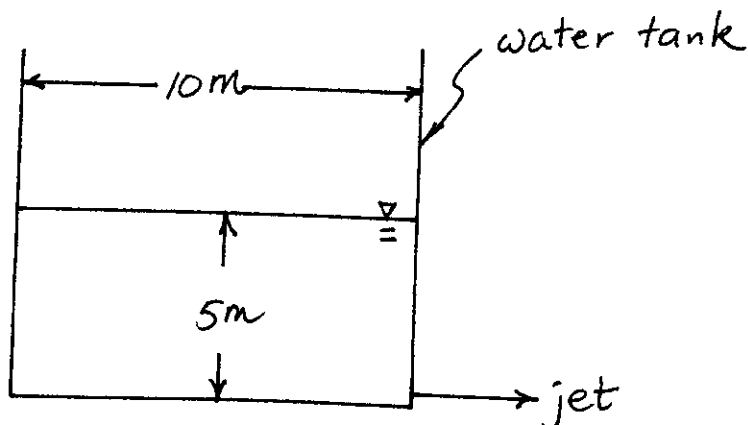


本試題是否可以使用計算機:  可使用,  不可使用 (請命題老師勾選)

1. (20%) Consider an electronic device with the resistance  $1\text{K}\Omega$ , whose operating current should be less than  $1\text{mA}$ , otherwise it is at the risk of burned-out. If you have a battery of  $1.5\text{Volts}$  and a resistor with variable resistance of  $0\text{-}10\text{K}\Omega$ , how would you connect the battery, the electronic device and the resistor together in order to make the electronic device work? What is the resistance value you will set on the variable resistance? Make a circuit diagram to explain your answer.

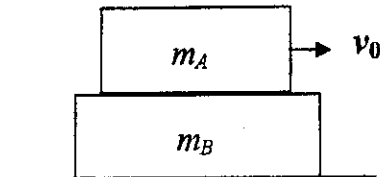
2. (20%) Consider a water tank  $10\text{m}$  in diameter, in which water is filled. Near the bottom, this is a small opening  $1\text{mm}$  in diameter which causes a water jet discharged from the tank. See the figure for this configuration. Estimate the velocity of the water jet when the water level in the tank is at  $5\text{m}$  from the bottom.



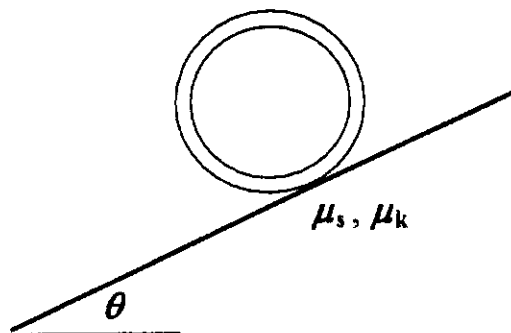
(背面仍有題目,請繼續作答)

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

- 3 (20%) Block  $A$  can slide relative to block  $B$ , which can slide on a perfectly smooth horizontal plane as shown. If block  $A$  is given an initial velocity  $v_0$ , find the final velocities of the two blocks and the distance that  $A$  slides relative to  $B$ . Assume that the coefficient of sliding friction between  $A$  and  $B$  is  $\mu$  and  $A$  always stays on  $B$ .



4. (20%) A ring of mass  $m$  and radius  $r$  is released from rest on a slope with an inclined angle  $\theta$  from the horizontal surface. If the coefficients of static and kinetic friction are  $\mu_s$  and  $\mu_k$  respectively, determine the angular acceleration  $\alpha$  of the ring.



本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

5. (20%) List the differences of (a) the main components and (b) the flight regime between the turbojet and ramjet engines. What are the advantages and disadvantages of the use of turbojet engine, as compared to the use of ramjet engine, in the design of a flight vehicle?