





(Section B)

Q. No. 2 Part (i)

Glomerular Capillaries	Vs	Peritubular Capillaries
1) Location		
They are found in the renal corpuscle.		The are found around renal tubules
2) Function		
They are involved in pressure filteration.		The re-gain essential substances (selective re-absorption) from filterate.
3) Pressure		
High pressure ≈ 50-60mmHg		Low pressure ≈ 10-20mmHg

Q. No. 2 Part (ii)

Phase of Ventilation:

The given phase of ventilation in the diagram is **expiration.**

Explanation of Expiration:

In expiration, diaphragm relaxes and become less domed shape, external intercostal muscles relaxes while internal inter-costal muscle contracts. This cause decrease in area of thoraxic cavity and increases the air-pressure. Due to these events air from lungs (higher pressures) goes out of the body. This phenomenon is also called as **Exhalation.**

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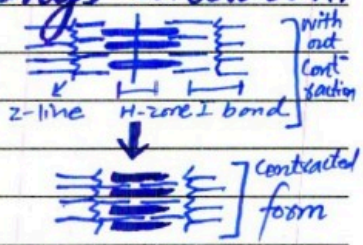
Q. No. 2 Part (iii)

→ Role of Calcium In Muscle Contraction:

Calcium (Ca^{2+}) binds with TnC which causes the troponic complex to move further away hence cause the sites on actin to be expose for formation of cross bridges while causing the tropomyosin to slightly tilt away to expose sites for binding of myosin heads.

→ Changes in Sarcomere Durings Contraction

- The H-zone Disappers.
- The I-band shortens
- Z-lines comes closer to each other.
- Overall length of sacromere reduces.



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Q. No. 2 Part (iv)

Arteries Vs Veins

Arteries	Veins
→ They carry oxygenated blood except from pulmonary & umblical artery.	→ They cary de-oxy-genated blood except from pulmonary and ublical vien.
→ The drain blood from heart to body.	→ They drains blood from body to Heart.
→ They have no-valves except from aorta.	→ They have valves throughout the body.
→ They have high pressure	→ They have low pressure

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Q. No. 2 Part (v)

Mono-clonal Antibodies:

Mon-clonal antibodies are artificially synthesized antibodies which are formed from single clone using different biotechnological techniques.

Advantages of Mono-clonal antibody:

Following are 3-advantages of mono-clonal antibody:

1. **Target specificity:** They are target specific and use to demolish only the harful cells.
2. **Cost fiendly:** They are cost fiendly
3. **Costumization:** They can be customized according to specific genome.

Q. No. 2 Part (vi)

Skin prevents Invasion:

Skin prevents invasion by following ways.

1) **De-squamation:** Skin epidermis layer continuously sheds the dead cell due to which pathogens are removed physically or they die due to lack of nutrition.

2) **Sebaceous glands:** The sebaceous glands in skin screates sebum which contain fatty acid that decreases pH which is harful for pathogen so change in pH cause their death.

3) **Sweat glands:** Sweat glands in skin screates sweat which contain lysozymes that kill the bacteria (pathoges) and retard their invasion

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Q. No. 2 Part (vii)

Osteoporosis: Osteoporosis is defined as bone disorder which occurs due to reduced bony ~~bass~~ mass.

Causes of Osteoporosis:

→ Low calcium intake of calcium in diet. → In women the reproductive hormones like progesterone can also leads to osteoporosis. → Lack of exercises during adolescence which cause low bone density. **Symptoms of Osteoporosis:** Severe degeneration. Bone Fractures Porus bones with sever pain in joints.

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Q. No. 2 Part (viii)

Absorption of Fats:

Fatty acids & glycerol mixes with to form **micles** with then mix with cholesterol and entre in **villi** of small intestine. Here it combine with protiens to form **chylomicrons** which are exocytosed into **lacteal** (lymph capillary) and they change from VLDL to LDL due to addition of protiens from lymph. Lymphatic vessel then drain it to **heart** by sub-clavian vien and through superior vana-cavae. From Heart fats goes to **liver** for further processing and **adipose tissues** for storage.

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Q. No. 2 Part (ix)

Hormones from Anterior Pituitry

Following Hormones are produces from anterior pituitry

GH (growth Hormones) by action of GHR factors from the hypothalamus.

TSH (thyroid glands stimulating Hormone) act on thyroid glands to produce thyroxin.

ACTH (Adrenocorticotrophic Hormone) acts on Adrenal glands located above the Kidney

LH (Leutinizing Hormone) & **FSH** (follical stimulating Hormones) that act on female & male reproductive system. **Probutin** involved in the laitation of milk in the breast.

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Q. No. 2 Part (x)

Complement System:

It is system of 40-50 protiens produced in liver and remain un-active in blood until a pathogen enter the body They peform their function by this way:

→**Cell-lysis:** They pinch hole in cell membrane of bauteria due to which water and salt entre in it and cause lysis and rupturing of pathogenic cell.

→**Opsonization:** These protiens binds with pathogen and cause its phagocytosis by the macrophages.

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Q. No. 2 Part (xi)

Signification of Selective Re-absorbtion:

Selective re-absorption which mostly takes place in proximal convulated tubules has so-significare because it helps to retain water and solutes in the body.

→ About 95% of water from glomerular filtrate is re-absorbed through osmosis (passive transport)

→ About 99% of glucose is re-absorbed from the glomerular filtrate through active transport.

→ A proportionate amount of Na^+ and Cl^- is re-absorbed

Q. No. 2 Part (xii)

Three roles of liver:

Following are 3 roles of liver:

→ **Glycogen Formation:** Liver converts glucose into glycogen and store it for later use when blood glucose level drops.

→ **Urea from Amonia:** Liver converts the ~~urea~~ amonia in to urea which is less-toxic and less-harmful.

→ **Blood clotting:** The liver helps in bloo-clotting by producing the blood clotting factors like fibrinogens.

→ **Protien formation:** Liver is also involve in Protien synthesis.

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Q. No. 2 Part (xiii)

Effects of Drug Addiction:

Drugs addiction harshly affects the nervous system. Basically, drug addiction like narcotics etc causes the **dopamine surge** which make the nervous system hyper-senstivity or dizziness when proper amount is take given to drug-addicted patient. **Tolerence with Function of the Nervous System:** Drugs addiction tolerate the nervous system by hyper activating some neuronal stimulation like increase in breathing rate and increased Heart rate.

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Q. No. 2 Part (xiv)

Mechanism of Heat Loss by Body:

Following are 2-mechanism of heat loss by the body.

→ **Sweating:** Continuous evaporation and sweating leads to loss of body Heat. Sweat glands release sweat which contain salts due to which water moves out of body carring larger amount of energy while leaving behind the cool downed body.

→ **Vasodialation:** In vaso-dialation the muscle located above the arteriole relaxes due to which blood volume in capillaries increases near skin which causes loss of Heat.

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Q. No. 3 (Page 1)

Negative Feedback:

➡ Negative feed back loop helps the regulation of standard and stable internal enviornment.

➡ Negative feebaik loop basically reduce the alteration or deviation from the homeostatic enviooment by help of the product form by specific reaction that lead the respone to be deviated.

➡ In other words in negative feedbaik, product of certain reaction has indirect impait on the synthesis of substrate.

Explanation by Example:

The altion of insulin and glucagon harmone is best example of negative feed baik loop.

When blood sluose level rises the pancrease secrets the insulin hormone from its β-cell, which is reponsible for bringing sluose level baik of noronal by doing the fodlowing changes in the body.

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Q. No. 3 (Page 2)

glycogenesis → Insulin from pacrease start the conversion of glucose into glycogen in liver. This help to reduce glucose level in the blood.

gluconeogenesis → Increased blood glucose level tend the insulin to convert the glucose into the fats for storage in lever and other body parts.

→ On the other hand **when blood glucose level falls** the pancrease α-cells secrets the glucagon hormone which is responsible for bringing glucose level of blood upto normal. Glucagone does its function by following ways.

glycogenolysis → In glycogenolysis glucogen is converted back to glucose by the action of glycogen hormone. This cause increase in glucose level of blood upto normal.

gluconeogenolysis → Glucagon cause the fats and protiens to be converted back into glucose to bring glucose level upto normal.

Hence the insulin and glucagon work in the negative

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Q. No. 3 (Page 3)

feedback loope to maintain the homeostatic (stable) amount of glucose in the blood.

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Q. No. 4 (Page 1)

Production of Insulin:

Insulin is produced by help of recombinant DNA technology in the following way.

→ Isolation of Insulin Gene:

→ Insulin is hormone secreted by pancreas specially from the β-cell.

→ The insulin gene in humans is called as INSL.

→ This gene is found in chromosome number elevent 11 on location 15.5 where 15 represent band on chromosome and 5 represents sub band.

→ Selection of plasmid:

Selection of plasmid is important step in the Recombinat DNA technology Following gene are suitable

pBR-322 It is a bacterial plasmid that has antibiotic resistance for ampicillin and tetracyclin. It also has the origin of replication and pBM-1 site.

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Q. No. 4 (Page 2)

⊙ **pUC 18/pUC 19:** These are the plasmid that are better of production of insulin and they have antibiotic resistance for the tetracycline.

Furthermore they have small size and high copy number.

→ Formation of Recombinant DNA:

plasmid of bacteria are not so-advanced that they could bear the α-chains of insulin i.e α and β-chain. That's way the chain are separately incorporated into the plasmid at the ~~glactoside~~ glactosidase gene.

→ Transformation of Recombinant DNA

In this step the Recombinat DNA is incorporated into the suitable expression system where it grows (divide) in presence of suitable pH and nutrients

Here: the bacteria having antibiotic resistance again the tetracycline survives upon induction of antibiotic while non-transformed genes are dead because of

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Q. No. 4 (Page 3)

lack of resistance.

Product after transformation is 2 chain of insulin i.e fused β-glactosidase α-chain and fused β-glactosidase β-chain which are then separated.

→ **Separation of chain from fusion:** The fused chain are separated from β-glactosidase upon reaction with the cyanogen bromide which adds extra $-CH_3$ group at N-terminal of chain.

→ **Joining of 2-chains:** In this step 2-chain i.e α and β are joined together to form the insulin. This is done by help of Sodium sulphonate and Sodium sulphite which is responsible for formation of sulphide bridges b/w the 2 chains.

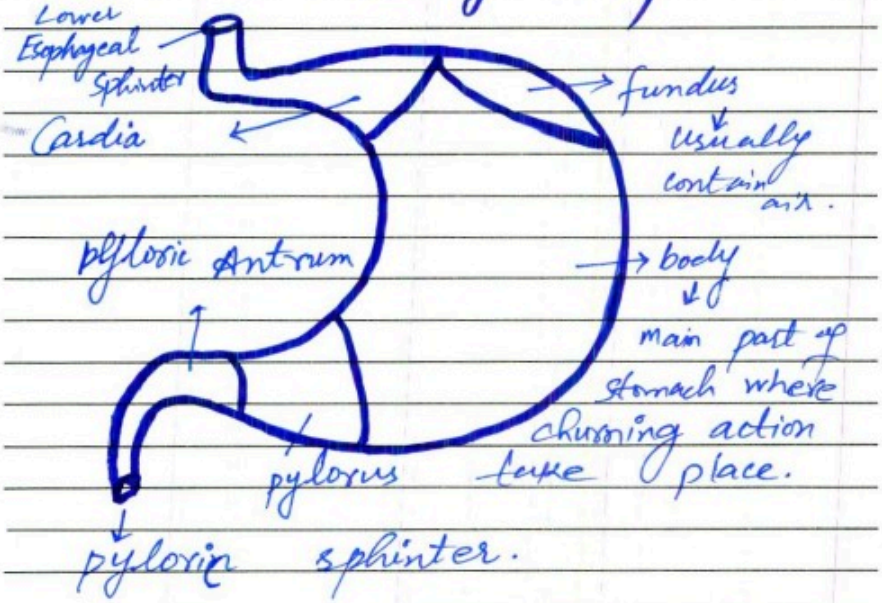
→ **Storage and protection:** These insulin gene are stored and protected at specific temperature & pH.

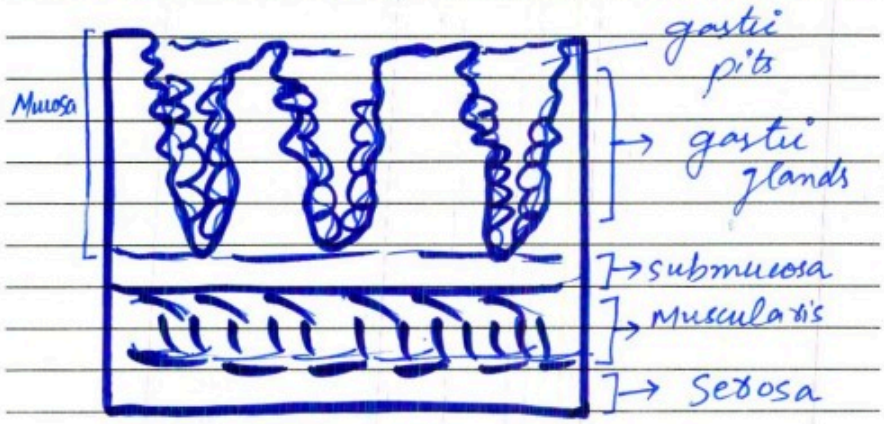
→ **Pre-market Trials:** Before the delivery to market, the pre-market and some clinical trials are made for save usage and consumption.

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Q. No. 5 (Page 1)

Labelled Diagram of Stomach





Layers of Stomach

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Q. No. 5 (Page 2)

Chemical Digestion In Stomach

The chemical digestion in the stomach converts the bolus from oesophagus into fulid like acidic material called as chyme. Following cells are involved in the chemical digestion in stomach.

Oxyntic cells (Parietal cells) The oxyntic cells and parietal cells found in the mucosa layer of stomach secret the HCl which is responsible for killing germs found in the bolous. Furthermore HCl has pH=2 which is responsible for the activation of the pepsinogen into an activestate that is pepsin after the removal of an extra polypeptide found just above the active site.

Chief cells (Zymogenic cells) The chief cell secrets the zymogenic granules which has pepsinogens which upon activation acts on the protien and convert them into small poly peptide.

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Q. No. 5 (Page 3)

Mucus cells are also found in stomach that help in secretion of mucus which protect the body from the harsh effect of Hcl.

Enochrine cells that are found in walls of stomach are responsible for secretion of gastric hormone which adds in digestion by causing the above orrentioned cells i.e chief & parietal cells to secret their section.

Digestion Process In Stomach:

→ In stomach mainly the digestion of protien occurs and there is no digestion of carbohydrates because pH = 2 is not suitable for the action of amylase enzyme which work best on pH ≈ 8.

→ The chemical digestion in the stomach is influenced by the neuronal signal from medula of brain upon distention of stomach or even though about the food.

→ Hormonal secretion are influced upon stomach which medula secrets acetylcholine which cause the endochrine gland to secrets the gastrin hormone which adds in digestion.

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Q. No. 6 (Page 1)

Transportation of CO_2:

Transportation of CO_2 in blood means the transportation of CO_2 from tissues (produces by metabolic activities) to the lungs by the help of blood. Following are the ways of transpostation of CO_2:

a) In form of HCO_3^-

About 70% of CO_2 is transported this way. when partial pressure of CO_2 increases in tissues, it entre into the blood where it combines with H_2O to form carbonic acid with the help of carbonic anhydrase.

$$H_2O + CO_2 \xrightarrow{\text{carbonic anhydrase}} H_2CO_3$$

The carbonic acid is unstable therefore it dissasocides into the H^+ and bi-carbonate ions by help of enzyme carbonic-anhydrase:

$$H_2CO_3 \xrightarrow{\text{carbonic anhydrase}} H^+ + HCO_3^-$$

This reaction cause increase in H^+ which leads to change (decrease) in pH of blood. However, suddenly the

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change in pH is buffered by HbO_2 which diassociates and transport O_2 to tissues while Hb combines with H^+ to form the Haemoglobulinic acid by help of carbonic anhydrase.

$$HbO_2 + H^+ \xrightarrow{\text{carbonic anhydrase}} HHb + O_2$$

Now HCO_3^- increases in blood plasma so they leave the blood plasma. To counter the balance of ions in the blood Cl^- moves into blood plasma from tissues. Bicarbonates react with Na^+ to form $NaHCO_3$ while Cl^- reacts with K^+ to form the potassium chloride. In this way the stable pH of blood i.e 4.5 to 7.4 is maintained with in its range.

$$HCO_3^- + Na^+ \longrightarrow NaHCO_3$$

$$K^+ + Cl^- \longrightarrow KCl$$

The opposite happens when partial pressure of CO_2 decreases in blood while after expiration. Here oxygen transport occurs.

This shift of ions i.e Cl^- into blood and HCO_3^- out of blood is regulated by chloride channels so called as **Chloride shift** or **Haemburger shift**

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b) As Carboxyhaemoglobin

About 23% of CO_2 in transported in this way. When partial pressure and concentration of CO_2 increases in the body formation of carboxyhaemoglobin occurs by following way.

$$CO_2 + Hb \xrightarrow{\text{carbonic anhydrase}} HbCO_2$$

While decline or decrease in concentration & partial pressure of CO_2 causes dissociation of carboxyhaemoglobin. Here carboxyhaemoglobin is 2nd major pathway for the transport of CO_2 from the tissues to lungs and then out of body through blood.

c) Being Dissolved in blood plasma:

Almost about 7% of transport of CO_2 occurs as being dissolved in the blood plasma. Although this way isn't ~~safe~~ efficient but it still occurs in the normal body reactions.