Tutorial II

Classical Mechanics

Course: PH211 + PH403 **Jul-Nov. 2010**

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1. Find the degree of freedom of a carbon-dioxide molecule (O=C=O) moving in 3-dimensions under each of the following "models".

   (a) The C=O bonds are rigid, and ∠O-C-O is rigid and is equal to 180^o.

   (b) The C=O bonds are harmonic (flexible), but ∠O-C-O is rigid and is equal to 180^o.

   (c) The C=O bonds are rigid, but ∠O-C-O is flexible.

   (d) The C=O bonds and ∠O-C-O are flexible.

2. Find the number of degree's of freedom of a CH_4 molecule according to the following models,

   (a) All C-H bonds and all H-C-H angles (∠H-C-H) are stiff

   (b) All C-H bonds are harmonic but all ∠H-C-H are stiff

   (c) All C-H bonds are stiff but all ∠H-C-H vary

   (d) All C-H bonds and all ∠H-C-H are harmonic

3. Use the D'Alembert's principle of virtual work to obtain the equation of motion of the following 2-D systems:

   (a) a simple pendulum.

   (b) a particle moving in a parabolic ($y = ax^2$) wire under gravity.

   (c) a particle sliding down a wedge of angle α.