

More Kidney PPQs – answers

2.

Increased

Hypothalamus

Pituitary body/gland

Collecting duct (and distal convoluted tubule)

More permeable

Reabsorbed

Concentrated

2. a)

Sweating increase / exercise increase / less fluid intake / increased salt intake

b) i)

Makes walls of the collecting ducts and distal convoluted tubules more permeable to water, therefore more water is reabsorbed into the blood

ii) The volume would decrease and the concentration would increase

c)

- Osmoreceptors in the hypothalamus of the brain detect the change in blood water content
- Negative feedback mechanism is in operation
- Less ADH is released
- DCT and collecting ducts become less permeable to water so less is reabsorbed into the blood and the blood water content decreases

7. a)

- The difference in width of the afferent and efferent arterioles in the glomerulus cause an increased hydrostatic pressure in the glomeruli capillaries
- This is also caused by the close proximity of the renal arteries to the aorta and heart and due to the coiling nature of the capillaries within the glomerulus
- The pressure forces plasma, with its dissolved substances e.g. amino acids, glucose, water, salts and urea, as well as very small proteins out and into the Bowman's capsule
- Through the capillary walls made of squamous endothelial cells with pores between them, the effective filter of the basement membrane and through the foot like processes of the Bowman's capsule wall called podocytes, which have spaces between them

b)

Some is reabsorbed by facilitated diffusion along a concentration gradient and the rest is actively transported back into the blood by carrier proteins against a concentration gradient using ATP

This occurs in the proximal convoluted tubule

c) i)

125 divided by 700 then multiplied by 100 = 17.86% / 18%

ii)

- Less filtrate because water is reabsorbed
- In the PCT by osmosis as glucose and amino acids are actively moved out of the PCT
- Some water out of the descending limb of the Loop of Henle due to the pumping of salt ions out of the descending limb
- In the collecting duct as the medulla is more hypertonic due to the action of the loop of Henle and also the action of ADH

5 a)

A = Bowman's capsule

B = Proximal convoluted tubule

C = Collecting duct

b) i)

Ultrafiltration

ii)

Top left (wider lumen)

iii)

Increase the rate of filtration due to the increased pressure from the blood flow (creates more of differential between the lumens of the afferent and efferent arterioles)

c)

i)

X = intense purple i.e. the true result for protein in the plasma

Y = very pale purple i.e. most protein too big to pass through the basement membrane but amino acids and very small proteins can cross over and cause a slightly positive result

ii)

All glucose is reabsorbed in the PCT so therefore none is present in sample Z

iii)

Slightly positive result for sugar as the active transport of glucose from the PCT into the blood is slowed due to the lower metabolic rate of these cells

Less respiration so less ATP available due to the lower temperature (lower kinetic energy of reacting molecules and proteins)

Slightly positive result for proteins as pinocytosis is also reduced as the temperature affects the fluidity of the membrane and its ability to surround the small proteins

a)

i) Fluid forced out of glomerulus due to high hydrostatic pressure of blood caused by

- Close proximity of renal artery to aorta and heart
- Wider lumen of the afferent arteriole compared to the efferent arteriole
- Coiled nature of the capillaries

The squamous endothelium of the capillary and the inner wall of the capsule (podocytes) are porous

Basement membrane between the two is the effective filter of the blood plasma

ii)

The filtrate has no proteins present as they are too large to pass through the effective filter of the basement membrane

b)

i)

Glucose is selectively reabsorbed in the proximal convoluted tubule by facilitated diffusion and active transport, therefore none is present at region C, the end of the proximal convoluted tubule

ii)

The urea becomes concentrated as fluid passes along the regions of the nephron; as water is reabsorbed into the blood plasma