

1994 A/L Structured Essay Question No (01)

1. (a) What is the basic cause for surface tension phenomenon observed in liquids? *(one line)*
- (b) (i) If you are given a suitable capillary tube, what is the essential equipment needed to determine the surface tension of water using the capillary rise method? *(one line)*  
(ii) Write down an expression for the surface tension of water,  $T$ , in terms of the capillary rise,  $h$ , radius of the capillary,  $r$ , density of water,  $\rho$ , and the acceleration due to gravity,  $g$ . (Assume the angle of contact to be zero.) *( 2 lines )*  
(iii) When this experiment was performed by students in a class using capillary tubes with same radius and identical set of apparatus, the heights  $h$  obtained by some students seemed to be very different. What is the main cause for this? *(one line)*  
(iv) To overcome this discrepancies certain experimental procedure should have been adopted correctly. Give the steps of this procedure. *( 3 lines )*
- (c) In such an experiment when the capillary tube is withdrawn from water and held vertically, a small column of water is found to remain at the bottom of the tube. Will the radius of the lower meniscus of this water column be same as that of the upper meniscus ? Explain your answer. *( 2 lines )*
- (d) When the capillary tube is held horizontally and water from a constant pressure head is connected to one end of the tube, water is found to flow out of the other end very slowly.  
(i) What property of the water determines the rate of flow? *(one line)*  
(ii) To determine the above property of water, the radius of the tube has to be measured very accurately. What is the other reason for this, apart from radius being small? *( 2 lines )*  
(iii) For the same reason as in d(ii) above the tube must be of uniform bore. How would you check whether the given tube is of uniform bore? *( 3 lines )*