University Physics I (Phys214) - Lesson Sheet 21

CJ Tinant

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Chapter 5 - Application of Newton's Laws of Motion - Part II

APPLICATION OF NEWTONS LAWS OF MOTION describes why the sifaka, a lemur (old-world monkey) from Madagascar, spreads out its arms and legs in front of itself while making spectacular leaps from tree to tree.

THE STUDENT LEARNING OUTCOME is **SLO2:** Use Newton's law of motion to analyze objects in dynamic equilibrium and undergoing acceleration.

WEEKLY LEARNING OBJECTIVES are to:

- Solve problems with sliding and rolling friction, and understand how static friction can prevent motion;
- Use the linear and quadratic models of drag to solve problems about motion through a fluid and to calculate terminal speeds;
- Use Newton's third law to identify forces on and to solve problems about interacting objects;

HOMEWORK IS DUE on the Friday following the next class period. Please upload homework assignments as a pdf to Google Scholar. You can either scan your assignment or take a picture of your assignment and convert it to a pdf. If you have an iPhone, tap on the 'Share' icon, then share to iBooks to automatically convert the jpg to a pdf.

WEEK ONE PROBLEMS Chapter 5 problems #: 27, 33, 39, 41, 43.

LOOKING FORWARD TO NEXT WEEK we will begin Chapter Six.

THE ROUGHNESS OF A SURFACE EXERTS FRICTION parallel to and in the opposite direction of the direction it is moving. Resting friction force is called static friction. [1] Sliding friction force is called kinetic friction. [2] Rolling friction force is called rolling friction. [3] [4]

[1] $\vec{f_s} = \mu_s n)$
[2] $\vec{f_k} = \mu_k n$
[3] $\vec{f_r} = \mu_r n$
[4] Rolling friction is always less than kinetic friction which is always less than static friction.

AS AN OBJECT MOVES THROUGH A FLUID like air or water, the resistive force is called *drag*. [5] Drag consists of two different forces. *Inertial forces* dominate for objects moving rapidly. *Viscous forces* dominate for objects moving slowly. To find which force dominates, find the Reynolds number [6], the *ratio* between inertial forces and viscous forces.

[5] Drag force is in the opposite direction of motion.

[6] $R_e = \frac{F_{inertia}}{F_{viscious}} = \frac{\rho v^2 L^2}{\eta L v} = \frac{\rho v L}{\eta}$

OBJECTS AT A HIGH REYNOLDS NUMBER are subject to inertial forces [7]

[7] $\vec{D} = \frac{1}{2} C_D \rho A v^2$

In Class Problems

PROBLEM 1–SYLLABUS Please go to Google Classroom, enroll for the class and print out your syllabus. Go to `https://classroom.google.com/c/MTUyNTI3NDQ0MDBa`. The class code is **kk6aw2y**. [8]

[8] You will need to use your OLC email address to access Google Classroom.