(a) \(2\text{NH}_3 + \text{CO}_2 \rightarrow \text{CO(NH}_2\text{)}_2 + \text{H}_2\text{O}\)

(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 oxidize 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
(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