BREATHING, VENTILATION & GASEOUS EXCHANGE.

process by which medium containing respiratory gas is taken in and out of the body.

Definition: Breathing is the process by which the medium containing the respiratory gases is taken into the body of an organism and out of the body.

We have ~~different~~ It occurs in higher organisms through body openings such as stomata in plants spiracles in insects and animals mouth and nostril and vessels.

Definition: Ventilation. This refers to the series of adjustment of a body ~~fluid~~ and they might be ~~under~~ ~~any fluid~~ containing respiratory gases during breathing

Definition: Gaseous exchange. This refers to exchange of respiratory gases between the external environment and tissues of an organism

Respiration.

This refers to the oxidation of food substance inside the body cells to produce energy.

- O_2 on food inside the body cells to produce energy -

th/02/2018

Respiratory organ.
This is a body organ where gaseous exchange occurs for example lungs, gills, leaves, mouth, etc

Respiratory surface.
This is a specific site for gaseous exchange for example alveoli, gill filaments skin, cell membrane

Necessity of the respiratory system.
In order to take in and take out the medium containing the respiratory gases such that food substances can be oxidised to release energy. needed for life maintenance, note that; ~~it is the kind~~

NB It is the higher organisms with special systems since they have a small surface area to volume ratio and thus need active muscles and tissues hence a great need to take in and out ~~air~~ respiratory medium.

Chicken
B

Factors affecting the rate of gaseous exchange.

Total area of diffusion available. The larger the area the higher the rate of gaseous exchange. The shorter the distance, the higher the rate of gaseous exchange.

Rate of gaseous exchange increases with increase in area

Concentration gradient across the exchange surface The higher the concentration gradient, the higher the rate of diffusion.

Rate of diffusion increases w/ increase in concentration gradient

Speed of diffusing molecules as determined by size charge and solubility.

Characteristics of a respiratory surface.

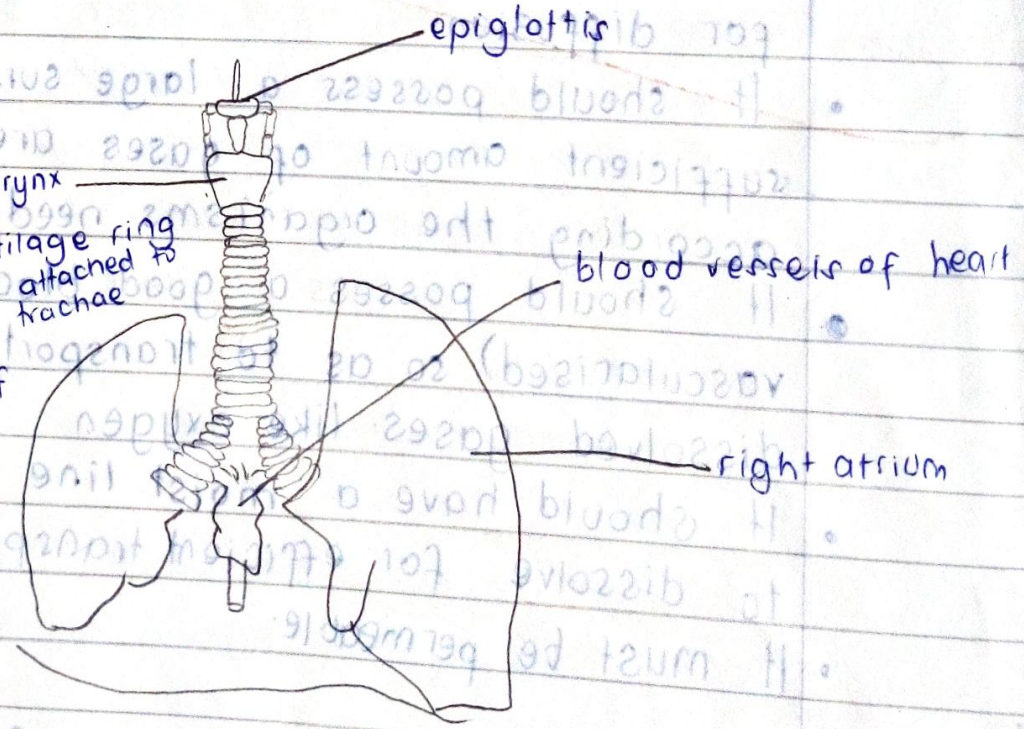
- It must be thin to provide a short distance for diffusion.
- It should possess a large surface area. so that sufficient amount of gases are able to be exchanged according the organisms need.
- It should possess a good blood supply. [highly vascularised) so as to transport the blood rich in dissolved gases like oxygen
- It should have a moist line to allow the gases to dissolve for efficient transportation.
- It must be permeable.

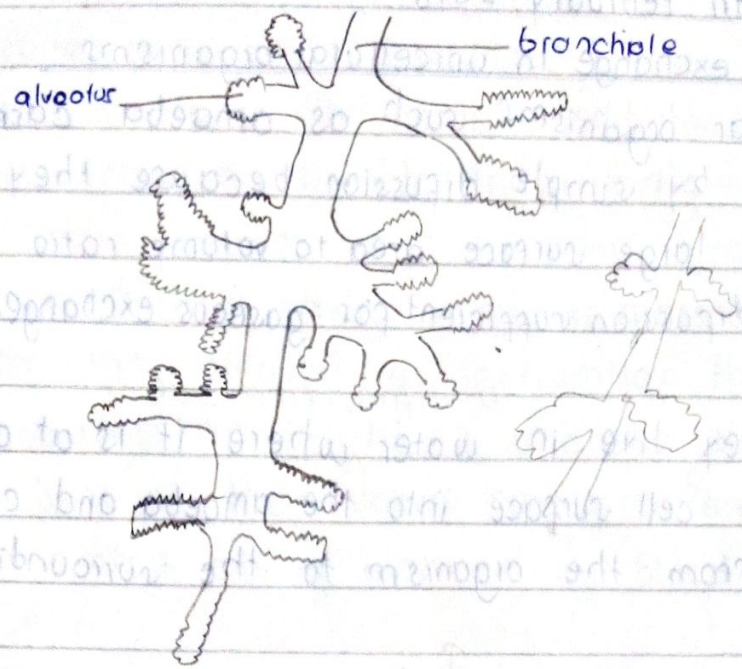
MAJOR RESPIRATORY MEDIA ORGANS AND SURFACES.

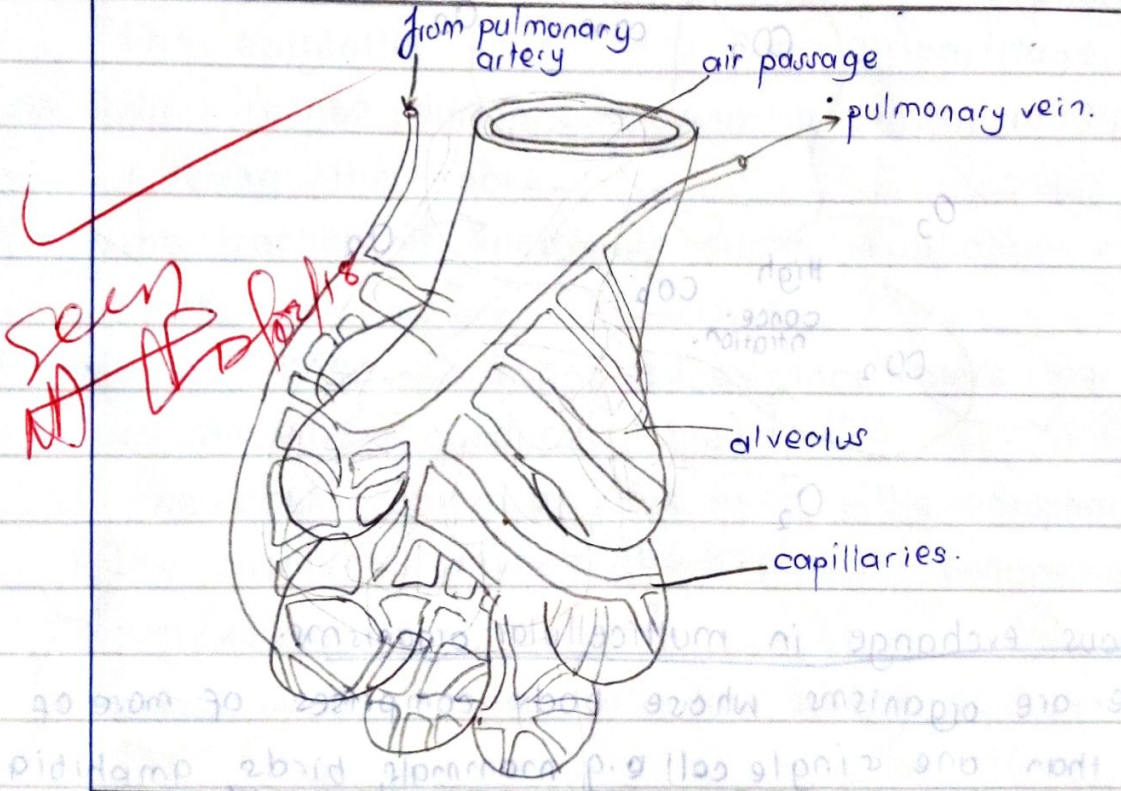
Organism	Medium	Respiratory organ	Gaseous exchange
Amoeba	Water		

Organism	Respiratory medium	Respiratory organ	Gaseous exchange surface.
Amoeba	Water	All membrane	General body surface all membrane.
Flat worm	Water	Body surface	Body surfaces.
Insects	Air	Tracheal surface	Tracheoles.
Fish	Water	Gills	Gill filaments
Reptiles	Air	Lungs	Alveoli
Birds	Air	Lungs	Parabronchi.
Man	Air	Lungs	Alveoli
Amphibians	Water	Tadpole, external gills skin.	Gill filaments
	Air.	Adult-skin	Alveoli
	Air.	Buccal cavity lungs	Alveoli.

Gaseous exchange in humans




bronchole
alveolus


from pulmonary artery
air passage
pulmonary vein.
alveolus
capillaries.

Friday, 9th February, 2018.

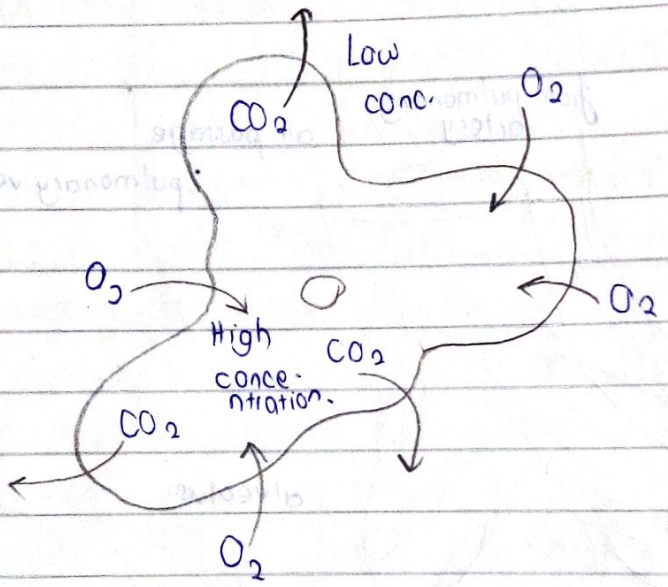
Gaseous exchange in unicellular organisms.

simple diffusion & gaseous exchange

Unicellular organisms such as amoeba carry out gaseous exchange by simple difussion because they are too small hence a large surface area to volume ratio which makes simple difussion sufficient for gaseous exchange.

O_2 diffuses from water

Since they live in water where it is at a high concentration across the cell surface into the amoeba and carbon dioxide diffuses from the organism to the surrounding water.



Gaseous exchange in multicellular organisms.

These are organisms whose body comprises of more of more than one single cell e.g mammals, birds, amphibians.

Such organisms are large with very small surface area to volume ratio implying that simple diffusion alone is not sufficient for gaseous exchange.

Such organisms therefore have special respiratory systems to move the medium containing the respiratory gases into and out of the organisms.

Gaseous exchange in humans.

i. Air passes through the nostrils and the mouth.

ii. Nostrils posses hairs which trap particles and filter them out of the system.

iii. Within the nasal cavity, mucus is secreted by the goblet cells in the ciliated epithelium of the nasal cavity.

iv. The mucus traps particles and the cilia moves them to the back of the buccal cavity where they are swallowed

v. The incoming air is warmed by blood vessels in the nose.

vi. From the nasal cavity, air moves into the pharynx past the epiglottis which is a flap of cartilage, that closes the trachea during swallowing to prevent food from entering the trachea.

vii. The trachea is lined with ciliated epithelium and goblet cells.

viii. The trachea is supported by incomplete rings of cartilage (c-shaped cartillage)

ix. The open section of C is next to the oesophagus.

x. The cartilage prevents the tubes from collapsing when the pressure inside them falls.

xi. The trachea divides into two bronchi each entering into the lungs.

xii. The bronchi are also supported by cartilage. They split into numerouse bronchioles which end into the alveoli.

xiii. The alveoli have thin elastic walls which are single celled and surrounded by a network of capillaries.

xiv. The lungs are surrounded by a membrane called Pleural membrane. is c

xv. Between the lungs and pleural membrane is a cavity containg ~~called~~ pleural fluid. This fluid lubricates the lungs so that there is no friction between the lungs and the ribs.

The ribs are connected by intercoastal muscles ie the inner muscles are the internal intercoastal muscles while the external or outer muscles are the external intercoastal muscles.

Below the lungs is a sheet of muscles called the ~~diagph~~ diaphragm separating the lungs from the abdominal cavity.

Monday, 12th February, 2018.

AIR PASSAGE.

Air is inhaled through the nose then travels via the pharynx, larynx to the trachea.
The air is warmed by the surface capillaries in the nose and the hairs filter any foreign particles in the air.
The air is then moistened by mucus secreted by the goblet cells.
The respiratory lining also contains cilia which move back and forth thereby pushing any foreign particles trapped with in mucus from the trachea ~~and~~ to the oesophogus.
They are then taken to the pharynx and either swallowed or coughed out.

VENTILATION IN MAN.

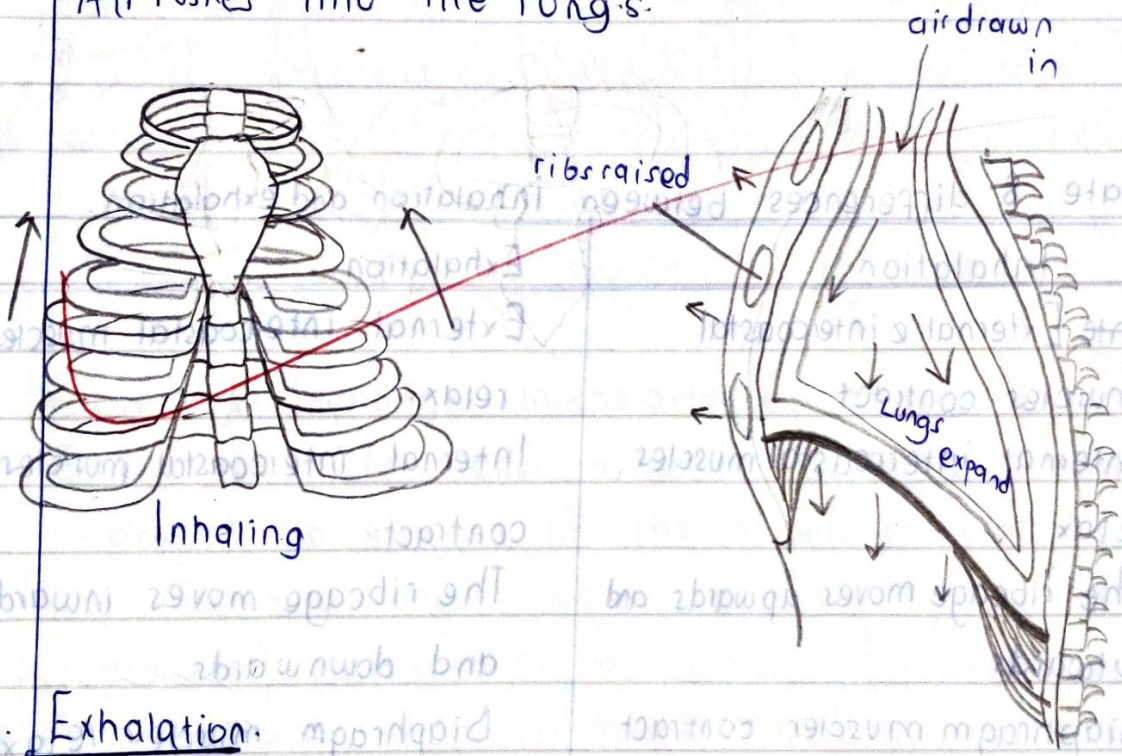
This refers to the flow of air in and out of the respiratory system in man.
It is divided into two phases ie

i. Inhalation / Inspiration / Breathing in.
ii. Exhalation / Expiration / Breathing out.

Mechanism of ventilation.

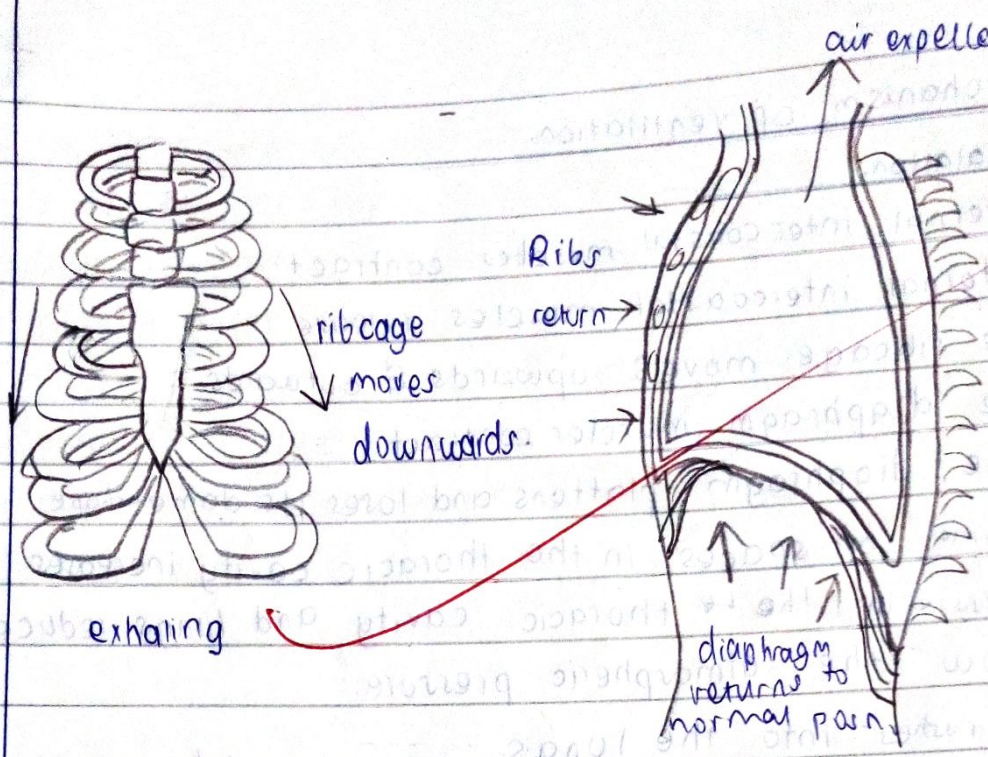
A Inhalation.

- External intercoastal muscles contract.
- Internal intercoastal muscles release relax
- The ribcage moves upwards & outwards.
- The diaphragm muscles contract
- The diaphragm flattens and loses its dome-shape.
- Volume of spaces in the thoracic cavity increases.
- Pressure in the ~~Le~~ thoracic cavity and lungs reduces below the atmospheric pressure.
- Air rushes into the lungs.



B. Exhalation.

Internal intercoastal muscles contract.
External intercoastal muscles relax
Rib cage moves downwards and inwards
The diaphragm muscles ~~re~~ ~~tea~~ relax.
~~The~~ ~~volume~~ ~~of~~ ~~spaces~~ Pressure ~~between~~ inside the thoracic cavity increases
Air rushes out of the lungs which contract to the atmosphere.
The diaphragm becomes dome shaped.



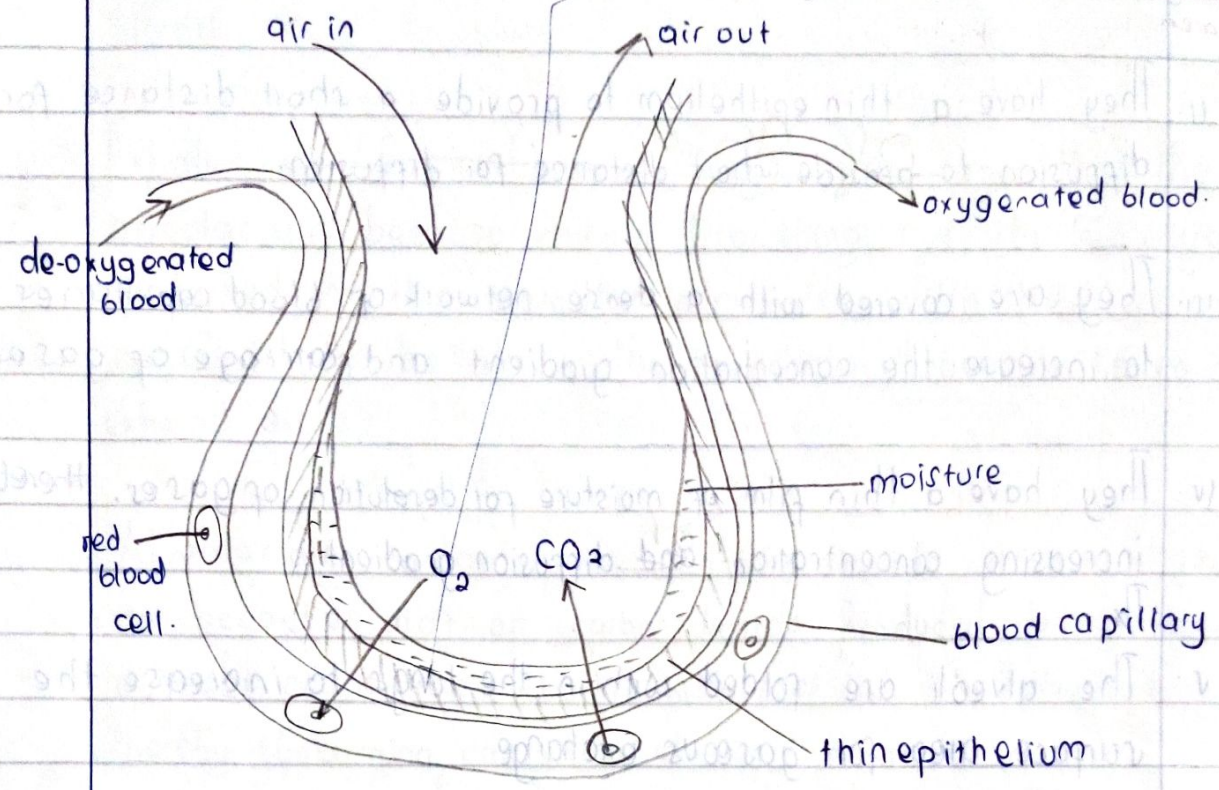
State 8 differences between inhalation and exhalation.

	Inhalation	Exhalation.
1.	~~Inte~~ External & intercoastal muscles contract	External intercoastal muscles relax.
2.	Internal intercoastal muscles relax	Internal intercoastal muscles contract.
3.	The ribcage moves upwards and outwards	The ribcage moves inwards and downwards.
4.	Diaphragm muscles contract	Diaphragm muscles relax.
5.	Diaphragm flattens	Diaphragm becomes domeshaped.
6.	Volume of thoracic cavity increases	Volume of thoracic cavity reduces.
7.	Pressure inside the thoracic cavity decreases	Pressure outside the thoracic cavity increases.
8.	Air rushes into the lungs which expand.	Air rushes out of the lungs which contract

Gaseous exchange in the lungs.

It occurs in sac like structures called the alveoli.

~~Gaseous exchange in the alveoli~~



Gaseous exchange in the alveolus occurs by simple diffusion.

→ Blood which is richer in carbon dioxide and relatively low in oxygen is brought to the alveoli from all body structures via the capillaries which are branches of the pulmonary artery.

→ Carbon dioxide diffuses from the blood into the alveolar space because it is at a relatively ~~to~~ higher concentration than in the alveoli.

→ On the other hand, oxygen diffuses from the alveolus space into the thin film of moisture and then finally into blood capillaries where it combines with haemoglobin in the red blood cells to form oxyhaemoglobin which is carried to all body parts / structures via the pulmonary vein.

→

Adaptations of the alveoli to gaseous exchange.

i. They are numerous with in the lungs to ~~provide~~ increase a large surface area for gaseous exchange.

ii. They have a thin epithelium to provide a short distance for diffusion to ~~provide short distance for diffusion~~ gases.

iii. They are covered with a dense network of blood capillaries to increase the concentration gradient and carriage of gases

iv. They have a thin film of moisture for dessolution of gases, thereby increasing concentration ~~and~~ diffusion gradient.

v. The alveoli are folded with in the lungs to increase the surface area for gaseous exchange.

vi. They have a flexible membrane in order to expand & get compressed for effective ventilation.

TABLE Showing CONCENTRATION IN THE ATMOSPHERE ALVEOLI AND EXPIRED AIR.

Gas	Atmospheric air (%)	Alveoli air (%)	Expired (%)
Oxygen	20.06	13.8	16.4
Carbon dioxide	0.03	5.5	4.1
Nitrogen	79.01	79.01	79.01
Water vapour	variable	variable	variable.

Explanation of results.

- Alveolar air contains less oxygen than atmospheric air because oxygen diffuses from the alveolar air into the blood.

- Exhaled air / Expired air contains more oxygen than the alveolar air because during breathing out the low oxygen contained in the alveolar air mixes with the high oxygen contained in the air in the respiratory tubes to form exhaled air

- Alveolar air contains more carbon dioxide than atmospheric air because alot of carbon dioxide produced during respiration diffuses from the blood capillaries into the alveolus thereby becoming concentrated in the alveolar air.

- Exhaled air, contains less carbon dioxide than alveolar air, because as this air leaves the tubes it meets air in which it has a low concentration hence diluting it and getting out in small quantities.

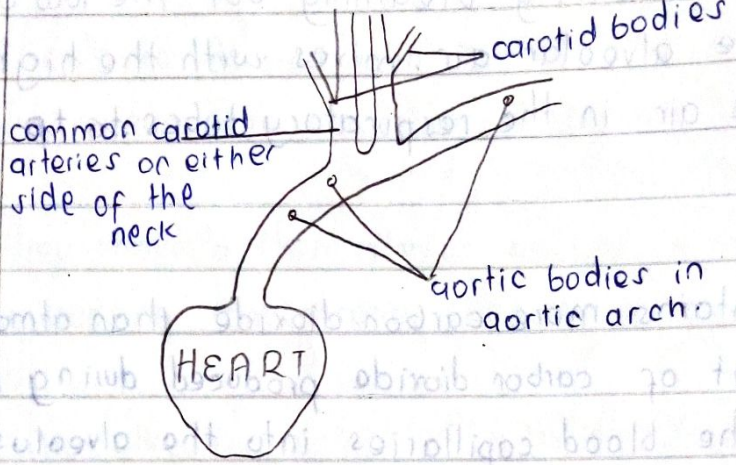
- The concentration of nitrogen remains constant in the alveolus and exhaled air because it is neither used or produced by the body.

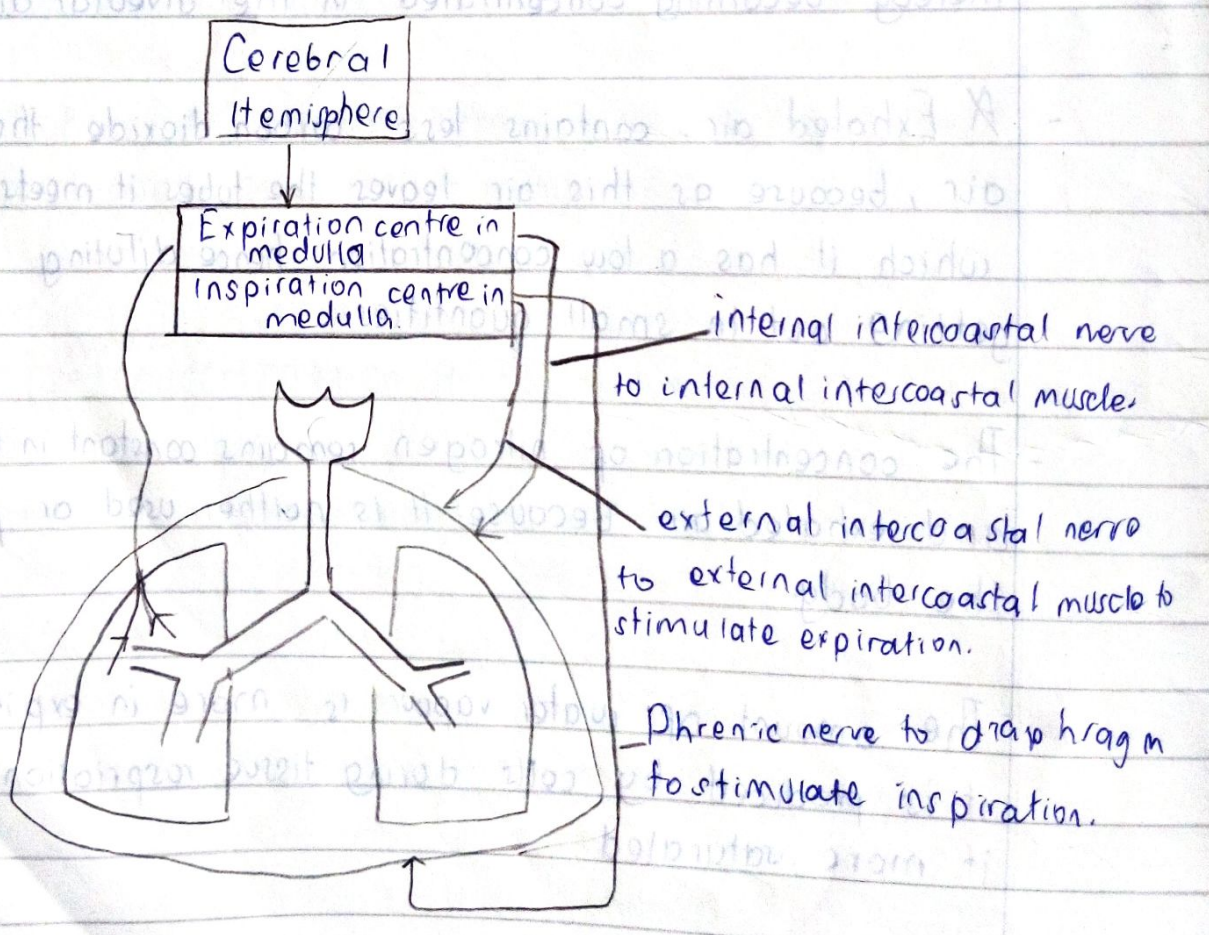
- The amount of water vapour is more in expired air because it is produced by cells during tissue respriation. which makes it more saturated.

Control of ventilation in humans.

Normally we ~~no~~ are not ~~concise~~ conscious of our breathing because it is controlled involuntarily. However we can take over some voluntary control.

Involuntary control of breathing (Nervous control of breathing)





Friday, 16th February, 2018

When the concentration of carbon dioxide in blood is high. its high concentration is detected by the aortic and carotid bodies which send impulses to the respiratory centre in the medulla oblongata.

~~The~~ It interprets the impulses and sends them to the ~~interno~~ external intercoastal muscles via the external intercoastal nerve. and to the diaphragm muscles via the phrenic nerve.

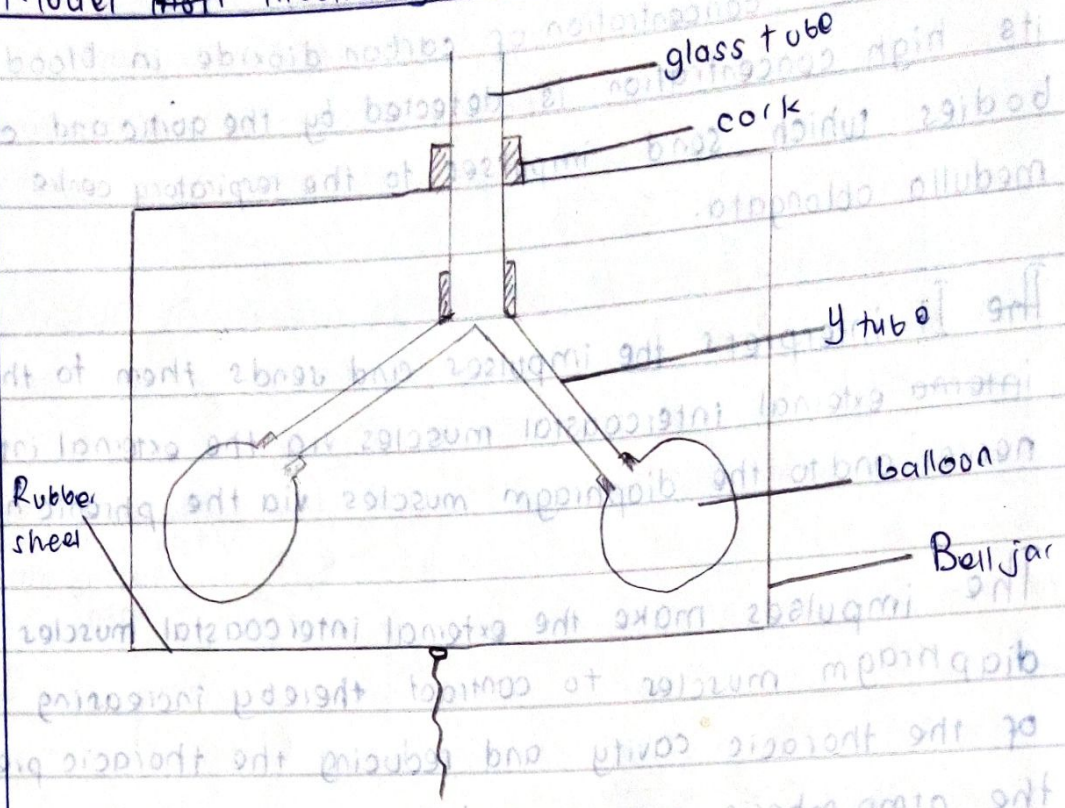
The impulses make the external intercoastal muscles and the diaphragm muscles to contract thereby increasing the volume of the thoracic cavity and reducing the thoracic pressure below the atmospheric pressure and so, air rushes into the lungs during breathing in.

As air enters into the lungs the stretch receptors of the bronchi get over stretched and send impulses via the vagus nerve to the expiratory centre which switches off the inspiratory centre. and one breathes out.

The expiratory centres sends impulses to the internal intercoastal muscles via the internal intercoastal nerve to stimulate breathing out.

NB. Incase one has stopped respiring, the individual is given mouth to mouth resuscitation which involves breathing in expired air into the victims mouth in order to increase the carbon dioxide concentration so that the above process is activated

Model ~~inst~~ illustrating human ventilation.



NB. The glass tube represents the trachea.
The Y-tube represents the bronchus.
The balloon represents the lungs.
The bell jar represents the rib cage.
The rubber sheet represents the diaphragm.
The thread represents the diaphragm muscles.
The space inside the bell jar represents the thoracic cavity.
The thread is pulled

The thread is pulled downwards which in turn pulls the rubber sheet downwards.
The balloons are then seen to expand.
The thread is then released to flatten the rubber sheet again and the balloons are seen to get compressed.

Explanation.

> When the thread is pulled downwards and the rubber sheet is made to come downwards and outwards, the space within the bell jar increases and the pressure within the bell jar ~~increases~~ decreases below the atmospheric pressure.

> This makes air to rush in through the glass tube and the ~~white~~ Y tube in the balloons which then expand and this illustration shows inspiration.

> When the thread is released, the rubber sheet flattens thus reducing the volume within the bell jar and increasing pressure within the bell jar relative to atmospheric pressure.

> This makes the baloons to get compressed and air to rush out of the balloons through the ~~us~~ Y tube and glass tube in to the atmosphere.

Differences between the model and the arrangement in man.

	MODEL	ARRANGEMENT IN MAN.
1.	The rubber sheet moves downwards during inspiration	The diaphragm flattens during inspiration.
2.	Bell jar is stationary	The ribcage is moved by intercoastal muscles.
3.	Baloons lack alveoli & are impermeable.	Lungs ~~have~~ have alveoli and they are permeable.
4.	Adjustment of the rubber sheet is voluntary	Adjustment of the diaphragm are involuntary.
5.	The rubber sheet flattens during expiration.	Diaphragm becomes dome shaped during expiration.
6.	There are no intercoastal muscles.	There are intercoastal muscles.
7.	There are no blood capillaries.	There is a dense network of capillaries in the lungs.
8.	There are no rings of cartilage in the glass tube	There are rings of cartilage in the trachea.

Experiments in gaseous exchange.

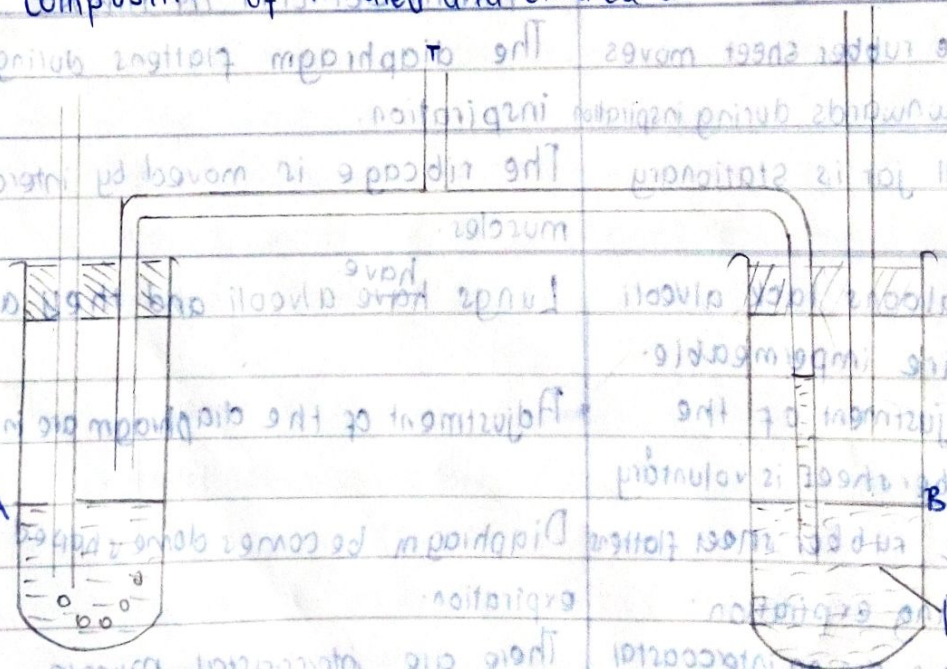
Experiments ~~in gaseous~~ 1.

Aim.

To show that expired air contains more carbon dioxide ~~contains~~ than inspired air.

1. Composition of exhaled air. By placing tube T in the mouth & breathing gently in and out is made to pass into ~~é~~ lungs via test tube A and out via B. After a few seconds the lime water of each test tube will indicate one of the oxygen concentration. The air exhaled first (tracheal and branchial) and last (alveolar) should be

1. Composition of exhaled air. By placing tube T in the mouth and breathing gently in and out air is made to pass into the lungs via test-tube will indicate one of the differences btn the composition of inhaled and exhaled air.



2. Oxygen concentration: Exhaled air is collected in a gas jar by downward ~~movemen~~ displacement of water. A lighted splint placed in the gas jar will give some indication of the oxygen concentration. The air exhaled first (tracheal and bronchial) and last (alveolar) should be collected separately and compared.

3. Lung capacity.

A large plastic bottle is callibrated up to 5 litres by filling it with water 1 litre at a time and marking the levels. The bottle, full of water is inverted in a trough or bowl of water, the stopper removed and a rubber tube inserted in ~~a trough~~ through the neck. The experimenter takes a deep breath and exhales through the tube so that the exhaled air collects in the bottle, displaced the water. The level of water left in the bottle will give a measure of the lung capacity.

4. The arrangement is shown.

Air is blown into the ~~lime~~ water in arrangement A through the mouth of the experimenter

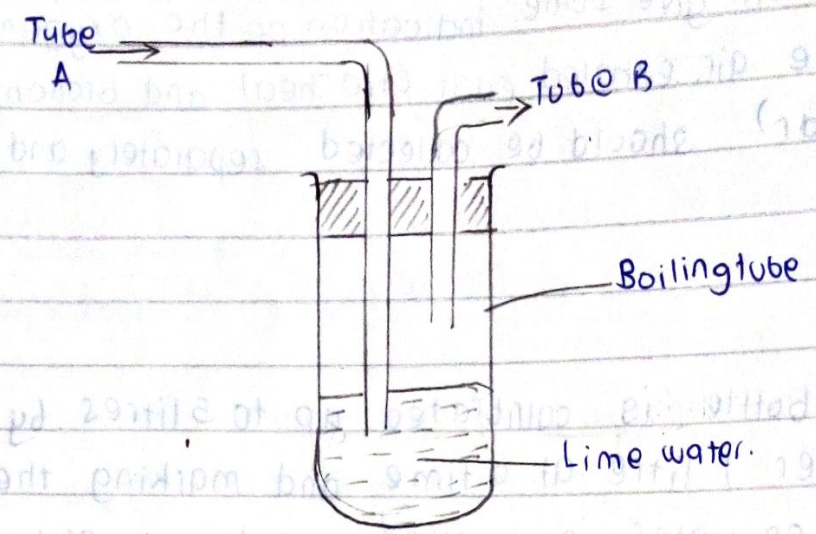
After a short period the lime water in A turns milky air is then taken into the mouth of the experimenter after bubbling through arrangement B.

The lime water in arrangement B takes a very long time to turn milky

Conclusion.

Expired air through arrangement A contains more carbon dioxide than inhaled air through arrangement B.

Alternative experiment



Procedure.

Air is blown into tube A through the mouth.

After a short period the lime water turns milky.

The milky lime water is then replaced by fresh clear lime water and air is drawn from the atmosphere into the lime water by sucking through tube B.

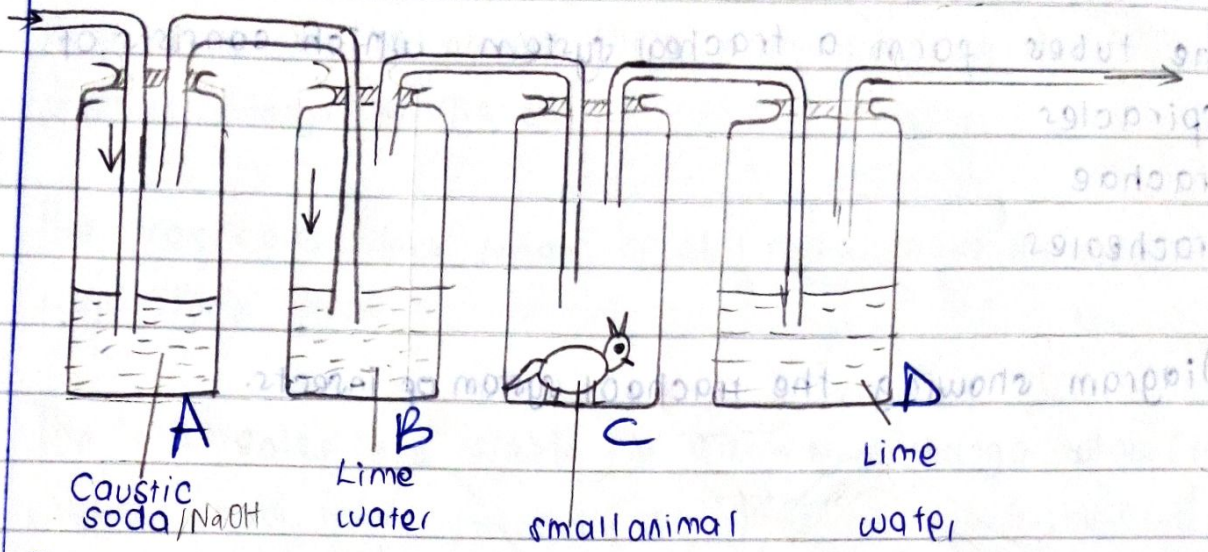
It takes a longer time for the lime water to turn milky.

Conclusion.

Expired air contains more carbon dioxide than inspired air.

2. Aim

To show that living organisms expire carbon dioxide.



Procedure.

a. The arrangement is as shown above.
b. A stream of air is drawn into the arrangement using a filter pump.
c. In A sodium hydroxide absorbs carbon dioxide from incoming air.
d. In B the lime water checks if the carbon dioxide is still present.
e In C the animal breathes out carbon dioxide.
f. In D the lime water tests for the carbon dioxide breathed out by the small animal.
g. ~~The lime water remains~~

Observation.

The lime water in B remained the same while that in D turned milky.

Conclusion.

Living organisms breathe out air containing carbon dioxide.

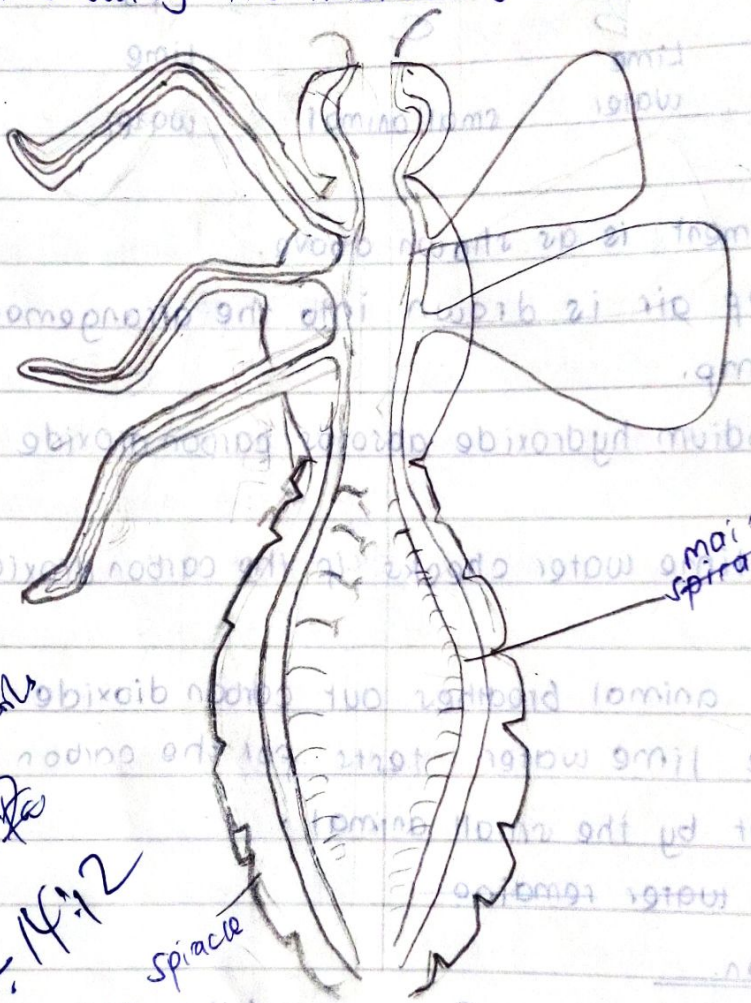
Gaseous exchange in insects.

In insects, gaseous exchange occurs through a network of tubes called the trachea

The tubes form a tracheal system which consists of

i.) spiracles
ii.) trachae
iii.) tracheoles

Diagram showing the tracheol system of insects.



Tropical school
15 7 fe
Eg: 14:12

* The tracheol system opens to the outside environment through the spiracles

The spiracles occur in pairs within the body segments of the abdomen and thorax

The trachea divides into the tracheal tubes ~~and~~ which

then divide into many fine tubes called tracheoles

The trachea and tracheole tubes have rings of chitin that support and prevent them from collapsing due to pressure changes in the body.

The tracheoles lack rings of chitin to make them permeable to respiratory gases.

The tracheoles are sights for gaseous exchange ~~where~~ (respiratory surfaces) and they penetrate through the insect tissues & deliver oxygen directly to the body tissues and carry carbon dioxide directly from the body tissues.

Tuesday, 2nd February, 2018

Tracheal system.

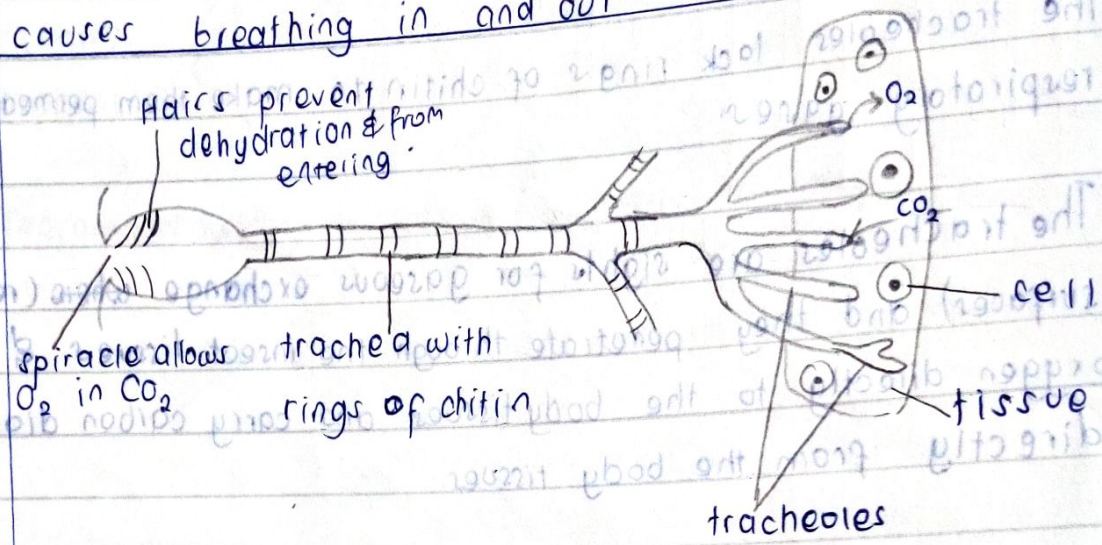
The tracheals contain a fluid which facilities dissolution of gases and uptake of gases by the tissues

This implies that, the respiratory gases in insects are not transported by the blood stream. and that is why their blood lacks haemoglobin.

The direct contact of the tracheals with the cells of the body makes the tracheal system very effective since it delivers oxygen directly to the tissues. and carbon dioxide is directly carried from the tissues. This makes the insects very active.

However, the process relies on diffusion & can occur only across a small distance. which limits the size of insects.

Contraction and relaxation of the abdominal muscles causes breathing in and out.



The tracheal system of an insect.

Ventilation ~~of a~~ in insects.

Inhalation Muscles of the abdomen, the abdomen and trachae increase in volume, pressure in the trachae decreases below atmospheric pressure.

Thoracic spiracles open, air enters through the thoracic spiracles into the ~~trachae th~~ tracheae and then tracheals.

Gaseous exchange occurs by oxygen in the air dissolving in the moisture in the tracheoles then diffuses into the tissues.

Carbon dioxide diffuses in the ti opposite direction from the tissues into the tracheals.

Expiration. Muscles of the abdomen ~~an~~ contract and the abdomen & trachae reduce in volume and the pressure increases above atmospheric pressure.

~~Abdominal spiracles open and air rich~~
Abdominal spiracles open and air rich in carbon dioxide is forced from the tracheals into the trachea and out through the abdominal spiracles.

Adaptations of the tracheal system for gaseous exchange.

Hairy → trap foreign bodies/ prevent dehydration

The spiracles are hairy to trap foreign particles and also prevent dehydration.

Made up of rings of cartilage → prevent them from collapsing

The trachea and tracheal tubes are made up of rings of chitin which prevent them from collapsing.

Tracheoles

The respiratory surfaces called tracheoles are in direct contact with the body cells making it very efficient for gaseous exchange.

The tracheales contain a fluid which ~~conte~~ dissolves respiratory gases making it easy for gaseous exchange to take place.

The tracheales lack rings of chitin to make them permeable to respiratory gases.

The tracheales are branched to increase the surface area in contact with the body cells for efficient gaseous exchange.

The spiracles are numerous on the body to increase the

surface area for the inlet & outlet of gases.

Gasoous exchange in fish.

BONY FISH.

Fish live in water and obtain their oxygen from water.

They use gills for gaseous exchange.

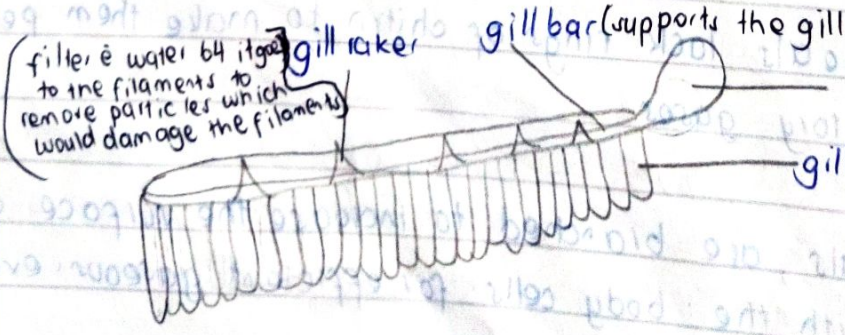
Their respiratory surfaces are the gill filaments.

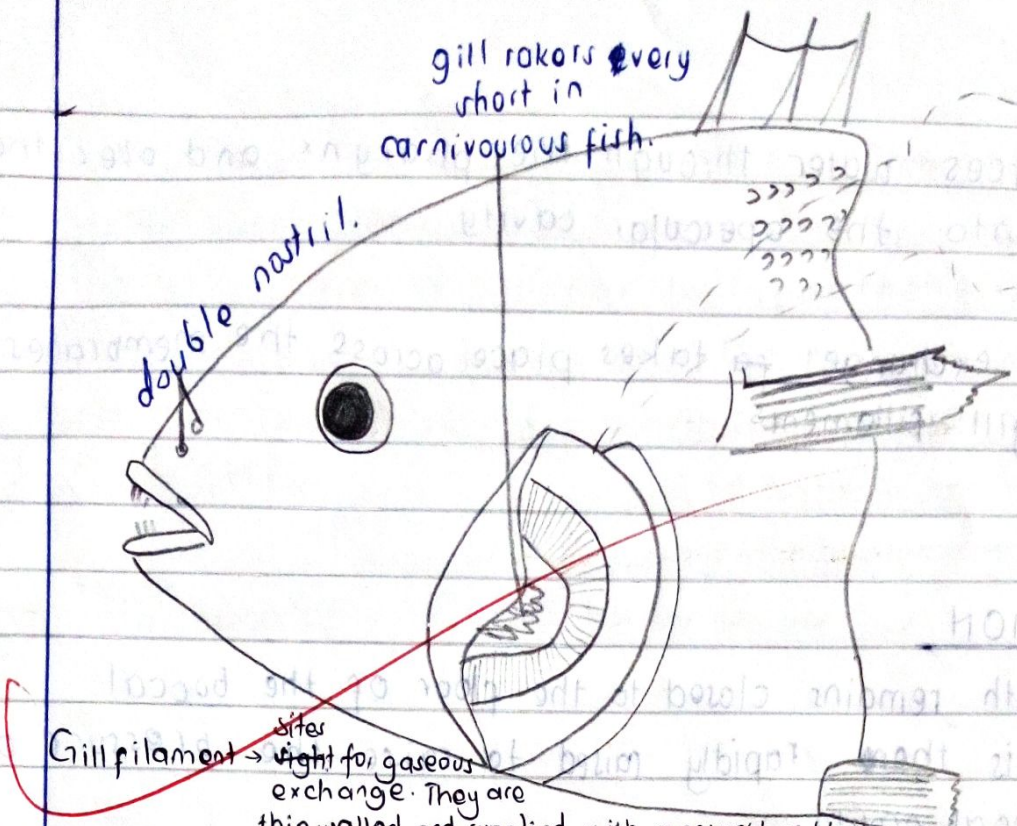
In bony fish, there are two opercular cavities one on either side and the operculum cover the gills located in the gill chamber.

Each gill is made up of 2 rows of thin gill filaments on a gill bar.

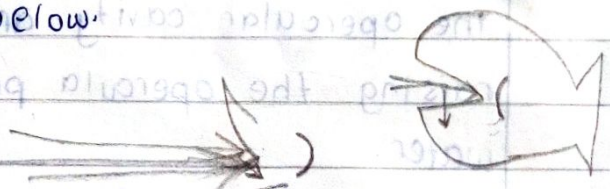
The gill bar has gill rakers which filter out solid particles in water and prevent them from reaching the gill filaments.

Diagram showing the structure of a gill.





Water is drawn into and ~~eat~~ out of the ~~the~~ fish mainly by the movement of the operculum following a series of events outlined below.



INHALATION.

The fish opens the mouth and closes the operculum

The floor of the ~~gro~~ mouth is lowered, the ~~presseance~~ pressure in the buccal cavity is lowered / reduces below ~~of~~ that of the surrounding water.

Water rushes into ~~int~~ the buccal ~~activity~~ cavity through the mouth and then the mouth closes.

~~After~~ At the same time opercular cavity expands by the opercula mouth outwards and causing pressure in fall below that of the buccal cavity.

- open mouth & operculum - close
- floor of buccal cavity, volume - increases
- decrease pressure
- water rushes into the buccal cavity

This forces water through the pharynx and over the gills into the opercular cavity.

Gaseous exchange ~~fo~~ takes place across the membranes of ~~the~~ gill fillaments.

EXHALATION

The mouth remains closed to the floor of the buccal cavity is then rapidly raised to raise the pressure of the buccal cavity

The floor of the mouth remains raised.

The opercular move inwards reducing the volome inside the opercular cavity and raising the opercolar cavity and raising the opercula pressure beyond that of the surrounding water.

This forces the valves to open.

This ~~themselves~~ then forces the water to flow over the gill filaments and through out the opercular cavity

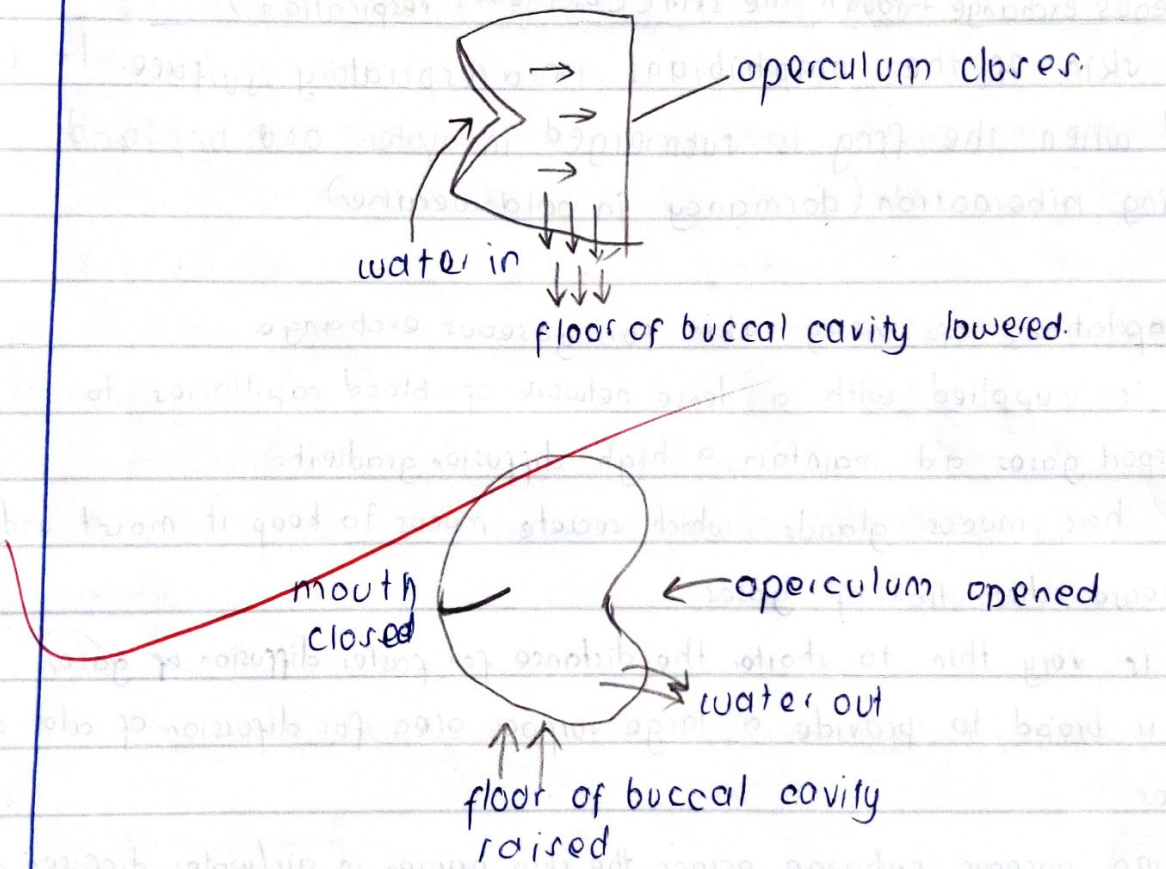
Adaptations of the gills for gaseous exchange.

i. The gills have many gill filaments which increase surface area for gaseous exchange.
ii. The filaments ~~we~~ are thin which reduces ~~the~~ diffusion distance
iii. The gill filaments have mucus which increases dissolution of gases
iv. The gills are well supplied with blood capillaries

to increase the ~~difficult~~ diffusion gradient of the gases and hence carry the ~~diffused~~ diffusion gases.

5. The gills have a gill bar to support the gill filaments.
6. They have gill rakers to filter foreign substances and prevent them from damaging the gill filaments.

Diagramatic illustrations



...eous exchange
...fish

Gaseous exchange in amphibians:

Young amphibians for example tadpoles use external gills for gaseous exchange.
This is because they are exclusively aquatic.
As the tadpole matures the gills become internal and as it developes into an adult frog or toad, the gills develop into lungs.
In adult amphibians gaseous exchange occurs by means of the skin, mouth / buccal cavity and the lungs

Gaseous exchange through the skin (Cutaneous respiration)

The skin of the amphibians is a respiratory surface. It is used when the frog is submerged in water and on land during hibernation (dormancy in cold weather)

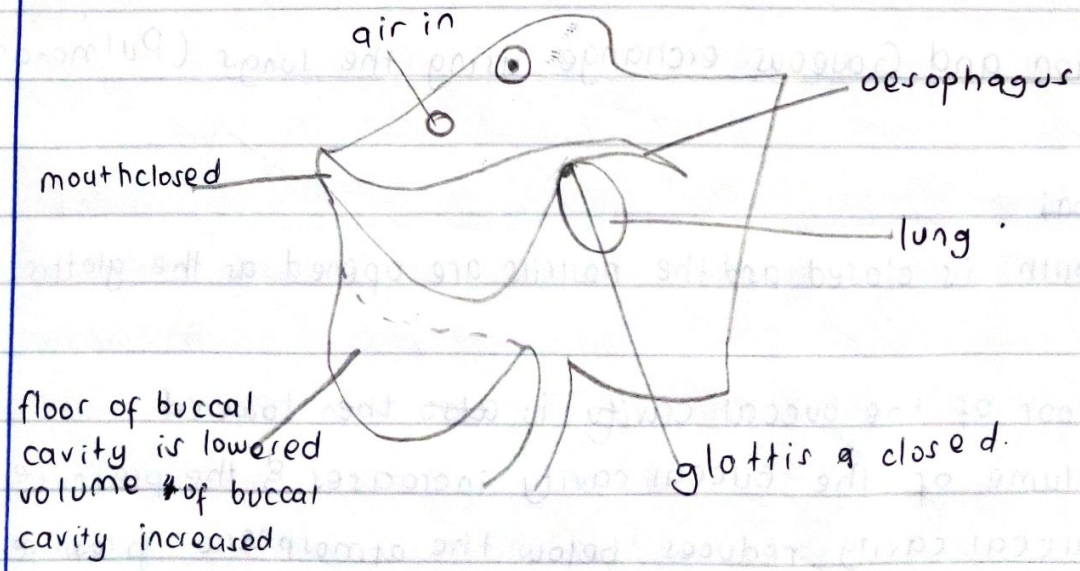
Adaptations of frog skin for gaseous exchange
It is supplied with a dense network of blood capillaries to transport gases and maintain a high diffusion gradient.
It has mucus glands which secrete mucus to keep it moist and increase dissolution of gases.
It is very thin to shorten the distance for faster diffusion of gases.
It is broad to provide a large surface area for difussion of alot of gases
During gaseous exchange across the skin oxygen in air/water diffuses directly into the moisture on the skin then into the blood capillaries & carbon dioxide diffuses out into the atmosphere or water.

Gaseous exchange through the mouth or buccal cavity.

This is used during the frogs active period for example in the breeding season. when cutaneous respiration is insuffrieient and must be supplemented by buccal respiration.

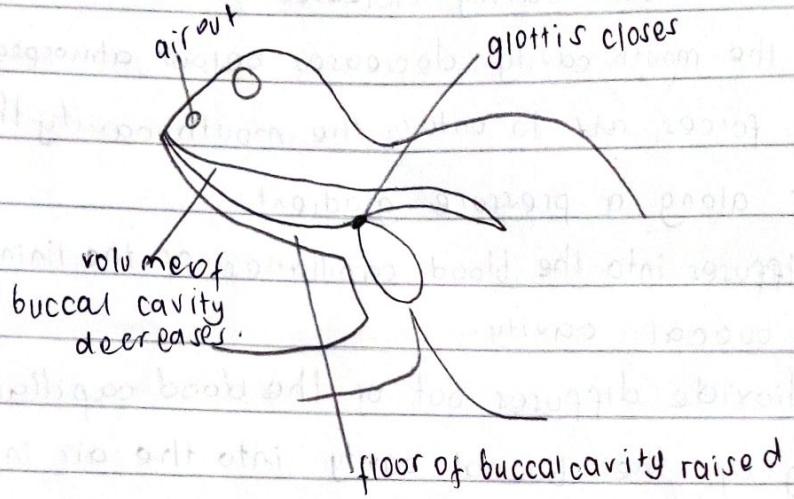
The epithelial lining of the buccal cavity is the respiratory surface in the mouth.
Gaseous exchange in the buccal cavity occurs as follows.

During inspiration;
- Muscles of the floor of the buccal cavity contract.
- Floor of the mouth is lowered
- Mouth is closed
- Nostrils opened
- The glottis closes the path to the lungs
- Volume of the mouth cavity increases
- Pressure in the mouth cavity decreases below atmospheric pressure. This forces air to enter the mouth cavity through the nostrils along a pressure gradient.
- Oxygen diffuses into the blood capillaries of the lining of the mouth or buccal cavity.
- Carbon dioxide diffuses out of the blood capillaries of the lining of the buccal cavity into the air in the mouth cavity.



During expiration.

- Muscles of the floor of the mouth expand.
- Floor of the mouth is raised.
- Mouth is open.
- Glottis still closes the path of the lungs.
- Nostrils open.
- Volume of the mouth cavity decreases.
- Pressure in the mouth cavity increases above atmospheric pressure.
- This forces air with carbon dioxide to rush out of the mouth cavity to the atmosphere through the nostrils



Ventilation and Gaseous exchange using the lungs (Pulmonary respiration)

Inspiration;

The mouth is closed and the nostrils are opened as the glottis is also closed.

The floor of the buccal cavity is ~~also~~ then lowered.

The volume of the buccal cavity increases & the pressure inside the buccal cavity reduces below the atmospheric pressure

This makes air to rush from the ~~air~~ atmosphere into the buccal cavity as the glottis is still closed.

The nostrils are then closed and the glottis is opened.

21/02/2018.

- The floor of the buccal cavity is raised when the mouth is still closed.
- The volume of the buccal cavity reduces and the pressure in the buccal cavity increases above ~~lung~~ atmospheric pressure.
- This forces air to rush through the lungs ~~on~~ via the glottis and gaseous exchange occurs ~~where~~ in the lungs where oxygen diffuses into blood and carbon dioxide diffuses from the blood to the lungs.

~~Ext~~ Exhalation;

- This involves movement of air from the lungs to the buccal cavity and from the buccal cavity to the atmosphere.
- The glottis is then opened. ~~and the~~
- The floor of the buccal cavity is lowered increasing the volume of the buccal cavity and reducing the pressure with in the buccal cavity below the lung pressure.
- The mouth and nostrils remain closed.
- Expired air rushes from the lungs into the buccal cavity through the glottis.
- This is then followed by closure of the glottis, opening of the nostrils and closure of the mouth.
- The floor of the buccal cavity is then raised hence reducing volume of the buccal cavity and increasing the pressure within the buccal cavity above the atmospheric pressure.
- This makes air to rush out from the buccal cavity to the atmosphere via the nostrils.

Gaseous exchange in plants.

Plants do not have specific surfaces & organs.

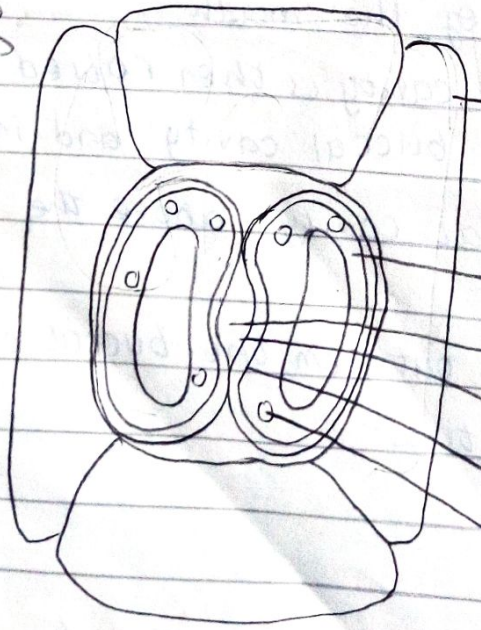
Reasons why plants lack special respiratory organs & ~~for~~ surfaces

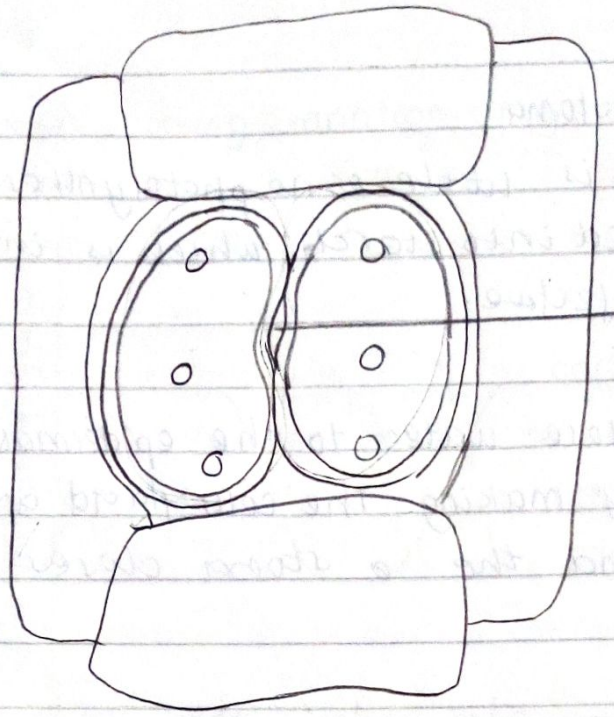
- They generally have a low metabolic rate implying that less oxygen is required for gaseous exchange/respiration
- They do not need to maintain a constant body temperature so their metabolic rates are low.
- They do not locomote hence low need for energy.
- Pta. Apart from gaseous exchange plants can obtain oxygen from the by products the photosynthesis.
(they can reuse their waste products)
- Gaseous exchange can occur in all organs of the plant except where the surfaces are covered by the bark or cutcle co.
- **Note** that in plants gaseous exchange takes place through the stomata and lenticells. However some plants have breathing roots for gaseous exchange.

lungs → heart → kidney
pulmonary vein

Mechanism of stomata opening & closing.

Diagram of open stomata.





Opening of stomata.

During the day, photosynthesis occurs in the guard cells, since they are the only cells with chloroplasts in the lower epidermis.

Sugar accumulates in the guard cells and they become more concentrated than the epidermal cells.

Water leaves the epidermal cells to the guard cells by osmosis.

35 | 100

The guard cells become turgid and the thin outer wall stretches more than the inner thick wall causing the guard cells to open in the middle hence stoma opens.