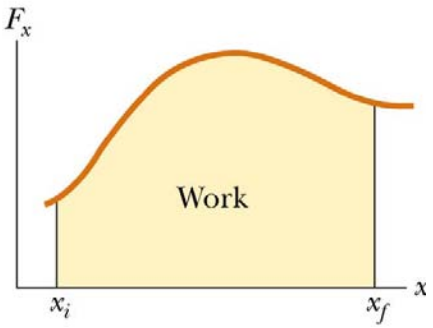
Review of Chapters 4 - 7

Summary of Work • Energy • Power

$$\text{Work} = F_{\parallel}\Delta x$$

$$\text{Work done} = \Delta KE$$

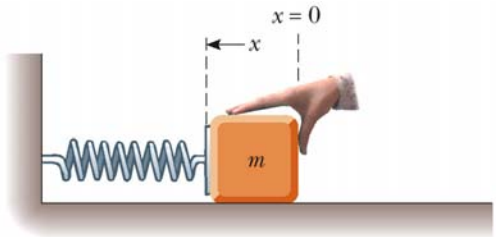
WORK ENERGY THEOREM



$$\text{Kinetic Energy} = \tfrac{1}{2}mv^2$$

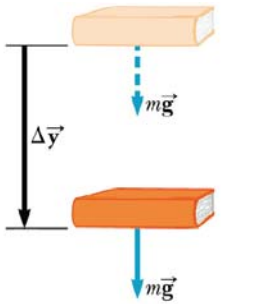
$$PE_i + KE_i = const = PE_f + KE_f$$

Conservation of Energy for conservative forces



$$F_{spring} = -kx$$

$$PE_{spring} = \tfrac{1}{2}kx^2$$



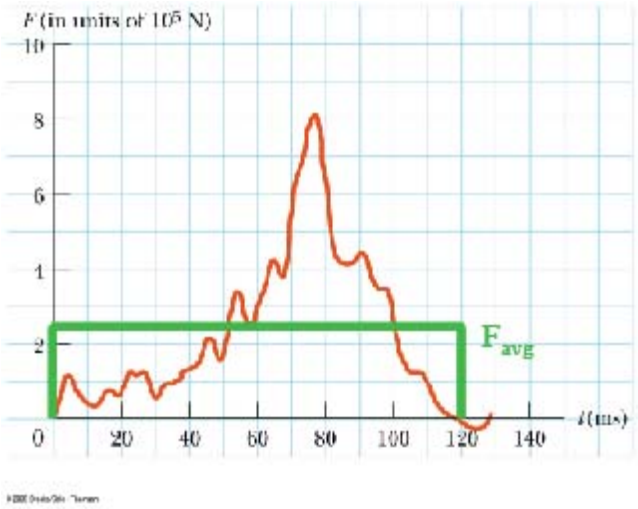
$$PE_{grav} = mgh$$

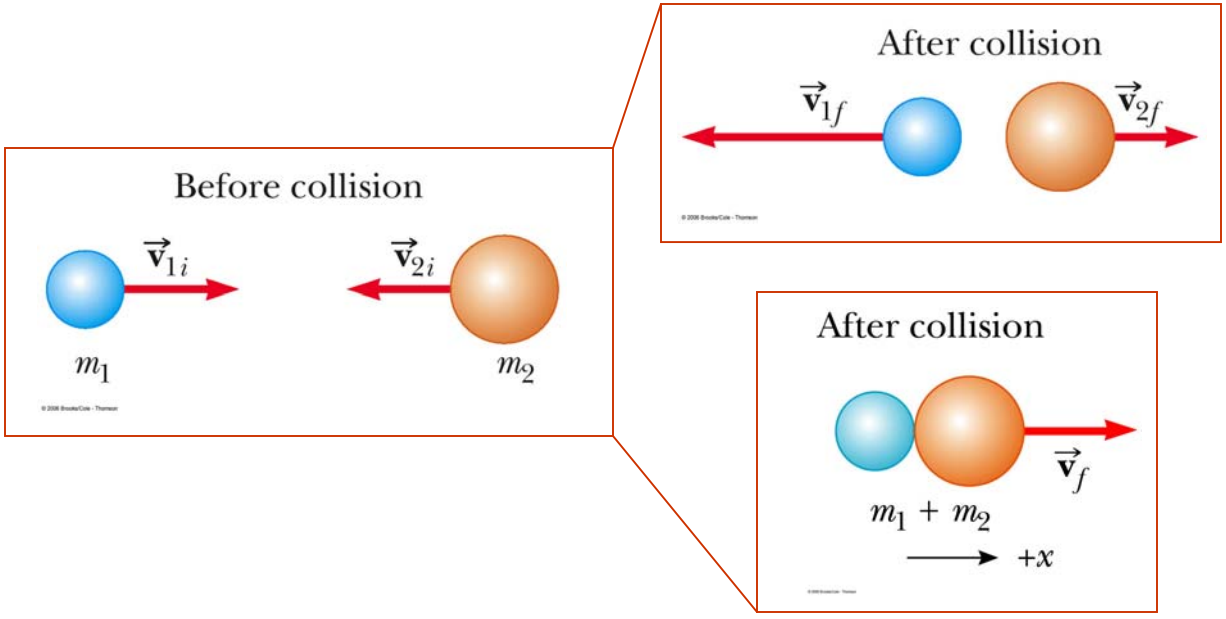
$$\text{Power} = \frac{\text{WORK}}{\Delta t}$$

Momentum

Impulse – Momentum Theorem

$$\vec{F}_{avg}\Delta t = \Delta(m\vec{v}) \equiv \vec{p}$$





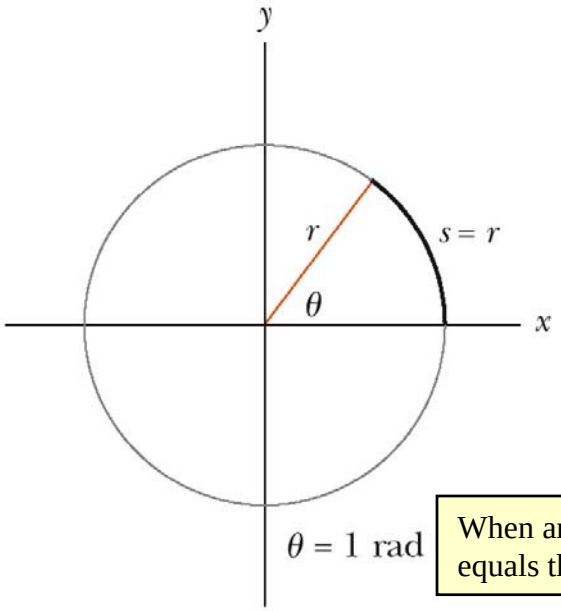
Conservation of Momentum

$$\sum \vec{p}_i = \sum \vec{p}_f$$

Summary of Angular Variables

Displacement	$s = r\,\theta$	Angular Displacement	(theta)
Velocity	$v = r\,\omega$	Angular Velocity	(omega)
Acceleration	$a = r\,\alpha$	Angular Acceleration	(alpha)

Possible units are:
Radians/sec, rpm (revolutions/minute), degrees/second etc.



When arclength *s* equals the radius *r*

$$1 = \frac{2\pi \text{ radians}}{360 \text{ degrees}}$$

Constant Acceleration

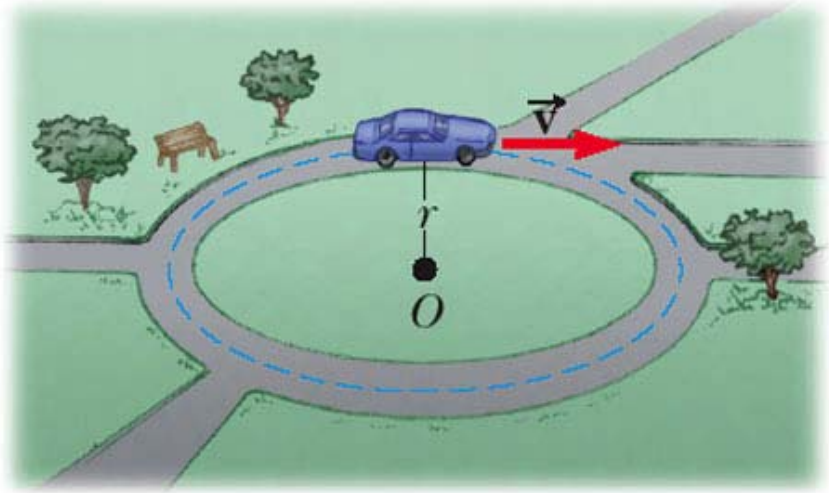
$$x(t) = x_0 + v_0 t + \tfrac{1}{2} a t^2$$

$$v(t) = v_0 + at$$

Constant Angular Acceleration

$$\theta(t) = \theta_0 + \omega_0 t + \tfrac{1}{2} \alpha t^2$$

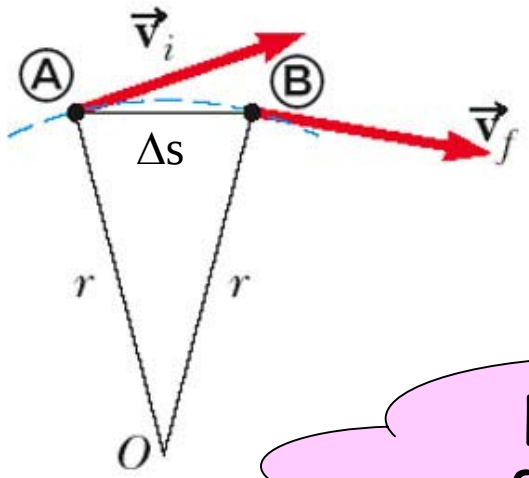
$$\omega(t) = \omega_0 + \alpha t$$



Centripetal Acceleration

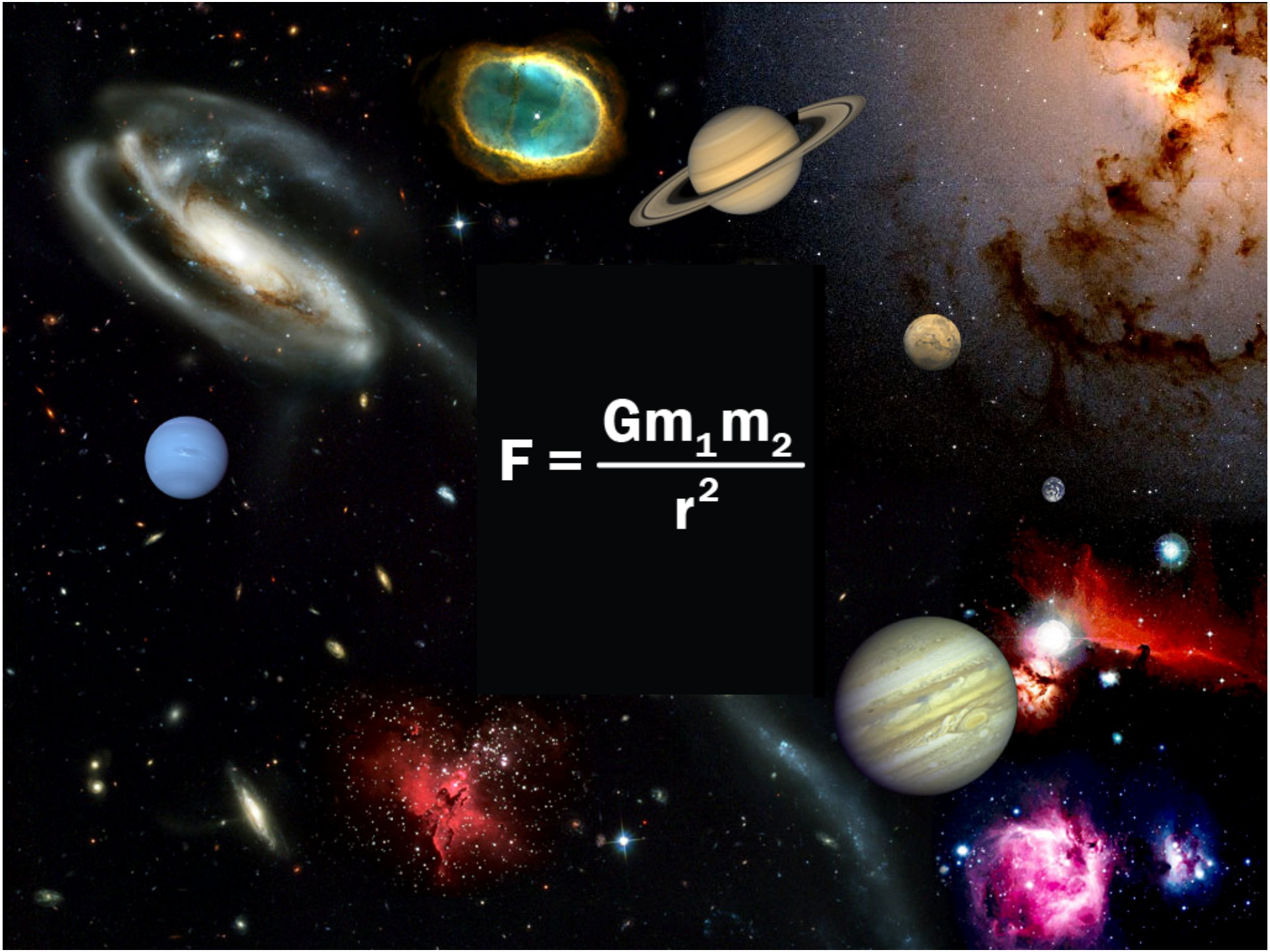
Direction: inward

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$$

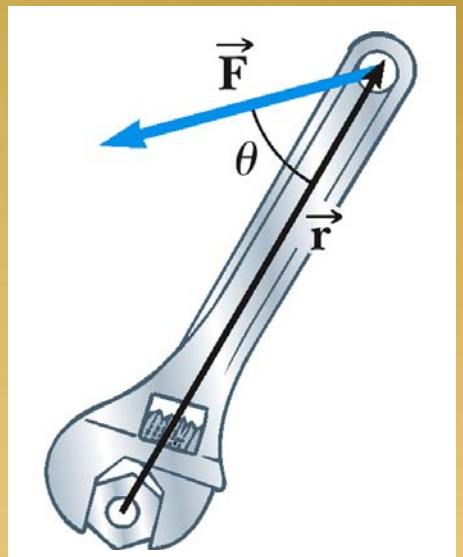


$$a_c = \frac{v^2}{r}$$

Find the force responsible for centripetal acceleration


$$F = \frac{Gm_1 m_2}{r^2}$$

Rotational Equilibrium

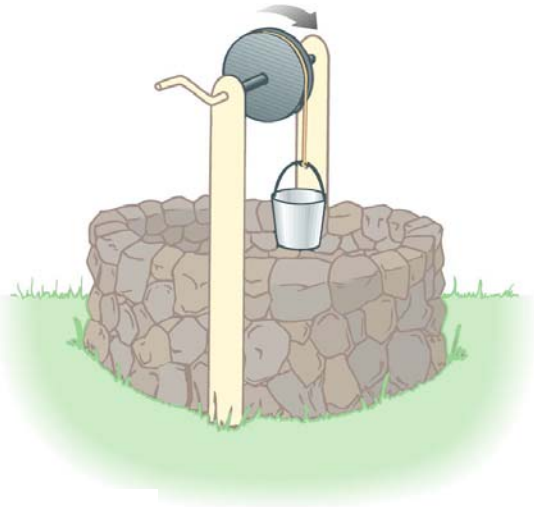


$$\tau = rF\sin\theta$$

$$x_{cg} = \frac{\sum x_i m_i}{\sum m_i}$$

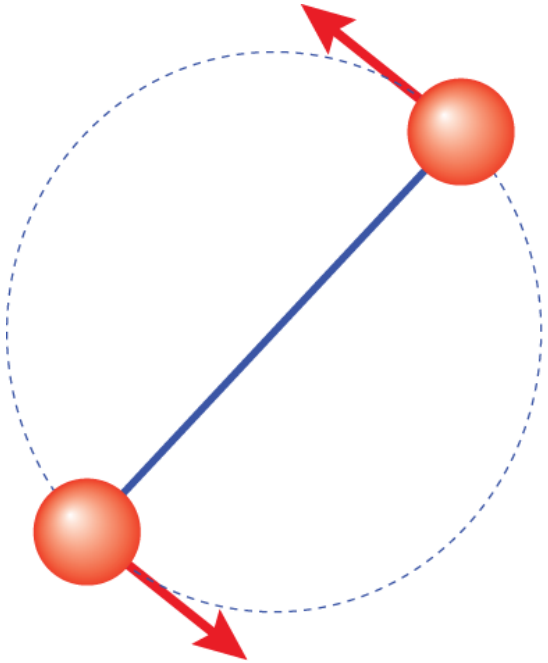
$$\sum \vec{\tau} = 0 \quad \text{and} \quad \sum \vec{F} = 0$$

Rotational Dynamics



$$\vec{\tau} = I\vec{\alpha}$$

$$\vec{L} = I\vec{\omega}$$



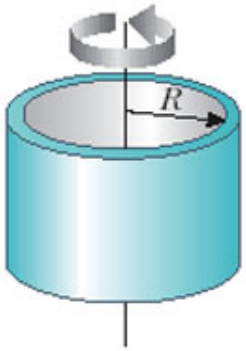
$$KE = \tfrac{1}{2} I\omega^2$$

TABLE 8.1

Moments of Inertia for Various Rigid Objects of Uniform Composition

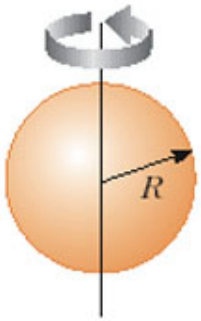
Hoop or thin cylindrical shell

$I = MR^2$



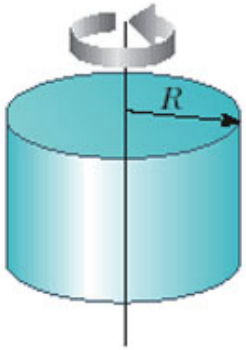
Solid sphere

$I = \frac{2}{5} MR^2$



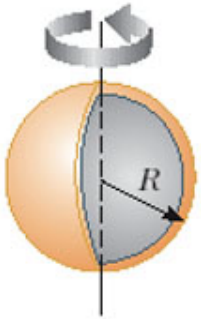
Solid cylinder or disk

$I = \frac{1}{2} MR^2$



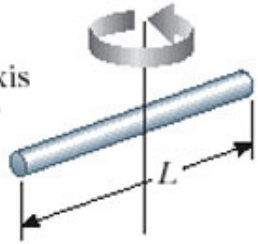
Thin spherical shell

$I = \frac{2}{3} MR^2$



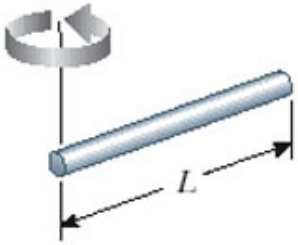
Long thin rod with rotation axis through center

$I = \frac{1}{12} ML^2$



Long thin rod with rotation axis through end

$I = \frac{1}{3} ML^2$



How to Study for a PY132 Physics Exam

(no)

checklist

Study Guide

Read Notes ☐

Equations and Concepts ☐

Suggestions, Skills & Strategies ☐

Review Checklist ☐

Textbook

Summaries ☐

Tips ☐

Do all Quick Quizzes ☐

Check your homework - Where did you lose points? Even if you didn't lose points, do you understand it? Also check the discussion quizzes. See online solutions. ☐

Work boxed problems in book/study guide as exam practice (formula sheet only). ☐

(yes)

If I were in a big hurry or just lazy, I might make an exam by grabbing questions from the book. These are possible exams I might make up. Odd numbered Problems are answered in the back of the book, and most of the ones below are answered in detail in the study guide. The Conceptual Questions are answered in the back of the textbook. The feel of Question [1] is the least similar to what I make up, as I would make them multiple choice, true-false, sketch, or something other than answer by writing a sentence.

Practice Exam 1

[1] Conceptual / Short Answer
- Chapter 6 Conceptual Question 13
- Chapter 7 Problem 7
- Chapter 7 Conceptual Question 13
- Chapter 8 Conceptual Question 17

[2] Chapter 6 Problem 29

[3] Chapter 7 Problem 47

[4] Chapter 8 Problem 9

Practice Exam 2

[1] Conceptual / Short Answer
Chapter 6 Problem 1
- Chapter 6 Conceptual Question 17
- Chapter 7 Conceptual Question 5
- Chapter 8 Conceptual Question 5

[2] Chapter 6 Problem 37

[3] Chapter 7 Problem 23

[4] Chapter 8 Problem 51

If you take anything away from this plus the How-To-Study guidelines, I hope you will learn how to create your own methodical study plan in such a way that you can effectively prepare for exams in other courses.

-ETK

Some equations that you might need to be reminded of:

$g = 10\,{}^{m}/_{s^2}$

$PE_{grav} = mgh$

$PE_{spring} = \frac{1}{2}kx^2, \quad F_{spring} = -kx$

impulse $= F_{avg}\Delta t = \Delta p$

Power $= {}^{W}/_{\Delta t}$

$x = x_0 + v_0 t + \frac{1}{2}at^2$

$v = v_0 + at$

$\vec{F} = m\vec{a}$

$\vec{p} = m\vec{v}$

$KE = \frac{1}{2}mv^2$

$w = Fd$

$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$

$\omega = \omega_0 + \alpha t$

$\vec{\tau} = I\vec{\alpha}$

$\vec{L} = I\vec{\omega}$

$KE = \frac{1}{2}I\omega^2$

$w = \tau\theta$

$\tau = rF\sin\theta$

$s = r\theta, \quad v = r\omega, \quad a = r\alpha, \quad a_c = {}^{v^2}/_{r}$

Point mass	$I = mr^2$
Ring, about axis	$I = mr^2$
Solid rod, about center	$I = \frac{1}{12}ml^2$
Solid rod, about end	$I = \frac{1}{3}ml^2$
Solid cylinder, about axis	$I = \frac{1}{2}mr^2$
Hollow cylinder, about axis	$I = mr^2$
Solid sphere	$I = \frac{2}{5}mr^2$
Hollow sphere	$I = \frac{2}{3}mr^2$

Week 6 Oct. 9-13 note: no class on Monday, Tuesday is Monday schedule	**Energy [lecture slides]** Reading: Chapter 5 Lab: Energy and Work Homework 4: SOLUTIONS: 1 2 3 4 5 QUIZ
Week 7 Oct. 16-20	**Momentum and Collisions [lecture slides]** Reading: Chapter 6 Lab: Collisions Homework 5 SOLUTIONS: 1 2 3 4 QUIZ
Week 8 Oct. 23-27	**Rotational Motion and the Law of Gravity [lecture slides]** Reading: Chapter 7 Lab: no lab Homework 6 SOLUTIONS: 1 2 3 4 QUIZ
Week 9 Oct. 30-Nov. 3	**Rotational Equilibrium and Dynamics [lecture slides]** Reading: Chapter 8 Lab: Torque and Moment of Inertia Homework 7 SOLUTIONS: 1 2 3 4 QUIZ
Week 10 Nov. 6-9 note: no class on Friday (holiday)	**Exam II [Exam prep] [Practice exam]** **WEDNESDAY Nov. 8: Exam II covers chapters 5-8.** Lab no lab Homework: **LECTURE THURSDAY during DISCUSSION**
Week 11 Nov. 13-17 **note: no class on MONDAY**	**Solids and Fluids** Reading: Chapter 9 Lab: Fluids Homework 8

Today

Next Lecture

I will cover fluids (Chapter 9) Thursday Nov. 9, Wednesday Nov. 15 & Friday Nov. 17. Homework due date will be Monday Nov.20