

QUIZ 4 1AW21

Full Name (Printed) _____

Full Name (Signature) _____

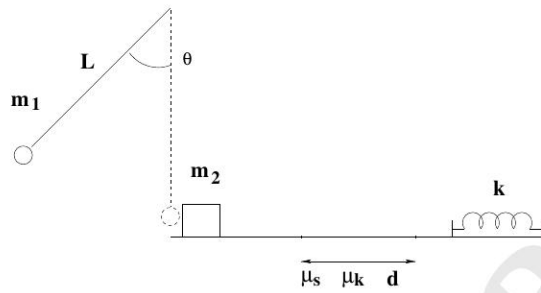
Student ID Number _____

- The exam is open-book and open notes. You will probably do better to limit yourself to a single page of notes you prepared well in advance.
- **All work must be your own.** You are not allowed to collaborate with anyone else, you are not allowed to discuss the exam with anyone until all the exams have been submitted (after the close of the submissions window for the exam).
- You have 30 minutes to complete the exam and sufficient time to scan the exam and upload it to GradeScope. The exam *must* be uploaded to GradeScope within the time allotted (that is, by the end of the first lecture hour). We will only accept submissions through GradeScope and will not accept any exam submitted after the submission window closes (CAE students must contact Corbin for instructions).
- **Given the limits of GradeScope, you must fit your work for each part into the space provided.** You may work on scratch paper, but you will not be able to upload the work you do on scratch paper, so it is essential that you copy your complete solution onto the exam form for final submission. We can only consider the work you submit on your exam form.
- **For full credit the grader must be able to follow your solution from first principles to your final answer. *There is a valid penalty for confusing the grader.***
- It is **YOUR** responsibility to make sure the exam is scanned correctly and uploaded before the end of the submission window. The graders may refuse to grade pages that are significantly blurred, solutions to problems that are not written in the correct place, pages submitted in landscape mode and/or work that is otherwise illegible - if any of this occurs, you may not receive *any* credit for the affected parts.
- Focus on the concepts involved in the problem, the tools to be used, and the set-up. If you get these right, all that's left is algebra.
- **Have Fun!**

The following must be signed before you submit your exam:

By my signature below, I hereby certify that all of the work on this exam was my own, that I did not collaborate with anyone else, nor did I discuss the exam with anyone while I was taking it.

Signature _____



4) A simple pendulum is constructed from a mass (m_1) and a light string of length L . It is released at rest from some initial angle and makes an elastic collision with another mass (m_2) at the very bottom of its swing. The second mass proceeds over a horizontal table that is frictionless save for a small friction patch described by the usual parameters (μ_s, μ_k, d). Upon exiting the friction patch, m_2 's motion is redirected by a spring of constant k . On its second trip through the friction patch, m_2 stops $\frac{1}{3}$ of the way from the left end of the friction patch.

- 4a) (5 points) How fast is m_2 moving immediately after its collision with m_1 ?

- 4b) (10 points) How fast is m_1 moving immediately before the collision with m_2 ? How fast is it moving immediately after the collision?

- 4c) (10 points) Find a simple relationship between the initial angular position of the pendulum and the final angular position of the pendulum (when it has risen as high as it is going to, after the collision). Evaluate your answer in the special case $m_1 = m_2$ and discuss.

- 4d) (5 points) What does it mean when we say a collision is elastic? In light of that, does your answer to part c make sense? Discuss.