1. Define Glomerular Filtration Rate (GFR).
Solution: The amount of filtrate formed by the kidneys per minute is called glomerular filtration rate (GFR). It is approximately 125 mL/min. in a healthy person.

2. Explain the autoregulatory mechanism of GFR.
Solution: The kidneys have built-in mechanisms for the regulation of glomerular filtration rate. One such efficient mechanism is carried out by juxta glomerular apparatus (JGA). JGA is a special sensitive region formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contact. A fall in GFR can activate the JG cells to release renin which can stimulate the glomerular blood flow and thereby the GFR back to normal.

3. Indicate whether the following statements are true or false.
(a) Micturition is carried out by a reflex.
(b) ADH helps in water elimination, making the urine hypotonic.
(c) Protein-free fluid is filtered from blood plasma into the Bowman's capsule.
(d) Henle's loop plays an important role in concentrating the urine.
(e) Glucose is actively reabsorbed in the proximal convoluted tubule.
Solution:
(a) True
(b) False
(c) True
(d) True
(e) True

4. Give a brief account of the counter current mechanism.
Solution. The kidneys have a special mechanism for concentrating the urine, it is called counter current mechanism. The mechanism is said to be a counter current mechanism because the out flow (in the ascending limb) of Henle's loop runs parallel to and in the opposite direction of the inflow (in the descending limb) and vasa recta. As the mechanism begins to function, the ascending limb of loop of Henle actively transports chloride and sodium ions out into the vasa recta from where it is secreted into the interstitial fluid. As a result the interstitial fluid around the loop of Henle contains large quantities of NaCl. The filtrate passes from the ascending limb of loop of Henle and enters a collecting duct. The collecting duct passes adjacent to the loop of Henle where the interstitial fluid contains large amounts of NaCl. The high osmotic pressure created by NaCl causes water to diffuse out of the collecting duct in the interstitial fluid and eventually to the blood of vasa recta. The filtrate becomes greatly concentrated and is now called urine. A similar counter current mechanism, operates between the interstitial fluid and blood passing through the vasa recta. As the blood capillary runs along the ascending limb of loop of Henle, NaCl diffuses out of the blood. The direction is reversed as the blood capillary passes along the descending limb of Henle. The blood flows in the vasa recta around the loop of Henle from ascending to the descending side while the fluid passing through the loop of Henle goes in the opposite direction. The arrangement helps to maintain the concentration gradient of NaCl. The overall

function of counter current mechanism is to concentrate sodium chloride in the interstitial fluid and thereby cause water to diffuse out of the collecting ducts and concentrate the urine.

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