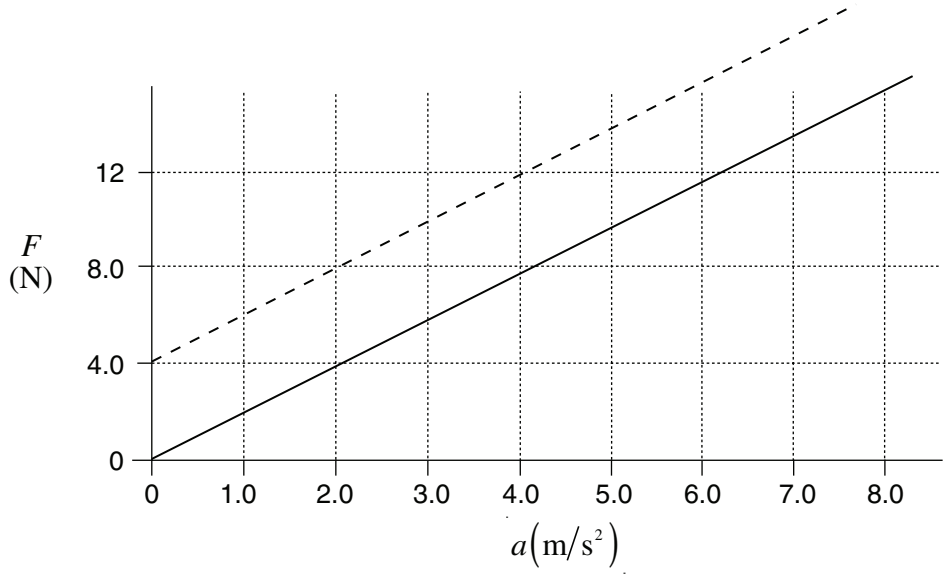
SAMPLE GRAPHING QUESTIONS

1. **(5 marks)**

A student performs an experiment by applying a force F to a frictionless cart, giving it an acceleration a. He plots a graph of F versus a, as shown below.



Determine the slope of this graph, expressing your answer in appropriate units.

$2.0 \dfrac{\text{N}}{\text{m/s}^2}$ or **2.0 kg** **(2 marks)**

What does the slope of your graph represent?

A mass of 2.0 kg **(1 mark)**

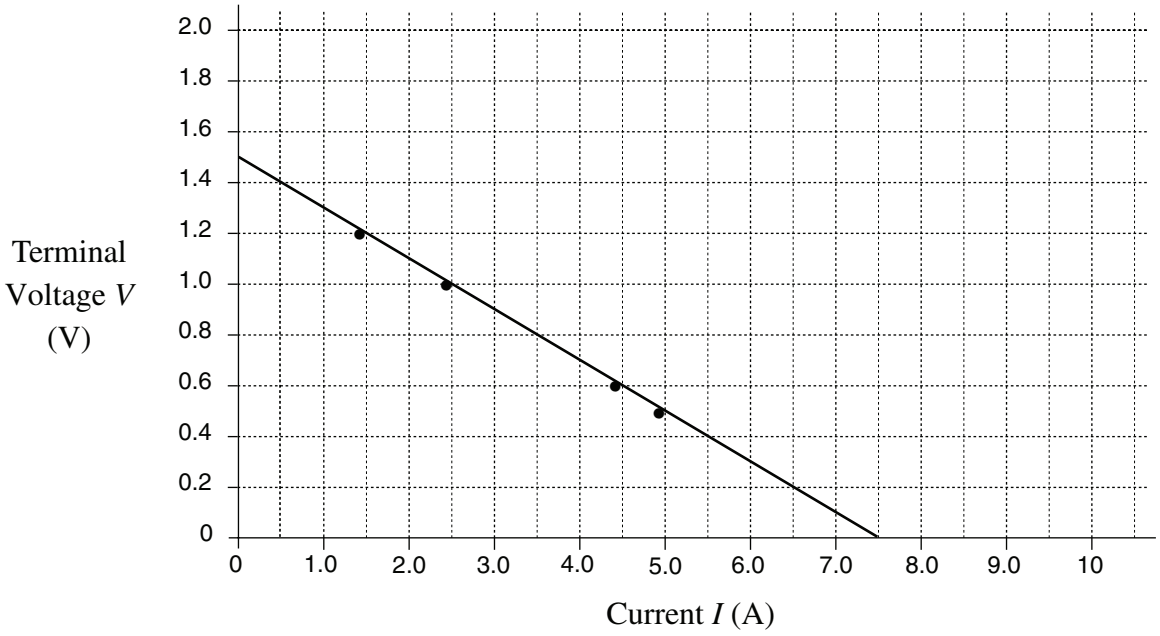
An identical cart with the same applied force F is placed on a different surface and now experiences a constant friction force of 4.0 N. On the axes above, sketch the graph that corresponds to this situation. (Use a pencil so that you may make changes to your answer, if necessary.)

See graph for response (dashed line). **(2 marks)**

2. **(5 marks)**

Using a cell with an emf of 1.50 V, a student measures and records various values of the terminal voltage V for different current values I, as shown below.

V (V)	1.20	1.00	0.60	0.50
I (A)	1.50	2.50	4.50	5.00



Plot a graph of V versus I on the axes above.

See graph for response. **(2 marks)**

What maximum current could this cell supply?

7.5 A **(1 mark)**

What is the internal resistance of the cell?

$$V_T = \mathcal{E} - Ir$$

substitute any data point

$$1.2 = 1.5 - (1.5)r$$

$$r = 0.20\ \Omega$$

or

$$-r = slope$$

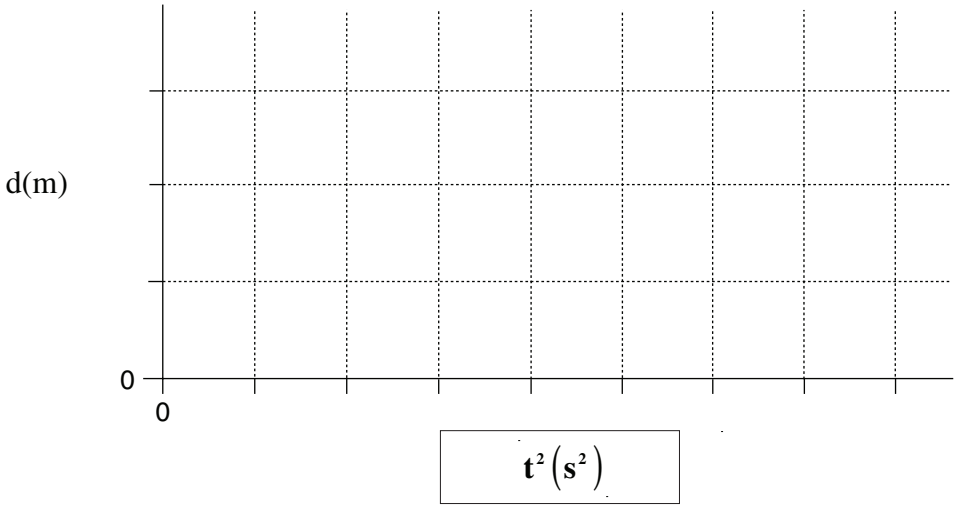
$$r = 0.20\ \Omega$$

(2 marks)

3. **(5 marks)**

During a kinematics experiment a box is pulled from rest across a smooth level floor with a constant acceleration. The box's displacement (d) is recorded at regular time intervals (t). Displacement equals zero when time equals zero. It is possible to use this data to create a linear graph and obtain a slope.

In the box on the graph below write the function (include units) of the time, t, that must be used on the horizontal axis to produce a linear relation from this data.



function of time, including units

The displacement of the box during constant acceleration from rest is described by:

$$\mathbf{d = \frac{1}{2}at^2}$$

d varies as the square of the time, t.

Therefore t^2 (2 marks) must be used on the horizontal axis to produce a linear relation from the data.

The units are s^2 (1 mark)

Clearly explain how you can use the slope of this graph to determine the acceleration of the box.

Since $d = \frac{1}{2}at^2$ the slope of the graph (d vs t^2) must be equal to $\frac{1}{2}a$. The acceleration, a, can be determined by equating the slope of the graph with $\frac{1}{2}a$ and solving for a, the only unknown.

slope = $\frac{1}{2}a$ (2 marks)