

PHYS2100 Problem Sheet 3

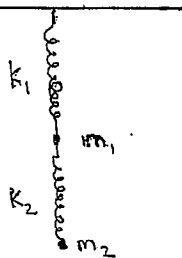
Semester 2, 2006

1. A particle moves in a central field of force with zero angular momentum. What can you deduce about the path of such a particle?
2. A meteor approaches the earth along a straight line. Given that its velocity when an infinite distance from the earth is zero, show that its velocity on impact is

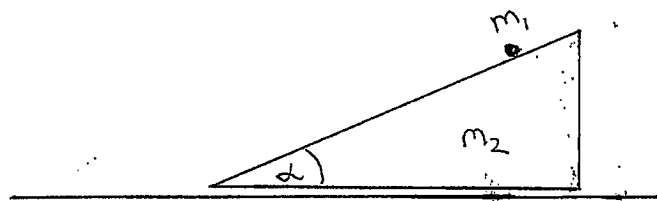
$$v = -\sqrt{2ga}$$

where a is the radius of the earth.

3. Two particles of mass m_1 and m_2 are suspended by two springs of stiffness k_1 and k_2 as shown. Write down expressions for the potential and kinetic energies and write down the equations of motion.



4. Suppose that the horizontal coordinate x is used as the generalised coordinate for a simple pendulum. Calculate the generalised force as a function of x .
5. Find expressions for the generalised forces for a double pendulum when the horizontal coordinates are used as generalised coordinates. Also write down an expression for the kinetic energy in these coordinates.
6. A particle of mass m_1 slides on a wedge of mass m_2 which moves freely over a horizontal plane as shown. There is no friction. Derive equations of motion for the system, using Lagrange's equations.



7. Use Lagrange's equations to derive the equations of motion of a double pendulum.