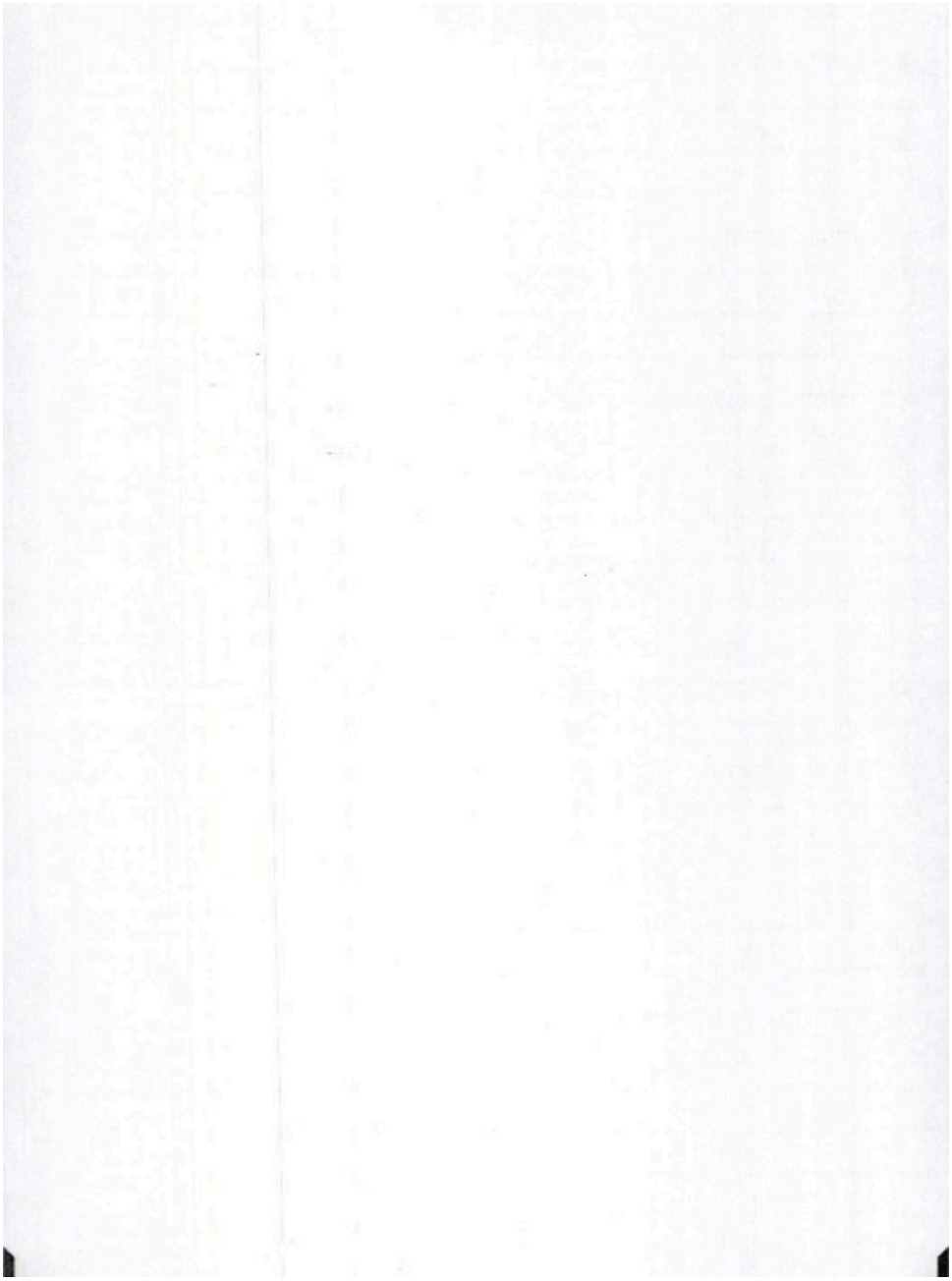
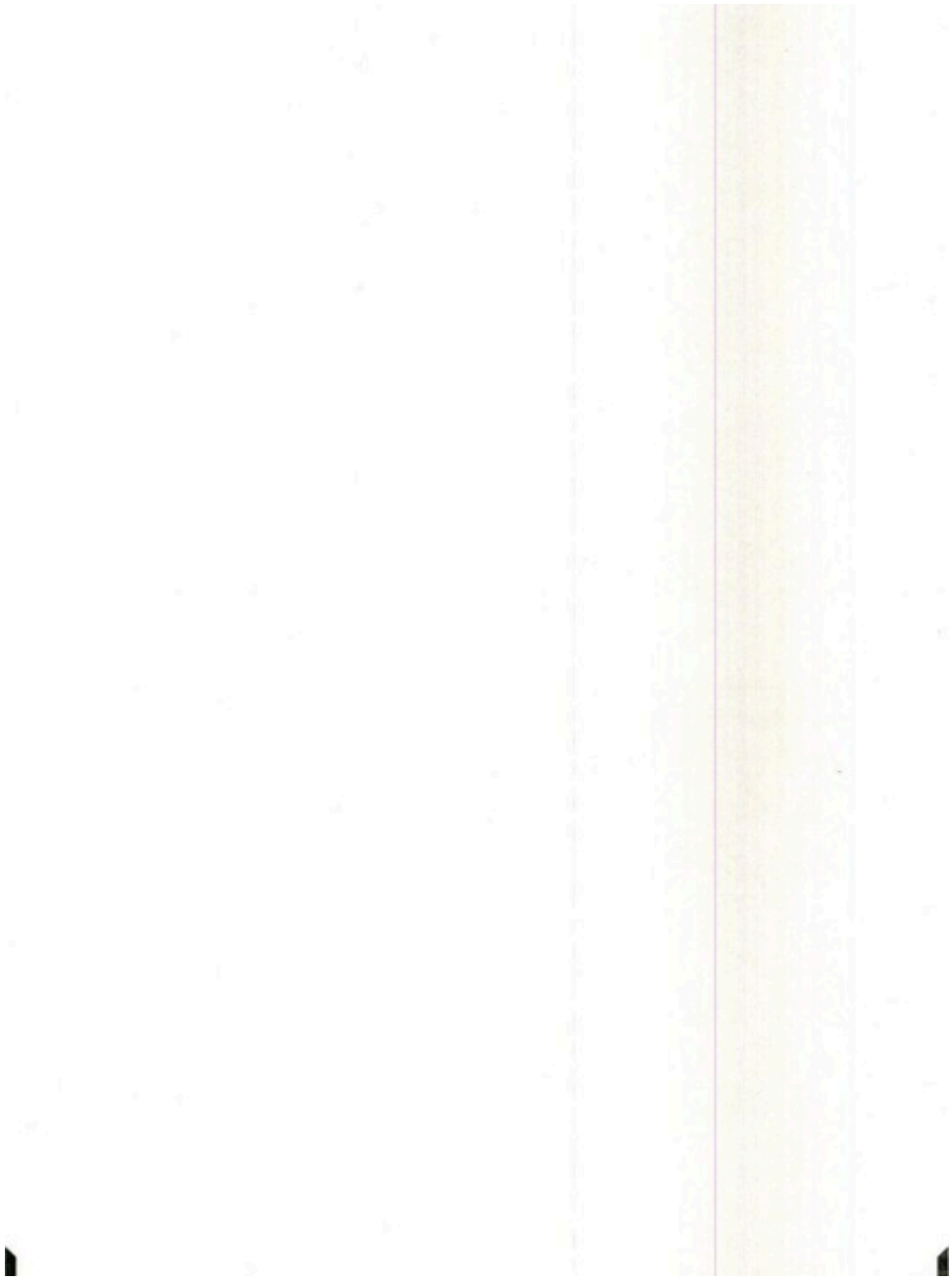
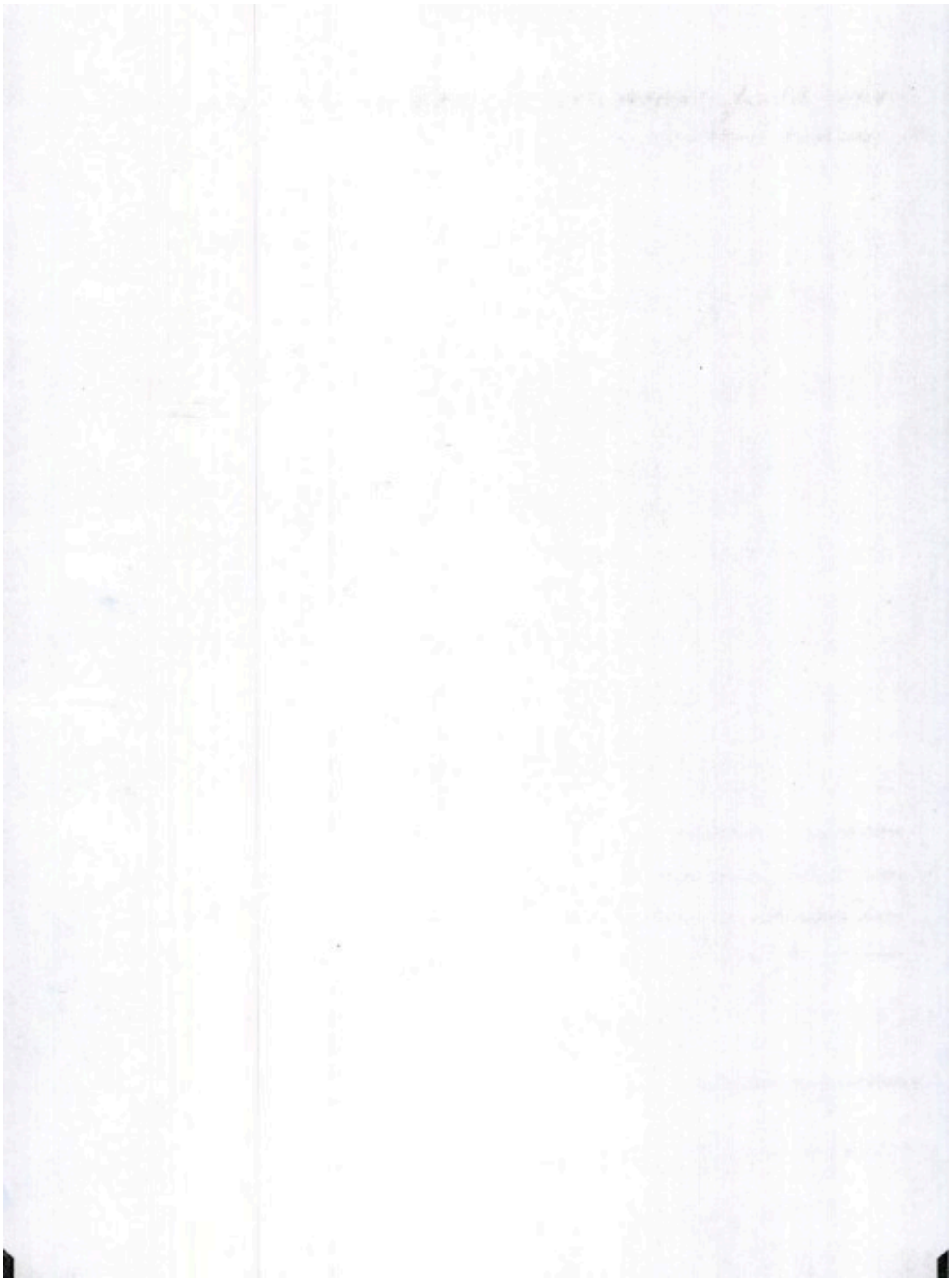






(Section B)

Q. No. 2 Part (i) **Emphesyma:** Damaged to air sacs (alveoli) causing lung diease and problems.

Causes: Smoking
Air pollution
Vaping.

Symptoms:
Difficulty breathing
Cough
fever, vomiting
Poor exchange of gases such as O_2 and CO_2 between lungs.

Q. No. 2 Part (ii) **Ventilation phase: Exhalation**

Exhalation: Expulsion of air is called exhalation. Also called expiration.

Event that occur during expiration:

- **Internal intercoastal contract, diaphragm** relax and become more domed shaped.
- **Rib cage** move downward and backward.
- **Volume of chest cavity** decrease
- **Pressure inside lungs increase**
- Air is forced out from lungs into the environment.
- **Passive.**

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Q. No. 2 Part (iii)

Synthetic biology	Genetic engineering.
1. Design and modify new biological systems.	1. Direct manipulation of organism's DNA to change its genetic makeup for useful products.
2. Does not interefere with normal biological process and work independently.	2. Interefere with biological system by changing the gene of organism.

Application of synthetic biology: **Synthetic microbes** such as synthetic bacteria and yeast. **Examples:** Biofuels, E.coli with human insulin gene → insulin

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Q. No. 2 Part (iv)

Arteries	Veins.
Blood pressure: High	**Blood pressure:** low (comparative to arteries).
Valves: Absent	**Valves:** Present (to prevent backflow of blood from lower parts of body).
Blood: Usually carry oxygenated blood (except the pulmonary arteries)	**Blood:** Usually carry deoxygenated blood (except the pulmonary veins)

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Q. No. 2 Part (v) **Monoclonal Antibodies:** Labortary-made proteins that act like body's natural antibodies.

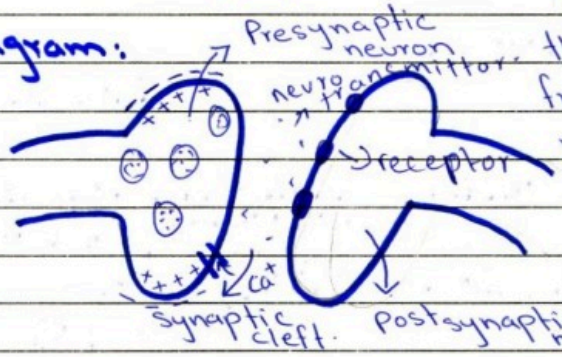
- Recognize antigens (harmful substances) and bind to them exposing it to immune system to destroy them.

Advantages: i) **Highly specific:** Bind to single antigen or epitope (**Attack only diseased cells while healthy and normal cells become unaffected**). ii) **Consistent quality:** As monoclonal antibodies are made up of one type of clone cell, so they have uniform and consistant quality across batches (**mABs are made from hybridoma cells that divide continuously**)

Q. No. 2 Part (vi) **Synapse:** Narrow gap junction between two neurons or between a neuron and effector (**muscle or gland**).

- The two neurons do not physically touch and separated by a small gap junction called synaptic cleft.

Diagram:



Function: Travel the nerve impulse from pre-synaptic neuron to post-synaptic neuron by releasing neurotransmitter in the synaptic cleft when action potential reach

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Q. No. 2 Part (vii) **Baroreceptors:** Present in the carotid sinus to check the blood pressure.

Role: If blood pressure is low it sends signals to hypothalamus to increase the activity of noradrenaline by secreting it. **(Opposite occurs during high blood pressure).** Immediately act through baroreflex which is negative feedback mechanism.

Volume Receptors: Present in aorta and arteries to observe blood volume. **Role:** If blood volume is low hypothalamus secretes Anti-diuretic hormone to increase the reabsorption of water from kidney regulating blood pressure.

Q. No. 2 Part (viii) **Nerve impulse:** Transmission of electrical signals from one neuron to another.

- **Occur:** In the axolemma (axon membrane).
- Stimuli travel from the cell body and travel through the axon membrane then to axon terminals.

Generated in neurons: Nerve impulse is generated when stimuli is having **Threshold frequency** (minimal strength of stimuli). ~~generate~~ **Before stimuli → resting membrane potential** ($3Na^+$ out, $2K^+$ in) (maintained by sodium-potassium pump) → **During Stimuli → Depolarization** (Na^+ in, K^+ out) → **Repolarization** (restoring action potential) → **Refractory period**

(Section B)

Q. No. 2 Part (ix)

Ectotherms	Endotherms.
i) Derive most of their body temperature from the environment (sunlight, warm rocks, air).	i) Derived most of their body temperature (heat) from metabolic processes.
ii) Their temperature vary with surroundings.	ii) Maintain 37°C due to physiological process and hormones.
iii) Require less food energy.	iii) Require food energy to perform complex processes.
Example: Reptile bask in sunlight to warm and move into shade to cool down.	**Example:** During cold condition, humans maintain 37°C due to vasoconstriction, shivering.

Q. No. 2 Part (x) **Ocean Acidification:** Decrease in the pH of ocean and increased acidity.

Harmful affects: Ocean acidification → Global warming

i) Threat to aquatic life: Increased acidity cause deaths of many fishes and plants. They are endangered and threat to their life decreasing their growth and reproduction.

ii) Decrease of carbonate (CO_3^{-2}) ions: Carbonates ions are essential to form ~~carb~~ calcium carbonate ($CaCO_3$) to produce shell and skeleton of many aquatic organisms. However, their decrease cause death of Planktons and others.

iii) Global warming: Warm water holds less CO_2 which elevates CO_2 levels in the atmosphere leading to global warming.

(Section B)

Q. No. 2 Part (xi) **Selective Reabsorption:** Process of reabsorbing useful substances from filterate back to the blood. • This process takes places after glomerular filteration. **Occurs in:** Proximal Convaluted Tubule, loop of Henle, Distal Convulated tubule. **Significance:** Those substances are reabsorbed which the body needs that's why it is called "selective reabsorption".

• **Substances reabsorbed:** Some water, inorganic salts, ions, vitamins, glucose, amino acids.

• **Water is reabsorbed through selective reabsorption during dehydration and forms concentrated urine (less H_2O conc.)**

Q. No. 2 Part (xii) **Roles of Liver:**

1. **Production of proteins:** Produce serum proteins such as albumin, globulin and fibrinogen. They help in maintaining blood pressure, and blood clotting.
2. **Storage of Glucose:** Convert excess glucose to glycogen when when blood glucose level is high. **↑Glucose → Liver → Glycogen**
   • Converted back to glucose during eating periods or when energy is required.
3. **Removal of harmful substances:** Liver helps to filter the blood by detoxifying alcohols and drugs such as **penicillin** which have harmful effects.

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Q. No. 2 Part (xiii) **Effects of drug addition and tolerance on nervous system.**

- They act as stimulants (increase nervous activity) or depressents (decrease nervous system activity) affecting the coordination of nerve impulses.
- Drugs may temporarily cause the feeling of euphoria, pleasure and relaxation but they disrupt the body systems.
- Drug addition means dependancy both physical and physiological. **Physical →** symptoms appear if drugs is not given **Physiological →** taking of drugs to feel good while drug tolerance means that body does not stimulate the same effect

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Q. No. 2 Part (xiv) **Anti viral:** Drugs that inhibit viral multiplication.

Working: • Block entry of viruses into host cells (for multiplication. • Prevent assembly and release of virus • Inhibit viral replication.

Antiretrovirals: Subset of antiviral specifically used against retrovirus like HIV.

Working: Attack HIV in its stages such as **insertion, maturation, reverse transcription, release**

- Reduce viral load **(amount of HIV in blood)** and risk of progression of AIDs **(Advanced form of HIV).**

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Q. No. 3 (Page 1) **Negative feedback Mechanism:**

. Process that is used to reverse the change and bring the body back to original state.

• Maintain homeostasis.

• This process occurs through three components that detect the stimulus and bring about specific responce. These components include:

. **Receptor** . **Control Center**

. **Effector.**

1. **Receptor** : Detect and recieve the stimulus (change).

2. **Control Center:** Compare the change to the set point (original state). and send commands.

3. **Effector:** Muscle or gland that perform corrective action.

Example: Blood glucose level.

After meal:

When blood glucose level is high → pancreas detect the change and release insulin.

Role of insulin: Decrease blood glucose level back to normal by increasing the ~~activity~~ glucose uptake by many cells such as muscles, livers or fats.

. **Perform glycogenesis** : Conversion of

(Section C)

Q. No. 3 (Page 2) glucose to glycogen.

· **Inhibit:** Gluconeogenolysis: Production of glucose from non-carbohydrate source.

· ~~Increase glucose uptake by~~ Excess glucose is used in cellular respiration.

· Also ↑ glucose in fat distribution and catabolism.

↑ Glucose → Insulin hormone → Glycogen
Glucose ↓ (back to normal).

When blood calcium level is low:

· α - cells of pancreas release glucagon.

· Convert glycogen to glucose **(Glycogenolysis).**

· Production of glucose from non-carbohydrate source **(Gluconeogenolysis)**

Role of glucagon: High blood glucose level back to normal.

~~**Glucagon**~~ **↓ Glucose → Glucagon →**
Glucose ↑ (back to normal)

Conclusion: Negative feedback mechanism is most common in humans.

· Occurs in all bodily processes.

· Maintain and regulate homeostasis.

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Q. No. 3 (Page 3) **Negative feedback mechanism:**

- Process that is used to reverse the change and bring the body to orignal state.
- Maintain homeostasis
- It is maintained by three components that detect the stimulus and bring about specific responce.
- These components include:
  - **Receptor**
  - **Control Center**
  - **Effector.**
- **Receptor:** Recieves the stimulus
- **Control center:** Detect the change in the body, compare it to the set point (original state) and send command to effector.
- **Effector:** Perform Corrective action
- Muscle or gland.

Muscle: control movement

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Q. No. 4 (Page 1)

Function of Pancreas: Pancreas as an endocrine gland consists of islets of langerhans.

- Islets of Langerhans consists of two types of hormone secreting cells.

α-cells: Secretes glucagon.
- Larger in number.

β-cells: Secretes insulin.
- β-cells are fewer in number.

Role: Both are released to control and regulate blood glucose level.

Insulin: It is secreted when blood glucose level is high.
- Increase glucose uptake by most body cells. such as liver, muscles.
- Increase fat catabolism.
- Convert excess glucose to glycogen. (Glucogenesis)
- Excess glucose used in cellular respiration.

Role: After meal blood glucose level is high so Insulin hormone regulates it to normal.

Glucagon: It is secreted when blood glucose level is low.
- Regulate blood glucose level by converting glycogen to glucose.

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Q. No. 4 (Page 2) (glycogenolysis).

- Production of glucose from non-carbohydrate sources to regulate the blood glucose level back to normal.

Location: Pancreas is located behind and below the stomach.

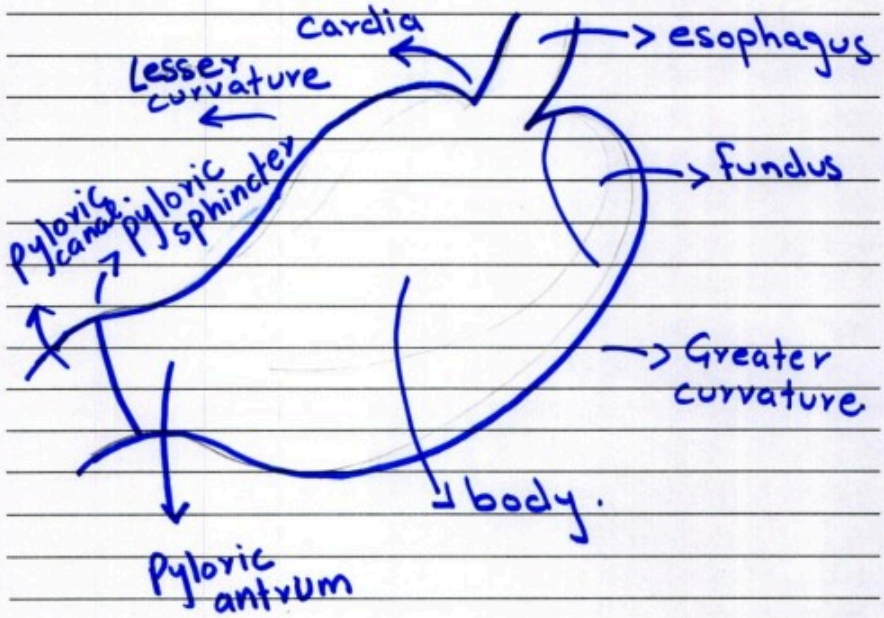
- Because as it is both exocrine (contain ducts) and endocrine (ductless)
- It also secretes pancreatic juice from exocrine part in the duodenum which play a role in digestion.

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Q. No. 4 (Page 3)

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Q. No. 5 (Page 1) Diagram of stomach:



Chemical Digestion: Stomach digest the bolus mainly through chemical digestion as stomach contains oxyntic /parietal cells, and zymogenic cells.

Oxyntic / Parietal cells: Secrete HCl and intrinsic factor.

Hydrochloric acid: HCl is highly acidic and lowers the pH of stomach.

- pH is between 1-3 but around 2.
- It has minor digestive role.

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Q. No. 5 (Page 2) · ~~bot~~ It kills bacteria which is engulfed with the food humans put into their mouth.
· It also stops the activity of salivary amylase and prevent furthur digestion of carbohydrates.
· Salivary amylase work effective in alkaline medium.

*** Intrinsic factor:** Stomach also release intrinsic factor which digest Vitamin B-12 (essential vitamin from bacteria) for RBC production.

Mucus: Stomach wall also secretes mucus.
· Protect the stomach walls from acidic HCl and acidic chyme.
· Maintain internal lining of walls of stomach.

Zymogenic cells: Zymogenic cells secrete pepsinogen through exocytosis.
· Pepsinogen is converted to pepsin by HCl and previously formed pepsin molecules.
· Pepsis acts on protein to digest them.

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Q. No. 5 (Page 3) Convert poly peptides chains to peptide chains.

(Section C)

Q. No. 6 (Page 1)

Ammoniotelic animals:

- Excrete ammonia as nitrogenous waste.
- Ammonia is highly toxic.
- It raise the pH.
- Highly soluble in water.
- Quickly diffuses into membrane ~~this~~
- Disrupts the membrane.
- 1 gram of nitrogen as ammonia require 500ml of water to exrete.
- As it requires large amount of water to excrete.
- Ammonia is excreted by fresh-water animals.

Such as: Sponges, Crustaceans, Protozoans, echinoderms.

Animals excreting ammonia are called ammoniotelic.

Ureotelic animals:

~~Am~~ Animals that excrete urea as nitrogenous waste.

- 100,000 less toxic than ammonia.
- Water is required for its excretion.
- 1 gram of nitrogen as urea require only 50 ml of water to excrete.
- Energy is required to convert ammonia into urea.

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Q. No. 6 (Page 2)

Examples:

- Some marine organisms: shark, fish
- All terestial vertebrates: Mammals, amphibians.

- Uricotelic Animals:
- Animals that excrete uric acid as their nitrogenous waste.
- Uric acid is the result of purine breakdown.
- It is released where there is less water available.
- 1 gram of nitrogen as uric acid requires only 1 ml of water to excrete.
- Uric acid contains 4 nitrogen atoms per molecule.

Examples of animals:

All terrestial invertibrates: land snails

Reptiles: snakes, lizards.

Birds.

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Q. No. 6 (Page 3)