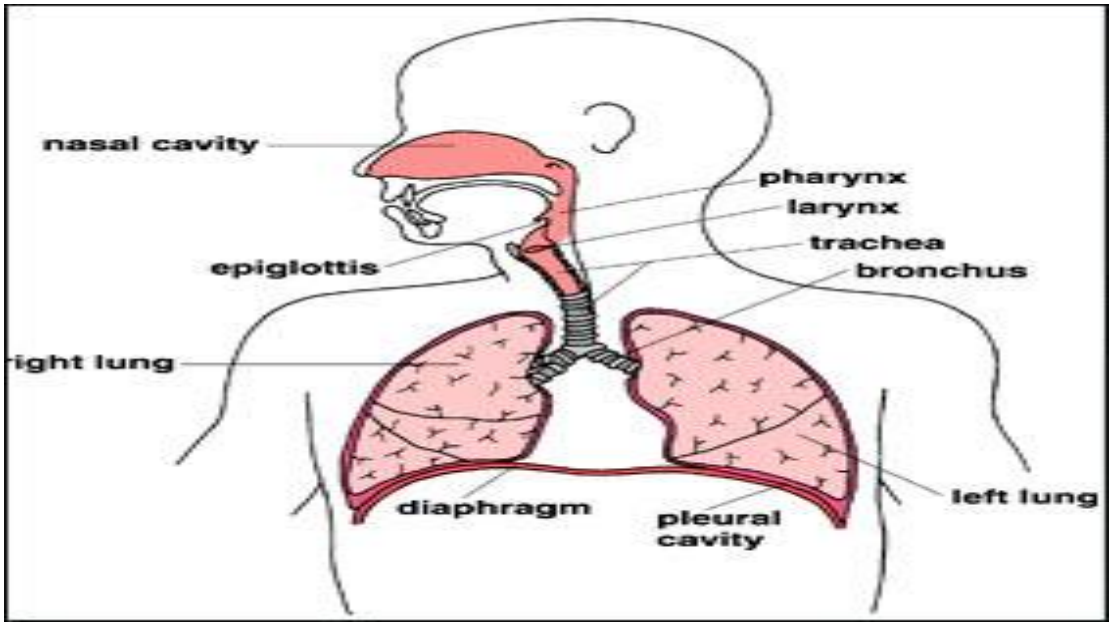
RESPIRATION

Breathing:

Intake of O2 from environment air for oxidative processes of the body, and removal of amount of CO2 to maintain a constant hydrogen ion concentration in the blood.
At rest (250 ml) of O2 absorbed /min. And (200 ml) of CO2 exhaled.

Respiratory system:

Respiratory system in human consist of lungs, chest box and air passages which consist of external nares, nasal cavities, internal nares, pharynx, trachea, bronchus, bronchioles and lungs.



Respiratory movements: movements seen during breathing.
Include:
1-costal (ribs) movements. during inspiration the inter ribs muscles contract causing ribs movement yielding enlargement of chest cavity and lungs and air inhalant into the lungs.
2-Diaphragmatic movements. also called (abdominal movement). The abdomen moves for word and back word during respiration.

Respiratory muscles:

The chief muscles of respiration are the:
1 – In respiratory muscle:
a-diaphragm, supplied by phrenic nerve that arise in the neck from cervical roots (C 3,4,5).
b-Intercostal muscles, supplied by thoracic intercostals nerve.
Both these muscles when contract, the volume of thoracic cavity and the lung increased, there for the inspiration is active process involving muscular contraction.

2- Expiratory muscles: involve muscles of abdominal wall. Expiration is brough about by the elastic recoil of lungs and chest wall flowing relaxation of inspiratory muscles. Expiration is a passive process and the lung and chest return to the resting respiratory level.

Respiratory velocity:

The velocity of respiratory movements could be measured as its number/min. by using stethograph spirometer.

For description of respiratory velocity many terms are used:

1-Eupnea: it means normal respiratory movements. only diaphragm used.

2-Dyspnea: it means stress breathing. rib is involved beside diaphragm.

3-hyperpnea: it means increasing respiratory movement velocity of its amplitude or both of them.

4-Polypnea: it means increasing respiratory movement rate only but not amplitude.

5- apnea: it means stop of respiratory movements.

The lungs:

lies in the chest box, each lung surrounded by delicate and moisted membrane celled (*visceral pleura*), which extend to cover internal chest box wall and called *pariatal pleura*. There cavity between the is 2 pleura called *pleural sac*. Which contain lymphatic fluid help them movements

Type of respiration:

The modern define of respiration is process of liberation of energy from food materials in side the body. This process need oxygen and produce carbon dioxide there called *aerobic respiration*, but in few organism as intestinal parasite and few microbes oxygen not used for energy production, this type called *anaerobic respiration.*

The respiration in higher animals include three main processes:

1-External respiration: Involve gas exchange between lung air and blood of capillaries of lung.

2-Transport of gases by the blood from lung to the cells.

3-Internal; respiration: Involve gas exchange between blood and cells of the body and called cellular respiration. And then oxygen used by the cells for oxidation.

Lung Capacity:

1-Total lung capacity: Maximum capacity of the lung due deep inspiration it is about (6 liters).

2-Normal lung capacity: Volume of air remain in the lung after normal , expiration, it is about (2.3 liter).

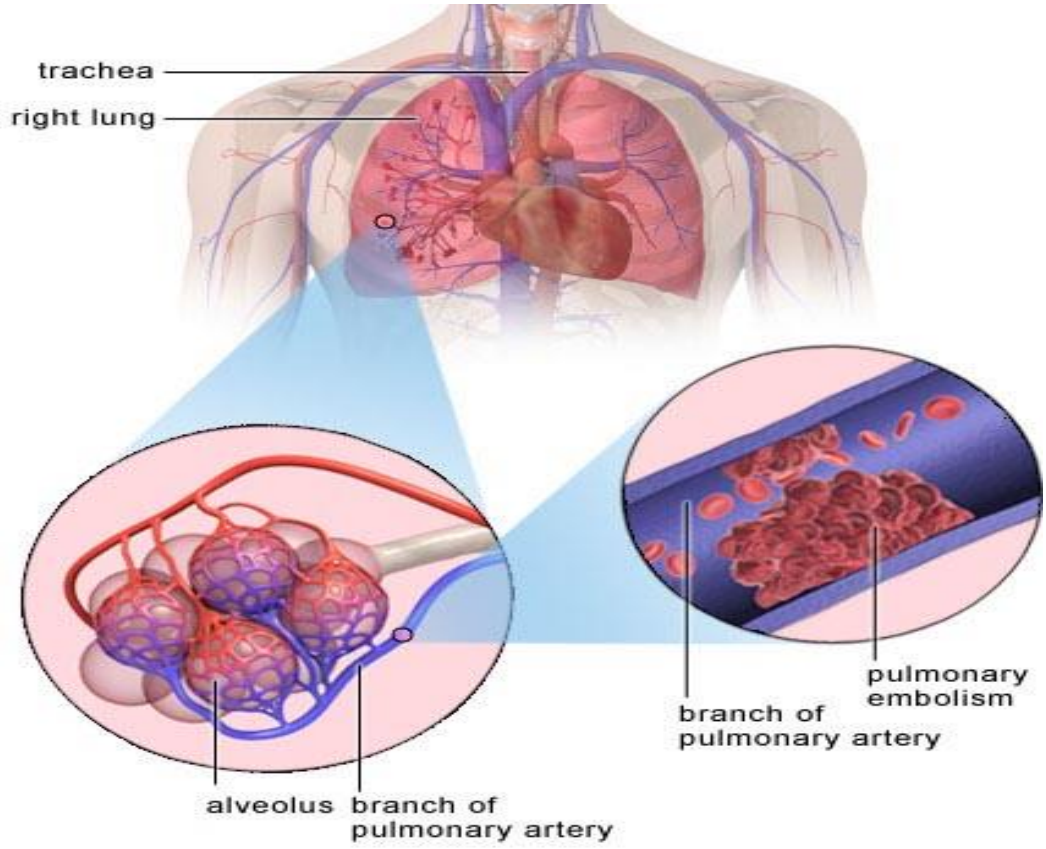
3-Inspiratory lung capacity: Maximum amount of air taken after deep inspiration, it is about (3.8 liter).

4-Vital lung capacity: Maximum amount of air exhalant by human after deep inspiration, it is about (5 liter).

PULMONARY VENTILATION

Pulmonary ventilation = Respiratory rate x Tidal volume Respiratory rate, at rest is about 15-20 breath / min. And the tidal volume is 400 ml.

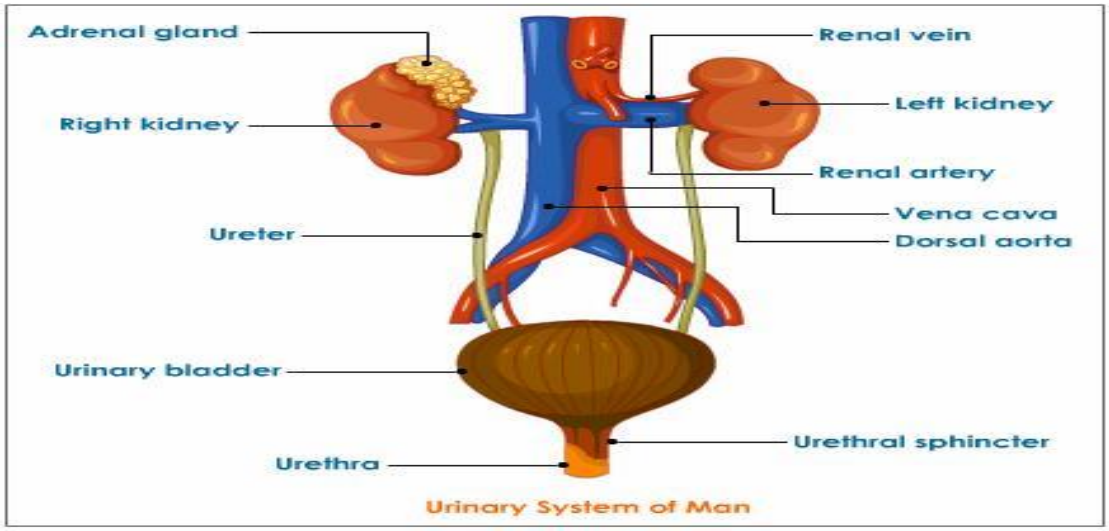
P.V. = (15 x 400) or (20 x 400), 6 - 8 liter / min.



Urinary system

Structure:

Urinary system consist of a pair of kidney , extent from each kidney long tube called ureter , both ureters open in a sac like structure called urinary bladder which open to out side the body through the external urinogenital organ.



Kidney :

Two kidneys at the back of abdomen on either side of vertebral column -Each about 11cm long, 6cm wide , 3cm thick, it weighs 140 gm

Functions of kidney :

1-It produce erythropoietin.
2- It produce renin .
3-It produce urine
4-Play a role in homeostasis .
5-Excrete waste product.
6-Excrete excessive water to regulate water content of the body .
7-Play a role in Acid - base balance of blood .
8-Regulate osmotic effect of blood .

Renal units (nephron):

Each kidney contain 1 million units of urine production each called *nephron* . each consist of a tuft of blood capillaries called *glomerulus* , in invagenated into closed tube end called *Bowmans capsule* (malpighian corpuscle) which extend as convoluted tubule which divided into :

1-Proximal convoluted tubule .
2-Descending limbs of loop of Henle .
3-Ascending limbs of loop of Henle .
4-Distal convoluted tubule .
5-Collecting tubule .

Nephron Function : (urine formation)

Through three mechanism nephron perform its Function :

1-Glomerular filtration :

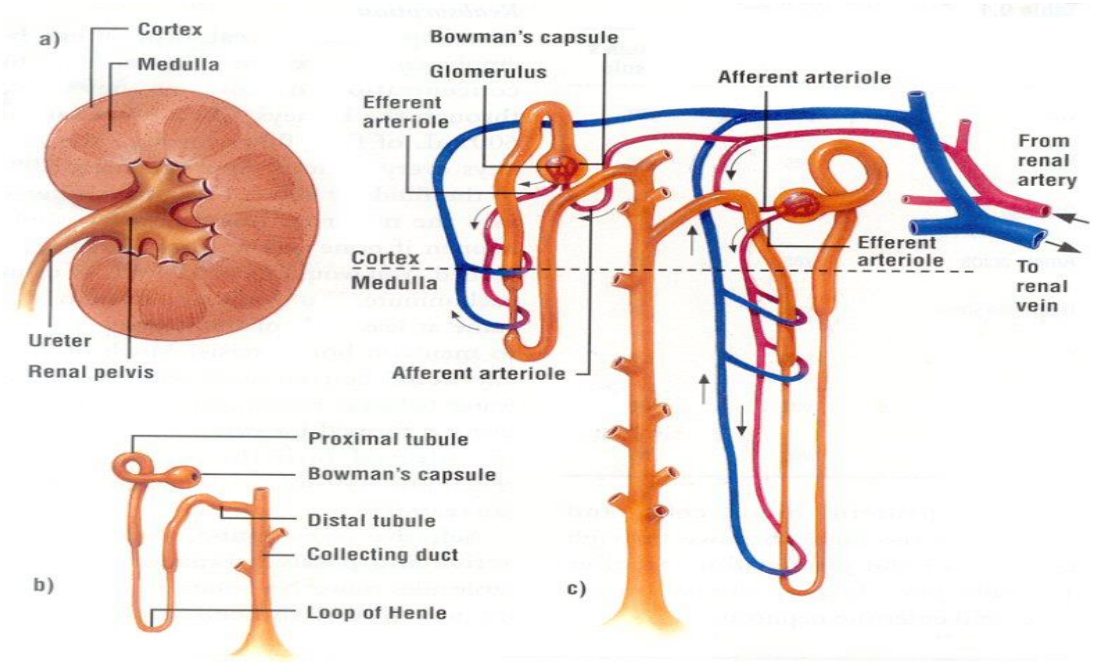
Is filtration of blood in glomerulus . it allows blood component with M.W. less than 68,000 to pass tubule , the filtrate contain plasma constituents with out blood cells. The volume of filtrate produced per minute termed glomerular filtration rate (GFR.)

2-Tubule reabsorption:

The tubule cells selectively reabsorb most constituents of the filtrate as they pass through tubule . The reabsorb is according to the body need . The reabsorbed substance transported into blood capillary . The reabsorbed substance include : water glucose and inorganic salts .

3-Tubule excretory:

The waste products in the urine are : urea , uric acid , creatinine , purine compounds , ketone bodies , derivatives of hormones , vitamin , drugs , these waste products excreted in the urine .



Kidney stones

In some cases some of urine constituents are in high concentrations as uric acid , calcium phosphate , in these cases the substance precipitated in the kidney and for hard body called kidney stones - the stone may be formed in kidney or in ureter or in bladder .

Acid -Base balance:

Kidney play a role in acid - base balance of blood by reabsorption sodium, potassium , bicarbonate and phosphate , by maintain the concentrations of the substance the acid - base content of the blood regulated and keep constant pH

(7-4) for the blood in human . And also kidney regulate blood pH by producing large amount of in case high acidity and low amount of amount in case high alkalinity .

Abnormal Renal Function ;

May occur some abnormality in renal function. Lead to excretion some materials in urine, normally not excreted.

These cases are:

1-Albuminuria - due nephritis

2-Uremia - due to shock or renal infection .

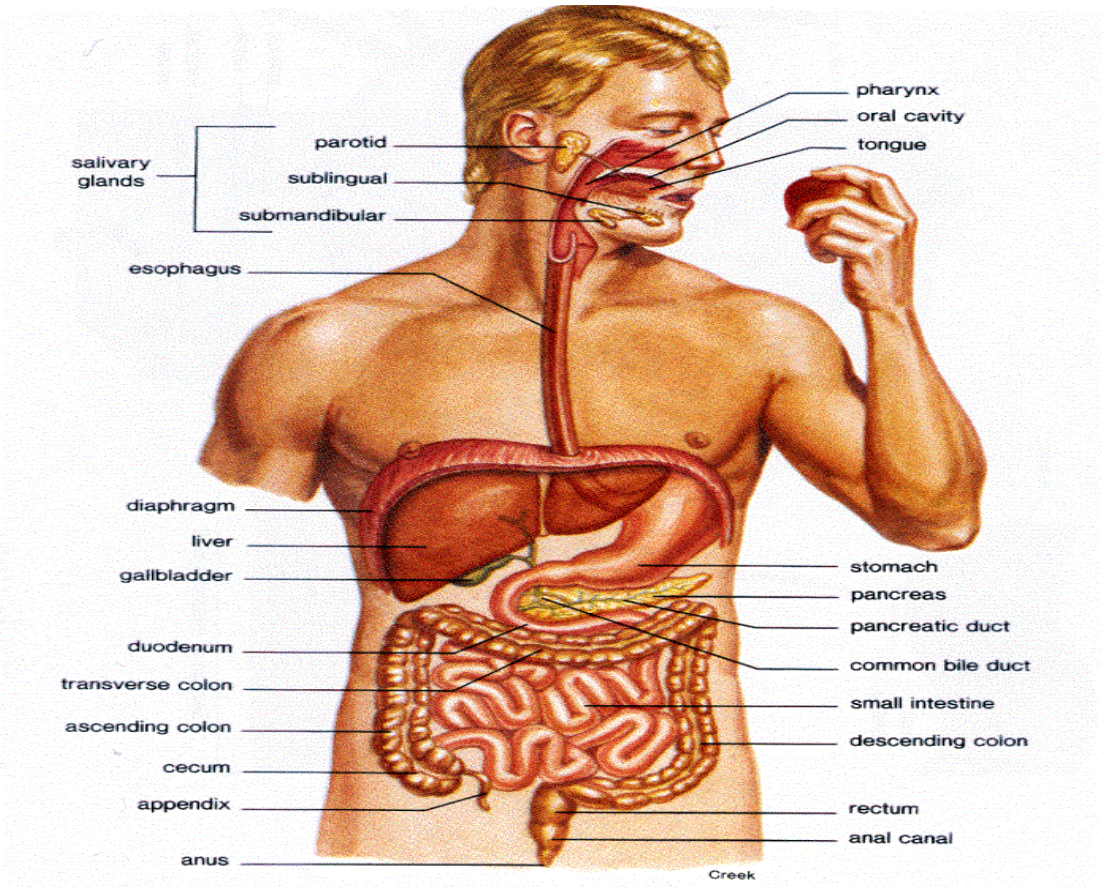
3-Glucosuria - in case of diabetes .

4-Ketone bodies .

Renal blood circulation :

The kidney receive blood supply from renal artery which arise from abdominal aorta . Renal artery branched, each one into malpighian corpuscle in which producing a glomerulus which in turn from veinuls and last from renal vein which drain into anterior vena cava.

(Digestive system)



Alimentary tract:

Mouth:

Food placed in the mouth, is chewed, grounded in to finer particles by teeth and mixed with saliva which digest starch by amylase in saliva. The food formed in to bolus salivary glands :three pairs of salivary glands found in human are:

1-paratoid glands
2-Submaxillary glands
3-Sublingual glands

All these glands secretes saliva about (1, 5 liter) daily.

SALIVA

Saliva consist of: 99 % water, amylase , mucin, Nacl , Kcl, albumin , urea, uric acid, ions of Na ,K, Ca, HCO3 .

Function of saliva

1-Help in chewing of foods .
2-moist the mouth cavity .
3-Dissolution of foods .
4-Digestion of starch .

OESOPHAGUS

Is passage between mouth and stomach. The bolus of food swallowed enter esophagus and by its peristaltic movement passed to stomach.

Peristalsis: Is the mechanism by which the food is moved along digestive tract.

STOMACH

The wall of the stomach is stronger than all regions of the tract, and is lined with million of **gastric glands** which secrete about 400 — 800 ml. of gastric juice at each meal.

Gastric glands

Three type of secretory cells found in each gland:

A-Parietal cells , B-chief cells , C-mucus cells .

Parietal cells (oxyntic cells): Secrete gastric Hcl and intrinsic factor.

Function of gastric Hcl:

1 -It has a role in digestion .
2-Making the medium of the stomach acidic (pH-2).
3-Stimulate pancreatic and bile secretion where it enter intestine .

Function of intrinsic factor :

It is a protein binds with ingested vitamin B12 and enable it to absorbed by intestine . A deficiency of this factor cause pernicious anemia .

Chief cells (Digestive cells)

It synthesize and secrete in active pepsinogen which activated by gastric Hcl into active pepsin that digest proteins by cleaving peptide bonds and breaks long polypeptide chains into shorter ones .

Duodenum and small intestine :

As the content of the stomach become liquefied , they pass into duodenum that is the 1st segment of mall intestine (about 10 inches long). In the duodenum food material called chyme .

Two ducts enter the duodenum which are:

1-Common duct which is composed from liver duct and bile duct -it draining the gall bladder and liver secretions into duodenum .

2-Pancreatic duct which draining the exocrine product from pancreas into duodenum.

The Liver:

The Liver secrete bile , accumulates in gall bladder . The bile juice enter duodenum by stimulation from hormone cholecystokinin (cck) which cause contract and discharge of gall bladder.

Bile juice :

It is about 500 - 1000 cm^3 / day in human . it contain bile acids , bile pigment, cholesterol, inorganic salts , urea .

Function of bile juice :

Emulsification of ingested fast by breaking large fat droplets into smaller &changing fast from insoluble material into water soluble that could digested by lipase . Also bile juice helps in absorption of fat soluble vitamins (E,D,A,K).

Pancreas:

Is an gland has two type of secretions :

First :

Endocrine secretions from islets of Langerhans , which are following hormones insulin , glucagons , somatostatin .

Second :

Exocrine secretion whose drain in to duodenum and called pancreatic juice , its pH (8) and contains :

1-sodium bicarbonate - neutralize the acidity of gastric Hcl in duodenum.

2-Ions of CI-, So4-, Hpo4, K^+ , Ca^+ , Mg^+.

3-Many digestive enzymes that are :

A- Pancreatic amylase ----------► hydrolyze starch .

B- pancreatic lipase ----------► hydrolyze fats .

C- trypsin ----------► hydrolyze proteins .

D- chemotrypsin ----------►hydrolyze proteins .

E- Elastase ----------►hydrolyze proteins .

F- Carboxypeptidase ----------►hydrolyze polypeptides .

G- nuclease ----------► hydrolyze nucleic acids .

Digestion in small intestine :

Digestion in the small intestine produces a mixture of disaccharides ,fatty acids and monosaccharides . The final digestion and absorption of these substances of small intestine . the crypts of villi contain cells which are : stem cells , goblet cells, endocrine cells & paneth cells.

Function of villi:

Increasing surface area of small intestine . and contain many enzymes that complete digestion.

1st-aminopeptidase --------- producing amino acids .
2nd-disaccharidase ------ convert disacharides to monosaccharides .
3rd- maltase ---------- hydrolyze maltose .
4th-sucrase ---------- hydrolyze sucrose .
5th-lactase ---------- hydrolyze lactose .

LARGE INTESTINE (COLON).

Large intestine receives liquid residue after digestion and absorption are complete , which consist mostly of water and undigested materials. Re-absorption of water take place in large intestine and the remain waste materials discharged out side of the body.

ABSORPTION

Absorption is transport of the end product of digestion from the alimentary to the blood or lymph, and then to the cells . 90% of absorption occur in small intestine, the other 10% occur in stomach and large intestine .

Absorption take place via three mechanisms :

1-diffusion.
2-faciliated diffusion
3-active transport.

Absorption of carbohydrates

All ingested carbohydrates converted into simple sugars (glucose , fructose, galactose):

Starch ~~amylase~~ —► maltose —maltase—► glucose
Sucrose —~~sucrase~~—► glucose + fructose
Lactose —~~lactase~~—► glucose + galactose

All these end product (glucose , fructose and galactose) absorbed through mucosa layer by active transport in presence of Na ion .

Absorption of protein

Ingested proteins broken down into amino acids by enzymatic activity :

Food protein—pepsin—► long chain peptides

tripsin
▼
short chain peptides

erppsin
▼
amino acids

All amino acids absorbed by active transport in the presence of Na ion .

Absorption of Fats

All fats ingested digested into three type of molecules which are :
Glycerol
Triglycerides
Fatty acids

These products are absorbed into intestinal lymphatic circulation not into the blood circulation. And then they pass to the fat despots of the body either in the abdomen or under the skin.

Absorption of Vitamins

Water soluble vitamin absorbed by acids of salt in the intestine. And lipid soluble vitamin absorbed by acids of bile salt in the intestine .

Absorption of water

Water absorbed in all regions of the alimentary tract by osmosis.