before increasing the mass.

They calculated the change in gravitational potential energy of the mass and the mean energy supplied. Their results are shown in the table below.

Mass / kg	Change in gravitational potential energy / J	Energy supplied / J			
		Trial 1	Trial 2	Trial 3	Mean
0.02	0.147	0.57	0.55	0.60	0.573
0.04	0.29	1.12	1.10	1.15	1.12
0.06	0.441	1.67	1.71	1.65	1.7
0.08	0.59	2.21	2.25	2.23	2.23
0.10	0.74	2.78	2.82	2.91	2.84
0.12		3.32	3.36	3.33	

(a) Criticise these results.

(2)

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(b) Complete the last row of the table.

(3)

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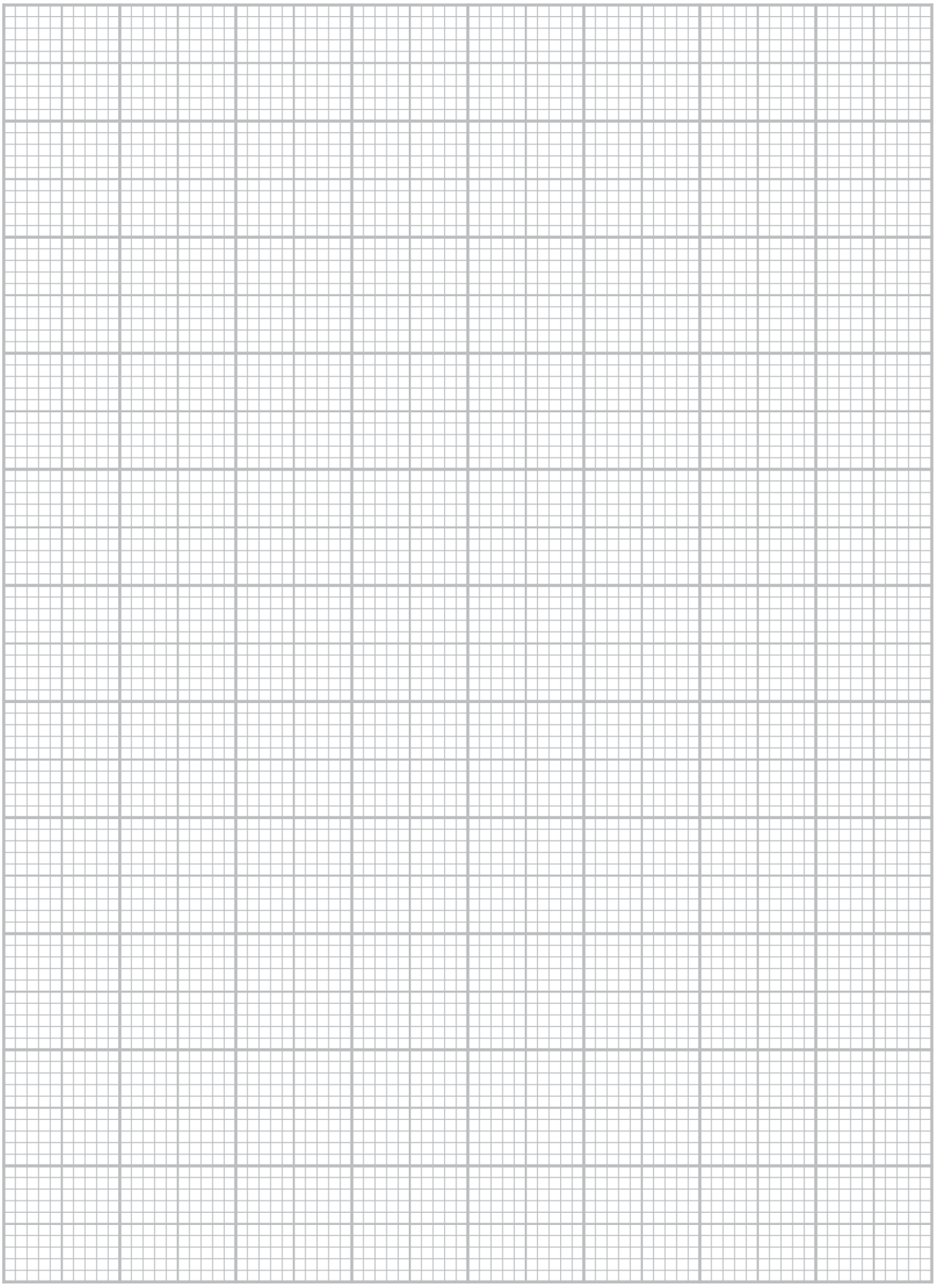
(c) Plot a graph of change in gravitational potential energy on the *y*-axis against mean energy supplied on the *x*-axis.

(5)



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(d) Determine the efficiency of the motor.

(2)

Efficiency = ...

(e) The students repeated the experiment with a much larger mass and determined that the efficiency of the motor was decreased.

Describe how they should collect and use data to determine the mass at which the efficiency starts to decrease.

(3)

(Total for Question 4 = 15 marks)

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