

malpighian Tubule

11.3.2

Malpighian Tubule System
 carries out osmoregulation and nitrogenous waste removal in insects

cell wall

absorbs water + ions

the tubules empty into the gut

dehydrated uric acid paste is released with other waste

waste

uric acid

semisolid wastes

Na⁺ K⁺ some ions reabsorbed in hindgut and some water follows

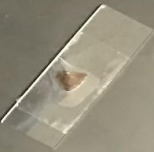
H₂O uric acid

midgut

tubules empty into hindgut

uric acid + ions transported in water follows via osmosis

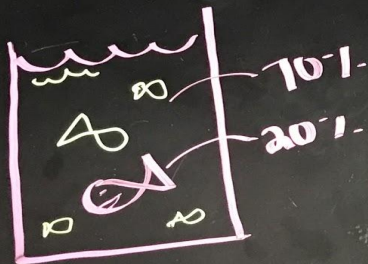
malpighian tubules



11.3.1

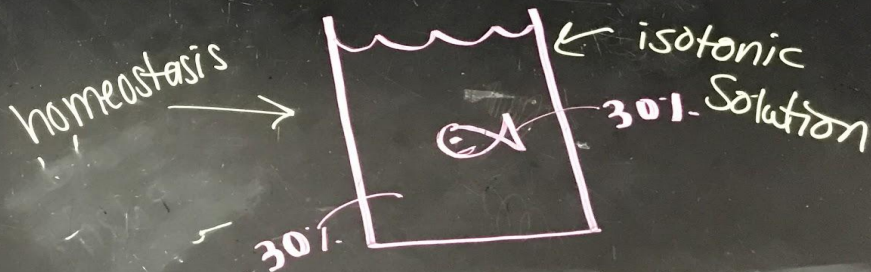
Animals are either osmoregulators or osmoconformers

↙
maintain a constant internal solute concentration



mammals are osmoregulators

↘
internal solute concentration tends to be the same as environment



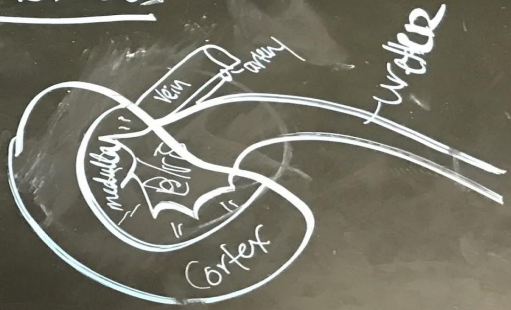
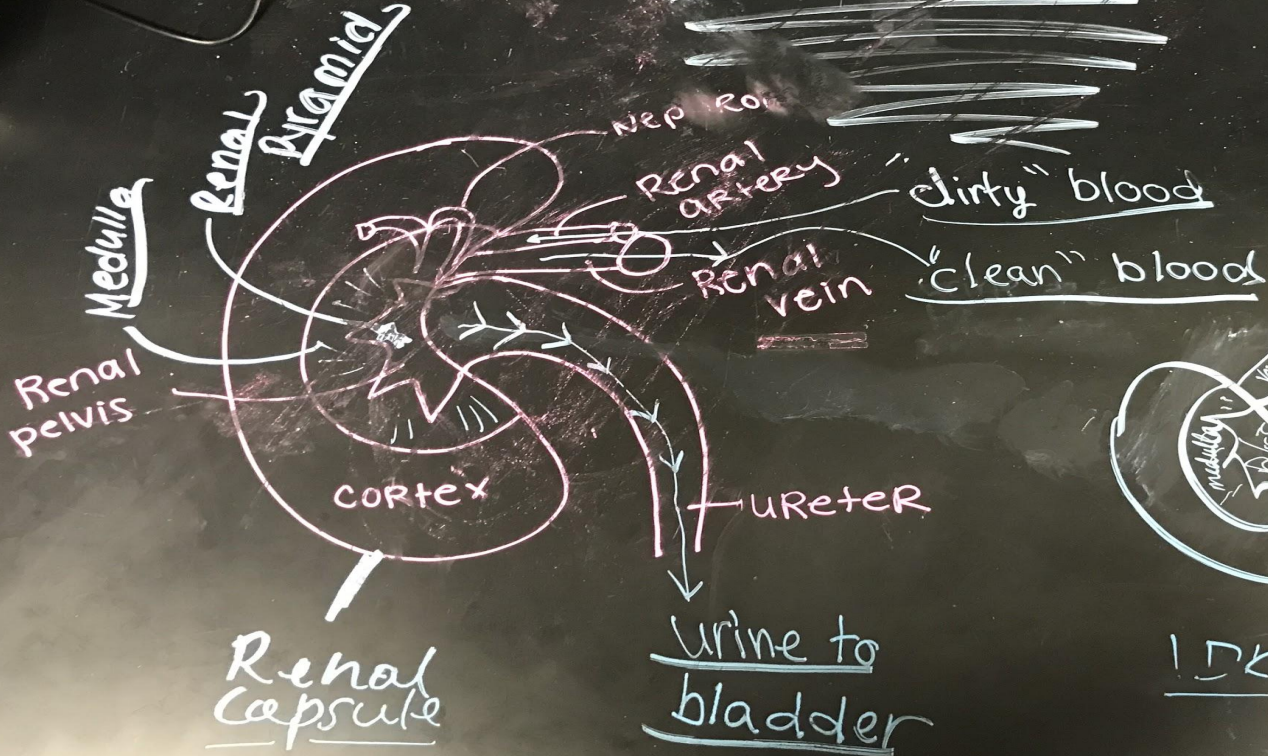
• most marine invertebrates are osmoconformers

• mostly saltwater animals

• have to survive in isotonic solutions to survive.

S 11.3.1

The Kidney



IDK

11.3.9 Types of Nitrogenous Wastes:

Ammonia

- The least concentrated.
- secreted by fish and amphibians.
- Easy to secrete in H_2O .



Urea

- slightly more concentrated
- mammals
- convert ammonia to urea
- More advanced evolution.



Uric Acid

- Most concentrated - to be lighter
- linked to adaptations for reproduction
- Birds and reptiles, insects
- Need to keep minimal amounts of H_2O .

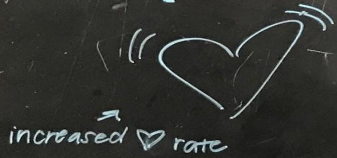
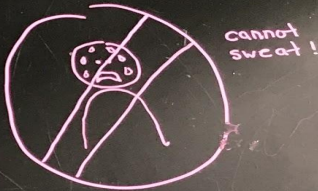


AW

A 11.3.2

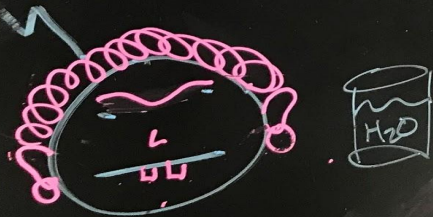
Dehydration

- darkened urine due to increased solute concentration
- tiredness + lethargy due to decreased efficiency of muscle function
- Blood Pressure fall + increased heart rate. Can lead to the disruption of metabolic processes. Body temp. may be affected because of an inability to sweat.
- death



Overhydration

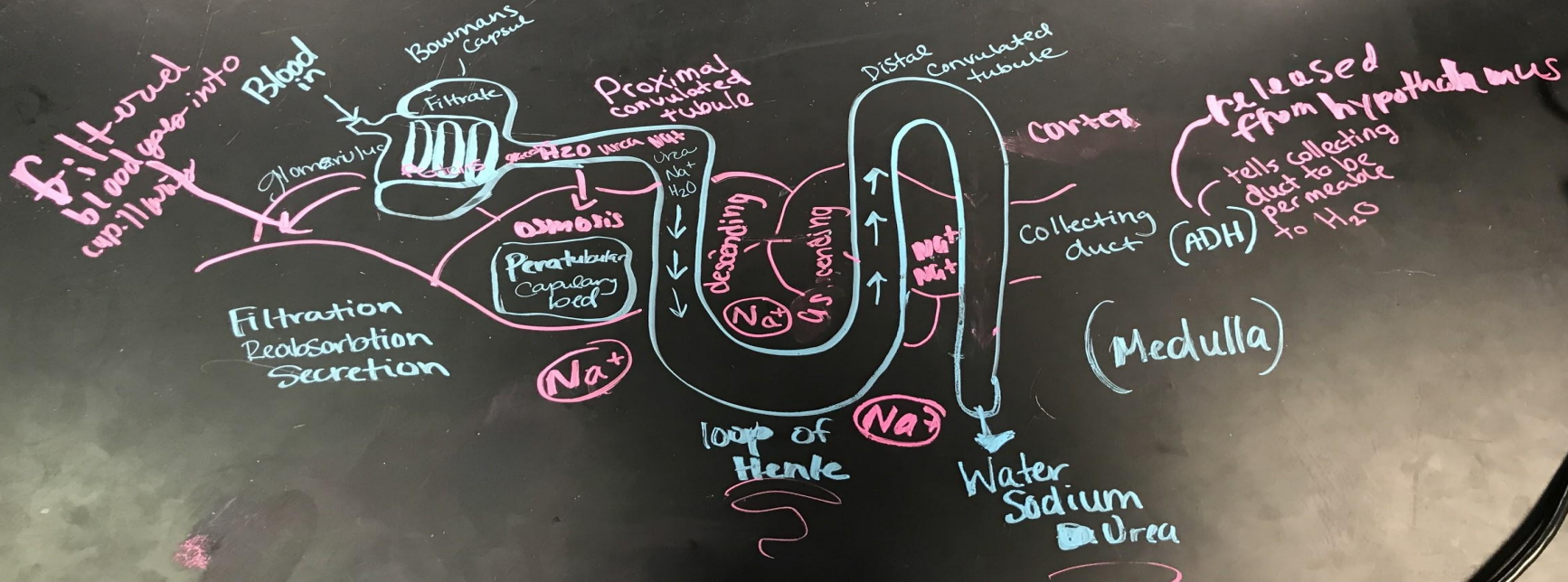
- occurs when overconsumption of water (headache + nerve function disruption)
- results in dilution of blood solutes
- too much water make body fluids hypotonic
- can result in swelling cells due to osmosis
- less common



↑
headache

Station
6

(1)
S 11.3.1



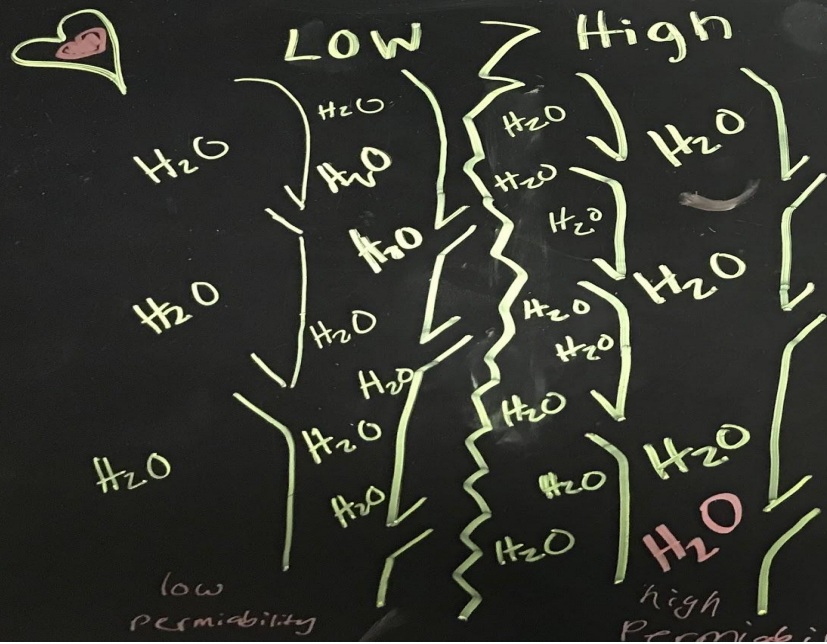
Station (15)

Loop of Henle

↓
distal convoluted Tubule

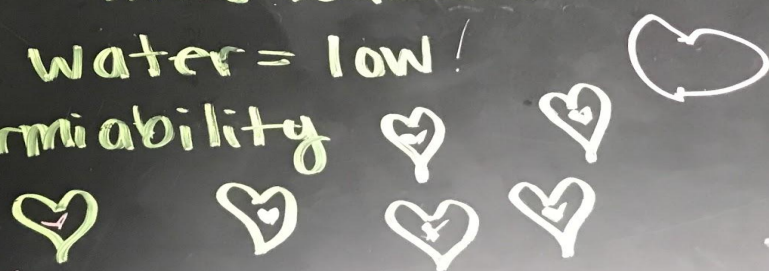
- ADH found in hypothalamus

11.3.7

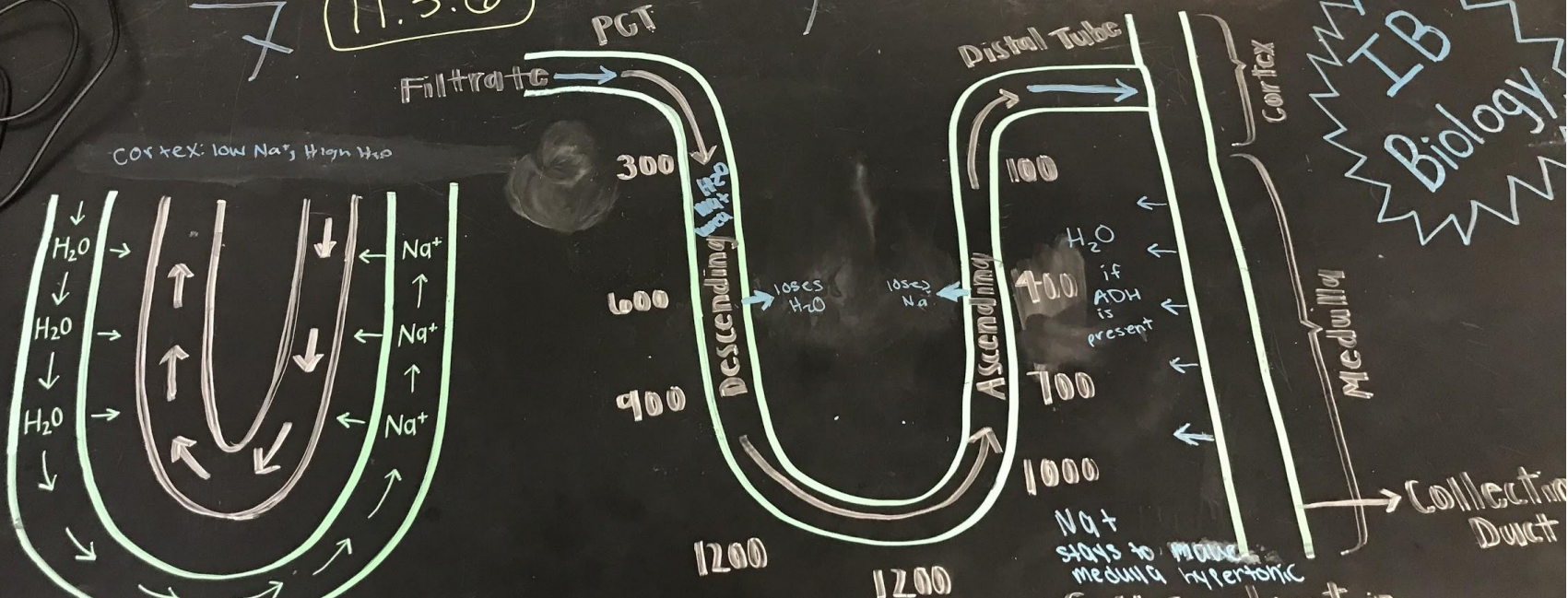


- Solute concentration high = Secrete ADH = permeable to water (H_2O) = water reabsorbed

- Solute concentration low = little reabsorption of water = low permeability



11.3.6



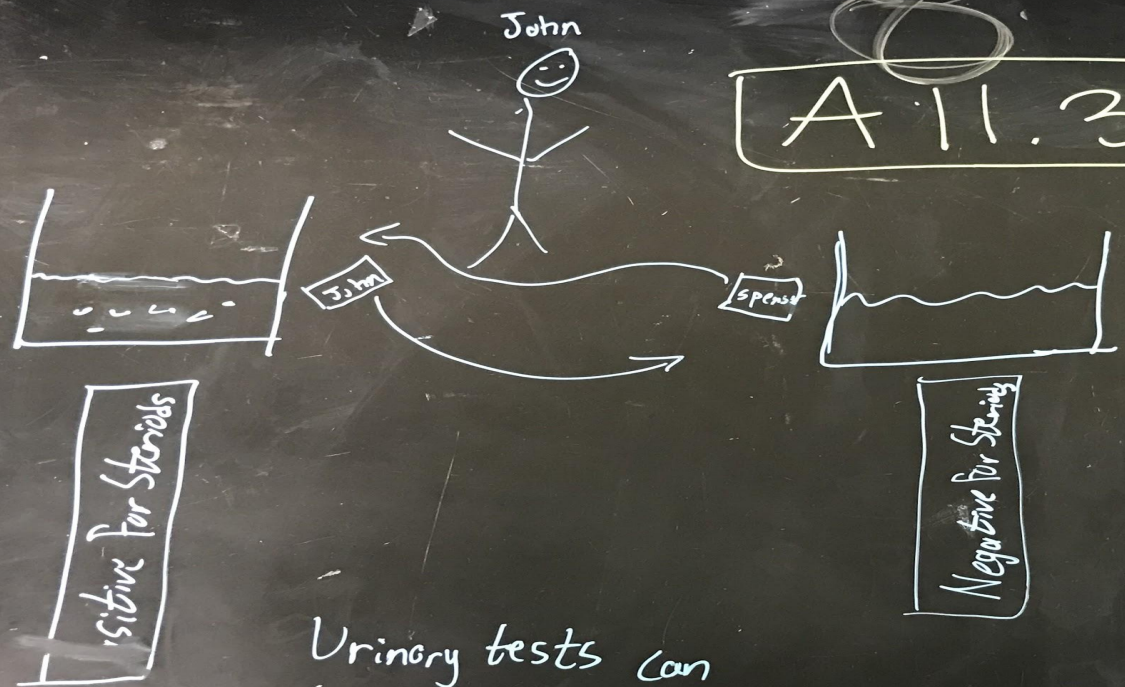
IB Biology

Countercurrent Exchange

Establishing a Salt Gradient in the Medulla of the Kidney

Na^+ stays to make medulla hypertonic

8
A11.3.1

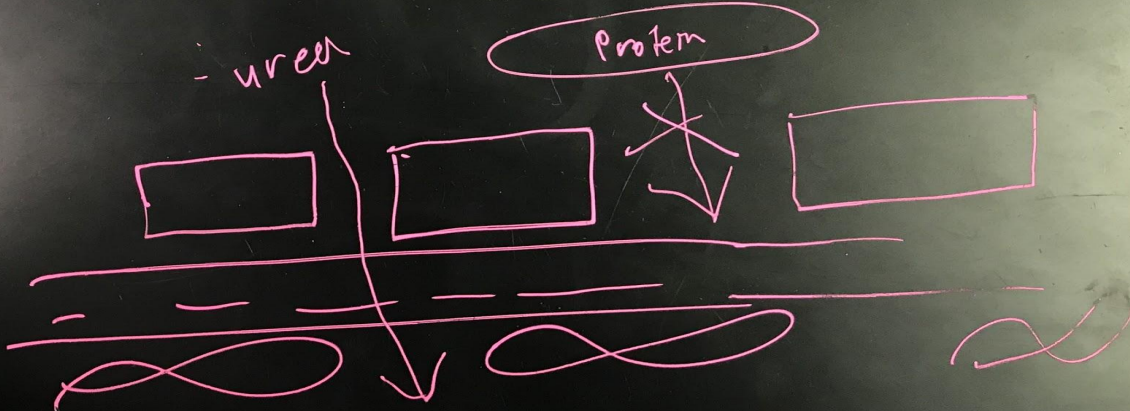


Urinary tests can
test blood cells, glucose, proteins
and drugs
glucose in urine would signal
diabetes

Kidney
disease

11.3.4

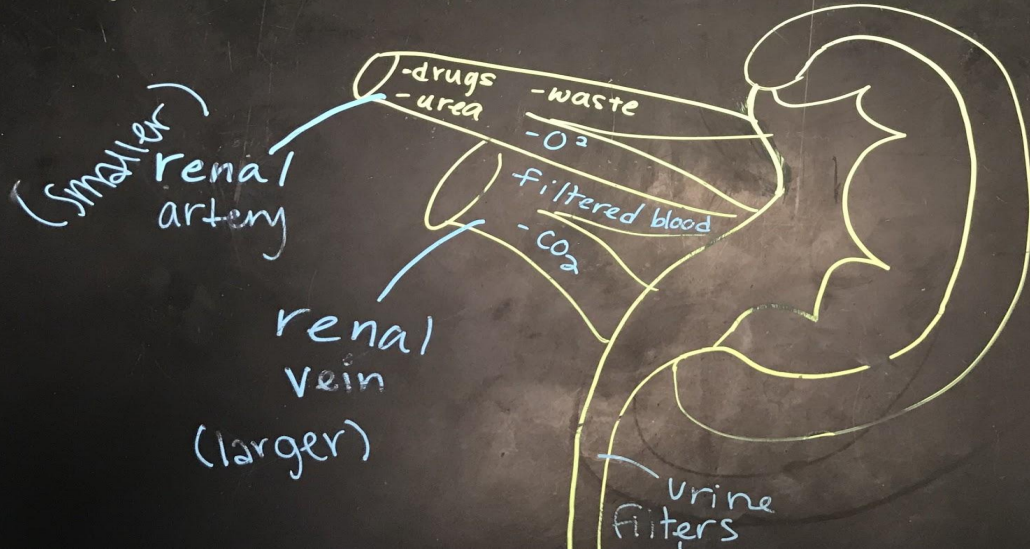
bowman's capsule



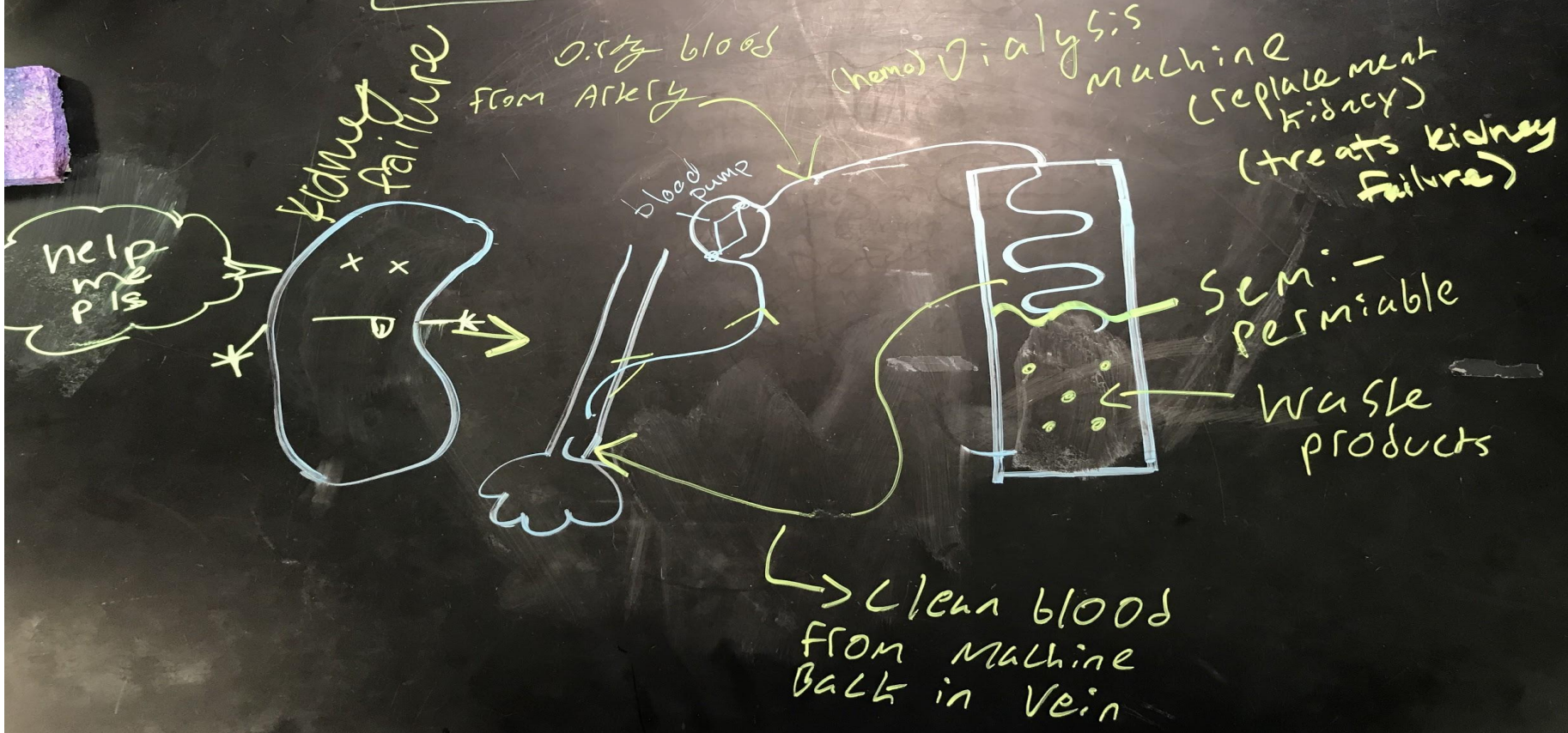
10

11.3.3

- the composition of blood in the renal artery is different from that in the renal vein.
- higher amount of substances in RA than ZV:
 - toxins absorbed but not fully metabolized (drugs, pigments in beats)
 - excretory waste products (urea)



A 11.3.3



help pls

Kidney failure

Oxy blood from Artery

blood pump

(hemodialysis) machine (replaces kidney) (treats kidney failure)

Semi-permeable

Waste products

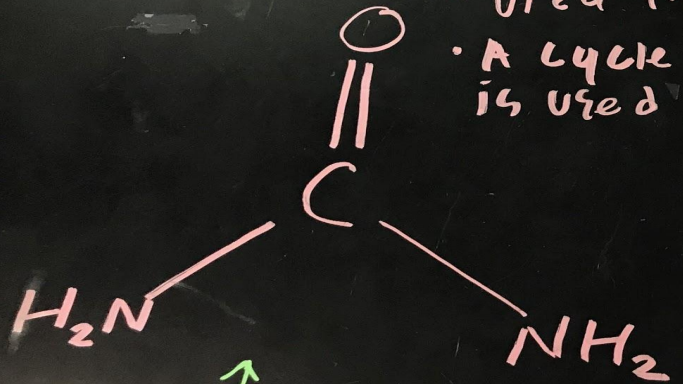
Clean blood from machine back in vein

A.2.1.1

- explains living processes

- Urea is an example of a compound that is produced by living organisms but can also be artificially synthesized

- Urea produced when there is excess of amino acids in body
- A cycle of reactions, catalysed by enzymes is used to produce it. (This happens in liver)



↑
molecular
biology of urea

First organic compound made by man

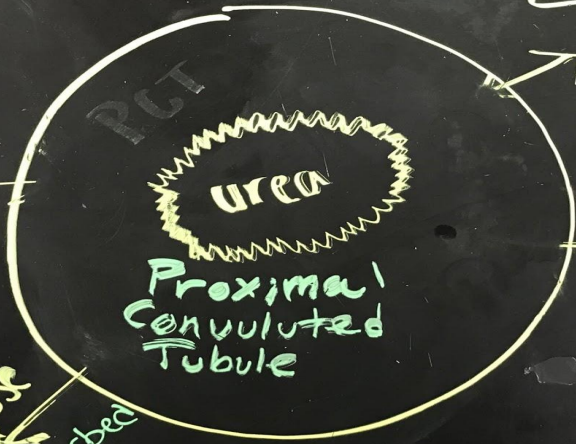
11.3.5

Station

13

Reabsorption

by water
OSMOSIS



All glucose reabsorbed

active transport

Sodium ions
Some reabsorbed

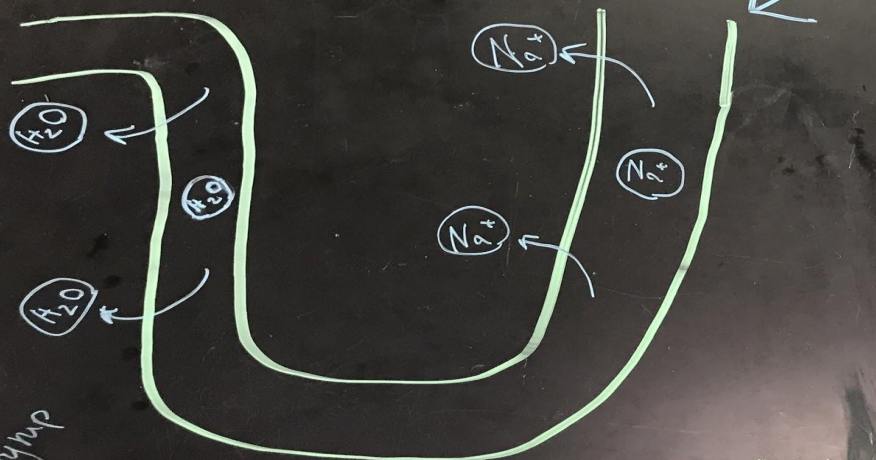
chloride ions
transported by a charge gradient
Set up by active transport of sodium ions

(Body)

11.3.8

desert

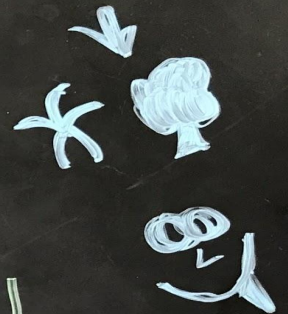
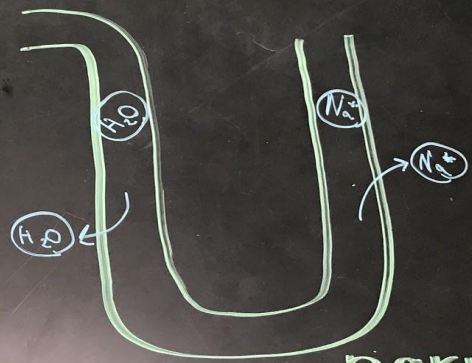
(snakes, desert rats...)



apleasymp

longer loop of Henle

longer loop for conservation of water in animals



normal loop of Henle

(human, fish, ...)