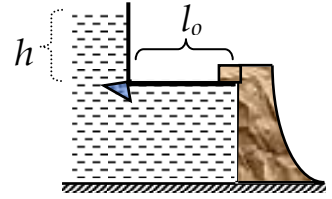


Physics Problems August-2010

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- Q1. Consider the figure showing a dam wall with an L type safety gate valve mechanism which can rotate about a horizontal axis perpendicular to the plane of the figure. The width of the horizontal portion of the gate is l_0 . Find the height of the water level in the dam at which the gate valve opens on its own to release the excess water.



- Q2. A brick is thrown from ground level, at an angle θ with respect to the horizontal. Assume that the long face of the brick remains parallel to the ground at all times, and that there is no deformation in the ground or the brick when the brick hits the ground. If the coefficient of friction between the brick and the ground is μ , what should θ be so that the brick stops, on the ground, as far as possible from the point of throw?
- Q3. A uniform slender rod of mass m_0 has a length l_0 at a temperature T_0 . Its coefficient of linear expansion is given as $\alpha = bT$ and its specific heat capacity is given to be $c = a/T$ where a and b are suitable physical constants. If the rod is given a total heat energy of ΔQ uniformly over its volume, then find its new length.
- Q4. Find the molar heat capacity of an ideal mono-atomic gas if put in the left portion of the smooth piston-cylinder arrangement shown in the figure. The right portion is empty (*vacuum*) and the ideal spring undeformed when the piston touches the left wall of the cylinder.

