PHYS-360 Quiz 2

# Rules and Guidlines

You are free to use ***all*** resources at your disposal—such as notes, websites, Wikipedia, and google searches—except for interacting in real time with live people, including via email, chat, and message board.

I have provided files for Vec2.py, particle.py, and circle.py. Copy into this directory your file for force.py. (Please copy it in and don’t just add it as a content root.)

Open the file bubbles.py. The file as-is creates an initial random setup of colorful bubbles. The circles initially have no interaction with one another or the medium.

1. [4] Add the necessary force list and for loops so that forces can be applied to the bubbles.
2. [7] Create a pair force with the following functional form:

where ( = 200, are the circles’ radii), , and the difference of position vectors. (Note that this force has both attractive and repulsive terms.) The bubbles will attract and partially overlap, but they will not coalesce nicely without the drag force in the next step.

1. [5] Add a linear (viscous) drag force to apply to each bubble, , where , and is the radius of the bubble. With all steps up to this done correctly, the bubbles will attract and coalesce nicely.
2. Add a force field that is active only when the mouse button is held down. This simulates blowing onto the bubbles. The bubbles will be pushed away from your mouse arrow, when the button is held down.
   1. [1] Use a state-check to test if the mouse button is being held down during that timestep.
   2. [3] Apply the following blowing force to each bubble if the mouse button is held down:  
      where 1e4 and is the displacement from the mouse position to the bubble’s center.