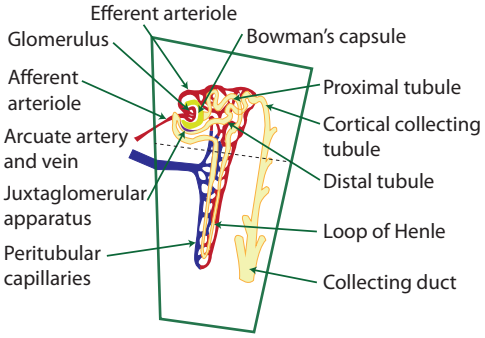
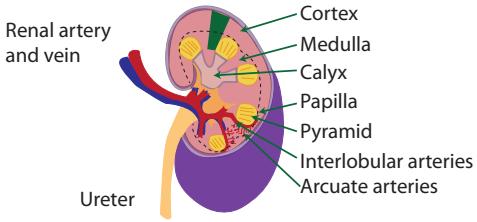
Second 2010
VIVA 8

Draw, and label, the structure of the Nephron, including the circulation. Most candidates had some level of knowledge of the renal circulation, but lacked depth in understanding how anatomy relates to function, blood oxygen tension within the kidney, autoregulation and graphically representing GFR and it's determinates.

"Please draw a picture of the nephron and label it"





"Describe the functional anatomy of the renal blood flow and how it is regulated"

consists of two capillary beds in series, as such it is a portal blood system
renal medulla blood supply is via the vasa recta which is important in setting up the counter current m.

intrinsically

demonstrates autoregulation

flow = change in pressure/resistance
when the pressure changes the kidney alters resistance via local myogenic mechanisms
maintains a relatively stable flow between 60 -160mmHg MAP

is under local metabolic control

via tubuloglomerular feedback
the macula densa cells sense a decrease in sodium delivery, release adenosine
efferent arteriolar constriction occurs which increases GFR and decreases renal blood flow

extrinsically

is under systemic hormonal control via the RAAS
is under sympathetic control via the afferent and efferent arteriolar tone

"What is the glomerular filtration rate?"

Glomerular filtration rate is a measure of the amount of plasma filtered at the glomerulus per unit time
Normal daily filtration is 180L/day (20% of renal blood flow - the filtration fraction)

is a product of the filtration co-efficient and the net starling forces.
the filtration coefficient is a marker of permiability glomerular permiability
net starling forces are a balance between
hydrostatic pressure which is elevated due to the cappillary beds in series
oncotic pressure which is almost zero in bowmans capsule due to the lack of filtered protiens.

"Define renal clearance and demonstrate how it may be used to calculate GFR"

Renal clearance is the volume of plasma completely cleared of a substance per unit time

clearance = (urine concentration)volume/plasma concentration C = UV/P

GFR = clearance if the substance is not reabsorbed along the tubule
inulin is a plant polysaccaride and is most accurate but problematic due to steady state requirements
serum creatinine may be used as an alternative

most accurate to collect urine and use the above formula to assess creatinine clearance
because serum creatinine it is at steady state, eGFR can be calculated by Cockroff-Gault