A boat carrying a large boulder is floating on a lake. The boulder is thrown overboard and sinks. The water level in the lake (with respect to the shore)

A. rises.

B. drops.

C. remains the same.

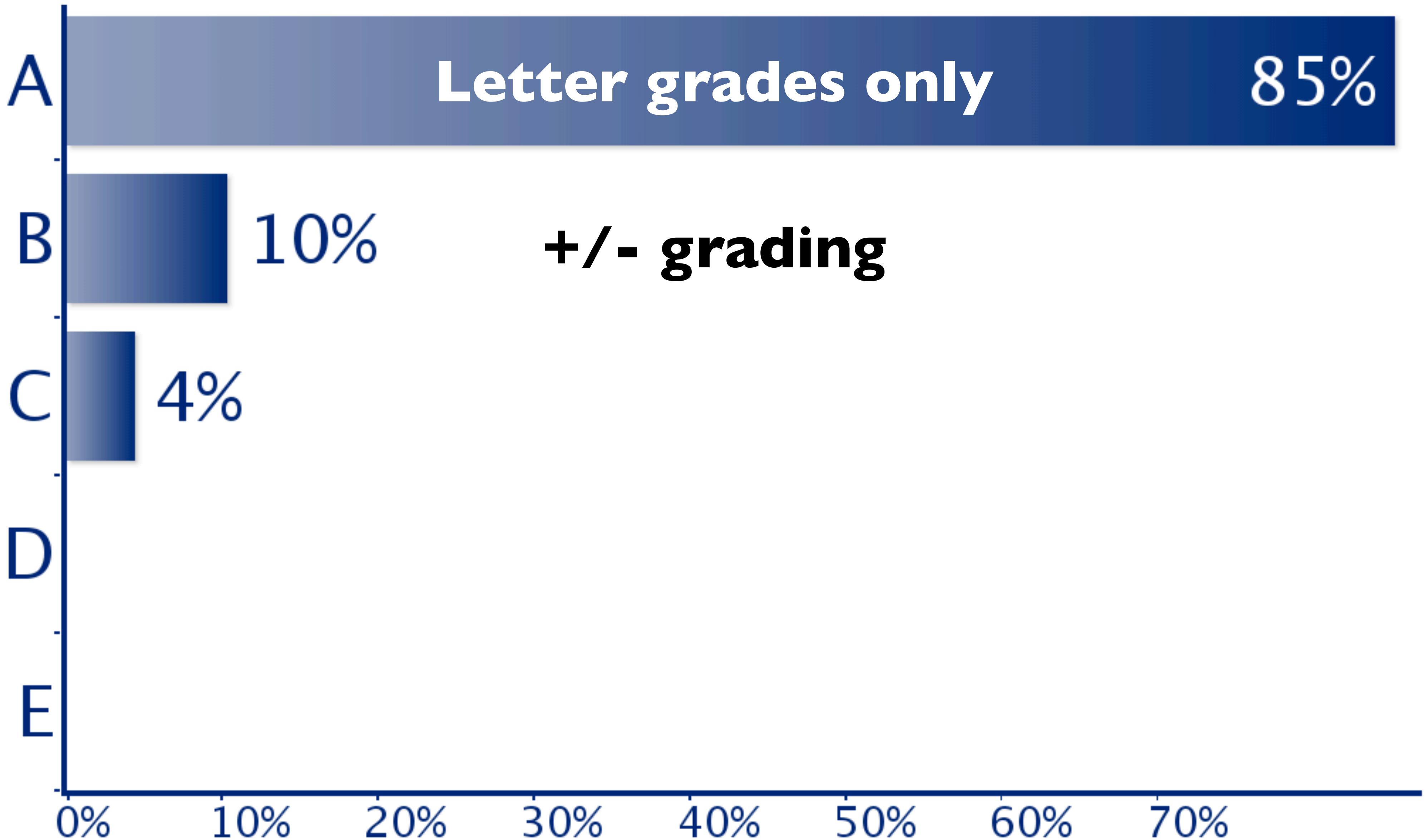
Text ‘PHYSJC’ and your answer to 22333

Announcements

- The derivation of Bernoulli's equation in full gory detail is on the course website
- Next week's Lab is not in the lab manual. Pick up a packet during lab this week or download it from the course website
- No office hours on Thursday 1-3pm.

A–E

Which grading system do you prefer for your final grade?



Goals for Chapter 12

- To study the concept of density
- To investigate pressure in a fluid
- To study buoyancy in fluids
- To compare laminar versus turbulent fluid flow and how the fluid speed depends on the size of the tube
- To learn how to use Bernoulli's equation to relate pressure and flow speed of a fluid

Two cups are filled to the same level with water. One of the two cups has ice cubes floating in it. When the ice cubes melt, in which cup is the level of the water higher?

F. The cup without ice cubes.
G. The cup with ice cubes.
H. It is the same in both.

Continuity Equation

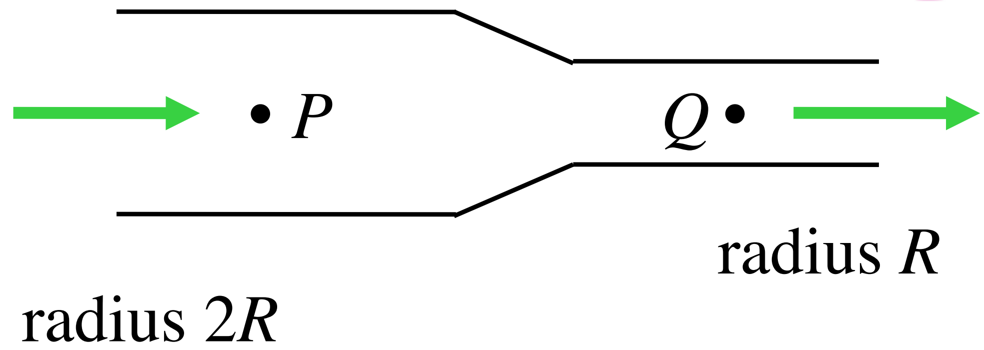
$$\rho_1 A_1 v_1 = \rho_2 A_2 v_2$$

Incompressible fluid: $(\rho_1 = \rho_2)$

$$A_1 v_1 = A_2 v_2$$

Q13.5

An incompressible fluid flows through a pipe of varying radius (shown in cross-section). Compared to the fluid at point *P*, the fluid at point *Q* has



K. 4 times the fluid speed.

L. 2 times the fluid speed.

M. the same fluid speed.

N. 1/2 the fluid speed.

P. 1/4 the fluid speed.

Bernoulli's Equation

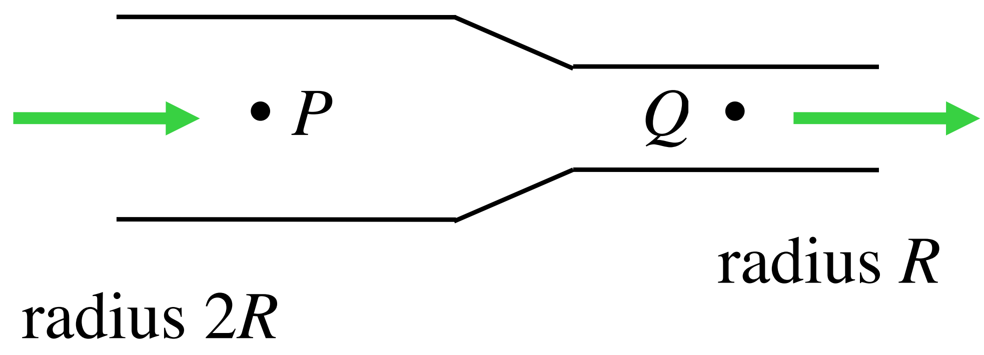
$$p_1 + \rho g y_1 + 1/2\ \rho {v_1}^2$$

$$=$$

$$p_2 + \rho g y_2 + 1/2\ \rho {v_2}^2$$

Q13.4

An incompressible fluid flows through a pipe of varying radius (shown in cross-section). Compared to the fluid at point *P*, the fluid at point *Q* has



Q. greater pressure and greater volume flow rate.

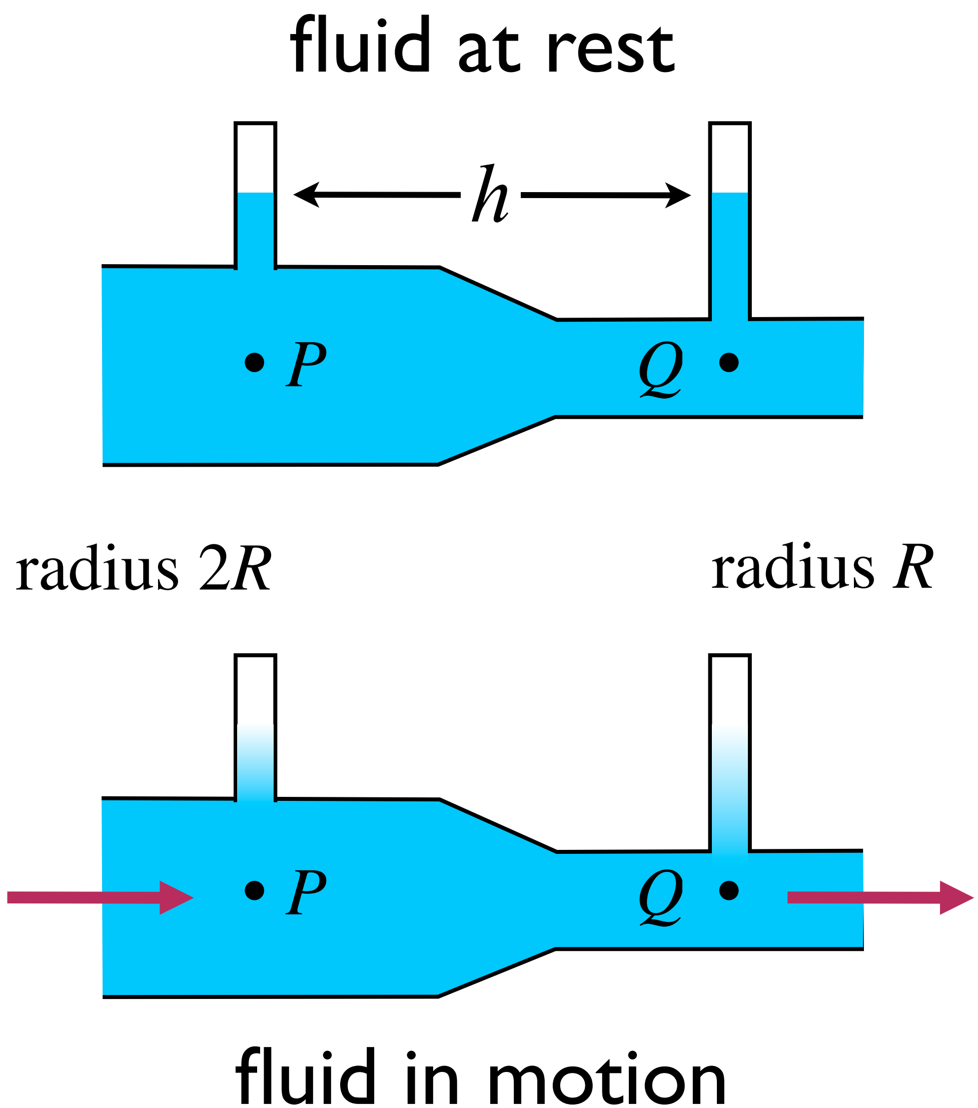
R. greater pressure and the same volume flow rate.

S. the same pressure and greater volume flow rate.

T. lower pressure and the same volume flow rate.

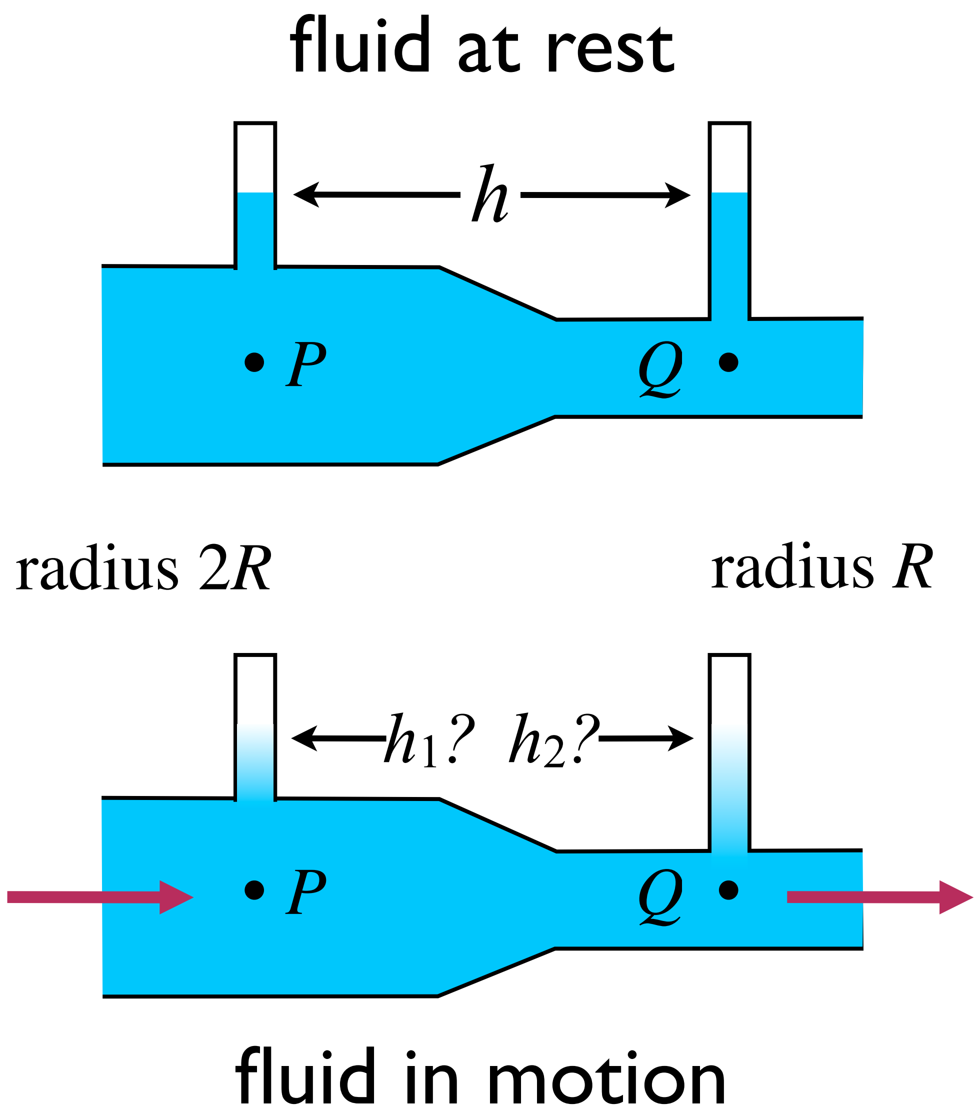
U. none of the above

Venturi meter



How does the pressure compare at points P & Q?

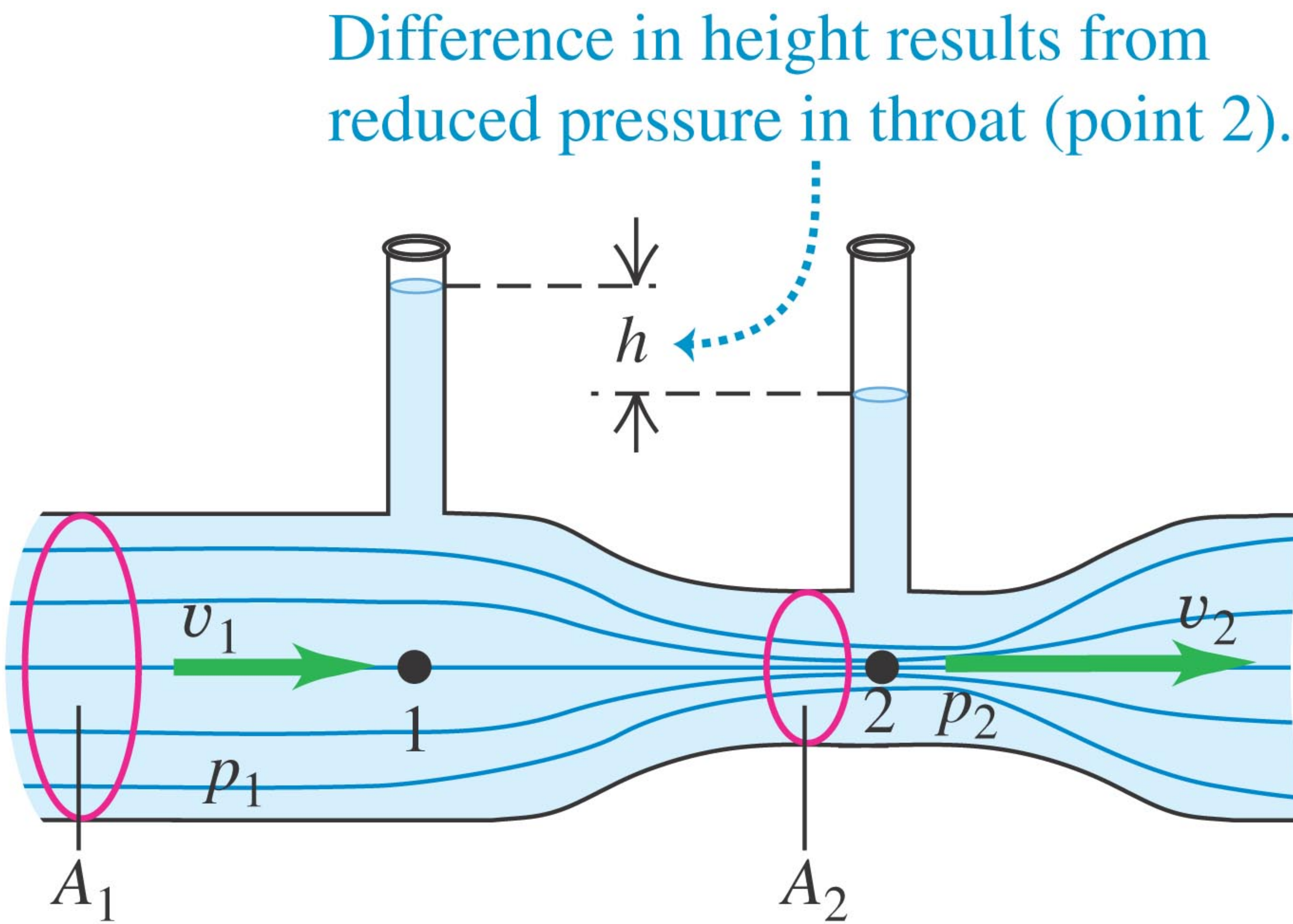
Venturi meter



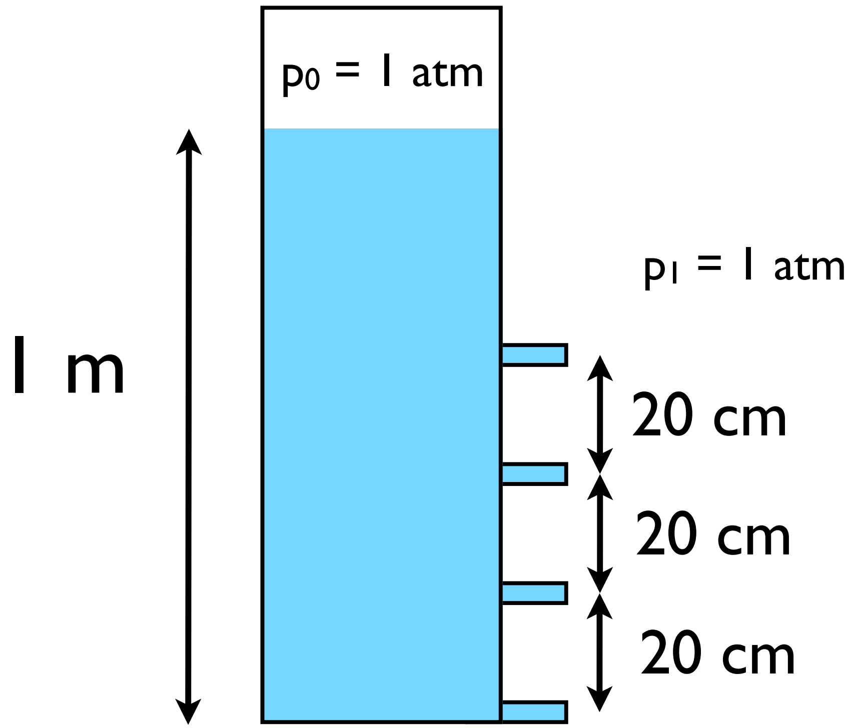
When the fluid is in motion,

1. $h_1 = h_2$
2. $h_1 < h_2$
3. $h_1 > h_2$
4. None of the above

The Venturi meter



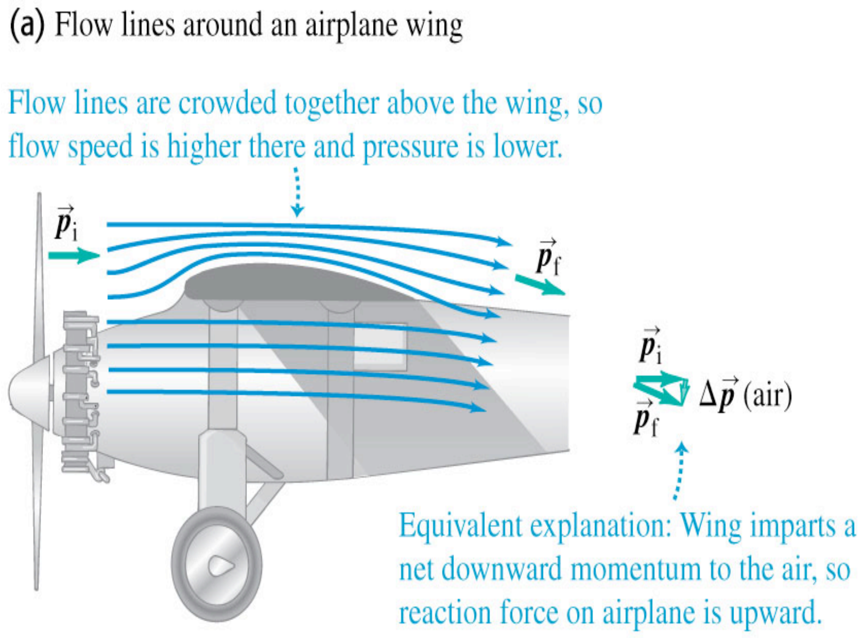
The Leaky Tower

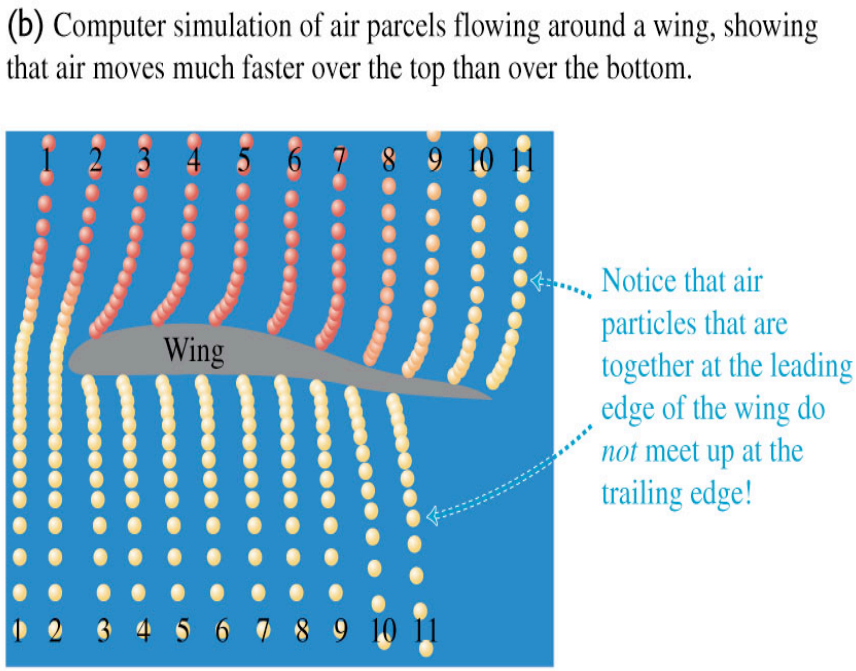


Each pipe has a diameter of 1 cm. At what speed will the water come out from each pipe?

Lift on an airplane wing

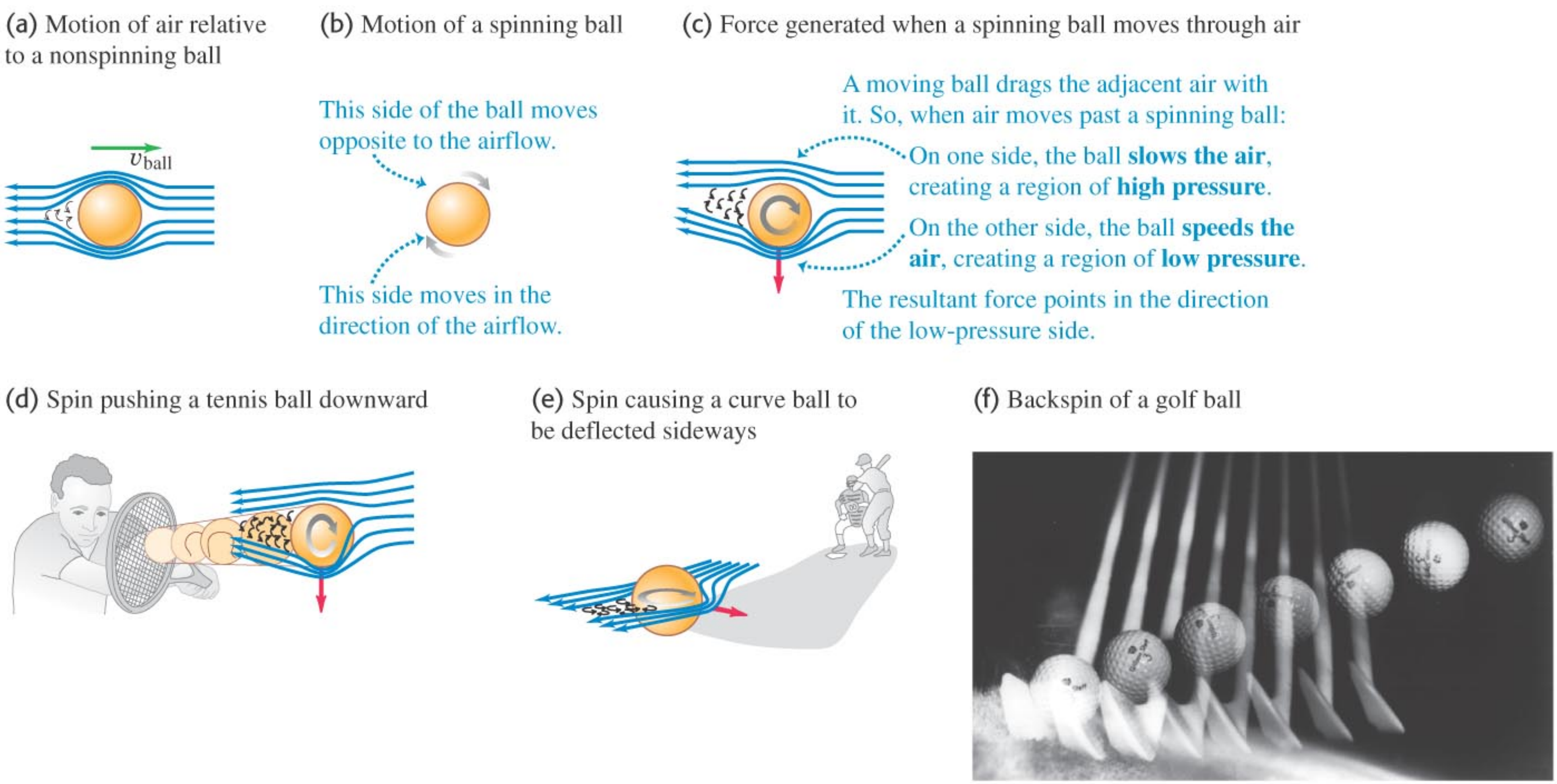
-





A curve ball (Bernoulli's equation applied to sports)

- Does a curve ball *really* curve? Follow Conceptual Example 12.11 and Figure 12.30 below to find out.



Video

Ch 13.1-3
Gravitation

PHYS 1210 - Prof. Jang-Condell

Chapter 13

Gravitation

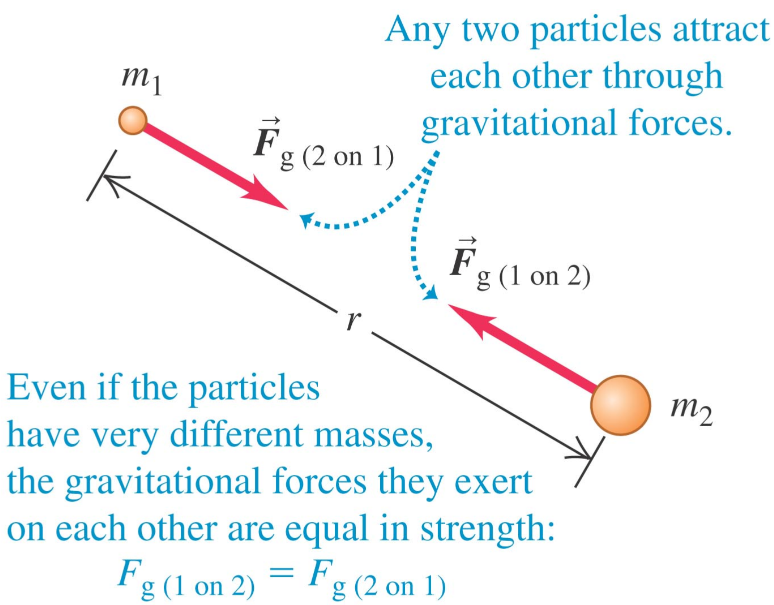
PowerPoint® Lectures for
University Physics, Thirteenth Edition
– Hugh D. Young and Roger A. Freedman

Lectures by Wayne Anderson

Goals for Chapter 13

- To calculate the gravitational forces that bodies exert on each other
- To relate weight to the gravitational force
- To use the generalized expression for gravitational potential energy
- To study the characteristics of circular orbits
- To investigate the laws governing planetary motion
- To look at the characteristics of black holes

Newton's Law of Gravitation



$$F_g = Gm_1m_2/r^2$$

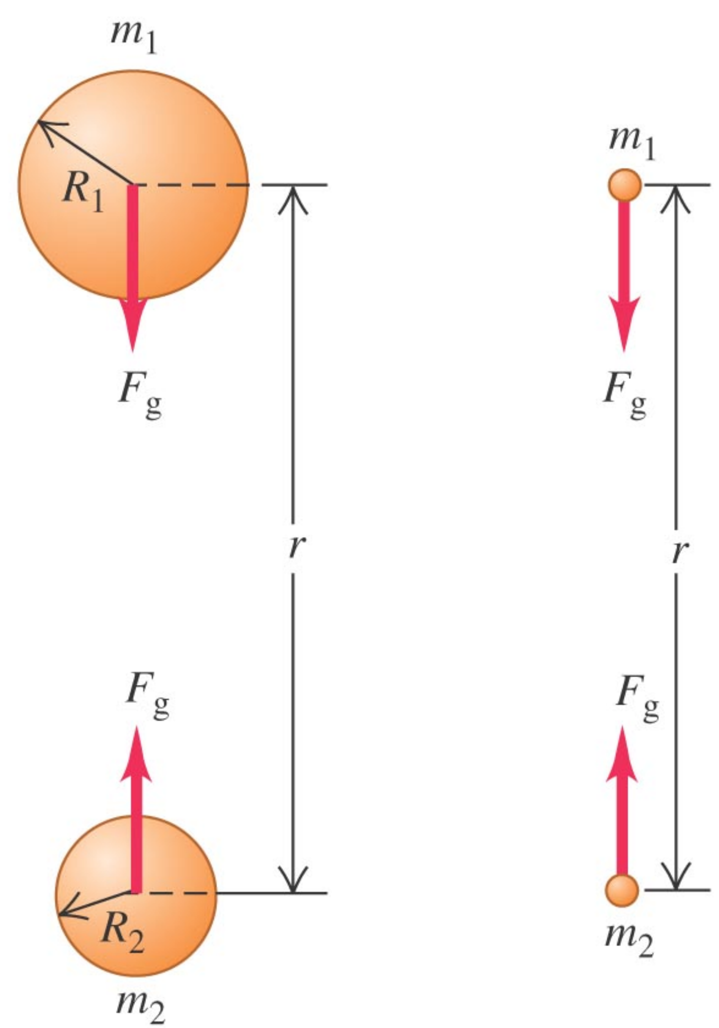
$$G = 6.67 \times 10^{-11}\ \text{N-m}^2/\text{kg}^2$$

Gravitation and spherically symmetric bodies

- The gravitational interaction of bodies having *spherically symmetric* mass distributions is the same as if all their mass were concentrated at their centers. (See Figure 13.2 at the right.)

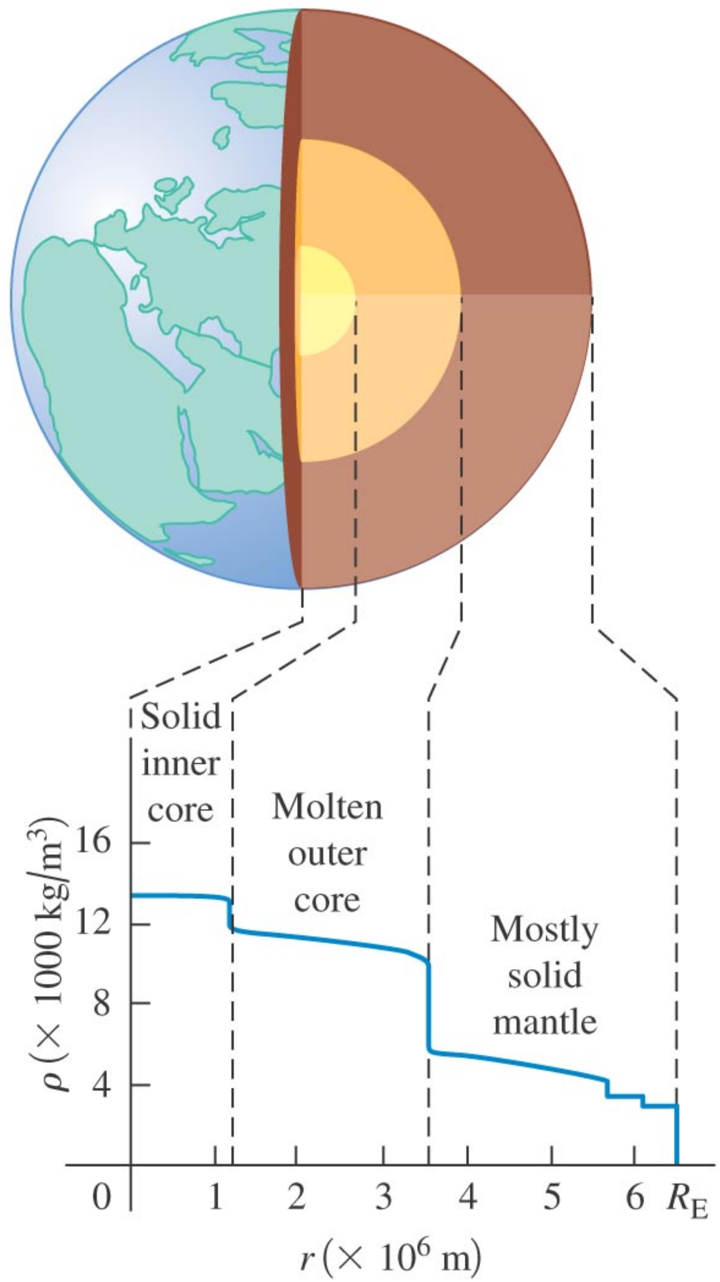
(a) The gravitational force between two spherically symmetric masses m_1 and m_2 ...

(b) ... is the same as if we concentrated all the mass of each sphere at the sphere's center.



Interior of the earth

- The earth is approximately spherically symmetric, but it is *not* uniform throughout its volume, as shown in Figure 13.9 at the right.



Q14.1

The mass of the Moon is 1/81 of the mass of the Earth.

Compared to the gravitational force that the Earth exerts on the Moon, the gravitational force that the Moon exerts on the Earth is

F. $81^2 = 6561$ times greater.

G. 81 times greater.

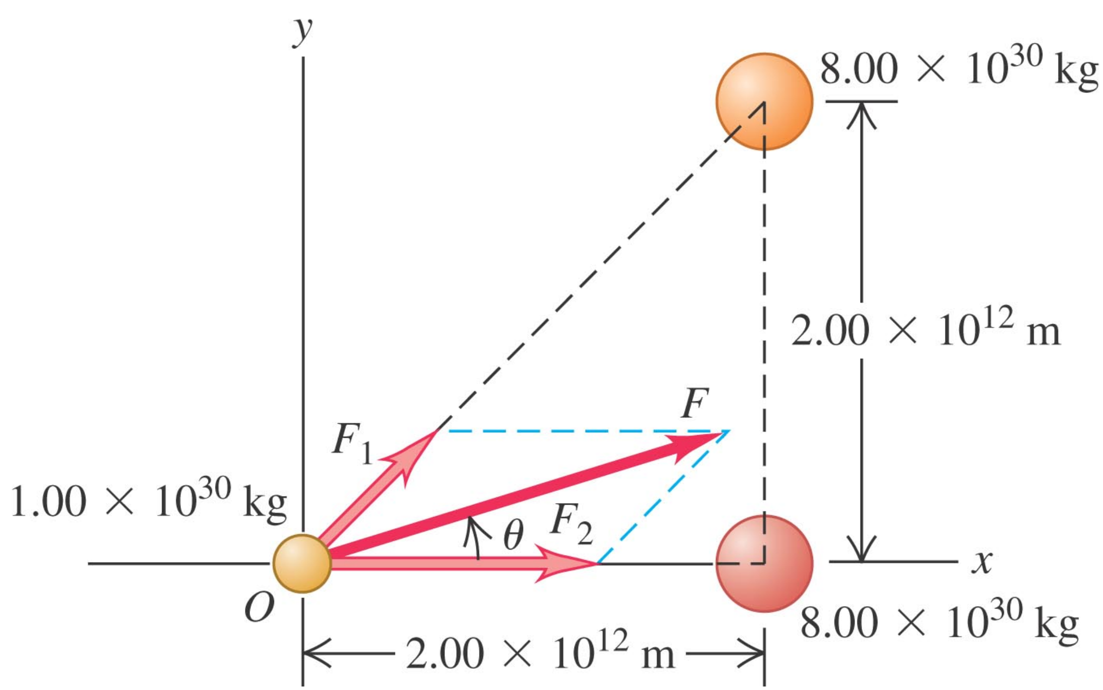
H. equally strong.

I. 1/81 as great.

J. $(1/81)^2 = 1/6561$ as great.

Some gravitational calculations

- Example 13.1 shows how to calculate the gravitational force between two masses.
- Example 13.2 shows the acceleration due to gravitational force.
- Example 13.3 illustrates the *superposition of forces*, meaning that gravitational forces combine vectorially. (See Figure 13.5 below.)



Weight

- The **weight** of a body is the total gravitational force exerted on it by all other bodies in the universe.
- At the surface of the Earth, the gravitational force of the Earth dominates. So a body's weight is

$$w = Gm_E m/R_E^2$$

- The acceleration due to gravity at the earth's surface is

$$g = Gm_E/R_E^2$$