

# PHY 107

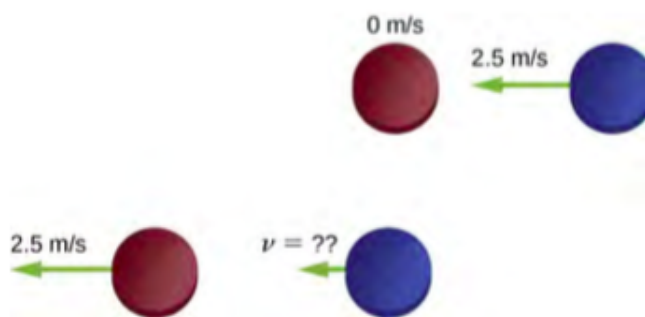
## Sample problems

### Problem 1

- Define **impulse** (in words). [2]
- A 1.2 kg ball drops vertically onto a floor, hitting with a speed of 25 m/s. It rebounds with an initial speed of 10 m/s. (a) What impulse acts on the ball during the contact? (b) If the ball is in contact with the floor for 0.020 s, what is the magnitude of the average force on the floor from the ball ? [2+2]

### Problem 2

- State **Conservation of Linear Momentum**. [3]
- Two particles of identical mass are on a flat, horizontal surface. The red particle is stationary; the blue particle is moving at 2.5 m/s to the left. It collides with the motionless red particle. The particles have a mass of 15 g. After the collision, the red particle is moving at 2.5 m/s, to the left. What is the final velocity of the blue particle? [3]



### Problem 3

- What is the difference between an **elastic** and an **inelastic collision**? [2]
- A cart with mass 340 g moving on a frictionless linear air track at an initial speed of 1.2 m/s undergoes an elastic collision with an initially stationary cart of unknown mass. After the collision, the first cart continues in its original direction at 0.66 m/s. (a) What is the mass of the second cart? (b) What is its speed after impact? (c) What is the speed of the two-cart center of mass? [2+2+2]

### Problem 4

Watch the video in the link below

<https://www.youtube.com/watch?v=4amzCq35t-I&t=21s>

.. and then answer the following questions.

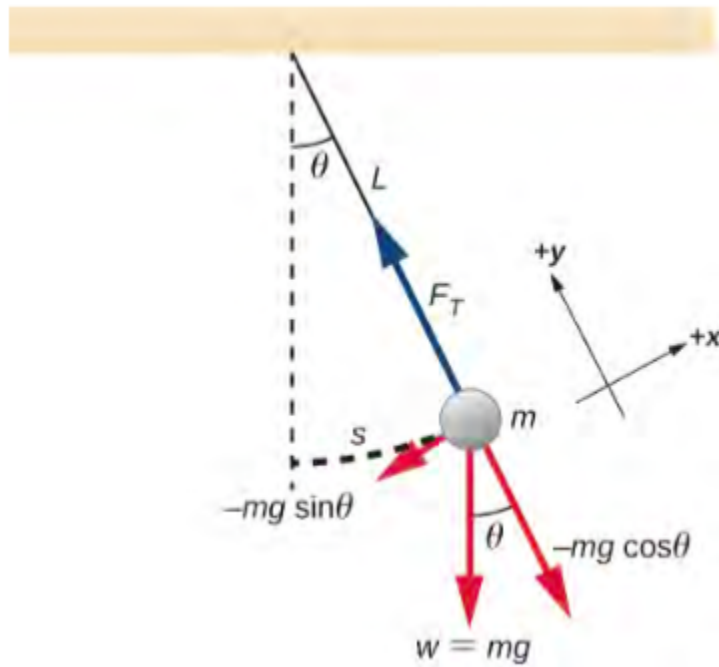
- What is the governing equation of **Simple Harmonic Motion**? [1]
- The function  $x = (6.0 \text{ m}) \cos[(3\pi \text{ rad/s})t + \pi/3 \text{ rad}]$  gives the simple harmonic motion of a body. At  $t = 2.0 \text{ s}$ , what are the (a) displacement, (b) velocity, (c) acceleration, and (d) phase of the motion? Also, what are the (e) frequency and (f) period of the motion? [2 × 6 = 12]

### Problem 5

The diagram below is a **simple pendulum**. The period of a simple pendulum depends on its length and the acceleration due to gravity.

$$T = 2\pi\sqrt{\frac{L}{g}}$$

The period is completely independent of other factors, such as mass and the maximum displacement.



What is the value of  $g$  in a region where a simple pendulum having a length 75.000 cm has a period of 1.7357 s? [3]