

- (a) $2\text{NH}_3 + \text{CO}_2 \rightarrow \text{CO}(\text{NH}_2)_2 + \text{H}_2\text{O}$
- (b) Occurs partly in the cytosol and partly in mitochondria (ATP is used)
- (4) Urea is both less soluble and less toxic than ammonia
- (5) Urea is released from the hepatocytes, into the blood, transported around the body and to the kidneys
- (6) In the kidneys, urea is filtered out of the blood and concentrated in urine
- (7) Urine stored in the bladder until it is released from the body via the urethra

v) *Describe the roles of the liver in detoxification*

- (1) Detoxification – conversion of toxic molecules to less toxic or non-toxic molecules
 - (a) Can be done via oxidation, reduction, methylation or a combination
 - (b) Liver detoxifies hydrogen peroxide using catalase to produce oxygen and water
 - (c) Liver can also detoxify ethanol – consumed rather than produced by the body

- (2) Mainly takes place in the SER in hepatocytes

- (a) Ethanol $\rightarrow$ ethanal by ethanol dehydrogenase
- (b) Ethanal $\rightarrow$ ethanoate ions (ethanoic acid) by aldehyde (ethanal) dehydrogenase
- (c) Acid combines with coenzyme A $\rightarrow$ acetyl coenzyme A
- (d) Ethanoic acid enters the Krebs Cycle to produce ATP

- (3) Ethanol is a good source of energy

- (4) But conversion of ethanol to ethanoic acid and Krebs Cycle need NAD to accept H^+ ions released

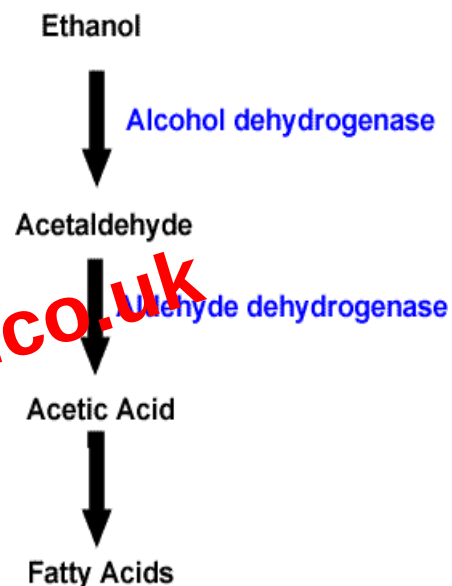
- (a) Too much alcohol = insufficient NAD to oxidise and break down fatty acids for respiration

- (b) Fatty acids accumulate

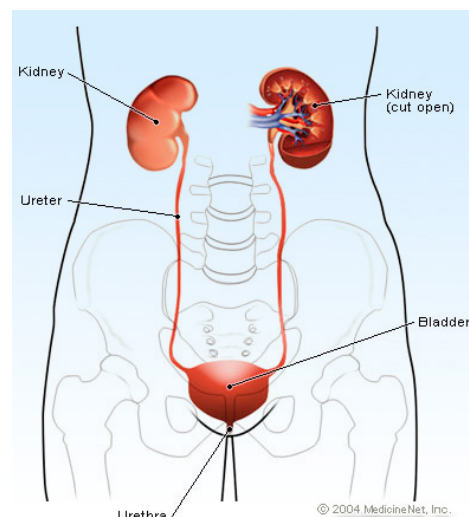
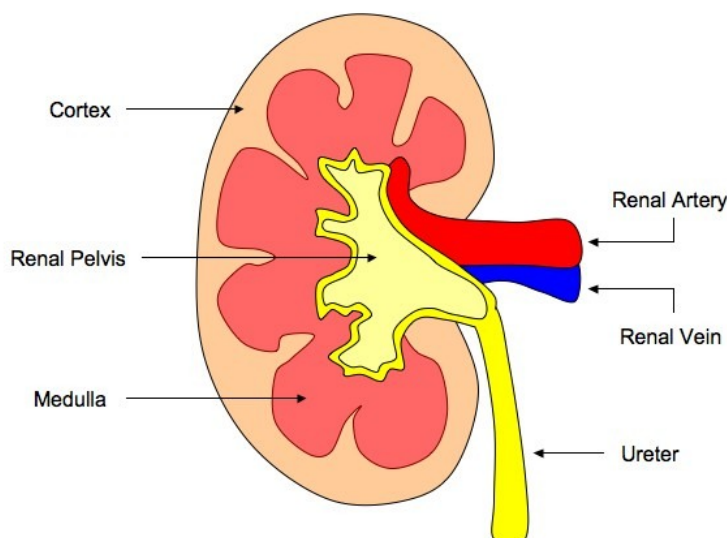
- (c) Fatty acids are converted back to lipids

- (d) Lipids deposited in the hepatocytes in the liver – enlarged, fatty liver

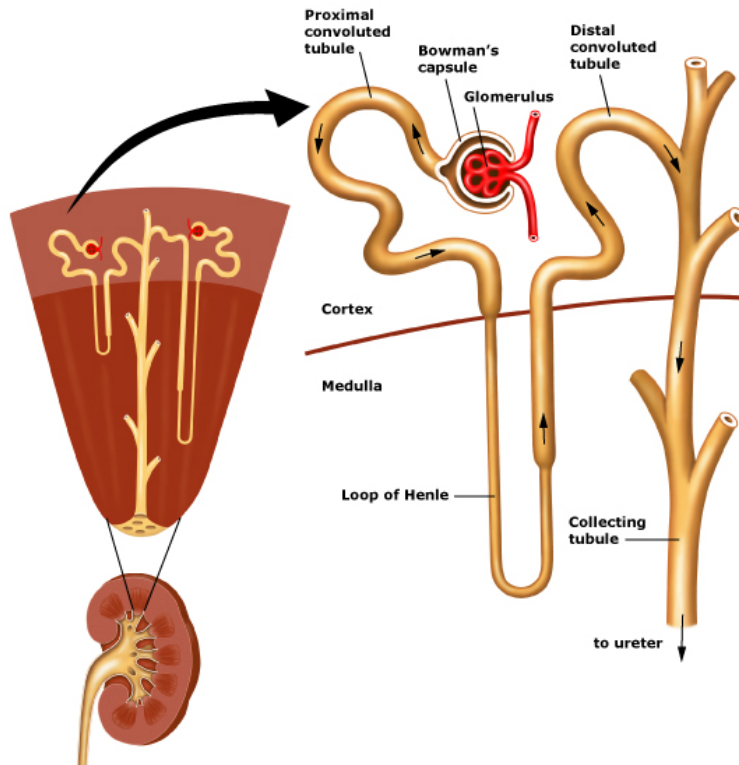
- (e) = Cirrhosis or alcohol-related hepatitis – result of enlarged liver due to excess fats



vi) *Describe, with the aid of diagrams and photographs, the histology and gross structure of the kidney*



- (ii) Ascending limb that carries blood back into the cortex
- (f) Venules – carry blood to the renal vein



(3) Key features of the nephron

- (a) Bowman's capsule – cup-shaped capsule which acts as the ultrafiltration unit
 - (i) Surrounds the glomerulus
 - (ii) Leads into the nephron
 - (iii) Filters blood by separating larger particles (stay in the blood vessels) from the smaller ones (pass into the nephron)
- (b) Proximal (closest to glomerulus) convoluted (bent and coiled) tube – site of selective re-absorption to ensure valuable substances are not lost in the urine
 - (i) 85% of fluid is selectively reabsorbed – all sugars, most salts and some water
- (c) Loop of Henle – countercurrent exchange mechanism that creates a low water potential in the medulla of the kidney so water is reabsorbed
 - (i) Descending limb – water potential of the fluid is decreased by the addition of salts and the removal of water
 - (ii) Ascending limb – water potential of the fluid is increased as salts are removed by active transport
- (d) Distal (furthest from the glomerulus) convoluted tube – concerned with osmoregulation as it varies the amount of water reabsorbed into the blood
- (e) Collecting duct – high water potential of fluid is decreased by the removal of water so the urine has a higher concentration of solutes than in blood/tissue fluid

viii) Describe and explain the production of urine, with reference to the processes of ultrafiltration and selective reabsorption