

Sultan Qaboos University
Department of Physics, College of Science
PHYS2107: Physics for Engineering I - Test 2

Name:
ID No:
Section:

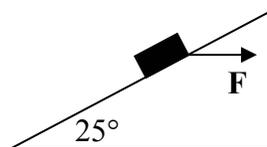
1	2	3	4	Tot.

Full Mark: 40 points	Answer all questions
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Monday, 14th November 2005

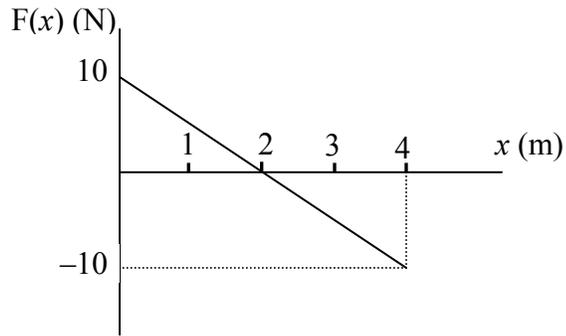
Time: 5:15 – 6:45 pm

1. A block of mass 5 kg on 25°-inclined plane, is subjected to a horizontal force F as shown in the figure. The coefficient of static friction is $\mu_s = 0.4$ and the coefficient of kinetic friction is $\mu_k = 0.2$.



- a) Find the minimum magnitude of the force F so that the block is about to slide down the inclined plane.
- b) Find the maximum magnitude of the force F so that the block is about to slide up the inclined plane.
- c) What value of F is required to move the block up the inclined plane at constant speed?
(10 marks)

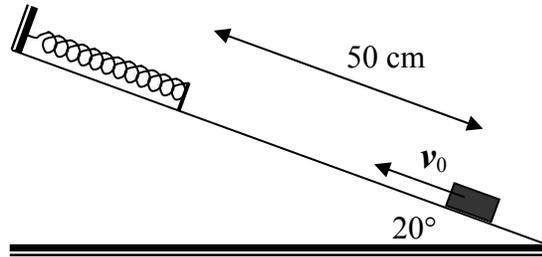
2. The only force acting on 1.5 kg body, as the body moves along the x-axis, varies as shown in the figure. The kinetic energy of the body at $x = 2$ m is 15 J.



- What is the kinetic energy of the body at the origin ($x = 0$)?
- What is the maximum kinetic energy attained by the body between $x = 0$ and $x = 4$ m.
- Does the body stop between $x = 0$ and $x = 4$ m? Justify your answer.

(10 marks)

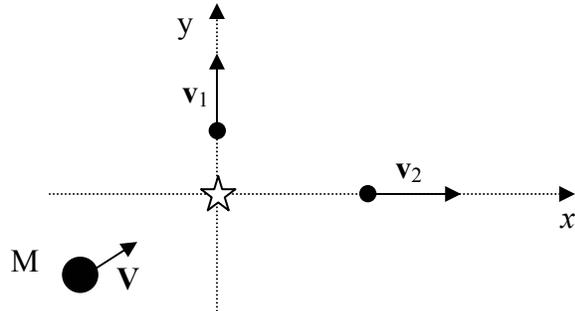
3. A 1.5 kg block, with an initial speed v_0 , slides head on into a (relaxed) spring with a spring constant $k = 200 \text{ N/m}$. Both the block and the spring are on a 20° -frictionless inclined plane, initially separated by 50 cm, as shown in the figure. The block momentarily stops when it compresses the spring by 2.5 cm.



- a) What is the work done by the spring force?
- b) What is the change in gravitational potential energy of the block?
- c) Find the initial speed v_0 of the block.

(10 marks)

4. A block of mass $M = 15$ kg moves with velocity \mathbf{V} and explodes at the origin into two pieces of masses $m_1 = 10$ kg and $m_2 = 5$ kg. The piece m_1 moves in the positive direction of y axis with speed $v_1 = 4.5$ m/s, whereas the other piece m_2 moves in the positive direction of x -axis with speed $v_2 = 8$ m/s.



- a) What is the velocity (magnitude and direction) of the center of mass before and after the explosion?
- b) How much energy is released in the explosion?

(10 marks)