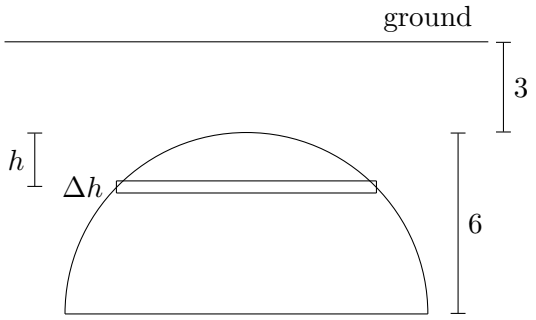
8. [15 points] A town's local cheese dispensary has a cheese tank that is located 3 meters below ground level. The cheese tank is in the shape of a **hemisphere with radius 6 meters**. The diagram below shows a cross-section of the tank below the ground.
Assume that the density of the cheese in the tank is given by the function $\delta(h)$ (measured in kilograms per cubic meter), where h is measured in meters from the **top of the tank**. You may assume that the acceleration due to gravity is $g = 9.8\text{m/s}^2$.



a. [5 points] Consider a horizontal slice of cheese, h meters from the top of the tank with a small thickness of Δh meters, as depicted in the diagram above. Write an expression which approximates the mass of this slice as a function of h. Your answer may include $\delta(h)$. Your answer should not involve any integrals. Include units.

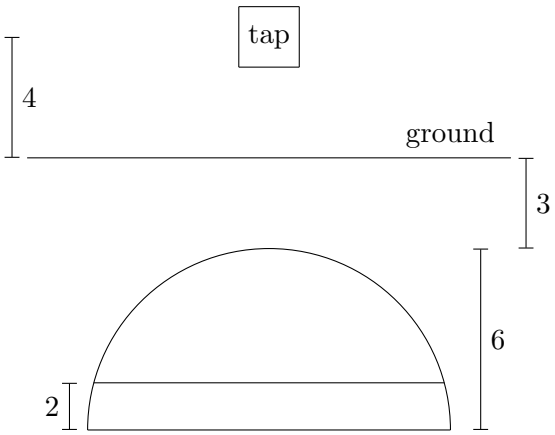
Answer: _____ **Units:** _____

b. [5 points] Assume that the tank is entirely filled with cheese. Write an expression involving one or more integrals that gives the work done to pump all the cheese in the tank up to ground level. Your answer may include $\delta(h)$. Do not evaluate your integral(s). Include units.

Answer: _____ **Units:** _____

8. (continued)

c. [5 points] Now assume that the tank is only filled up to a depth of 2 meters with cheese. The dispensary has a tap to the tank that is located 4 meters above ground level. The diagram below depicts the tank of cheese and the position of the tap. Write an expression involving one or more integrals that gives the work done to pump all the cheese in the tank up to the tap. Your answer may involve $\delta(h)$. Do not evaluate your integral(s). Include units.



Answer: _____ **Units:** _____