

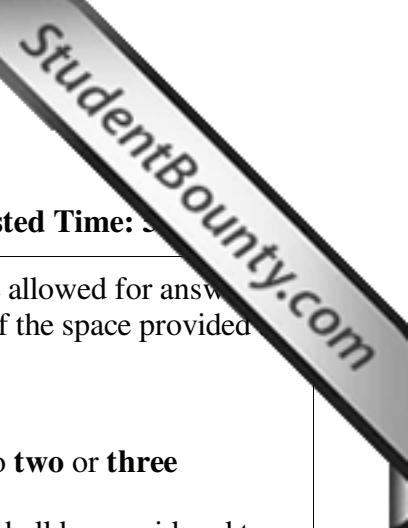


Physics 12
Resource Exam B
Response Booklet

PART B: WRITTEN RESPONSE

Value: 30% of the exam

Suggested Time: 30 minutes

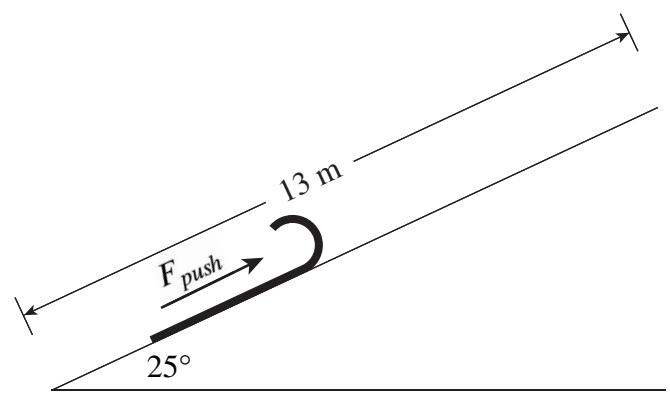


INSTRUCTIONS:

1. Rough-work space has been incorporated into the space allowed for answers to each written-response question. You may not need all of the space provided to answer each question.
2.
 - a) Final answers must include appropriate **units**.
 - b) Marks will not be deducted for answers expressed to **two** or **three** significant figures.
 - c) In this examination the zero in a number such as 30 shall be considered to be a significant zero.
3. You are expected to communicate your knowledge and understanding of physics principles in a clear and logical manner. Partial marks will be awarded for steps and assumptions leading to a solution.
4. If you are unable to determine the value of a quantity required in order to proceed, you may assume a reasonable value and continue toward the solution. Such a solution, however, may not be eligible for full marks.
5. **Full marks will NOT be awarded for providing only a final answer.**

1. (6 marks)

A 25 kg sled is pushed 13 m up a 25° ramp at a constant speed as shown. The energy loss due to the frictional force between the ramp and the sled is 590 J.

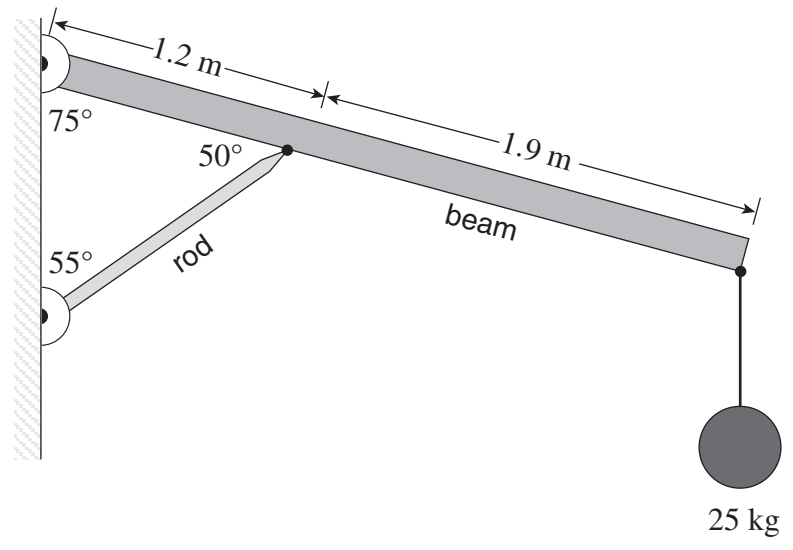


a) What is the work done in moving the sled up the ramp?

- b) The ramp in part 1 is then lowered to a smaller angle. Explain using principles of physics why more work is done to move the sled to the same vertical height as in part 1.

2. (5 marks)

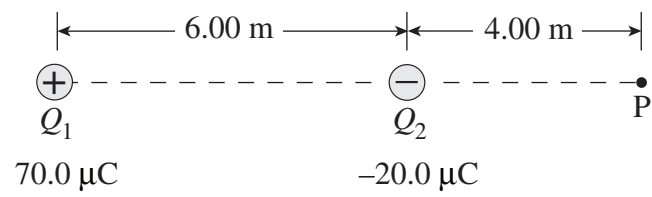
A 3.1 m-long uniform 15 kg beam is held in place by a rod and supports a 25 kg mass as shown.



What is the force exerted by the rod on the beam?

3. (5 marks)

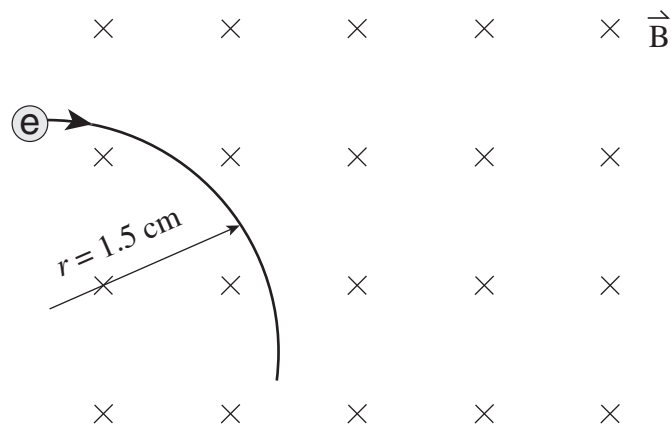
Point P is located on the line that passes through the two charges shown below.



Determine the size and direction of the electric field at point P.

4. (5 marks)

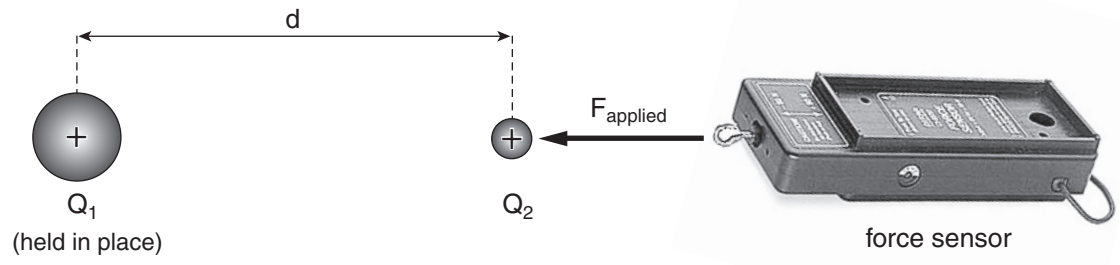
An electron with a kinetic energy of 5.2×10^{-16} J enters a magnetic field causing it to travel in a circular path of radius 1.5 cm.



What is the strength of the magnetic field?

5. (5 marks)

A charge Q_2 is pushed towards a fixed charge Q_1 . A sensor is used to measure the repulsive force being experienced by Q_2 .



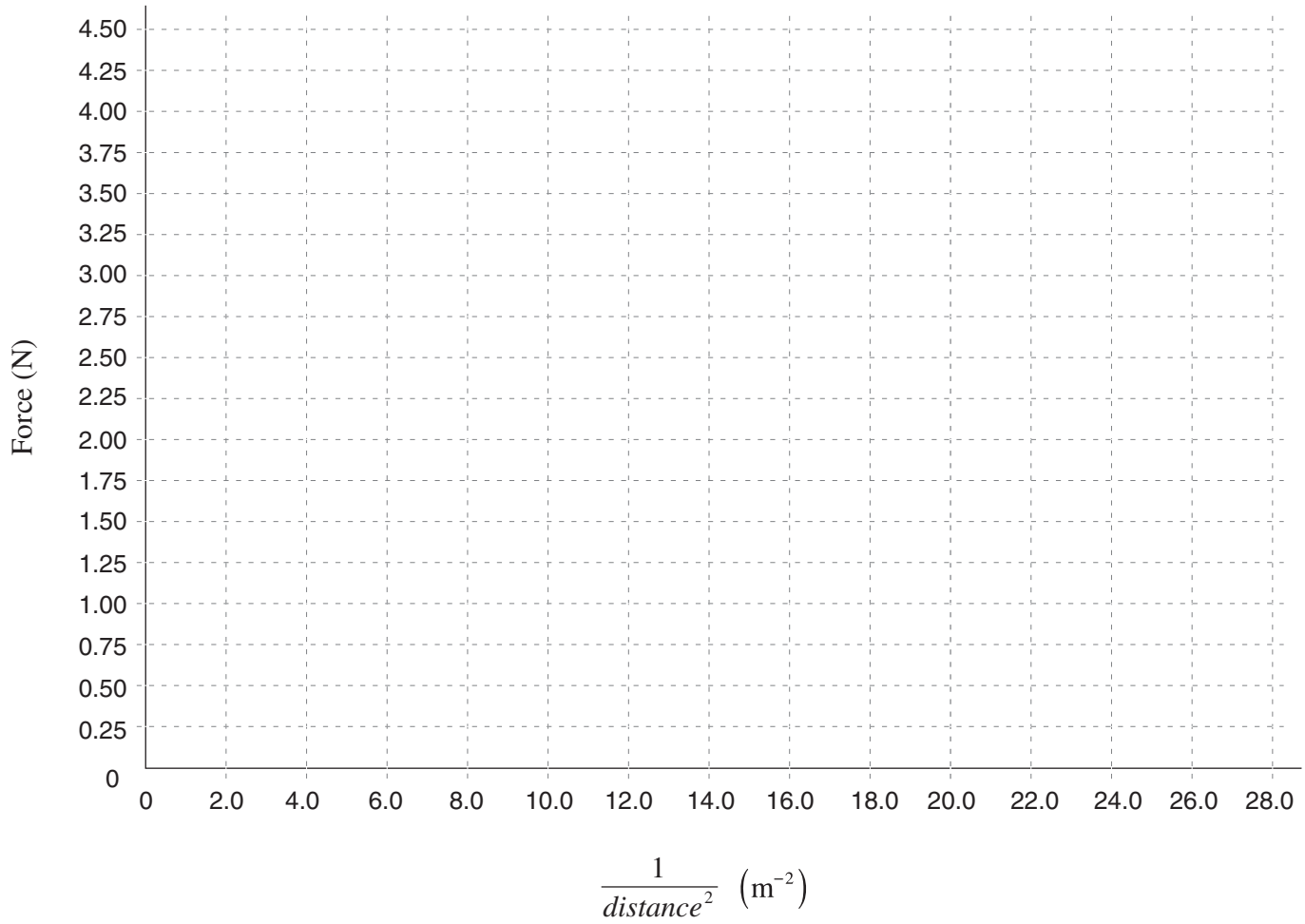
The distance between the charges and the readings on the force sensor are recorded for several different positions. In order to produce a linear plot of the data, the original measurements are adjusted as shown in the table below.

Adjusted Data

FORCE (N)	$\frac{1}{\text{distance}^2} \text{ (m}^{-2}\text{)}$
4.2	25.0
1.8	11.1
1.2	6.2
0.7	4.0
0.4	2.8
0.3	2.0

- a) Construct a linear plot of the adjusted data and determine the slope of the best fit (including appropriate units).

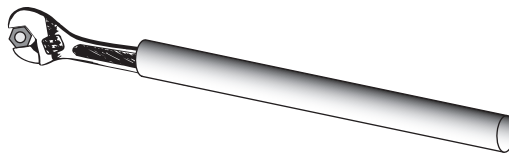
Linear Plot of the Data



- b) Given that Q_2 has a charge that is three times larger than Q_1 , use the slope from part a) to calculate the magnitude of charge Q_1 .

6. (4 marks)

A student is unable to loosen a nut by using a wrench. The student then attaches a pipe to the end of the wrench (see diagram).



Using principles of physics, explain why the student is now able to loosen the nut.

END OF EXAM