PHYSICS 211 GROUP EXAM 2, FORM 4

(Friday afternoon sections)

Question 7	Question 8	Total
/25	/25	/50

Name: _____

Partner #1: _____

Partner #2: _____

Recitation section number: _____

- There are two questions, each worth twenty-five points.

- **You must show your reasoning to receive credit**. A numerical answer with no logic shown will be treated as no answer.

- You are highly encouraged to use both pictures and words to show your reasoning, not just algebra.

- If you run out of room, continue your work on the back of the page.

- Remember, show your reasoning as thoroughly as possible for partial credit.

- You may use $g = 10 \, \text{m/s}^2$ throughout, except where indicated, to minimize arithmetic.
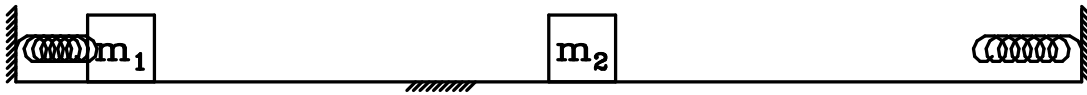
QUESTION 7

A spring of spring constant k is compressed by a distance d by a mass m_1 and released. This propels the mass down a flat track. Another spring, also of spring constant k, is on the other side.

Another object of mass m_2 is sitting in the middle of the track. The first mass strikes it and sticks to it.

The entire track is frictionless, except for a small region of the track to the left of m_2, of width b, with a coefficient of kinetic friction μ. (This is indicated by diagonal lines on the track in the diagram.)

(The space below is for you to draw other diagrams, if you so choose, or to do scratch work.)

(This part continues on the next page.)

a) How fast is the first mass moving right before it collides with the second block? (5 points)

b) How fast are the two masses moving right after the collision? (5 points)

c) When the two blocks reach the spring on the other side, they will bounce off of it, compressing it in the process. What is the maximum distance that this spring is compressed? (15 points)

QUESTION 8

Two billiard balls of equal mass are resting next to each other on a pool table.

A player hits them with a third ball (also of equal mass); this third ball is traveling at a velocity $v_3 = (0, 4)$ m/s.

The three balls bounce off one another. After the collision the velocities of the first two balls are:

- $v_1 = (-1, 2)$ m/s
- $v_2 = (2, 1)$ m/s

a) What is the velocity vector of the third ball after the collision? *(15 points)*

b) What fraction of the initial kinetic energy was lost during the collision? *(10 points)*