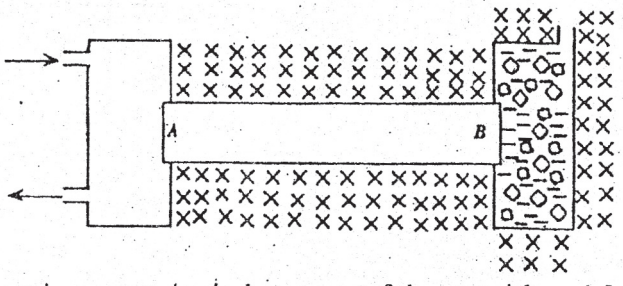
2. Figure shows a uniform metal rod AB of length 50 cm whose one end, *A*, is maintained at 100 ^{0}C and the other end, B, is in contact with a water-ice mixture at 0 ^{0}C. The cross-sectional area of the rod is 0.5 cm^{2} and it is well lagged. You can assume that there is no heat transfer with the surroundings.



(a) (i) What is the most important physical property of the material used for the lagging? *(one line)*
(ii) Liquids are generally not used for lagging. What is the main reason for this? *(one line)*

(b) Draw rough sketches of the temperature variations along the rod,
(i) at any instant before reaching the steady state.
(ii) in the steady state.

(c) What is the temperature gradient along the rod, in the steady state? *(one line)*

(d) If the rate of melting of ice in the steady state is 0.01 kg s^{-1} , find the rate of heat flow through the rod. (specific latent heat of fusion of ice = 3 x 10^{5} J kg^{-1}) *(one line)*

(e) Calculate the thermal conductivity of the material of the rod. *(2 lines)*

(f) After sometime the ice gets completely melted. If you wait long enough will the water boil? Explain your answer. *(2 lines)*