Announcements

- This week's homework 2 parts
- Quiz on Friday, Chs 2 and 3
- Today's class:
 - Relative motion
 - > Circular motion, what causes it ... centripetal acceleration
 - > Circular kinematics, how to describe it ... same as linear motion
- Movie of the week, circular motion. Film it, measure the centripetal acceleration, identify its source (tension, gravity, etc,)

PHYS 1021: Chap. 4, Pg 1







ConcepTest 4.9.a Centrifuge

You load a centrifuge tube with mercury and water and you shake it. Then set it spinning at high speed. What happens to the water and mercury?

- 1. They mix together
- 2. They separate, water on top, mercury on bottom
- 3. They separate, mercury on top, water on bottom
- 4. Nothing happens

PHYS 1021: Chap. 4, Pg 5



PHYS 1021: Chap. 4, Pg 6

Important Concepts

Nonuniform Circular Motion

Angular acceleration $\alpha = d\omega/dt$. The radial acceleration

$$a_r = \frac{v^2}{r} = \omega^2 r$$

changes the particle's direction. The tangential component

$$a_t = \alpha r$$

changes the particle's speed.

PHYS 1021: Chap. 4, Pg 7

a a,

What more can we ask about a rotating object?				
 How much did it rotate? How fast did it spin? 		Angular displacement θ		
> How does it accelerate?		Angular acceleration Q		
Why are these useful?		Every point on a rotating object has the same angular velocity and angular acceleration		
Why are these u	iseful? has	ry point on a rotating object the same angular velocity and angular acceleration		
Why are these u	iseful? has angular	ry point on a rotating object the same angular velocity and angular acceleration		
Why are these under the service of t	$\theta = \theta_0 + \omega_0 t + 1/2\alpha t^2$	ry point on a rotating object the same angular velocity and angular acceleration rad		
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Why are these under the service of t	Iseful? has angular $\theta = \theta_0 + \omega_0 t + 1/2\alpha t^2$ $\Delta \omega = \omega_{0+} \alpha t$ $\alpha = constant$	ry point on a rotating object to the same angular velocity and angular acceleration rad rad/sec rad/s ²		







ConcepTest 5.1 Newton's First Law II				
In which movie(s) is the net force zero	 A B C A and B A and C B and C All of the 	movies		
Α	В	C PHYS 1021: Chap. 5, Pg 12		





PHYS 1021: Chap. 5, Pg 14













ConcepTest 5.4a Newton's First Law III

You put your book on the bus seat next to you. When the bus stops suddenly, the book slides forward off the seat. Why?

- 1) a net force acted on it
- 2) no net force acted on it
- 3) it remained at rest
- 4) it did not move, but only seemed to
- 5) gravity briefly stopped acting on it

PHYS 1021: Chap. 5, Pg 21









- Does not need to be pretty
- Technically a 'point' is enough, but a box, circle or schematic representation of the object at hand is enough
- 'Free Body' \rightarrow no other objects, no background, ...
- Add the forces acting on the object
- Keep the magnitudes of the vectors roughly in proportion
- Add a coordinate system, choose wisely ...

PHYS 1021: Chap. 5, Pg 25















