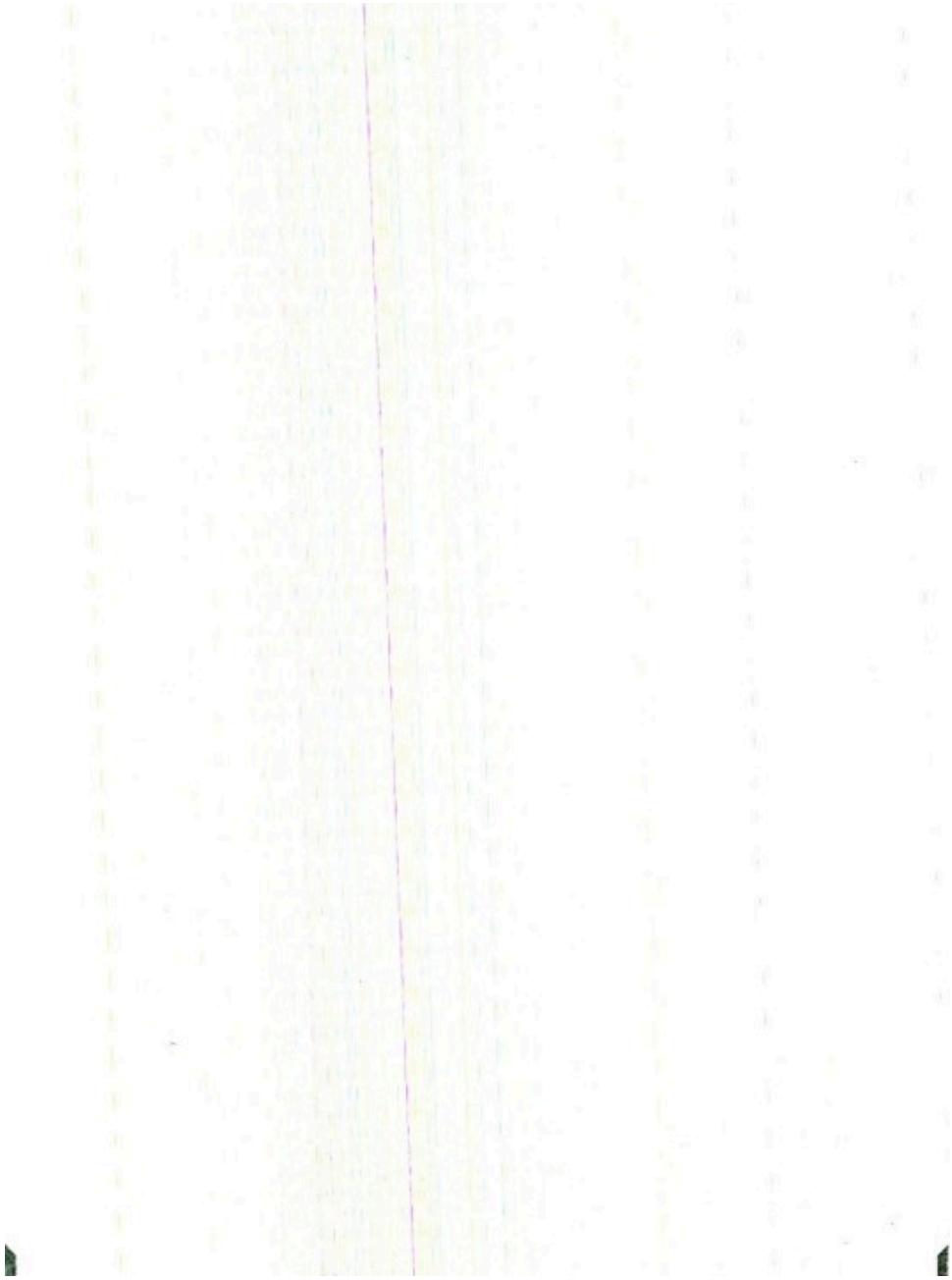
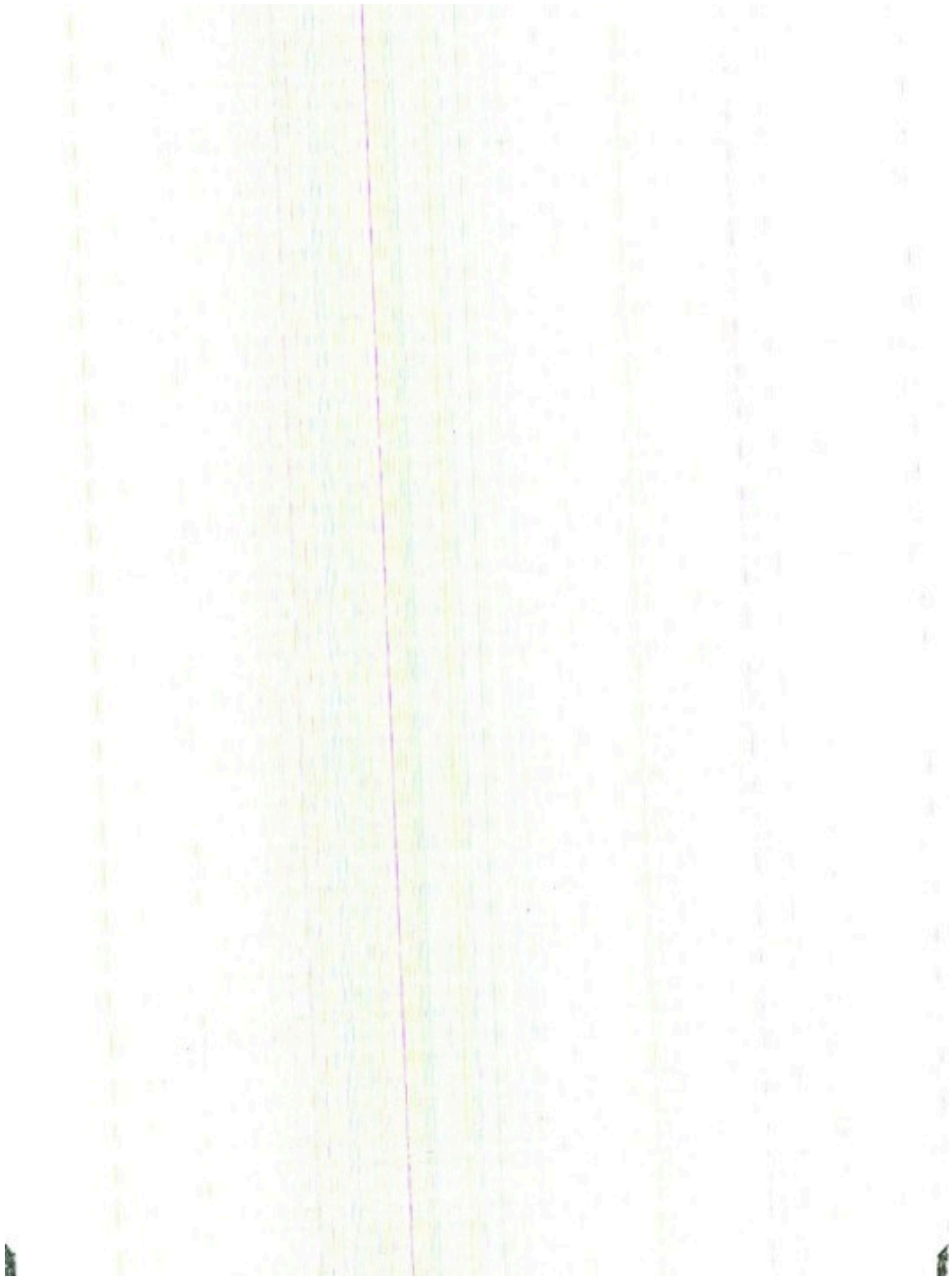






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Q. No. 2 Part (i) **Emphysema:-**

Emphysema is a respiratory disorder, in which alveoli are effected.

→ Causes:-

Causes of emphysema include marijuana, smoking, cigar, ciggerettes and E-vaping. In short main cause of emphysema is smoking. Smoke and dust particles also cause emphysema.

→ Impacts On Body:-

It has severe impacts on body including difficulty in breathing, chest pain, asthma, coughing, wheezing etc.

Q. No. 2 Part (ii) ***Ventilation Phase:-**

It is the exhalation or expiration phase of ventilation.

→ Exhalation:-

Exhalation is the passive phase of ventilation in which CO_2 is released out. In exhalation following events occur:-

1) Ribs move downward and backward.
2) External intercostal muscles relax.
3) Internal intercostal muscles contract.
4) Diaphragm become dome shape.
5) Pressure in lungs increases.
6) Air moves out of lungs.

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Q. No. 2 Part (iii) a) **Role OF Calcium:-**

During muscle contraction calcium plays an important role. When nerve impulse of brain arrives at Sarcoplasmic reticulum (SR) it opens calcium gates and release calcium ions these calcium ions bind with troponin present on actin and pull tropomyosin along with it, thus it free the myosin binding site on actin and actin and myosin bind together forming cross bridges.

b) Changes In Sarcomere:-

* Length of sarcomere shortens as Z-lines move closer to each other.
* I-band shortens
* H-Zone disappear
* A-band become closer but its length remain unchanged

Q. No. 2 Part (iv) * **Median:-** In ungrouped data median is the middle value. First we have to arrange data in ascending order:-

3, 6, 9, **12**, 15, 18, 21

-> 12 is the middle value, thus it is median.

* **Mean:-**

Mean is obtained by adding all the values and dividing by total number of observations.

Formula:-

$$\bar{X} = \frac{\Sigma X}{n}$$

$$\bar{X} = \frac{3+6+9+12+15+18+21}{7}$$

$$\bar{X} = \frac{84}{7} \Rightarrow \boxed{\bar{X} = 12}$$

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Q. No. 2 Part (v) * **Monoclonal Antibodies:-**

Antibodies are proteins produced by body after invasion of antigen. However Monoclonal antibodies are those antibodies which artificially replicated by scientists in laboratories. mAb's are synthesized in laboratory by using by using specific natural antibodies and clones are made.

→ Importance Of Monoclonal Antibodies:-

→ Monoclonal antibodies are highly specific. They are used in drugs discovery to produce medicinal drugs.
→ Monoclonal antibodies are used to develop drugs/ for treatment against cancerous cells.
→ These are made part of researches to develop mAbs against particular antigens.

Q. No. 2 Part (vi) * **Skin As External Barriers:-**

Skin is the part of First Line of defence and it prevents the entry of pathogens in human body. Skin prevents invasion of foreign particles in following ways:-

1) The epidermis consists of dry and dead cells, when pathogens bind to skin they do not get nutrients and die.
2) Desquamation is the process of shedding dead skin, so pathogens are also removed along with skin during desquamation.
3) The skin has acidic pH (5.5) thus pathogens cannot grow and die in such acidic medium. Also secretions of sebaceous gland and sweat glands prevent foreign invasion.

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Q. No. 2 Part (vii) * **Osteoporosis :-**

Osteoporosis is a bone degenerative disease. It is a progressive disease which leads to bone breakage.

* **Causes :-** Causes of osteoporosis include aging, deficiency of calcium and lack of movement and exercise.

* **Symptoms :-** Symptoms of osteoporosis include pain in bones, bone porosis, difficulty in movement and bone breakage.

Q. No. 2 Part (viii) * **Nerve Impulse :-**

Nerve impulse is defined as wave of electrochemical changes that occurs across the length of neuron from one end to other. A stimulus triggers receptors which send message to brain or spinal cord for processing and generates a response through effectors.

-> Electrochemical refers to electrical potential of neuronal membrane which is termed as membrane potential.

-> There are two types of membrane potential :-

1) Resting membrane potential (RMP)
2) Action membrane potential.

-> Action membrane potential is produced by threshold stimulus.

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Q. No. 2 Part (ix) * **Harmones Secreted By Anterior Pituitary:-**

Following are the harmones secreted by anterior pituitary gland:-

1) Somatotrophin harmone (or growth harmone). (STH or GH)
2) Thyroid stimulating harmone (TSH)
3) Adrenocorticotrophic harmone (ACTH)
4) Follicle stimulating harmone (FSH)
5) Leutinizing harmone (LH or Interstitial cell stimulating harmone (ICSH in males).
6) Leuteotrophic harmone (LTH)

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Q. No. 2 Part (x) * **Complement System:-**

Complement system consists of 50 different small proteins which are produced by liver and are present in blood in their inactive form. Protective proteins of complementry system are activated by invasion of pathogen. Activation of one protein activates other protein and so on.

* **Destroying Of Bacteria:-**

-> Complementary system destroys bacteria by activating phagocytic cells which engulf pathogen and remove dead cells.

-> An other example of complementary system is (MAC) membrane action complex. The perforin protein creates holes in bacterial plasma membrane, Fluid and salts diffuse to bacterium cell and accumulation of these substances cause bursting of bacterium cell.

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Q. No. 2 Part (xi) * **Selective Reabsorption:-**

During urine Formation the reabsorption of certain substances takes place in loop of Henle and proximal convoluted tubule. Substances such as water, vitamins, glucose, salts etc are selectively reabsorbed in the body.

* **Significance Of Selective Reabsorption:-**

Selective reabsorption is of great importance, it causes the reabsorption of specific substances which are required by body for its proper functions. Also it reabsorbs water to prevent dehydration.

Q. No. 2 Part (xii) * **Extinct Species :-**

The species which are no longer found on earth are said to be extinct. Following are some extinct species:-

1) **Bramble Cay Melomys:-**

Bramble cay melomys is the first specie to become extinct due to climate change and food inavailability.

2) **Golden Toad:-**

Golden Toad is also an important specie extinct due to the consequences of climate change and habitat loss.

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Q. No. 2 Part (xiii)

Homologous	Analogous
→ Homologous structures are those structure which are similar to each other in structure.	→ Analogous structures are those structure which do not have similarity between them.
→ Similarity in structures.	→ Dissimilarity in structure.
→ They originate from a common ancestor.	→ They originate from different ancestors.
e.g:- Forelimbs of human and monkeys.	e.g:- wings of birds and human arms

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Q. No. 2 Part (xiv) * **Response To High Temperature:-**

Two mechanisms used by human body to lose heat are:-

1) Sweating:- Sweat is a salty solution produced by sweat glands. Evaporation of sweat provides cooling effect to body and removes body heat. Sweating depends upon humidity.

2) Vasodilation:- Vasodilation refers to dilation of blood which allows more blood to flow in blood vessels and thus remove heat. More blood flowing in blood vessels removes more body heat.

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Q. No. 3 (Page 1) * **Feedback Mechanisms:-**

Feedback mechanisms are those mechanisms which allow body to maintain homeostasis and perform several Functions. There are two types of feedback mechanisms:-

1) Positive feedback mechanism
2) Negative feedback mechanism.

* **Negative Feedback Mechanism:-**

Negative feedback mechanism is that mechanism in which a change in one direction causes change in opposite direction to maintain homeostasis and the internal environment of body remains same.

-> Also negative feedback brings the system back to its set point. An increase in concentration of a substances causes decrease in its concentration by negative feedback mechanism to maintain homeostasis.

-> Different organs in body are performing negative feedback mechanism to maintain homeostasis. Like when water concentration in body increases kidney allows production of diluted urine to maintain water concentration. Similarly when body temperature rise it causes vasodilation and sweating to maintain normal body temperature.

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Q. No. 3 (Page 2) * **Example 1:-**

When blood sugar level increases to a higher level. The B-cells of Islet of Langerhans in pancreas stimulates the release of insulin harmone which is secreted when blood sugar level is high. Insulin causes decreased of blood sugar level to maintain homeostasis. Insulin stimulates glycogenesis (conversion of glucose to glycogen) and inhibits gluconeogenesis (production of glucose) thus in this way insulin harmone from B-cells of pancreas maintain blood sugar level, maintain homeostasis and prevent the individual from suffering from diabetes mellitus.

* **Example 2:-**

Similarly, when blood calcium level in body increases the thyroid gland rapidly secrete calcitonin harmone to maintain normal blood calcium level. The calcitonin reduces blood calcium level by depositing calcium from blood to bones. Also when blood calcium level decreases the parathyroid gland releases parathormone harmone which increases blood calcium level by depositing calcium stored in bones to the blood. Thus in this way

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Q. No. 3 (Page 3) body maintains homeostasis by negative feedback mechanism.

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Q. No. 4 (Page 1) * **Location:-**

Pancreas is an important endocrine glands located in the abdominal cavity. It is one of the most important endocrine gland. Pancreas is located near to the liver and kidney.

-> Function OF Pancreas:-

Pancreas is an important endocrine gland which is made up of up two types of tissues i-e exocrine tissues and endocrine tissue. The endocrine tissue forms a special unit called Islets of Langerhans.

-> These Islets of langerhans produces two types of cells α-cells and β-cells. α-cells are lesses in number and produce glucagon whereas β-cells are more in numbers thus they secrete insulin harmone.

*** Secretion OF Insulin:-**

Insulin harmone is secreted by β-cells of Islets of Langerhans in pancreas. Insulin is released when the blood sugar level increases. Right after a meal mostly. So, when the blood sugar levels are elevated pancreas secrete insulin harmone which decreases blood sugar level by depositing / converting most of

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Q. No. 4 (Page 2) glucose into glycogen. Release of Insulin stimulate glycogenesis i-e Conversion of glucose into glycogen to reduce blood sugar level. Also insulin hormone inhibits gluconeogenesis i-e production of glucose because the concentration of glucose is also too high. Therefore insulin decreases blood sugar level.

→ **Under Secretion:-** Under secretion of insulin results in diabetes mellitus which is defined as high blood glucose level.

→ **Over Secretion:-** Over secretion of insulin causes extremely low blood glucose level which ultimately leads to death.

→ Insulin works antagonistically to glucagon.

→ **Secretion Of Glucagon:-**

Glucagon is another harmone secretes by pancreas. Glucagon is secreted by α cells of Islets of langerhans. Glucagon is produced in response to low blood glucose level. When the blood glucose level is too low α-cells causes the secretion of glucagon to increase blood glucose level.

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Q. No. 4 (Page 3) → Glucagon increases blood sugar level by converting stored glycogen into glucose or gluconeogenesis. Thus by converting glycogen back into glucose, glucagon causes increase in blood sugar level.

→ **Under Secretion:-** Under secretion of glucagon causes extremely low blood glucose level which eventually leads to death.

→ **Over Secretion:-** Over secretion of glucagon causes diabetes mellitus.

→ Glucagon work antagonistically to insulin

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Q. No. 5 (Page 1) * **Third Line OF Defence:-**

Third line of defence includes B-Lymphocytes and T-Lymphocytes. It is specific immune response.

* **Activation OF B-cells:-**

When T-Lymphocytes causes the release of a specific protein Interleukin-2 it causes increase in the production of cytotoxic-T-cells and B-cells.

B-cells produced by interleukin-2 are differentiated in bone marrow they have B-cell receptors called (BCR's) which are extremely specific and bind to particular antigen.

→ When B-cells bind to specific antigens through BCr's they are activated and are converted into plasma clone cells and memory cells.

→ Plasma clone cells formed by B-cells are extremely important because they produced specific antibody to specific antigen. Plasma cells are the cells which produces β antibodies.

→ Memory cells are those cells which are present in dormant state and perform no function when they are interacted with pathogens for the first

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Q. No. 5 (Page 2) time. However, when the same antigen appears again even after 10 years. Memory cells attack them and are converted into helper T cells to act again antigen.

→ **Cell Mediated Immune Response:-**

The production of B-cells which are converted into plasma cells and memory cells to produce antibody and kill pathogens is called cell mediated response.

b) Structure Of Antibody:-

Antibody is a large Y-shape structure of proteins.

*) It consists of two long strands of similar length called heavy chains.

*) It also consist of two short polypeptide chains called light chains.

*) It is made up of 4 different polypeptide chains (2 same and other 2 same).

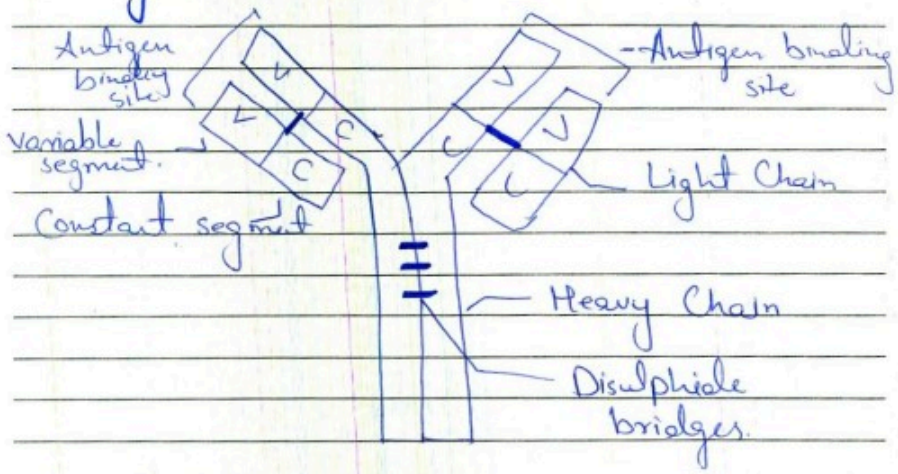
*) The lower region of antibody consist of a constant segment which has a constant sequence of amino acids.

* The upper or proximal region of polypeptide chains consist of variable region which have variable sequence of amino acid to bind different antigens.

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Q. No. 5 (Page 3) → The variable segment regions are called antigen binding sites.

→ Diagram:-



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Q. No. 6 (Page 1) * Transport OF CO_2 In Blood:-

CO_2 is transported in the body in three different ways.

1) In the form of bicarbonate Ion
2) As Carbaminhemoglobin
3) As dissolved in plasma.

1) As Bicarbonate Ions:-

70% CO_2 is transported in the body as bicarbonate ion 70%. CO_2 from tissues diffuses into blood and enter RBC. In RBC's CO_2 combine with water in the presence of enzyme carbonic anhydrase. Reaction is given below.

$$CO_2 + H_2O \xrightarrow{\text{Carbonic Anhydrase}} H_2CO_3.$$

As carbonic acid is unstable compound and dissociates into bicarbonate ion and H^+ ion.

$$H_2CO_3 \longrightarrow H^+ + HCO_3^-$$

The accumulation of H^+ ions decrease pH by increasing acidity. However this doesn't happen because of buffer action of hemoglobin. In RBCs H^+ rapidly combine with oxyhemoglobin to form Hemoglobinic acid HHb and releases oxygen to tissues.

$$HbO_2 + H^+ \longrightarrow HHb + O_2$$

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Q. No. 6 (Page 2) → In RBC's the negatively charged bicarbonate ion (HCO_3^-) leaves RBC and diffuses outside. Whereas Cl^- ion enter the RBC through special bicarbonate-chloride transport protein. This is called chloride shift or hamburger's phenomenon.

→ Inside the RBC Cl^- ion bind with potassium to form KCl whereas outside RBC bicarbonate ion combines with sodium to form sodium bicarbonate. These mechanisms maintain pH of blood at 7.4.

→ In lungs the process reverses and bicarbonate ion combine with H^+ to form / release water and CO_2.

2) As Carbaminheamoglobin:-

Nearly 23% of oxygen is transported in the form of carbaminheamoglobin. CO_2 combines with globin part of heamoglobin to form carbaminheamoglobin. It depends upon PCO_2. When partial pressure of CO_2 increases in tissues it causes formation of Carbaminheamoglobin.

→ When PCO_2 is low CO_2 is released.

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Q. No. 6 (Page 3) → Dissolved In Plasma:-

Nearly 7%. of CO_2 is transported as dissolved in plasma. It is inefficient method but transport do occur.