Q1: What is the phenomenon of capillary condensation?

A1: Capillary condensation is the "process by which multilayer adsorption from the vapor into a porous medium proceeds to the point at which pore spaces become filled with condensed liquid from the vapor. The unique aspect of capillary condensation is that vapor condensation occurs below the saturation vapor pressure, P_{sat}, of the pure liquid. This result is due to an increased number of van der Waals interactions between vapor phase molecules inside the confined space of a capillary. Once condensation has occurred, a meniscus immediately forms at the liquid-vapor interface which allows for equilibrium below the saturation vapor pressure.

Q2: Why there is occurrence of hysteresis loop in adsorption isotherm?

A2: Above relative pressures of about 0.2. porous adsorbents desorb a larger quantity of vapour at a given relative pressure than that corresponding to adsorption. Several explanations have been proposed to account for such hysteresis. It was assumed that during adsorption the vapour does not completely wet the walls of the adsorbent capillaries because an impurity, such as air, may be permanently adsorbed on the walls. Raising the pressure displaces any impurities until, at the saturated vapour pressure of the adsorbate, complete wetting takes place. On desorption, the angle of contact in the Kelvin equation is thus zero. Hence, for a given volume adsorbed, the pressure Pa on adsorption is greater than that on desorption $P_{d.}$

Q3: How pore volume of the catalyst can be determined by the helium-Mercury method ?

A3: The pore volume of the catalyst can be determined by the helium-Mercury method. The volume of Mercury and Helium displaced by the catalyst is used to measure the pore volume of the catalyst. Since mercury cannot pass through the pores of the catalyst , the difference in the volume gives the pore volume.

- $V_{mercury}$ => external volume of solid, $V_{He\ =}$ pore vol+soild vol.
- Pore volume Vg = $(V_{mercury} – V_{Helium})$/(Mass of catalyst)
- Porosity= e= $1/\rho p - 1/\rho S = \rho p\ Vg$