# OSMO-REGULATION AND EXCRETION.

## Excretion.

The removal of wastes from the body.

Most of these materials are toxic to the body, if they accumulate within the body cells.

Some of
Egestion is the ~~materi~~ removal of undigested materials from the body.

Secretion is the production of useful substances e.g mucus, digestive fluids, nectar etc by living cells

Excretion is a process which occurs only in living cells.

Any excretory material should be originally taken into the cell or have been formed as a result of cell activities.

## Necessity of excretion in organisms

Excretion is necessary in living organisms for two reasons.

The organisms cannot always excrete such strict control oor ê intake 2 reach êir body requirements exactly without any excess so there is great need to eliminate the excess.

Their method of dealing with the absorbed materials cannot utilise them without any wastage.

This therefore:

How expiratory products arise.

- From animals dead substances absorbed with food.
- From absorption of excess nutrients.
- From osmoregulatory process.
- From breakdown of protoplasm constituents
- From body metabolism.

## Monday, 24th March, 2018.

### Summary for necesity of excretion.

To ~~rete~~ reduce waste products which it the accumulates become toxic.

To ~~produce~~ provide an environment for proper cell functioning.

To enable the ~~f~~ normal functioning of enzymes by maintaining the required environment.

To regulate the water content in blood.

### Excretory products.

Nitrogenous wastes

Non-nitrogenous Ammonia Uric acid

Metabolic reactions produce wastes, some of which are toxic. These wastes have to be eliminated as soon as they are form in order to prevent damage.

These excretory wastes are divided into two.

- Nitrogenous wastes.

These are metabolic wastes which contain nitrogen for example urea $[(NH_2)_2 CO H_2 N-C-NH_2]$, ammonia uric acid $(C_5H_4N_4O_3)$. Trimethylamine oxide, Uric acid $[C_5H_4N_4O_3]$

- Non-nitrogenous wastes.

These are metabolic waste products which do not contain nitrogen. They include carbon dioxide, oxygen, excess water, excess salts, bile and very many others.

## Excretory organs

These are organs involved in the process of excretion. There organisms differ from one organism to another and they excrete different substances as shown below.

Table showing excretory organs, waster in diff. organisms and habitats.

| | ORGANISM | Excretory organ | Excretory waster | Habitat |
|---|---|---|---|---|
| 1. | Amoeba | Has a cell surface membrane. | Ammonia | Fresh Water. |
| 2. | Platyhelminthes (Tape worm) | Flame cells. | Uric acid | Terrestrial (on land.) |
| 3. | ~~Terrestrial~~ Earth worm | -Nephridia<br>-Skin | Ammonia | (on land) |
| 4. | Fish (Bony) | Gills<br>Kidney. | ~~Ammonia~~ Carbon dioxide<br>Ammonia<br>Trimethylamine oxide for sea dwellers | Aquatic<br>Fresh water<br>Aquatic |
| | (Cartiliginous) | Kidney | Urea (for seadwellers) | Aquatic / Marine. |
| 5. | Insects | Malpighian tubules<br>Tracheal system | Uric acid<br>Carbon dioxide & excess water | Terrestrial |
| 6. | Amphibians | | | |
| | i) Tadpoles | External gills | Ammonia & $CO_2$ | Aquatic (Fresh water.) |
| | ii) Adults | Lungs<br>Skin<br>Kidney. | $CO_2$<br>Excess $H_2O$<br>Urea on land<br>$NH_4$ in $H_2O$ | Terrestrial<br>Terrestrial<br>Aquatic |
| 7. | Reptiles & Bird | Kidneys & Skin | Uric acid, $CO_2$ & Excess $H_2O$ | Terrestrial |
| 8. | Mammals | Kidneys<br>Lungs<br>Skin | ~~$CO_2$~~ Urea<br>$CO_2$ & Excess $H_2O$.<br>Excess $H_2O$ & Salts. | Terrestrial. |

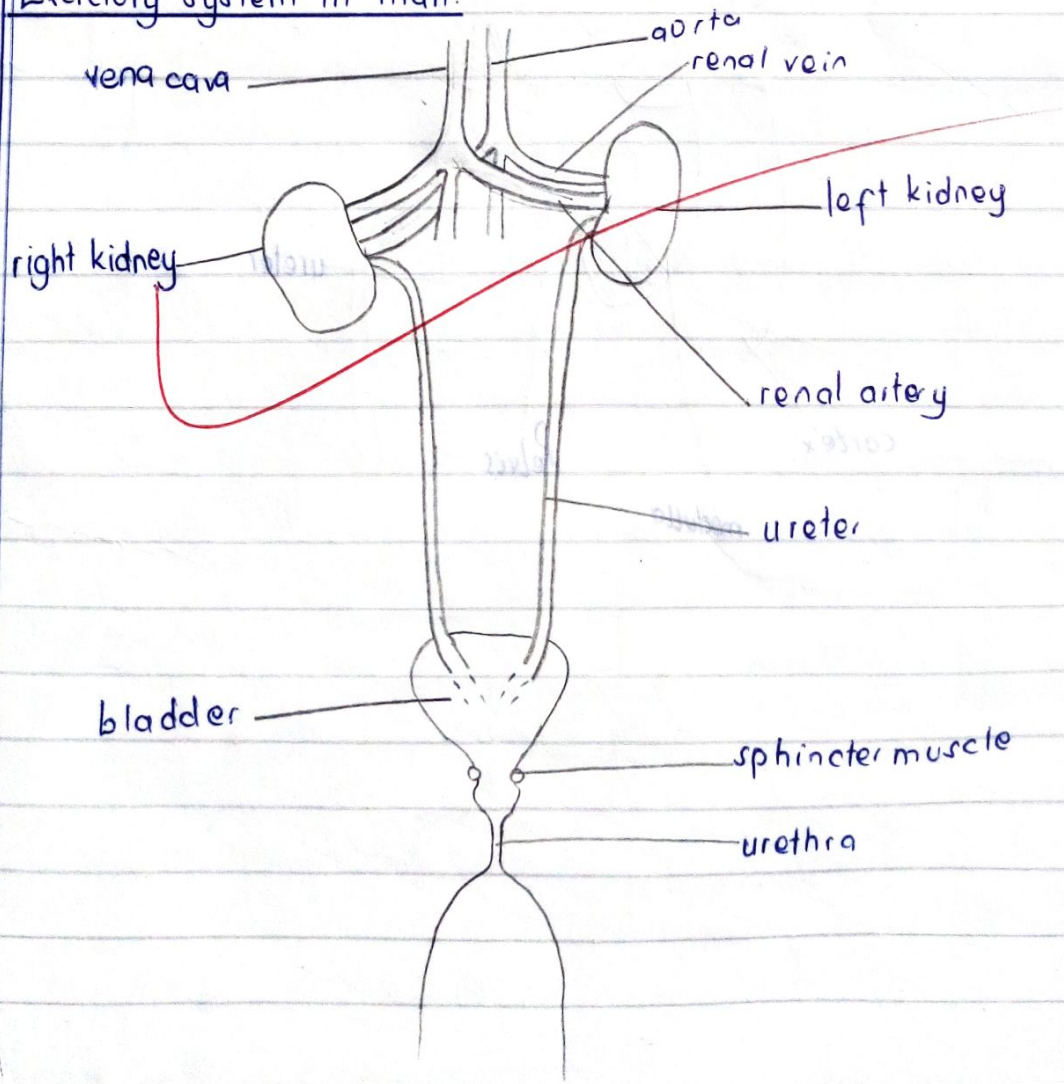
## Note:

Organisms which live in plenty of water excrete nitrogenous wastes in form of ammonia while those with a lot of water in their body excrete wastes in form of urea and those in with very little water in their body excrete their waste products in form of uric acid.

Uric acid needs the least ~~nth~~ amount of $H_2O$ to be released followed by urea then $NH_3$ respectively.

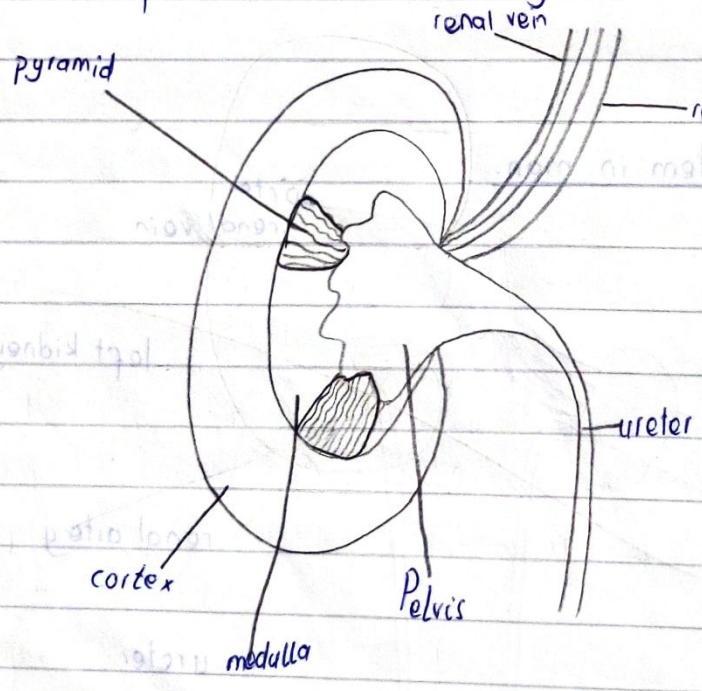
Therefore animals will excrete semi-solid uric acid so as to conserve $H_2O$. $NH_3$ is very toxic and highly soluble so it must be eliminated very fast or converted to the less toxic urea.

## Excretory system in man.



1. The kidneys are deep red bean shaped structures found in the abdominal cavity.
2. They receive blood from the renal arteries which are branches of the aorta
3. The renal veins take de-oxygenated blood away from the kidneys to the vena cava. The small tubes called ureters carry urine from the kidneys to the bladder where it is temporarily stored.
4. Sphincter muscles close and open the bladder to either make urine accumulate in the bladder or get rid of the urine.
5. Relaxation of the sphincter muscles releases urine from the bladder through the urethra to the outside.
6. The bladder is an organ for temporary storage of urine.

Internal structure of the mammalian kidney.



## Vertical section of a kidney

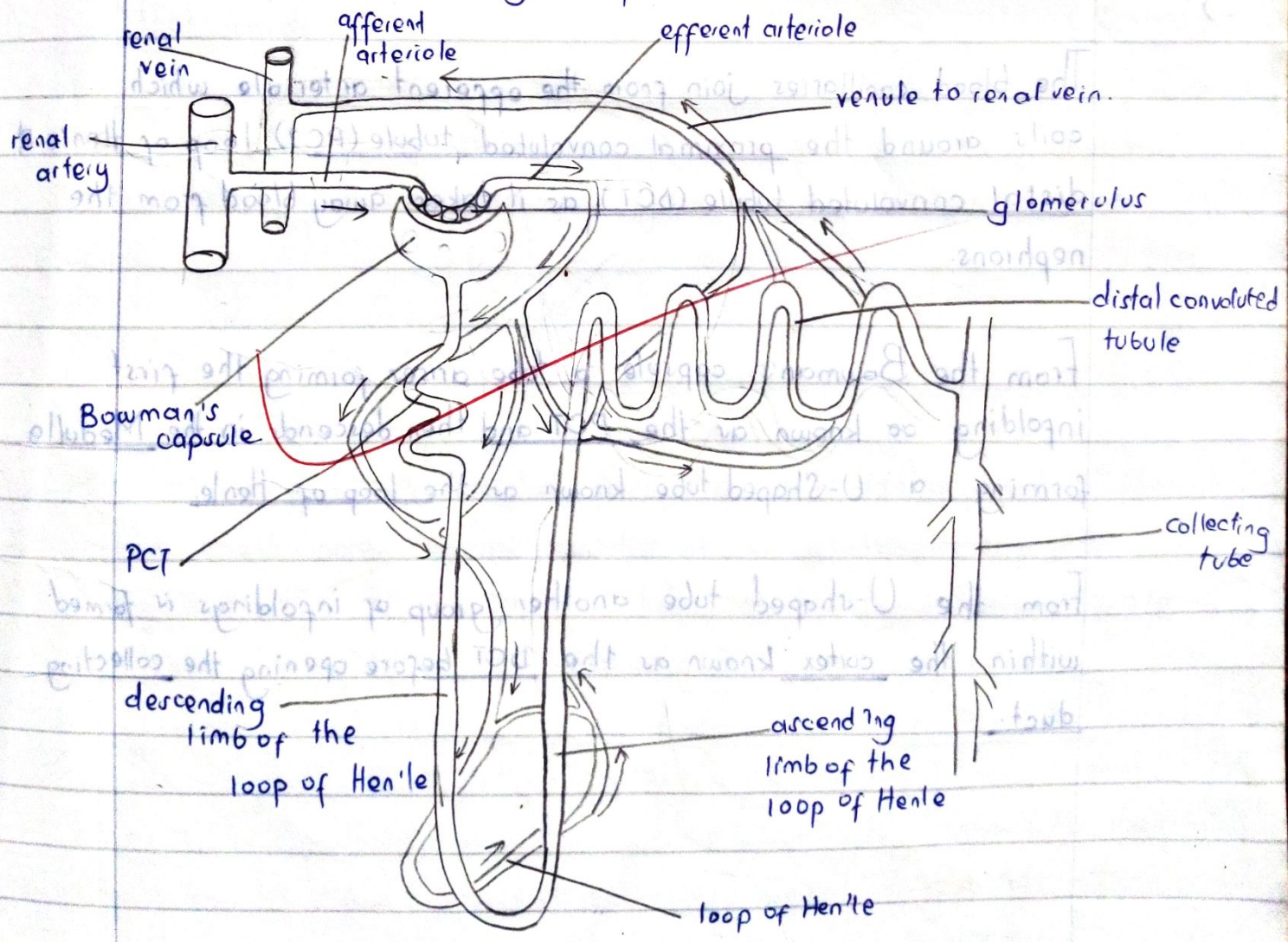
The vertical section of a kidney shows the two main section. The outer section, is called the cortex and it is made up of the Bowmans capsule, proximal convoluted tubule, and distal convoluted tubo.

The inner zone called the Medulla contains the loop of the Henle and a ~~pen~~ ~~pelvis~~ collecting duct.

The Medulla contains corn like structures called pyramids & the pyramids project a space called pelvis. From the pelvis, the ureter arises.

NB: The basic structural & functional unit of a kidney are called nephrons.

## Structure of the kidney nephron



The nephrons are the functional units of a kidney.
The single kidney is made up of approximately 1·5 million nephrons.
The kidney has the following functions.

i) Excretion
ii) Osmoregulation
iii) Regulation of pH
iv. Regulation of ions.

The kidney is made up of a cup shaped organ (structure) called a Bowman's capsule
It receives blood from the afferent blood vessel that divides to give a no. of capillaries in the Bowman's capsule called the glomerulus (ie knot of capillaries)

The blood capillaries join from the efferent arteriole which coils around the proximal convoluted tubule (PCT), loop of Henle & distal convoluted tubule (DCT) as it takes away blood from the nephrons.

From the Bowman's capsule a tube arises forming the first infolding ∞ known as the PCT and then descends in the Medulla forming a U-Shaped tube known as the loop of Henle.

From the U-shaped tube another group of infoldings is formed within the cortex known as the DCT before opening the collecting duct.

## The process of urine formation.

Urine formation involves two processes i.e

i. Ultra filtration
ii. Selective re-absorption

### Ultra filtration / Pressure filtration of blood.

i. This is the filtration of blood under high pressure.
ii. It occurs in the ~~glomus~~ glomerulus within the Bowman's capsule.
iii. The ~~smo~~ glomerulus has small pores that act as a sieve of blood.
iv. The high pressure is created by:
a. The afferent arteriole having a wider lumen than the efferent arteriole (The major cause) thus more blood flows to the glomerulus than blood that leaves it.
b. The pumping action of the heart.
c. The tortoise nature / twists & turns of capillaries of the glomerulus. which offer resistance to blood flow and result in high pressure.

Friday 6th April, 2018.

★ The high pressure created, forces the blood plasma to filter through the small pores of the capillaries or glomeruli and the walls of the Bowman's capsule to form the glomerulus filtrate that flows into the Bowman's capsular space.

The Glomeruli filtrate contains all components of blood except proteins and blood cells (leucocytes, erythrocytes, thrombocytes) Because they are large and can't pass through the small pores of the glomerular capillaries, hence the blood cells and proteins will not be found in urine.

Thus, the glomerular filtrate has the same components as the tissue fluid ie it has glucose, amino acids, vitamins, hormones, water, urea, uric acid, and salts or ions for example $Na^+$, $K^+$, $NH_4^+$, $Cl^-$ etc.

## Selective reabsorption.

i. This the process by which the useful substances in the ~~glomerular~~ filtrate are taken back into the blood in the capillaries surrounding the nephron such that they are not lost in urine.

ii. The unwanted materials, for example ureq, excess water, excess salts remain in the renal tubule to be excreted as urine.

## Selective reabsorption at the PCT.

→ All glucose, acids, vitamins, active hormones, ~~some~~ some salts, and some water are reabsorbed into the blood of the capillaries surrounding the PCT. by active transport and diffusion.

* The water is reabsorbed by osmosis.

→ 80% of the glomerular filtrate is reabsorbed at the PCT. ~~No gluco~~ Glucose will not be part of the urine since it is all reabsorbed at the PCT.

## Selective reabsorption at the loop of Henle.

The descending limb of the loop of Henle has thin walls. The resulting renal fluid then flows in the ascending limb of the loop of Henle. The lower half of the ascending limb also has thin walls like the descending limb. ~~The upper half has~~

The upper half has thick walls. Both parts of the ascending limb are almost totally impermeable to water, so water cannot leave the ascending limb by osmosis.,

However, the descending limb is permeable to water, and more water is reabsorbed here.

Note: The longer the loop of Henle the more water re-absorbed and retained in the blood and hence conserved with in the body. Thus, desert animals have longer loops of Henle than their counterparts in the tropics to conserve much water in the body. Aquatic organisms, have very short, or no loops of Henle to allow their bodies lose alot of water.

In the ascending limb, Na and Cl ions are re-absorbed by active transport and diffusion into the blood vessels.

The renal fluid then flows to the DCT where there is re-absorption of $Na^+$, $HCO_3^-$ by active transport and diffusion. There is also re-absorption of water by osmosis under the influence of the antidiuretic hormone (ADH).

Seen

Proximal Convoluted Tubule

Monday, 9th April, 2018.

## Selective reabsorption in the collecting duct

Also more salts or ions and more water are selectively reabsorbed at the collecting ducts.

The remaining fluid forms urine which contains urea, excess water, excess salts and some uric acid.

Very little or no urea is reabsorbed making it more concentrated in urine than in the blood plasma and the glomerular filtrate.

Urine formed in several nephrons collects in the collecting duct and flows to the pelvis, the urinary bladder, where is temporarily stored before it flows out through the urethra.

As the renal fluid flows down the descending loop of Henle, there is subsequent increase in the conc. of salts in the renal fluid due to active pumping of salts from the ascending loop of Henle to the descending loop of Henle and due to subsequent loss of water.

The subsequent increase in the concentration in the loop of Henle is called unit effect.

As the renal fluid flows, there is a subsequent increase in the concentration as the fluid flows down.

As the renal fluid flows upwards there is a subsequent decrease in the concentration of salts in the renal fluid since the salts are actively pumped out of the renal fluid.

This forms the counter current multiplier effect.

Question.

A 1. Name the components of blood that do not enter the renal tubule.

- blood cells
- proteins.

2. Name four substances whose concentration is much higher than the afferent vessel than the efferent.

- hormones
- salts
- urea
- vitamins

3. Name three substances that are completely reabsorbed at the proximal convoluted tubule.

- vitamins
- glucose
- amino acids.

B. 1. What is ultra filtration.

Ultra filtration is the filtration of blood under high pressure.

2. State one major cause of ultra fitration.

The afferent arteriole has a wider lumen than the efferent arteriole.

3. How does selective reabsorption of

i. Glucose

ii. Water occur at the proximal convoluted tubule

c The table below shows the ~~cont~~ concentration of substances of blood plasma.

| Substances | % in blood plasma | % in glomerulus | % in urine |
|---|---|---|---|
| Water | 91.9 | 91.0 | 95 |
| Protein | 7.0 | 0 | 0 |
| Glucose | 0.1 | 0.1 | 0 |
| Amino-acids | 0.05 | 0.05 | 0 |
| Urea | 0.03 | 0.03 | 2.0 |
| Sodium ions | 0.37 | 0.37 | 2.0 |
| Chloride ions | 0.37 | 0.37 | 0.6 |
| Uric acid | 0.004 | 0.004 | 0.05 |

a.i) Explain why there are no proteins in urine.
This is because protein molecules are large and cannot pass through the pores of the glomerulus and basement membrane of blood capillaries to form the glomerular filtrate. Since they cannot be part of the glomerular filtrate, they cannot be so part of urine.

Tuesday, 10th April, 2018.

ii.) Explain the prescence of glucose and amino acids in the glomerular filtrate and their abscence in water.
This is because glucose and amino acids have very small particles that can pass through the small pores of the glomerular and basement membrane and they are absent in urine because they are completely re-absorbed back into the blood stream at the PCT.

iii) Explain why there is a higher percentage of urea in urine than in glomerulus.

This is because urea is not re-absorbed into the blood stream since it is moderately toxic. while other materials in the glomerular filtrate are reabsorbed into the blood stream making urea to accumulate.

iv) Explain the variation of percentage of $Na^+$ in the glomerular filtrate and ~~th~~ urine.

same reasons as $K^+$ & $Cl^-$ ions.

Urine contains a higher percentage of sodium ions because despite its re-absorption other components of the glomerular filtrate are re-absorbed at a higher rate making the %age of sodium ions to slightly accumulate.

b.) What is the health condition of a person whose urine contains glucose or sugar?

Diabetes mellitus.

## ABNORMAL FUNCTIONING OF THE KIDNEY.

There are two main diseases of the kidney. ie diabetes mellitus, diabetes inspidus

## DIABETES MELLITUS

Mellitus is a greek word to mean honey.

It is a disease ~~asso~~ associated with production of very sweet urine.

It is caused by the inability of the kidneys to completely re-absorb the abnormally large amount of glucose in the glomerular filtrate.

It is caused by ~~ad~~ inadequate ~~relac~~ release of the hormone insulin.

by the B-cells (Beta cells) of the Islets of the Langhorns in the pancreas.

> Inadequate release of insulin prevents glucose uptake by the blood cells from blood resulting into internal hunger due to failure by body cells to receive glocose.

> Such individuals produce very sweet urine and their urine is boiled with Benedicts' solution, the mixture turns from blue soln to green solution to yellow precipitate to orange precipitate and finally to brown precipitate.

> Diabetes mellitus has two types of diabeter ie type I and type II.

Type I diabeter.

I. This is where your immune system destroys cells in your pancreas called the beta cells wich are responsible for making insulin.

II. Some people get a condition called secondary diabetes which is similar to type I except the immune system does not destroy the Beta cells. They are wiped out by something else like a disease or an injury to the pancreas.

Type II diabetes

I. This is where the body produces insulin but the body loses its ability to respond to it.

II. This is known as insulin resistance.

III The more excess body weight we carry, the less sensitive we are to insulin.

## Signs of diabetes mellitus

- Heavy thirst.
- Increased hunger especially after eating.
- Dry mouth
- Nausea and vomiting.
- Unexplained weight loss
- Fatigue
- Frequent urination (by Malule.)
- Blurred vision.
- Heavy laboured breathing.
- Frequent infections of the skin, urinary tract, vagina.

## Effects of diabetes.

- Weight loss
- Dehydration: When there is excess sugar in blood, you urinate more and that is the way of getting rid of it.
- Damage on your body: High glucose levels can harm your eyes and kidneys. It can also cause hardening of arteries (atherosclerosis) which can lead to ~~ath~~ stroke

Please turn over for more work

## DIABETES INSPIDUS.

This is caused by lack of enough Anti-Diuretic Hormone from the pitutary gland where the kidney fails to conserve water.
This a volume of dilute urine is produced by a condition known as diuresis
ADH prevents diuresis hence called anti-diuretic hormone ie
Anti means against, Diuresis means too much water in urine.
The urine is almost tasteless due to too much dilution by water in the urine.
~~The urine is almost tasteless because water is dilute~~
Gk: (Diabetes = urine, Inspidus = tasteless)

### Symptoms of diabetes inspidus.

- Dilute urine.
- Feeling excessively thirsty more frequently.
- Dehydration of the body.
- Excretion of ~~more~~ alot of urine due to frequent urination

## OSMOREGULATION.

This is the process by which the osmotic pressure of blood and tissue ~~its~~ fluid is kept constant.

The osmotic pressure of the body fluid depends on the balance between the concentration of that of osmoregulation in the body fluids or in that any flactuations in the osmotic pressure of the cells

The osmotic pressure of the body fluids depends on the balance between the concentration of the water and salts in ~~them~~ body.

The importance of osmoregulation in the body fluids as in the fact that any fluctuations in the osmotic pressure of the cells would normally result in the cells taking in more or losing much water, either of which would damage them.

Therefore it is important for organisms to osmoregulate to prevent damage of body cells.

> Water can be lost from the body in the following ways.

i. Sweating
ii. Urinating
iii. Exhalation.
iv. Crying.
v. Release of body cells like mucus.

> Water can be gained through the following.

i Drinking
ii Eating foods
iii Metabolism.

> Salts can be gained by.

i. Drinking mineral water.

> Salts can be lost by.

i Crying
ii Sweating
iii Urinating

> When the osmotic pressure of blood is very high ie with a high ion concentration of solutes after a salty meal.
As this blood travels through the hypothalamus. The receptors in the

the hypothalamus are stimulated.

They send electrical messages called impulses to the posterior lobe of the pituitary gland instructing it to release a hormone called antidiuretic hormone also called vasopresin in the blood stream.

ADH is carried to the collecting ducts and DCT where it increases their permeability to water.

A lot of water is then re-absorbed from the renal fluid via the collecting ducts and DCT into the blood stream. This lowers the osmotic ~~tension of blood~~ potential of blood.

If the osmotic potential of blood is very ~~to~~ low ie with a low percentage of salts ie after drinking alot of water the osmoreceptors in the hypothalamus are not activated by such blood, as a result, the posterior lobe of the pituitary gland is not stimulated to ~~ree~~ release ADH and the permeability of the collecting duct and of DCT to water is not increased but instead lowered.

This causes loss of large amounts of water in urine which slowly rises the osmotic potential of blood back to normal.

# Osmoregulation in Protozoans.

Protozoans are single celled organisms. for example:

- Paramecium
- Trypanosoma
- Plasmodia

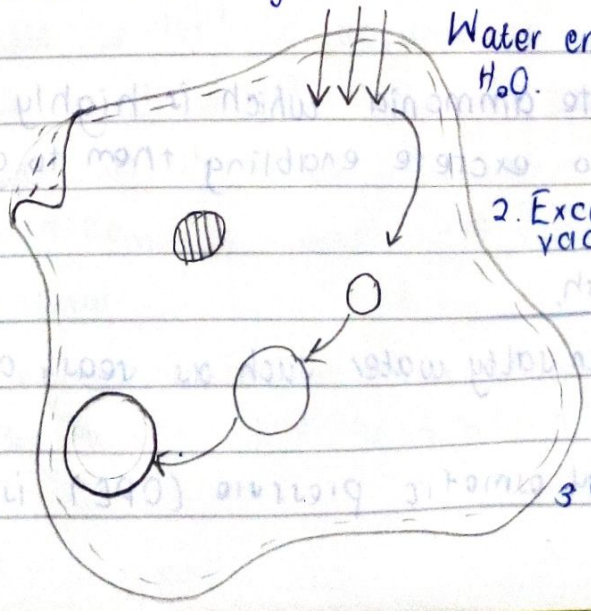
Amoeba lives in fresh water where the external osmotic pressure ($O_{pe}$) is lower than the osmotic pressure of its cytoplasm ie internal osmotic prassure. ($O_{pi}$)

Therefore risks diffusion of its cytoplasm due to osmotic inflow of $H_2O$. It overcomes this problem by use of a contractile vacuole

The vacuole starts as a vacuum in the cytoplasm and excess water is drained into the

The ~~vacuum~~ vacuole then expands as ~~it enters~~ water enters it ~~th~~ until it reaches maximum size and then move towards the cell membrane and releases excess water by exocytosis.

A new bubble then forms and the cycle repeat.



## OSMOREGULATION IN FISH

Fish are divided into three categories depending on the osmotic pressure of the environment in which they live:

i. Fresh water fish
ii. Marine water fish
iii. Migratory fish

### Fresh water fish.

These stay in fresh water such as rivers, lakes, streams. Their internal environment. (external osmotic pressure) so water continuously enters their bodies or tissues by ~~osmot~~ osmosis through the lining of the mouth and gills to prevent dilution in their tissues they carry out osmoregulation in the following ways.

i. High glomerular filtration rate since they have ~~glomerular~~ many glomeruli enabling them to eliminate excess water as soon as it enters.

ii. They have short loops of Henle to minimise re-absorption of water.

iii. They have special cells known as the Chloride secreting cells ~~known as~~ that actively move ~~salts~~ ~~that~~ salts of water into their body.

iv. They excrete ammonia which is highly toxic and requires alot of water to excrete enabling them to get rid of excess.

### Marine fish.

They live in salty water such as seas, oceans.

The external osmotic pressure (OPE) is higher than the internal

osmotic pressure (OPI).

The fish continuously lose water by osmosis through the mouth lining and the gills. To overcome this challenge they carry out osmoregulation through the following ways.

i. They continuously swallow salty water to make up for the loss.
ii. They have a low glomerular filtration rate since they have few glomeruli.
iii. They have longer loops of Henle to maximise water re-absorption.
iv. They have Chloride secretory cells that actively pump water out of their bodies
v. They excret urea which in less toxic and requires less water to excrete
vi. This enables them to conserve more water.

## Migrating fish.

They have the ability to osmoregulate in both environments that is fresh water and marine water.

## Roles of lungs as an excretory organ.

- Carbon dioxide is a waste product of metabolism. By removing carbon dioxide from the body, lungs are excretory organs
- If carbon dioxide is left to accumulate in the body the pH of the tissue fluid would lower. and the rate of respiration would be lowered as it is an inhibitor as there would be little space to accomodate additional $CO_2$ from respiration.

Other roles of lungs:
Elimination of excess water as an excretory role.
Elimination of excess heat which is a role in temp. regulation.

17th - April - 2018.

## Role of the liver as the excretory organ in formation and elimination of urea.

After digestion all Amino acids go to the liver. Those required by cells for example to make enzymes, proteins are then taken out and allowed to proceed in blood.

Excess Amino acids can't be stored in the body so they are quickly deaminated (broken down) by removal of amino group (by the liver cells)

One of the products is ammonia which combines with carbon dioxide to form urea.

$$CO_2(g) + 2NH_3(g) \longrightarrow \underset{\text{urea}}{H_2N-\overset{\overset{O}{\|}}{C}-NH_2} + \underset{\text{water}}{H_2O}$$

This reaction also requires to directly remove $CO_2$ (g) and the urea goes to the kidneys for excretion

## ✱ EXCRETION IN PLANTS.

plants donot have special excretory organs because;

recyclable waste pdts

i) They produce very simple waste products like $CO_2$ and $O_2$ which can be recycled.

use up all the proteins due to their continous growth

ii) plants keep on growing throughout their life & hence use up all the proteins they have producing very little dinitrogenous wastes where excretion does not need special organs

low metabolic rate / pdce fewer metabolic wastes

iii) plants have a low metabolic rate compared to animals and so they produce fewer metabolic wastes that donot need special excretory organisms for elimination.

autotrophic hence easily convert excess protein to useful substances

iv) plants are autotrophic, ie they manufacture their own food including proteins and this implies that do not consume excess proteins and incase of excess protein they easily convert to useful substances.

concentrate their metabolic wastes to parts like leaves that easily fall off

plants concentrate some of their metabolic wastes in parts like leaves and fruits which upon falling off are channels of getting rid of these wastes.

In some plants like acquatic plants the waste differ into water.

Osmoregulation on water plants

plants can be divided into four groups having on water ability in their habitants.

These groups include.

> Hydrophytes
> Mesophytes
> Halophytes
> Xerophytes.

Hydrophytes

These are plants which live either completely or partially submerged in water forexample water hyancith, water lillies, mangroove lettuce etc.

Their major osmotic problem is too much water in their bodies However they have the following adaptations.

> They have numerous stomata on the upper epidermis to do away with the transpiration rate
> They have dull coloured leaves to increase heat absorption which consequetly increases rate of transportation.
> They have air spares in their tissues to increase on their bouyancy ie to float on water.

Mesophytes.

These are plants which grow in well drained soils.

They have a well developed root system and they don't require special adaptations for conserving or eliminating water.

Xerophytes.

These are plants found in reddy plants with limited supply of water

forexample cactus, prickly pear.

There osmotic problem is lack of water and they have the following adaptations to conserve and obtain water.

1. They have tissues which are tolerant to dessications or drying
2. some of these plants have their leaves reduced to thorns resulting in a smaller surface area for water loss
3. Most of these plants survive extreme drought by existing in form of seeds.
4. some of these plants have superficial roots ie roots that are closed to the surface to absorb the little water after a slight shower.
5. They have more stomata located on the lower epidermis to minimise water loss through the stomach.

some plants store their water in tissues forexample cactus which is succulent

6. Some plants have got a reversed stomata rythmic open their stomata at night and close them during day to minimise water loss on hot days.

They have numerous hairs on their leaves to reduce the rate of transpiration by trapping moisture.

7. Some of them roll their leaves which reduces the surface area for water loss.
8. some plants shed off their leaves (deciduous plants) to reduce the surface area over which water is lost.

## Halophytes.

These are plants which grow in salty environment forexample sea water in along the coast.

Such plants osmotically lose alot of water to the medium. They overcome this problem by developing adaptations similar to those of xerophytes

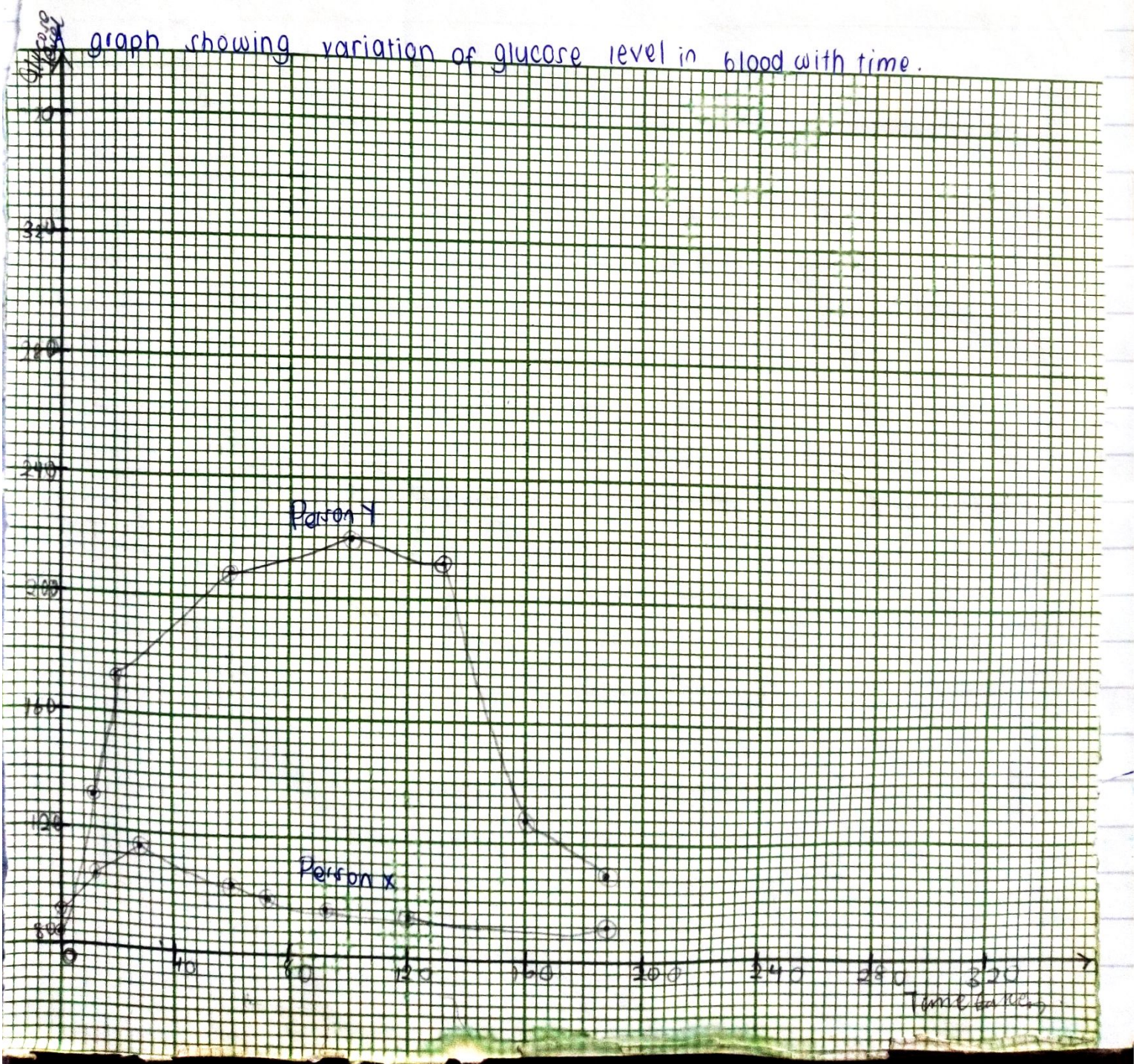
20-04-2018

2 persons x and y drank a volume of conc. sln of glucose. The amount of glucose in their blood was determined at interval. The results are shown in the table below.

| Time/minutes | 0 | 15 | 30 | 45 | 60 | 90 | 120 | 150 |
|---|---|---|---|---|---|---|---|---|
| glucose level in blood (mg/100cm³) | ~~87~~ 84 | 112 123 | X Y | 87 84 | 112 123 | ~~139~~ 170 | 116 100 | |

| Time (minutes) | | 0 | 15 | 30 | 45 | 60 | 90 | 120 | 150 |
|---|---|---|---|---|---|---|---|---|---|
| glucose level in blood | X | 87 | 112 | 139 | 116 | ~~100~~ | 95 | 92 | 88 |
| Mol 100cm³ | Y | 84 | 123 | 170 | 188 | 208 | 202 | 144 | 123 |

graph showing variation of glucose level in blood with time.



What was the concentration of glucose in the blood of x & y in the 20th minute.

120 mg /100cm³.

c) Suggest why glucose level continued raising in and stopped raising in person x is able to regulate glucose while person y can't ie he is diabetic.

d) Account for the decrease in the glucose rate in the person after 30 min & person y after 60 min.

From 30min to 60 min, the level of glucose in blood decreases rapidly.

from 60 mins to 150 mins, the levels of glucose in blood decreases rapidly this is because person x secretes enough insulin that stimulates the conversion of excess glucose to glycogen which is stored by the liver cells.

From 60mins - 90 mins that level of glucose in blood decreases gradually.

From 90mins - 150 mins the level of glucose in blood decreases rapidly this is because person Y cannot secrete enough insulin & the level of glucose in blood decreases due to glucose being lost in urine.