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8.1 MINERAL NUTRITION IN PLANTS

LONG QUESTIONS

Q.1 Describe mineral nutrition in plants. (*Knowledge Base*)

Ans: MINERAL NUTRITION IN PLANTS

Mode of Nutrition:

Plants have the most efficient mechanisms for autotrophic mode of nutrition.

Requirement of Nutrients:

Plants get carbon, hydrogen, and oxygen from carbon dioxide and water. In addition to these elements, plants also require mineral elements for various activities and structures.

Types of Nutrients:

There are two types of nutrients required by plants:

- i. Micronutrients
- ii. Macronutrients

i. Macronutrients:

“The nutrients which are required by plants in large quantities are called macronutrients.”

Examples:

- Carbon
- Hydrogen
- Oxygen
- Nitrogen
- Magnesium
- Potassium

ii. Micronutrients:

“The nutrients which are required by plants in small quantities are called micronutrients.”

Examples:

- Iron
- Molybdenum
- Boron
- Chlorine
- Zinc

ROLE OF IMPORTANT NUTRIENTS IN PLANT LIFE

Macronutrients	Role in Plant Life
Phosphorus	<ul style="list-style-type: none"> • Component of ATP, Nucleic acids, Co-enzymes, • Necessary for seed germination • Photosynthesis • Protein formation
Potassium	<ul style="list-style-type: none"> • Regulates the opening and closing of stomata, • Reduces water loss from leaves
Sulphur	<ul style="list-style-type: none"> • Component of Proteins, Vitamins, Enzymes
Calcium	<ul style="list-style-type: none"> • Activates enzymes • Structural component of cell wall • Influences water movement in cells

Micronutrients	Role in Plant Life
Iron	<ul style="list-style-type: none"> Necessary for photosynthesis Activates many enzymes
Molybdenum	<ul style="list-style-type: none"> Component of the enzyme that reduces nitrates to ammonia Important in building amino acids
Boron	<ul style="list-style-type: none"> Important in sugar transport, cell division and Synthesizing certain enzymes
Copper	Component of several enzymes
Manganese	<ul style="list-style-type: none"> Involved in enzyme activity for photosynthesis, Respiration and nitrogen metabolism
Zinc	Required in a large number of enzymes.
Chlorine	Involved in osmosis of water
Nickel	Required in nitrogen metabolism.

Lack of Nutrients:

If any of these nutrients is not available to plant, they show abnormalities and do not grow normally.

Q.2 Discuss role of nitrogen and magnesium in plants. (Application Base)

(Ex Q. No 1 2015) (MTN 2015)

Ans:

ROLE OF NITROGEN**Source:**

Plants get nitrogen in the form of nitrates.

Major Factor:

Nitrogen metabolism is a major factor in stem and leaf growth.

Major Component:

Nitrogen is a major component of the following compounds which are highly essential for plant life:

- Proteins
- Hormones
- Chlorophyll
- Vitamins
- Enzymes

Excessive Nitrogen:

Too much nitrogen can delay flowering and fruiting.

Deficiency:

Deficiency of nitrogen can:

- Reduce yields
- Cause yellowing of leaves
- Stunt growth

Carnivorous plants:

Carnivorous plants have **evolved mechanisms for trapping and digesting small animals**. The products of this digestion are used to supplement the plant's supply of nitrogen.

ROLE OF MAGNESIUM**Functions:**

- Magnesium is a **structural component of chlorophyll**.
- It is **necessary for the functioning of plant enzymes to produce carbohydrates, sugars and fats**.
- It is used for **fruit and nut formation**.
- It is essential for the **germination of seeds**.

Deficiency:

Deficiency of magnesium causes **yellowing and wilting of leaves**.

Q.3 Define fertilizers and describe their importance. (A.B)

(Ex Q. No 2)(GWR 2015, LHR 2016)

Ans:

FERTILIZERS**Definition:**

“As humans cultivated plants, it was **learned that addition of certain materials to soil sometimes resulted in plants with desirable characteristics**. Such materials were named as fertilizers.”

Desirable Characteristics:

- **More fruit**
- **Faster growth**
- **More attractive flowers**

Types of Fertilizers:

Fertilizers are **broadly classified into two types:**

- Inorganic fertilizers**
- Organic fertilizers**

i. Inorganic Fertilizers:

Naturally occurring inorganic fertilizers are **not chemically modified**. These include:

- **Rock phosphate**
- **Elemental Sulfur**
- **Gypsum**

Nitrogen Fertilizers:

If **nitrogen is the main element**, they are called nitrogen fertilizers.

Properties:

- **Most inorganic fertilizers dissolve readily in water.**
- **They are immediately available to plants for uptake.**

ii. Organic Fertilizers:**Source:**

The organic fertilizers are derived from plant and **animal materials**.

Properties:

They are **more complex and take time to be broken down into forms reusable by plants**.

Benefits:

They **increase soil drainage, aeration and the ability of the soil to hold nutrients**.

Examples:

These include:

- Manure
- Compost

Unclear Distinction between Inorganic and Organic Fertilizers.

The distinction between organic and inorganic fertilizers is not always clear-cut. Urea, for example is an organic compound, but chemically synthesized urea is generally grouped with inorganic fertilizers.

Q.4 Enlist and explain environmental hazards related to fertilizers use. (A.B) (DGK 2014)

Ans: ENVIRONMENTAL HAZARDS RELATED TO FERTILIZERS USE

Following are the environmental hazards related to fertilizers use:

Effect on Soil:

Massive quantities of inorganic fertilizers affect the soil nutrient-holding capacity.

Eutrophication:

Their high solubilities degrade ecosystems through eutrophication, which is the increase in chemical nutrients in an ecosystem.

Emission of Green House Gases:

Storage and application of some nitrogen fertilizers may cause emission of the green house gas, nitrous oxide. Ammonia gas may be emitted from inorganic fertilizers.

Reproduction Rate of Pests:

Excessive nitrogen fertilizers lead to pest problems by increasing their reproduction rate.

Environmental Problems:

Excessive amounts of organic fertilizers cause environmental problems due to nitrate leaching, or run off of soluble organic compounds.

Recommendation for Use:

It is recommended that the nutrient content of the soil and nutrient requirements of the crop should be calculated before the application of inorganic fertilizers.

SHORT QUESTIONS (Topic 8.1)

Q.1 Why does an organism need food? (U.B)

Ans: NEED OF FOOD

Every organism needs food for:

- Growth
- Energy
- Normal functions

Q.2 Define nutrition. (K.B)

Ans: NUTRITION

Definition:

“The process in which food is obtained or prepared, absorbed and converted into body substances for growth and energy is called nutrition”.

Q.3 What are nutrients? (K.B)

Ans: NUTRIENTS

Definition:

“The elements and compounds that an organism obtains and uses for energy or for the synthesis of new materials are called nutrients”.

There are two types of nutrients.

- Macronutrients
- Micronutrients

Q.4 Differentiate between nutrition and nutrient. (K.B)

(LHR 2016)

Ans: DIFFERENTIATION

The differences between nutrition and nutrient is as follow:

Nutrition	Nutrient
<ul style="list-style-type: none"> The process in which food is obtained or prepared, absorbed and converted into body substances for growth and energy, is called nutrition. 	<ul style="list-style-type: none"> Nutrients are the elements and compounds that an organism obtains and uses for energy or for the synthesis of new materials.

Q.5 What is the difference between autotrophic and heterotrophic organisms? (K.B)

(LHR 2012)

Ans: DIFFERENTIATION

The differences between autotrophic and heterotrophic organisms is as follows:

Autotrophic Organisms	Heterotrophic Organisms
Definition	
The organisms which obtain water, carbon dioxide, and minerals from their environment and prepare their food which is then used for growth and energy are called autotrophic organisms.	The organisms which obtain their food from other organisms and use it for growth and energy are called heterotrophic organisms.
Examples	
<ul style="list-style-type: none"> Plants Some protists Some bacteria 	<ul style="list-style-type: none"> Human beings Animals

Q.6 What are macronutrients? Give examples. (K.B)

(LHR 2013, LHR 2014)

Ans: Page no 233.

Q.7 What is the difference between macronutrients and micronutrients? (K.B)

Ans: DIFFERENTIATION

The differences between macronutrients and micronutrients is as follows:

Micronutrients	Macronutrients
Definition	
The nutrients which are required by plants in small quantities are called micronutrients.	The nutrients which are required by plants in large quantities are called macronutrients.
Examples	
<ul style="list-style-type: none"> Iron Molybdenum Boron 	<ul style="list-style-type: none"> Carbon Hydrogen Oxygen

Q.8 What is the role of iron and boron in plant life? (A.B)

(GRW 2014)

Ans: ROLE OF IRON AND BORON IN PLANT LIFE

Iron:

It is necessary for

- Photosynthesis
- Activates many enzymes

Boron:

Boron is important in:

- Sugar transport
- Cell division
- Synthesizing certain enzymes

Q.9 What is the role of phosphorus and potassium in plant life? (A.B) (GRW 2015)

Ans: ROLE OF PHOSPHORUS AND POTASSIUM IN PLANT LIFE

Phosphorus:

It is the component of:

- ATP
- Nucleic acids
- Coenzymes

It is necessary for

- Seed germination
- Photosynthesis
- Protein formation

Potassium:

- It regulates the opening and closing of the stomata.
- It reduces water loss from the leaves.

Q.10 Discuss the role of nitrogen in plants. (A.B)

Ans: ROLE OF NITROGEN IN PLANTS

Nitrogen metabolism is a major factor in stem and leaf growth. Nitrogen is a major component of the following compounds essential for plant life:

- Proteins
- Hormones
- Chlorophyll
- Vitamins
- Enzymes

Q.11 Describe the importance of magnesium for plants? (A.B)

(GRW 2013)

Ans: Page no 235.

Q.12 Why carnivorous plants have evolved mechanisms for trapping animals? (U.B)

Ans: Page no 235.

Q.13 Define fertilizers. (K.B)

OR

What are fertilizers?

Ans: Page no 235.

Q.14 What are the different types of fertilizers? (K.B)

(LHR 2013)

Ans: DIFFERENT TYPES OF FERTILIZERS

Fertilizers are broadly classified as organic or inorganic.

Inorganic Fertilizers:

These are not chemically modified. If nitrogen is main element, they are called nitrogen fertilizers. Naturally occurring inorganic fertilizers include:

- Rock phosphate
- Elemental sulfur
- Gypsum

Organic Fertilizers:

They are derived from plant and animal materials. They are more complex and take time to be broken down into forms useable by plants. The major organic fertilizers are:

- Manure
- Compost

Q.15 Differentiate between organic and inorganic fertilizers. (K.B)

(LHR 2014)

Ans: DIFFERENTIATION

The difference between inorganic and organic fertilizers is as follows:

Inorganic Fertilizers	Organic Fertilizers
Definition	
These are not chemically modified. If nitrogen is main element, they are called nitrogen fertilizers.	They are derived from plant and animal materials. They are more complex and take time to be broken down into forms useable by plants.
Examples	
<ul style="list-style-type: none"> • Rock phosphate • Elemental sulfur • Gypsum 	<ul style="list-style-type: none"> • Manure • Compost

Q.16 Explain with example that distinction between organic and inorganic fertilizers is not always clear cut. (K.B)

(LHR 2013)

Ans: DISTINCTION BETWEEN ORGANIC AND INORGANIC FERTILIZERS

The distinction between the organic and inorganic fertilizers is not always clear cut. Urea, for example, is an organic compound, but chemically synthesized urea is generally grouped with inorganic fertilizers.

Q.17 Define eutrophication. (K.B)

(GRW 2014, SGD 2015)

Ans: Page no 236.

Q.18 What are some of environmental hazards related to nitrogen fertilizers? (A.B)

Ans: Page no 236.

Q.19 If we supply organic and inorganic fertilizers to a plant, which one would be the first available to the plant for uptake? (A.B)

Ans: AVAILABILITY OF FERTILIZERS TO PLANT

If we supply organic and inorganic fertilizers to a plant, inorganic fertilizer would be the first available to the plant for uptake.

MULTIPLE CHOICE QUESTIONS (Topic 8.1)

1. The organisms which can prepare their food from CO₂ and water are named: (K.B)

- (A) Autotrophs (B) Heterotrophs
(C) Consumers (D) Decomposers

2. The most efficient mechanism of autotrophic mode of nutrition is observed in: (K.B)

- (A) Plants (B) Algae
(C) Bacteria (D) All of these

3. Which one is a macronutrient? (K.B)

- (A) Iron (E) Magnesium
(C) Copper (D) Boron

4. Which of the following nutrient(s) is a structural component of cell wall? (K.B)

- (A) Iron (B) Calcium
(C) Potassium (D) Copper

5. Which of the following is a micronutrient? (K.B)

(SGD 2015)

- (A) Potassium (B) Sulphur
(C) Copper (D) Calcium

6. **The micronutrient that is required by plants for nitrogen metabolism: (K.B)**
 (A) Chlorine (B) Iron
 (C) Zinc (D) Nickel
7. **Which of the following nutrient is/are components of enzymes? (K.B)**
 (A) Molybdenum (B) Copper
 (C) Sulphur (D) All of these
8. **The functions of phosphorus are: (A.B)**
 (A) It is component of ATP, nucleic acids and coenzymes.
 (B) It is necessary for seed germination.
 (C) Photosynthesis and protein formation.
 (D) All of these
9. **Which of the following nutrient(s) activates enzymes? (K.B)**
 (A) Calcium (B) Iron
 (C) Manganese (D) All of these
10. **Plants get nitrogen in the form of: (U.B)**
 (A) Nitrites (B) Nitrates
 (C) Nitric acid (D) All of these
11. **Chlorine is involved in: (K.B)**
 (A) Respiration (B) Reduction of nitrates into ammonia
 (C) Osmosis of water (D) Opening and closing of stomata
12. **Deficiency of which element causes the yellowing of leaves in plants? (A.B)**
 (LHR 2013, BWP 2015)
 (A) Zinc (B) Magnesium
 (C) Copper (D) Chlorine
13. **Which one is an organic fertilizer? (K.B)**
 (A) Rock phosphate (B) Elemental sulphur
 (C) Compost (D) Gypsum
14. **The increase in the chemical nutrients in an ecosystem is called: (K.B)**
 (A) Absorption (B) Assimilation
 (C) Eutrophication (D) Nutrition
15. **Which of the following is classified as organic fertilizer? (K.B)**
 (A) Rock phosphate (B) Urea
 (C) Manure (D) Elemental sulfur
16. **Which of the following is an attribute of inorganic fertilizers? (K.B)**
 (A) Complex in composition (B) Increases soil drainage
 (C) Increases soil ability to hold nutrients (D) Dissolve readily in water
17. **Increase in chemical nutrients in an ecosystem is termed as: (K.B)**
 (A) Soil erosion (B) Eutrophication
 (C) Chemotropism (D) Greenhouse effect
18. **Which of the following is a greenhouse gas? (U.B)**
 (A) Nitrogen oxide (B) Nitric oxide
 (C) Nitrous oxide (D) Nitrogen dioxide
19. **Anoxemia in soil causes: (K.B)**
 (A) Erosion of nutrients (B) Acidity
 (C) Alkalinity (D) Decrease the population of insects

8.2 COMPONENTS OF HUMAN FOOD

LONG QUESTIONS

Q.1 Explain carbohydrates and lipids. (Knowledge Base) (MTN 2014, 2015)

Ans: CARBOHYDRATES

Energy Source:

Carbohydrates are the **basic source of energy for all organisms**. About half to **2/3 of the total calories every animal consumes daily are from carbohydrates**.

Examples:

Glucose is the most often used carbohydrate for energy. Other useful carbohydrates are:

- **Maltose**
- **Lactose**
- **Sucrose**
- **Starch**

Energy Content:

Carbohydrates contain **4 kilocalories per gram**.

Sources:

Humans get carbohydrates from foods like:

- **Bread**
- **Pastas**
- **Beans**
- **Potatoes**
- **Bran**
- **Rice**
- **Cereals**

LIPIDS

Composition:

The lipids **present in food are composed of fatty acids bonded to glycerol**.

Types of Fatty Acids:

The fatty acids present in lipids are of two types:

- i. **Saturated fatty acids**
- ii. **Unsaturated fatty acids**

i. Saturated Fatty Acids:

Saturated fatty acids have **all of their carbon atoms bonded to hydrogen atoms**. Lipids containing saturated fatty acids are **solid at room temperature**.

Example:

- Butter contains **70% saturated and 30% unsaturated fatty acids**.

ii. Unsaturated Fatty Acids:

Unsaturated fatty acids have **some of their carbon atoms double-bonded in place of a hydrogen atom**. Lipids containing unsaturated fatty acids are **liquid at room temperature**.

Example:

- Sunflower oil contains **75% unsaturated fatty acids**.

Functions:

Lipids are used to form:

- **Membranes**
- **Sheaths surrounding neurons**
- **Certain hormones**

Energy Source:

Lipids are extremely useful energy sources.

Energy Content:

One gram of lipids contains 9 kilocalories of energy.

Sources:

Important sources of lipids include:

- **Milk**
- **Butter**
- **Cheese**
- **Eggs**
- **Mutton**
- **Fish**
- **Mustard seeds**
- **Coconut**
- **Dry fruits**

Q.2 Describe the role of proteins and minerals in human diet. (A.B)

(GWR 2014)

Ans:

PROTEINS**Composition:**

Proteins are composed of amino acids.

Functions:

They are essential components of:

- **Cytoplasm**
- **Membranes**
- **Organelles**
- **Muscles**
- **Ligaments**
- **Tendons**

So, we use proteins for growth. Many proteins play role as enzymes.

Energy Source:

They can also be used for gaining energy. They can be converted into carbohydrates.

Energy Content:

One gram of proteins contains 4 kilocalories of energy.

Sources:

Dietary sources of proteins include:

- **Meat**
- **Eggs**
- **Grains**
- **Legumes**
- **Dairy products such as milk and cheese**

MINERALS**Definition:**

Minerals are **inorganic elements** that **originate in the earth** and **cannot be made in the body**.

Functions:

They play **roles in various body functions** and **are necessary to maintain health**.

Sources:

Most of the minerals in human diet come directly from.

- Plants
- Water
- Animal foods

Types of Minerals:

Minerals are categorized into:

- i. **Major minerals**
- ii. **Trace minerals**

i. Major Minerals:

The minerals that are **required in amounts of 100 mg** (milligrams) or **more per day** are called major minerals.

ii. Trace Minerals:

The minerals that are **required in amounts less than 100 mg per day** are called trace minerals.

IMPORTANT MINERALS IN HUMAN DIET AND THEIR ROLES

Major Minerals	Role in Body	
Sodium	<ul style="list-style-type: none"> • Fluid balance in the body • Helps in absorption of other nutrients 	Important for <ul style="list-style-type: none"> • Muscle contraction, • Nerve impulse transmission • Heart function • Blood pressure
Potassium	<ul style="list-style-type: none"> • Fluid balance in the body • Acts as cofactor for enzymes 	
Chloride	<ul style="list-style-type: none"> • Fluid balance in the body • Component of hydrochloric acid 	
Calcium	<ul style="list-style-type: none"> • Development and maintenance of bones and teeth • Blood clotting 	
Magnesium and phosphorus	<ul style="list-style-type: none"> • Development and maintenance of bones and teeth 	
TRACE MINERALS		
Iron	Oxygen transport and storage	<ul style="list-style-type: none"> • Act as enzyme cofactors • Support immune function
Zinc	<ul style="list-style-type: none"> • Aids insulin action • Helps in growth and reproduction 	
Copper	Acts as enzyme cofactor	
Chromium	Helps in insulin action	
Fluoride	Stabilizes bone mineral and hardens tooth enamel	
Iodine	Essential for normal thyroid function	

Q.3 Describe role of calcium and iron in humans. (A.B)

(Ex Q. No 5) (GWR 2013, LHR 2014, 2015, 2016)

Ans:

ROLE OF CALCIUM

Functions:

- Calcium is **essential for the development and maintenance of bones and teeth.**
- It is needed for **maintaining cell membranes and connective tissues.**
- It is needed for **activation of several enzymes.**
- It also **aids in blood clotting.**
- Good calcium nutrition, along with low salt and **high potassium intake, prevents from hypertension and kidney stones.**

Sources:

Humans get calcium from

- **Milk**
- **Cheese**
- **Egg yolk**
- **Beans**
- **Nuts**
- **Cabbage**

Deficiency:

- Deficiency of calcium causes **spontaneous discharge of nerve impulses which may result in tetany.**
- **Bones become soft.**
- **Blood clots slowly.**
- **Wounds heal slowly.**

ROLE OF IRON

Functions:

- Iron plays a major role in **oxygen transport and storage.**
- It is a **component of haemoglobin in red blood cells.**
- It is a **component of myoglobin in muscle cells.**
- **Cellular energy production** also requires iron.
- It acts as a **cofactor for many enzymes of cellular respiration.**
- It also **supports immune function.**

Sources:

Humans get iron from:

- **Red meat**
- **Egg yolk**
- **Whole wheat**
- **Fish**
- **Spinach**
- **Mustard**

Deficiency:

Its deficiency is **the most common nutrient deficiency worldwide. Iron deficiency causes anaemia.**

Q.4 What are vitamins? Describe the role of vitamin A in humans. (A.B)

(Ex O No4) (LHR 2014)

Ans:

VITAMINS

Definition:

“Vitamins are the chemical compounds that are required in low amounts but are essential for normal growth and metabolism.”

ROLE OF VITAMIN A IN HUMANS

Introduction:

Vitamin A was the first fat-soluble vitamin, identified in 1913.

Functions:

- It combines with a protein called opsin to form rhodopsin in rod cells of the retina of eye.
- It is involved in cell-differentiation, a process through which embryonic cells transform into mature cells with specific functions.
- It also supports bone growth and immune functions.

Sources:

Humans get Vitamin A from:

- Leafy vegetables (spinach, carrots)
- Yellow/orange fruits (mango)
- Liver
- Fish
- Eggs
- Milk
- Butter

Deficiency:

The deficiency of vitamin A results in the following diseases:

Blindness:

Deficiency of vitamin A is the leading cause of blindness in children worldwide.

Night Blindness:

One of the symptoms of vitamin A deficiency is night blindness. When vitamin A is inadequate, the lack of rhodopsin makes it difficult to see in dim light. It is a temporary condition, but if left untreated, it can cause permanent blindness.

Skin Changes:

Vitamin A deficiency can also cause a condition in which hair follicles become plugged with keratin, giving dry texture to skin.

Q.5 Write a note on vitamin C. (Knowledge Base)

(Ex Q No 4) (LHR 2014)

Ans:

VITAMIN C

Other Name:

Other name of vitamin C is ascorbic acid.

Functions:

- Vitamin C participates in many reactions.
- It is needed to form collagen (a fibrous protein) that gives strength to connective tissues. Collagen is also needed for wound healing.
- Vitamin C in white blood cells enables the immune system to function properly.

Sources:

Humans get vitamin C from:

- **Citrus fruits** (oranges, lemons, grape-fruit)
- **Leafy green vegetables**
- **Beef liver**
- Minute quantities of vitamin C are present in muscles. Since meat consists of muscles so it is not a **good source of vitamin C.**

Deficiency:

The deficiency of vitamin C results in the following diseases:

Connective Tissue Damage:

Deficiency of Vitamin C causes **connective tissue changes throughout the body.**

Scurvy:

The disease known as scurvy results **from lack of vitamin C.** In this condition the synthesized collagen is unstable. Symptoms of scurvy include:

- **Muscle and joint pain**
- **Swollen and bleeding gums**
- **Slow wound healing**
- **Dry skin**

Q.6 Write a note on vitamin D. (K.B)

(Ex Q. No 4) (LHR 2014)

Ans:

VITAMIN D**Functions:**

- The best known function of vitamin D is **to help regulate blood levels of calcium and phosphorus.**
- Vitamin D **increases the absorption of these minerals from intestine** and their **deposition in bones.**

Sources:

Vitamin D is mainly found in:

- **Fish liver oil**
- **Milk**
- **Ghee**
- **Butter**

Synthesis:

It is also synthesized by **skin when ultraviolet (UV) radiations from the sun are used to convert a compound into vitamin D.**

Deficiency:

Long term deficiency of vitamin D **affects bones.**

Rickets:

In children, vitamin D deficiency leads **to rickets**, a condition in which **bones weaken and bow under pressure.**

Osteomalacia:

In adults, vitamin D deficiency causes **osteomalacia**, or “**soft bones,**” **increasing the risk of fractures in bones.**

Q.7 Describe effect of water and dietary fibre on life of human beings. (A.B)
(Ex Q. No 6) (LHR 2012, 2013, 2015, GWR 2014)

Ans: **WATER**

Strictly speaking, **water and dietary fibre** are **not considered as nutrients**, but they do **play important role in life.**

Percentage Composition:

Approximately **60% of the adult human body is composed of water.**

Functions:

Following are the functions of water in human bodies:

Metabolism:

Nearly all **life-sustaining chemical reactions require** an aqueous (watery) environment.

Absorption:

Water functions as the **environment in which water-soluble food stuff is absorbed** in the intestines.

Excretion:

The **waste products are eliminated in the urine through water.**

Sweating:

An **essential role of water** is to **maintain body temperature through evaporation**, as in sweating.

Deficiency:

Severe dehydration may result in **cardiovascular problems.**

Daily Requirement:

The **estimated water requirement of an average adult is two litres per day.**

Sources:

Important sources of daily water intake are:

- **Natural water**
- **Milk**
- **Juicy fruits**
- **Vegetables**

DIETARY FIBRE

Other Name:

Dietary fibre is also known as **roughage.**

Introduction:

Dietary fibre is the part of **human food which is indigestible.** It is found **only in plant foods** and it **moves undigested through stomach and small intestine into colon.**

Types:

Dietary fibre is of two types.

- i. Insoluble dietary fibre
- ii. Soluble dietary fibre

i. Insoluble Dietary Fibre:

The **insoluble dietary fibre travels quickly through small intestine.**

Sources:

The sources of insoluble dietary fibre are:

- **Wheat bran**
- **Cereals**
- **Skins of many fruits and vegetables**

ii. Soluble Dietary Fibre:

The soluble dietary fibre breaks down as it passes through the alimentary canal.

Sources:

The sources of soluble dietary fibre are:

- Oats
- Beans
- Barley
- Many fruits and vegetables

Functions:

- Fiber prevents and relieves constipation by stimulating the contraction of intestinal muscles. Avoiding constipation reduces the risk of many other diseases.
- Soluble fibre helps in lowering blood cholesterol and sugar levels.
- Insoluble fibre speeds up the movement of carcinogens (cancer causing agents) from intestine.

Precaution for Use:

Fibre supplements (such as ispaghol husk) should be used only with a physician's recommendations. Taken properly, these supplements may help in constipation and in lowering cholesterol level.

Q.8 Write a note on balanced diet. (K.B)

(Ex Q. No 7)

Ans:

BALANCED DIET**Introduction:**

Humans require various types of nutrients in order to keep them healthy and fit. These nutrients should be taken appropriately in diet.

Definition:

“A diet which contains all the essential nutrients in correct proportion for the normal growth and development of body is called balanced diet.”

Composition:

The balanced diet should include different types of nutrients and should be according to the energy requirements.

Relation of Balanced Diet:

A balanced diet is related to one's:

- i. Age
- ii. Gender
- iii. Activity

i. Age:

During growth period of the body, there is a higher metabolic rate in body cells and so body needs a balanced diet that contains more energy.

Adults:

Adults need less protein per kilogram of body weight.

Growing Persons:

A growing boy or girl needs more proteins per kilogram body weight.

Children:

Children need more calcium and iron for their growing bones and red blood cells respectively.

ii. Gender:

Gender has an **impact on the requirements of a balanced diet.**

Women:

Women have **comparatively less metabolic rate than men** of the same age and weight.

Men:

So men need a **balanced diet that provides comparatively more energy.**

iii. Activity:

Different people have different lifestyles and varied nature of work.

- A man with **sedentary habits does not require as much energy as a man who is on his feet for most of the day.**

The following chart shows some of the common foods, taken in Pakistan and the percentage of carbohydrates, lipids and proteins in each of them.

COMMON FOODS AND THE PERCENTAGE OF NUTRIENTS

Food	Carbohydrates	Lipids	Proteins
Bread (Roti)	52%	03%	09%
Rice	23%	0.1%	2.2%
Potato	19%	0.1%	02%
Apple	12.8%	0.5%	0.3%
Eggs	0.7%	12%	13%
Milk	04%	04%	03%
Butter	0.4%	81%	0.6%
Chicken	0	11%	20%

Q.9 Discuss problems related to nutrition. (A.B)

(Ex Q. No 8)

Ans:

PROBLEMS RELATED TO NUTRITION

Introduction:

Problem related to **nutrition** are **grouped as malnutrition**. It often **refers to under-nutrition resulting from inadequate consumption, poor absorption, or excessive loss of nutrients**. Malnutrition also includes **over-nutrition, resulting from overeating or excessive intake of specific nutrients**.

Forms of Malnutrition:

Common forms of malnutrition include:

- Protein-energy malnutrition (PEM)
- Mineral deficiency diseases (MDD)
- Over-intake of nutrients (OIN)

i. Protein-Energy Malnutrition.

(GWR 2014, LHR 2014)

Definition:

"The **inadequate availability or absorption of energy and proteins in the body** is called protein-energy malnutrition."

Effects:

It is the **leading cause of death in children in developing countries**. It leads to the following diseases:

Functions of Iodine:

Iodine is used by thyroid gland to produce hormones that control body's normal functioning and growth.

Deficiency of Iodine:

If sufficient Iodine is not available in a person's diet, thyroid gland becomes enlarged and it results in a swelling in neck. This condition is known as goiter.

ii. Anemia:

Anemia is the most common of all mineral deficiency diseases.

Meaning:

The term 'anemia' literally means 'a lack of blood'.

Cause:

It is caused when the number of red blood cells is reduced than the normal. Haemoglobin molecule contains a single atom of iron in the centre. If body fails to receive sufficient amounts of iron, adequate number of haemoglobin molecules is not formed.

Effects:

There are not enough functioning red blood cells. The patient is weak and there is shortage of oxygen supply to body cells.

iii. Over-Intake of Nutrients:**Introduction:**

Over-intake of nutrients (OIN) is a form of malnutrition in which more nutrients are taken than the amounts required for normal growth, development and metabolism.

Reason:

The effects of over-intake of nutrients are usually intensified when there is reduction in daily physical activity (decline in energy expenditure).

Effects:

Over-intake of nutrients causes a number of health problems.

Carbohydrates and Fats:

High intake of carbohydrates and fats leads to:

- Obesity
- Diabetes
- Cardiovascular problems

Vitamin A:

High doses of vitamin A cause:

- Loss of appetite
- Liver problems

Vitamin D:

Excessive intake of vitamin D leads to deposition of calcium in various tissues.

Q.10 What are the effects of malnutrition? (A.B)

(GWR 2013, 2015, LHR 2014, SWL 2014, DGK 2014)

Ans:

EFFECTS OF MALNUTRITION

An extended period of malnutrition can lead to problems like:

- i. Starvation
- ii. Heart diseases
- iii. Constipation

iv. **Obesity**i. **Starvation:**

Starvation is a **severe reduction in nutrient and energy intake** and is the **most horrible effect of malnutrition.**

Effects:

In humans, prolonged starvation causes **permanent organ damage** and **eventually results in death.**

Incidence:

According to the **Food and Agriculture Organization** of the **United Nations**, **more than 25,000 people die of starvation every day.** On average, every five seconds a child dies from starvation.

ii. **Heart Diseases:**

Heart diseases are **also rising on the global level.**

Cause:

One of the causes of heart diseases is malnutrition. **People who take unbalanced diet (high in fats) are more exposed to heart problems.**

iii. **Constipation:**

Malnutrition often leads to situations where people cannot schedule their meals. This irregularity results in many **health problems including constipation.**

iv. **Obesity:**

Obesity means **becoming over-weight.**

Cause:

Obesity is also due to **malnutrition.** **People who take food which contains energy more than their requirement and do very little physical work can become obese.**

Mother Disease:

Obesity is known as the mother disease as it can give rise to:

- **Heart problems**
- **Hypertension**
- **Diabetes**

Q.11 Discuss famine as the major cause of malnutrition. (A.B) (Ex Q. No 9) (GWR 2015)

Ans: FAMINE THE MAJOR CAUSE OF MALNUTRITION

Definition:

“The lack of enough food to feed all people living in that area is called as famine.”

Examples:

The most terrible famines of the twentieth century are:

- **The Ethiopian famine (1983-85)**
- **The North Korean famine (1990s)**

Major Causes of Famine:

The major causes of famines are:

- i. **Unequal distribution of food**
- ii. **Drought**
- iii. **Flooding**
- iv. **Increasing population**
- v. **Problems created by humans**

i. Unequal Distribution of Food:

The achievements in science have enabled human beings to produce better food in terms of quality and quantity. Today, the agricultural practices produce more than enough food that can be supplied to everyone on the earth.

Cause:

Due to **political and administrative problems**, food is **not equally distributed to different regions of the world.**

Effects:

The result is, there is always surplus food in countries like

- America
- UK
- Canada

And at the same time, people have nothing to eat in countries like

- Ethiopia
- Somalia

Role of WFP:

The **World Food Program (WFP)** is the **food aid branch of United Nations. It is the world's largest agency providing food to more than 90 million people in 80 countries.**

ii. Drought:**Definition:**

“A **period of time when there is not enough water to support agricultural and human need** is called as drought.”

Cause:

Drought is usually **due to a long period of below-normal rainfall.**

Effect:

Drought decrease or even stop the crop yields and it results in famine.

iii. Flooding:**Causes:**

Flooding occurs due to:

- **More than normal rainfall**
- **Weak water distribution system**

Effects:

Rivers and canals overflow their banks and destroy the soil quality of agricultural lands. It becomes impossible to grow crops immediately after flooding. In this way, flooding may be a reason for short-term famine.

iv. Increasing Population:**Overuse of Resources:**

In spite of the global increase in food production, millions of human beings are undernourished. In the over-populated regions of the world, large populations overuse natural resources to grow maximum food in order to meet the problems of food shortage.

Effects:

It leads to dry and infertile lands and depletion of resources. In such situations crops can no longer be grown and famines result.

v. Problems created by Humans:

Famines may also be due to the problems created by humans like:

- **Wars**
- **Wrong economic policies**

SHORT QUESTIONS (Topic 8.2)**Q.1 Which nutrients are common source of energy? (A.B)****Ans:** NUTRIENTS SOURCE OF ENERGY

The following nutrients are common source of energy:

- Carbohydrates
- Proteins
- Lipids

Q.2 Name the components of human food. (K.B)**Ans:** COMPONENTS OF HUMAN FOOD

The components of human food are as follow:

- Carbohydrates
- Lipids
- Nucleic Acids
- Proteins
- Minerals
- Vitamins

Q.3 What are the differences between saturated and unsaturated fatty acids? (K.B)

(LHR 2014, SGD 2015)

Ans: DIFFERENTIATION

The difference between saturated and unsaturated fatty acids is as follows:

Saturated Fatty Acids	Unsaturated Fatty Acids
Bonds	
They have all of their carbon atoms bonded to hydrogen atoms.	They have some of their carbon atoms double bonded in place of a hydrogen atom.
Physical State	
Generally the lipids containing saturated fatty acids are solid at room temperature.	The lipids containing unsaturated fatty acids are liquid at room temperature.
Source	
They are obtained from animals.	They are obtained from plants.
Examples	
• Butter	• Sunflower oil

Q.4 How do saturated fatty acids increase a person's cholesterol? (U.B)**Ans:** Cholesterol's level

- Saturated fatty acids can increase a person's cholesterol level
- As increased cholesterol level may eventually result in clogging of arteries and heart disease.

Q.5 What are the sources and uses of lipids? (A.B)**Ans:** Page no 241.**Q.6 Write the main food sources of proteins in human diet. (K.B)**

(LHR 2014, 2016)

Ans: Page no 242.**Q.7 What are functions of proteins? Functions of proteins: (A.B)**

(LHR-G-14)

Ans: Proteins are essential for:

- The components of cytoplasm, membranes and organelles.
- The components of muscles, ligaments and tendons.
- The growth
- The energy source
- Formation of enzymes

Q.8 Define minerals. (K.B)

Ans: Page no 243.

Q.9 Differentiate between major minerals and trace minerals. (K.B)

Ans: **DIFFERENTIATION**

The difference between major minerals and trace minerals is as follows:

Major Minerals	Trace Minerals
Requirement	
They are required in the amounts of 100mg or more per day.	They are required in the amounts less than 100mg per day.
Examples	
<ul style="list-style-type: none"> • Sodium • Potassium • Chloride 	<ul style="list-style-type: none"> • Iron • Zinc • Copper

Q.10 What is the role of chloride and zinc in human diet? (A.B)

Ans: Page no 243.

Q.11 Write importance of calcium. (A.B)

(LHR 2012)

Ans: Page no 244.

Q.12 What is the role of iron in human diet? (A.B)

(LHR 2012)

Ans: Page no 244.

Q.13 What can happen if a person's diet is deficient in calcium? (A.B)

Ans: Page no 244.

Q.14 How can hypertension and kidney stones be prevented? (A.B)

Ans: **PREVENTION OF HYPERTENSION AND KIDNEY STONES**

The hypertension and kidney stones can be prevented by intake of:

- Good calcium nutrition
- Low salt
- High potassium

Q.15 What are vitamins? Which are the two main groups of vitamins? (K.B) (LHR 2016)

Ans: Page no 245.

Q.16 Why the level of water-soluble vitamins can decrease more quickly in our bodies? (U.B)

Ans: **LEVEL OF WATER SOLUBLE VITAMINS**

Fat-soluble vitamins are much less excreted from body as compared to water-soluble vitamins. So the level of water-soluble vitamins can decrease more quickly in our bodies leading to vitamin deficiencies.

Q.17 What are the different roles of vitamin A in human diet? (K.B) (RWP 2014)

Ans: **DIFFERENT ROLES OF VITAMIN A IN HUMAN DIET**

Following are the roles of vitamin A.

- It combines with a protein called opsin to form rhodopsin in rod cell of the retina of eye.
- It is also involved in cell differentiation, a process through which embryonic cells transforms into mature cells with specific functions.
- Vitamin A also supports bone growth and immune functions.

Q.18 What can happen due to deficiency of Vitamin A? (A.B)

Ans: DEFICIENCY OF VITAMIN A

Following are the problems due to deficiency of vitamin A in human diet.

- One of the symptoms of vitamin A deficiency is night blindness.
- Vitamin A deficiency can also cause a condition in which hair follicles become plugged with keratin, giving dry texture to skin.

Q.19 Which vitamins are destroyed by cooking and heating? (U.B)

Ans: VITAMIN DESTRUCTION BY HEATING

Cooking or heating destroys water-soluble vitamins more readily than the fat-soluble vitamins.

Q.20 What are the functions of vitamin C in human beings? (A.B)

(LHR 2016)

Ans: Page no 245.

Q.21 What is scurvy? Write down its symptoms. (K.B)

(RWP 2015)

Ans: Page no 246.

Q.22 What are sources of vitamin C? (K.B)

(GRW 2014)

Ans: Page no 246.

Q.23 Write sources of vitamin D. (K.B)

(GRW 2012, LHR 2012, 2015)

Ans: Page no 246.

Q.24 What are the diseases caused due to deficiency of vitamin D? (A.B)

(RWP 2015)

Ans: Page no 246.

Q.25 Enlist functions, deficiencies and sources of vitamin A in form of table. (A.B)

Ans: VITAMIN A

Sources	Functions	Deficiency Symptoms
<ul style="list-style-type: none"> • Leafy vegetables (Spinach, carrots) • Yellow Fruits • Fish • Liver • Egg, Milk, butter 	<ul style="list-style-type: none"> • Vision in dim light • Cell differentiation • Growth • Immunity 	<ul style="list-style-type: none"> • Poor growth • Dry Skin • Blindness

Q.26 What is dietary fibre? (K.B)

(LHR 2014, 2015, GRW 2015)

Ans: Page no 247.

Q.27 What is the difference between soluble and insoluble dietary fibre? (K.B)

Ans: DIFFERENTIATION

The difference between soluble and insoluble dietary fibre is as follows:

Soluble Dietary Fibre	Insoluble Dietary Fibre
Fate	
It break down as it passes through alimentary canal.	It travels quickly through small intestines.
Sources	
<ul style="list-style-type: none"> • Oats • Beans • Barley • Many fruits and vegetables 	<ul style="list-style-type: none"> • Wheat bran • Serials • Skins of many fruits and vegetables.

Q.28 What are benefits of fibre supplements? (A.B)

Ans: Page no 248.

Q.29 Define balanced diet. (K.B)

(GRW 2012, LHR 2016)

Ans: Page no 248.

Q.30 What is relation of balanced diet with age of living organisms? (K.B)

Ans: Page no 248.

Q.31 Define malnutrition. (K.B)

Ans: Page no 249.

Q.32 What are the effects of malnutrition? (A.B)

Ans: Page no 249

Q.33 Define PEM? Which diseases are caused by PEM?

Ans: PROTEIN – ENERGY MALNUTRITION

PEM means inadequate availability or absorption of energy and protein in the body” It may lead to diseases such as

- Kwashiorkor
- Marasmus

Q.34 What is the major cause of mortality in children? (U.B)

Ans: Page no 249.

Q.35 Write a comparison of kwashiorkor and marasmus? (K.B)

(LHR 2013, GRW2013)

Ans: COMPARISON

Kwashiorkor	Marasmus
<ul style="list-style-type: none"> • It appears at the age of about 12 • discontinued • Children with marasmus show poor growth and look small for their age. 	<ul style="list-style-type: none"> • It appears at the age of six months to one year • Children grow to normal height but are abnormally thin

Q.36 What is MDD? Give a comparison of goiter and Anemia.

Ans: MINERAL DEFICIENCY DISEASES

Diseases resulting from the deficiency of mineral are known as MDD.

Goiter

(GRW-G-15,16)

- It is caused by an insufficient amount of iodine in diet
- If sufficient amount of iodine is missing, then thyroid gland become enlarged and it result of in swelling of neck

Anemia

(GRW-G-15)

- It is caused by the reduction in the number of RBCs, than the normal.
- If sufficient amount of iron is not present in blood then the number of hemoglobin molecules will be reduced.

Q.37 Write down the name of two diseases caused by minerals deficiency. (K.B) (LHR 2016)

Ans: Page no 250.

Q.38 What is meant by CIN? (K.B)

Ans: Page no 251.

Q.39 Define starvation. (K.B)

(GRW 2013)

Ans: Page no 252.

Q.40 What are the statistics of Food and Agriculture Organization of the UN?

Ans: According to the Food and Agriculture Organization of the United Nation, more than 25,000 people die of starvation every day. On average, every five seconds a child dies from starvation.

Q.41 What are different effects of malnutrition? (K.B)

Ans: Page no 251.

Q.42 What is the estimation of WHO about malnutrition?

Ans: The World Health Organization (WHO) estimated that, within the next few years, diseases due to malnutrition will become the principal global causes of mortality.

Q.43 Define famine and also tell its causes. (A.B)

Ans: Page no 252.

Q.44 What do you know about world food program? (K.B)

Ans: Page no 253.

Q.45 How flooding becomes a cause of famine? (U.B)

Ans: Page no 253.

Q.46 What is meant by drought? (K.B)

(RWP 2015)

Ans: Page no 253.

MULTIPLE CHOICE QUESTIONS (Topic 8.2)

1. Which of the following are the most common source of energy? (K.B)

(SWL 2014, LHR 2015)

- | | |
|-------------------|------------------|
| (A) Carbohydrates | (B) Lipids |
| (C) Proteins | (D) All of these |

2. How much percentage of total calories every animal consumes daily are from Carbohydrates? (U.B)

- | | |
|------------|------------|
| (A) 50-65% | (B) 25-40% |
| (C) 75-90% | (D) 20-35% |

3. Sources of carbohydrates for humans except: (K.B)

- | | |
|------------|-----------|
| (A) Cheese | (B) Bread |
| (C) Bran | (D) Rice |

4. How much energy is provided by one gram of carbohydrates? (K.B) (SWL 2014, LHR 2015)

- | | |
|-------------------|-------------------|
| (A) 1000 calories | (B) 2000 calories |
| (C) 3000 calories | (D) 4000 calories |

5. The lipids are composed of: (K.B)

- | | |
|------------------|-------------------|
| (A) Fatty acids | (B) Glycerol |
| (C) Both A and B | (D) None of these |

6. Which of the following is an attribute of saturated fatty acids? (K.B)

- | | |
|---|----------------------------------|
| (A) Liquid at room temperature | (B) Taken from the animal source |
| (C) Having double bond between carbon atoms | (D) Taken from plant source |

7. How much energy is provided by one gram of lipids? (K.B)

(DGK 2015, BRW 2014, LHR 2013)

- | | |
|-------------------|-------------------|
| (A) 6000 calories | (B) 7000 calories |
| (C) 8000 calories | (D) 9000 calories |

8. How much saturated fatty acids are present in butter? (K.B)

- | | |
|----------|----------|
| (A) 40 % | (B) 50 % |
| (C) 60 % | (D) 70 % |

9. How much unsaturated fatty acids are present in sunflower oil? (K.B)
(A) 55 % (B) 65 %
(C) 75 % (D) 85 %
10. Proteins are composed of: (K.B) (LIR G-14)
(A) Fatty acids (B) Amino acids
(C) Lactic acid (D) Glycerols
11. The amount of energy provided by one gram of protein? (K.B) (GRW 2015)
(A) 2000 calories (B) 4000 calories
(C) 5000 calories (D) 7000 calories
12. Which of the following major component of food is needed as the main structural component of the body? (K.B)
(A) Carbohydrates (B) Lipids
(C) Proteins (D) Vitamins
13. Proteins are the major components of: (K.B)
(A) Muscles (B) Ligaments
(C) Tendons (D) All of these
14. Which of the following is a major mineral? (K.B)
(A) Iron (B) Zinc
(C) Copper (D) Calcium
15. Which of the following mineral is responsible for oxygen transport and storage? (K.B)
(A) Iron (B) Copper
(C) Chloride (D) Iodine
16. The minerals required for fluid balance in the body: (A.B)
(A) Sodium (B) Potassium
(C) Chloride (D) All of these
17. Which mineral is essential for development and maintenance of bones and teeth? (A.B) (FSD 2014)
(A) Potassium (B) Sodium
(C) Iodine (D) Calcium
18. Which of the following mineral act as enzyme co-factor? (K.B)
(A) Iron (B) Zinc
(C) Potassium (D) All of these
19. The functions of calcium: (K.B)
(A) Development and maintenance of bones and teeth
(B) Blood clotting
(C) Oxygen transport and storage
(D) Both A and B
20. Which one is trace mineral? (K.B)
(A) Sodium (B) Potassium
(C) Chromium (D) Magnesium
21. The mineral that stabilizes bone mineral and hardens tooth enamel: (A.B)
(A) Iodine (B) Fluoride
(C) Zinc (D) Potassium
22. Hypocalcaemia (low calcium ion) is a cause of following disorders except: (A.B)
(A) Tetany (B) scurvy
(C) Slow healing of wounds (D) Soft bones

23. Which one trace mineral is required for normal thyroid function? (A.B)
 (A) Iron (B) Zinc
 (C) Copper (D) Iodine
24. The deficiency of which mineral causes anaemia? (A.B)
 (A) Calcium (B) Iron
 (C) Sodium (D) Magnesium
25. Which of the following is not fat soluble vitamin? (K.B) (LHR 2014)
 (A) A (B) B
 (C) D (D) E
26. Water soluble vitamin is: (K.B) (SGD 2015, RWP 2015)
 (A) A (B) B
 (C) K (D) D
27. The first fat-soluble vitamin identified in 1913: (K.B)
 (A) A (B) D
 (C) K (D) C
28. Which vitamin converts opsin into rhodopsin? (A.B)
 (A) A (B) C
 (C) D (D) E
29. Night blindness is caused by the deficiency of: (A.B) (BWP 2014, SGD 2015)
 (A) Vitamin A (B) Vitamin B
 (C) Vitamin C (D) Vitamin D
30. Poor Growth, blindness and dry skin are the deficiency symptoms of: (K.B)
 (A) Vitamin E (B) Vitamin D
 (C) Vitamin B (D) Vitamin A
31. Citrus fruit is enriched with: (K.B)
 (A) Vitamin A (B) Vitamin C
 (C) Vitamin D (D) Vitamin K
32. The deficiency of vitamin C results in: (A.B) (GRW 2014)
 (A) Poor growth (B) Scurvy
 (C) Osteomalacia (D) Rickets
33. Scurvy is caused due to deficiency of ____ in body. (A.B) (LHR 2016)
 (A) Protein (B) Vitamin C
 (C) Vitamin D (D) Lipids
34. Vitamin C is needed: (A.B)
 (A) To form collagen (B) In healing of wounds
 (C) In immune system (D) All of these
35. Which vitamin is synthesized by skin exposed to ultraviolet radiations of the sun? (U.B)
 (A) A (B) B
 (C) C (D) D
36. Deficiency of vitamin D leads to: (A.B) (GRW 2015)
 (A) Rickets (B) Osteomalacia
 (C) Scurvy (D) Both A and B
37. How much of the adult human body is composed of water? (K.B)
 (A) 40 % (B) 50 %
 (C) 60 % (D) 70 %

38. The estimated water requirement of an average adult per day: (K.B)
(A) 1 litre (B) 2 litres
(C) 3 litres (D) 4 litres
39. Which one is an insoluble dietary fibre? (K.B) (SVL 2014)
(A) Cereals (B) Cats
(C) Beans (D) Barley
40. Source(s) of dietary fibers/are: (K.B)
(A) Animals (B) Plants
(C) Fungi (D) Both a and b
41. Which of the following is the soluble dietary fibre? (K.B)
(A) Wheat bran (B) Cereals
(C) Barley (D) Vegetables
42. A balanced diet is related to one's: (K.B)
(A) Age (B) Gender
(C) Activity (D) All of these
43. The percentage of carbohydrates in bread: (K.B)
(A) 42 % (B) 52 %
(C) 62 % (D) 65 %
44. The percentage of carbohydrates in potato: (K.B)
(A) 19 % (B) 21 %
(C) 31 % (D) 41 %
45. The percentage of lipids in chicken: (K.B)
(A) 10 % (B) 11 %
(C) 12 % (D) 13 %
46. How much % of lipids is present in milk? (K.B) (LHR 2014)
(A) 10% (B) 12%
(C) 9% (D) 4%
47. The percentage of proteins in egg: (K.B)
(A) 13 % (B) 15 %
(C) 17 % (D) 19 %
48. According to UNICEF, number of children (under age 5) die due to malnutrition each year: (A.B)
(A) 0.6 million (B) 6 million
(C) 60 million (D) 3 million
49. The diseases of kwashiorkor and marasmus may be due to: (K.B)
(A) Over intake of nutrients (B) Mineral deficiency
(C) Ulcer (D) Protein energy malnutrition
50. Kwashiorkor is a protein deficiency disease that takes place at the age of: (K.B)
(A) 4 months (B) 6 months
(C) 8 months (D) 12 months
51. The leading cause in death in children in developing countries is: (K.B)
(A) OIN (B) PEM
(C) MED (D) Constipation
52. Marasmus is due to the deficiency of: (K.B)
(A) Proteins (B) Minerals
(C) Vitamins (D) Carbohydrates

53. Goiter is due to the deficiency of: (K.B)
 (A) Protein (B) Iron
 (C) Iodine (D) Nickel
54. Which disease is caused due to the deficiency of iodine? (K.B)
 (A) Anaemia (E) Goiter
 (C) Scurvy (D) Rickets
 (D.G.K 2014, 2015, L.H.R 2016, GRW 2015)
55. High intake of carbohydrates and fats leads to: (U.B)
 (A) Obesity (B) Diabetes
 (C) Cardiovascular problems (D) All of these
56. Which of the following is known as the mother disease? (K.B)
 (A) Starvation (B) Heart disease
 (C) Obesity (D) Constipation
57. The most terrible famines of twentieth century are: (K.B)
 (A) Ethiopian famine (B) North Korean famine
 (C) Somalian famine (D) Both A and B

8.3 DIGESTION IN HUMAN

LONG QUESTIONS

- Q.1 Define human alimentary canal and discuss role of oral cavity in digestive system.
 (A.B) (Ex Q. No 10) (BWP 2014)

Ans: HUMAN ALIMENTARY CANAL

Definition:

“The digestive system of human consists of a long tube that extends from mouth to anus this tube is called alimentary canal.”

Parts:

Its main sections are:

- Oral cavity
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine

Glands:

In addition, there are many glands associated with alimentary canal. These are:

- Three pairs of salivary glands
- Pancreas
- Liver

ORAL CAVITY

Location:

Oral cavity is the space behind mouth.

Functions:

The oral cavity has many important functions in the whole process of digestion.

Food Selection:

One of the functions of oral cavity is food selection. When food enters oral cavity, it is tasted and felt. If its taste suggests that it is old, we reject it. If teeth or tongue detect some hard object, such as dirt, we also reject that bite.

The sense of smell and vision also help oral cavity in the selection of food.

Mastication:

The second function of the oral cavity is the grinding of food by teeth. This is known as chewing or mastication. This is a useful process because oesophagus can pass only small pieces. Enzymes also can not act on large pieces of food. They require small pieces with large surface area to attack.

Lubrication:

The chewing process stimulates the three pairs of salivary glands (under tongue, behind jaws, and in front of ears) to release a juice called saliva in oral cavity.

Role of Saliva:

Saliva adds water and mucus to food which act as lubricant to ease the passage of food through esophagus.

Partial Digestion:

Saliva also contains an enzyme salivary amylase, which helps in the semi-digestion of starch.

Bolus Formation:

During the processes of chewing, lubrication, and semi-digestion, the pieces of food are rolled up by tongue into small, slippery, spherical mass called bolus.

Swallowing of Bolus:

The bolus is swallowed and pushed into esophagus through the pharynx.

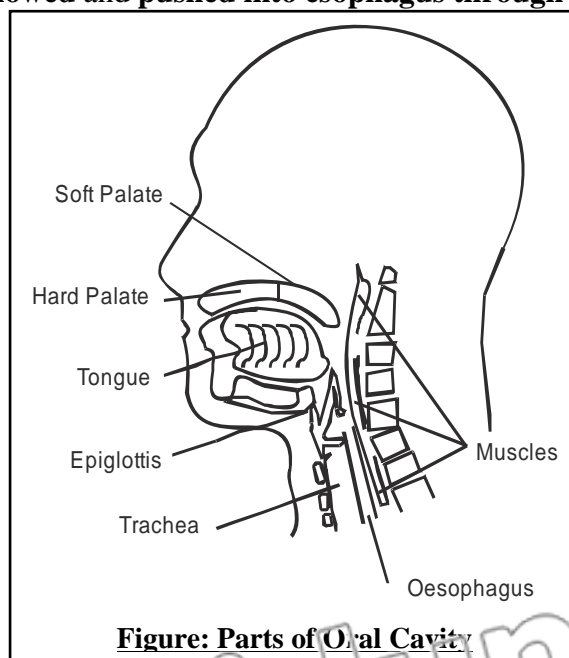


Figure: Parts of Oral Cavity

Q.2 Describe the role of pharynx and esophagus in swallowing and peristalsis.

(A.B) (Ex Q. No 10, 11)

Ans:

ROLE OF PHARYNX

Role of Tongue:

During swallowing, bolus is pushed to the back of the mouth by tongue.

Role of Soft Palate:

- When tongue pushes bolus, the soft palate also moves upward and to rear. In this way, the opening of the nasal cavity is closed.
- When swallowed, the bolus passes pharynx to enter esophagus.

Pharynx:

Pharynx has **adaptations to prevent the entry of bolus particles in trachea** (wind-pipe to lungs).

Function:

During swallowing, **larynx** (the top of trachea) **moves upward and forces the epiglottis** (a flap of cartilage) **into horizontal position. Thus glottis** (the opening of trachea) **is closed.**

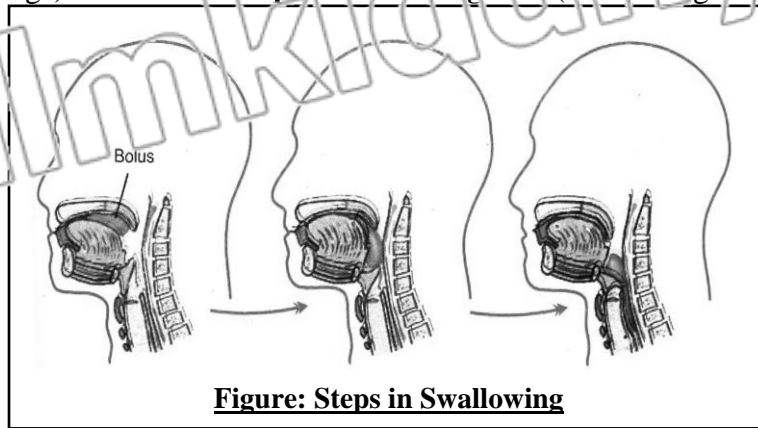


Figure: Steps in Swallowing

Control of Swallowing

The **beginning of swallowing action is voluntary**, but **once food reaches the back of mouth, swallowing becomes automatic.**

ROLE OF OESOPHAGUS**Length:**

In humans the esophagus is about **25 cm long.**

Bolus Entry:

After being swallowed, **food enters the tube called esophagus**, which **connects pharynx to stomach.** Neither pharynx nor esophagus contributes to digestion and the previous digestive actions of saliva continue.

Peristalsis:

“The **wave of contraction and relaxation** in the **smooth muscles of alimentary canal walls** is called peristalsis.”

Function:

Peristalsis **moves food from oral cavity to rectum.**

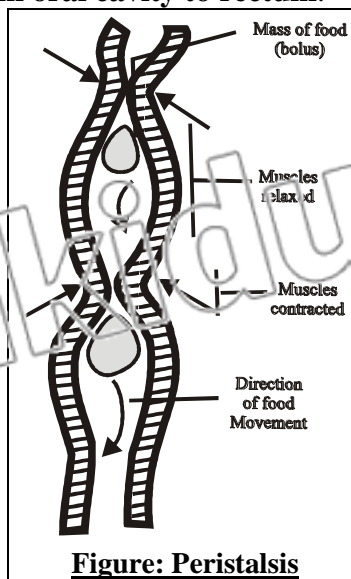


Figure: Peristalsis

Q.3 Describe the role of stomach in digestion. (A.B) (Ex Q. No 10)

(LHR 2012, GWR 2015, SWL 2015) (LHR 2013)

Ans:

STOMACH

Shape:

Stomach is a dilated part of alimentary canal. It is J-shaped.

Location:

It is located in the left of abdomen, just beneath diaphragm.

Main Portions:

Stomach has two main portions:

i. Cardiac Portion:

Cardiac portion is present immediately after esophagus.

ii. Pyloric Portion:

Pyloric portion is located beneath cardiac portion.

Sphincters:

Sphincters are the openings which are guarded by muscles.

Stomach has two sphincters:

i. Cardiac Sphincter:

Cardiac sphincter is between stomach and esophagus. Bolus enters stomach from esophagus through cardiac sphincter.

ii. Pyloric Sphincter:

Pyloric sphincter is present between stomach and small intestine.

Functions:

Stomach performs functions of:

Digestion:

When food enters stomach, the gastric glands found in the stomach wall are stimulated to secrete gastric juice.

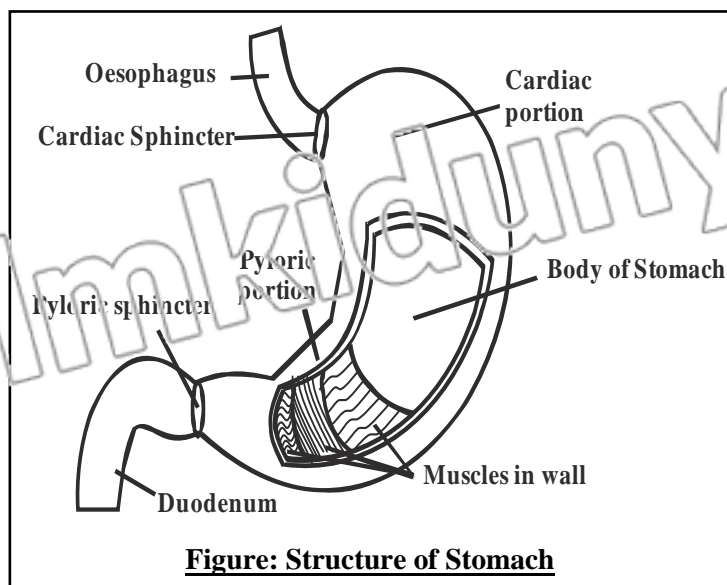
Components of Gastric Juice:

Gastric juice is composed chiefly of:

- Mucus
- Hydrochloric acid
- Pepsinogen (A protein-digesting enzyme)

Role of HCl

- Hydrochloric acid converts the inactive enzyme pepsinogen into its active form i.e. pepsin.
- HCl also kills microorganisms present in food.

**Role of Pepsin:**

Pepsin partially digests the protein portion of food into polypeptides and shorter peptide chains.

Role of Mucus:

Mucus not only aids in lubrication, but it forms a thick coating over the inner walls of stomach, and protects them from the strong HCl by neutralizing it. Hence pepsinogen cannot be activated to attack stomach walls.

Churning and Melting:

In stomach, food is further broken apart through a process of churning. The walls of stomach contract and relax and these movements help in thorough mixing of gastric juice and food. The churning action also produces heat which helps to melt the lipid content of food.

Chyme Formation:

The starch and protein in the food have been partially digested and the food has been converted into a soup-like mixture called chyme. After it, the pyloric sphincter allows a little mass of chyme to enter duodenum.

Role of Gastrin:

The peptides stimulate some cells of stomach walls to release a hormone called gastrin. This hormone enters blood and is distributed to all parts of body. In stomach, it has specific effect and stimulates the gastric glands to secrete more gastric juice.

Q.4 Describe the role of small intestine in digestion. (A/B) (Ex Q. No 10)

(LHR 2015, DGK 2015)

Ans: SMALL INTESTINE

The stomach opens into the small intestine.

Parts:

Small intestine has three parts:

- i. Duodenum
- ii. Jejunum
- iii. Ileum

i. Duodenum:

Duodenum comprises of the first 10 inches (25cm) of small intestine and it is the part of small intestine where most of the digestive process occurs

Functions:

In small intestine, food is further mixed with 3 different secretions:

Bile:

Bile from liver helps in the digestion of lipids through the process of emulsification i.e. by keeping the lipid droplets separate from one another.

Pancreatic Juice:

Pancreatic juice from pancreas contains three enzymes:

- Trypsin digests proteins.
- Pancreatic amylase digests carbohydrates.
- Lipase digests lipids.

Intestinal Juice:

Intestinal juice from intestine walls contains many enzymes for the complete digestion of all kinds of food.

ii. Jejunum:

Next to the duodenum is jejunum.

Length:

It is 2.4 meters long.

Functions:

It is concerned with the rest of the digestion of proteins, carbohydrates and lipids.

iii. Ileum:

This is the last part of the small intestine.

Length:

It is 3.5 meters long.

Function:

It is concerned with the absorption of digested food.

ROLE OF SMALL INTESTINE IN ABSORPTION**Villi:**

There are circular folds in the inner wall of ileum. These folds have numerous finger like projections called villi. The singular of villi is villus.

Function:

- Villi increase the surface area of the inner walls.
- They help in the absorption of food.

Structure of a Villus:

- Each villus is richly supplied with blood capillaries and it has a vessel of lymphatic system called lacteal.
- The walls of a villus are only single cell thick.

Absorption of Sugars and Amino Acids:

The digested molecules i.e. simple sugars and amino acids are absorbed from intestine into the blood capillaries present in villi. The blood carries them away from the small intestine via the hepatic portal vein and goes to liver for filtering. Here the toxins are removed and extra food is stored.

Absorption of Fatty Acids and Glycerol:

Fatty acids and glycerol are **absorbed** into **the lacteal of villus**. The **lacteal** carries them to the **main lymphatic duct**, from where they enter in bloodstream.

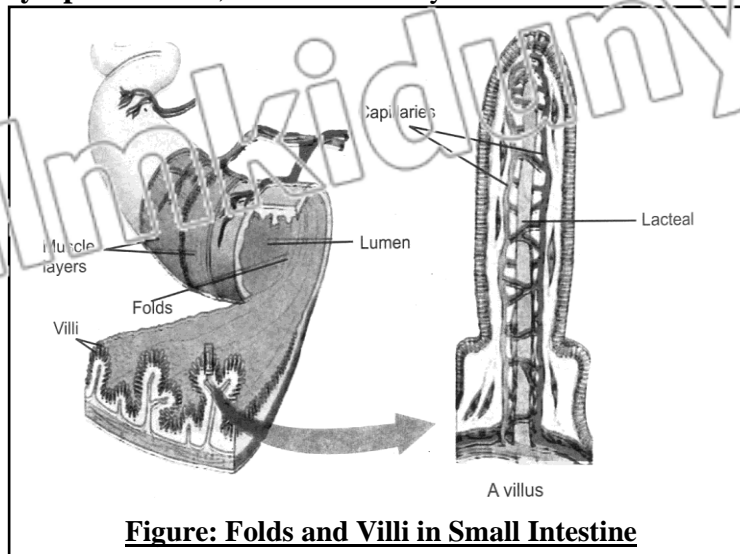


Figure: Folds and Villi in Small Intestine

Q.5 Describe the role of large intestine in human digestive system. (A.B) (Ex Q. No 10)

Ans: **ROLE OF LARGE INTESTINE**

After the **digested products** of our bite have been **absorbed in blood**, the **remaining mass** enters the large intestine.

Parts:

Large intestine has three parts:

- i. **Caecum** (the pouch that forms T-junction with small intestine).
- ii. **Colon**
- iii. **Rectum**

Functions:

Following are the functions of large intestine,

Absorption of water:

From **colon**, **water** is **absorbed** into **blood**.

Faeces:

As **water** is **absorbed**, the **solid remains** of **food** are called **faeces**.

Components of Faeces:

Faeces mainly consist of:

- **Undigested material**
- **A large number of bacteria**
- **Dead cells of alimentary canal**
- **Bile pigments**
- **Water**

Storage of Faeces:

Faeces are temporarily stored in the **rectum**, which **opens** out **through anus**.

Defecation:

Under **normal conditions**, when the **rectum** is **filled up** with **faeces**, it gives **rise** to a **reflex** and **anus** is **opened** for **defecation**.

Control of Reflex:

In Adults: The reflex is consciously inhibited in adults.

In Infants: In infants, it is controlled involuntarily. During growth, child learns to bring this reflex under voluntary control.

Q.6 Write a note on liver. (A.E) (GWR 2014, SWL 2015, MTN 2015, DGK 2015)

Ans: **LIVER**

Largest Gland:

Liver is the largest gland of the body.

Lobes:

It is multi-lobed.

Colour:

It is a dark-reddish in appearance.

Location:

It lies beneath the diaphragm, on the right side of abdomen.

Weight:

In an adult human, it weighs about 1.5 kg.

Size:

It is the size of a football.

GALL BLADDER**Shape:**

It is pear shaped.

Colour:

It is a greenish-yellow sac.

Location:

It lies along the right lobe of liver on ventral side.

Bile Juice:

The secretion of liver is called bile juice.

Storage:

Liver secretes bile, which is stored in gall bladder

Release:

When gall bladder contracts, bile is released into duodenum through common bile duct.

Composition:

Bile has no enzymes but contains bile salts for the emulsification of lipids.

Function:

It helps the lipid-digesting enzymes to attack on lipids

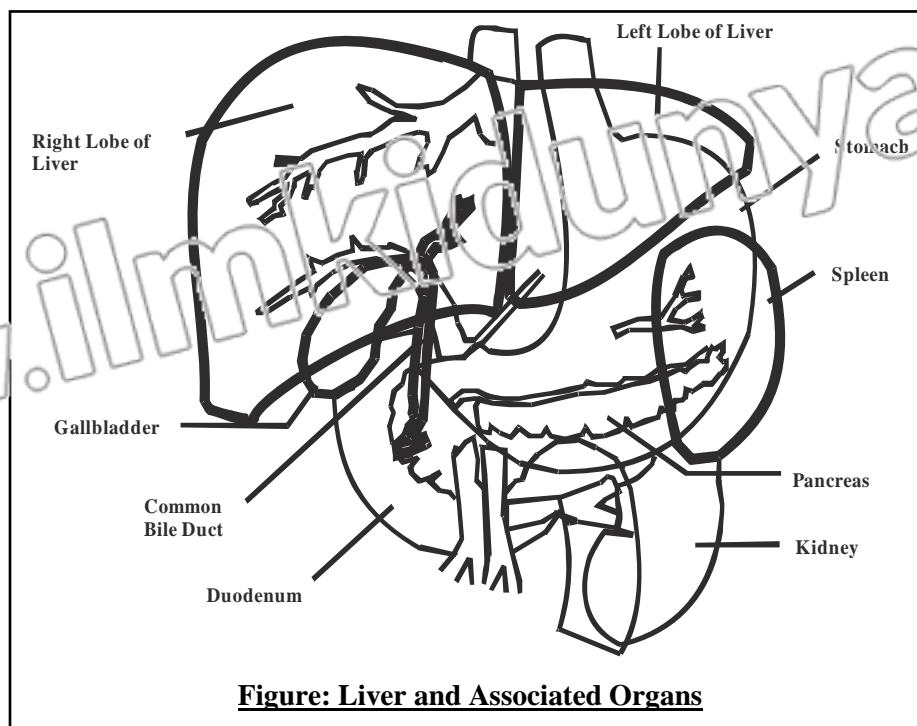


Figure: Liver and Associated Organs

FUNCTIONS OF LIVER

Besides digestion, liver carries out a number of other functions, some of which are summarized here:

Deamination:

It removes amino-groups from amino-acids.

Formation of Urea:

It converts ammonia to a less toxic form, urea.

Destruction of Red Blood Cells:

It destroys the old red blood cells.

Formation of Fibrinogen:

It manufactures blood clotting protein called fibrinogen.

Glucose-Glycogen Interconversion:

It converts glucose into glycogen and, when required, breaks glycogen into glucose.

Cholesterol Formation:

It converts carbohydrates and proteins into lipids and produces cholesterol.

Heat Production:

It produces heat to maintain body temperature.

Storage of Vitamins and Ions:

It stores fat-soluble vitamins (A, D, E, and K) and mineral ions, such as iron.

Q.7 Write the names of organs of our digestive system and draw a labeled diagram. (K.B)

Ans:

HUMAN DIGESTIVE SYSTEM

The **digestive system** of human consists of a **long tube** that extends from **mouth** to **anus**. This tube is called **alimentary canal**.

The human digestive system consists of the following organs:

Main Organs:

- Oral cavity
- Pharynx
- Oesophagus
- Stomach
- Small intestine
- Large intestine
- Rectum
- Anus

Glands:

- Three pairs of salivary glands
- Pancreas
- Liver

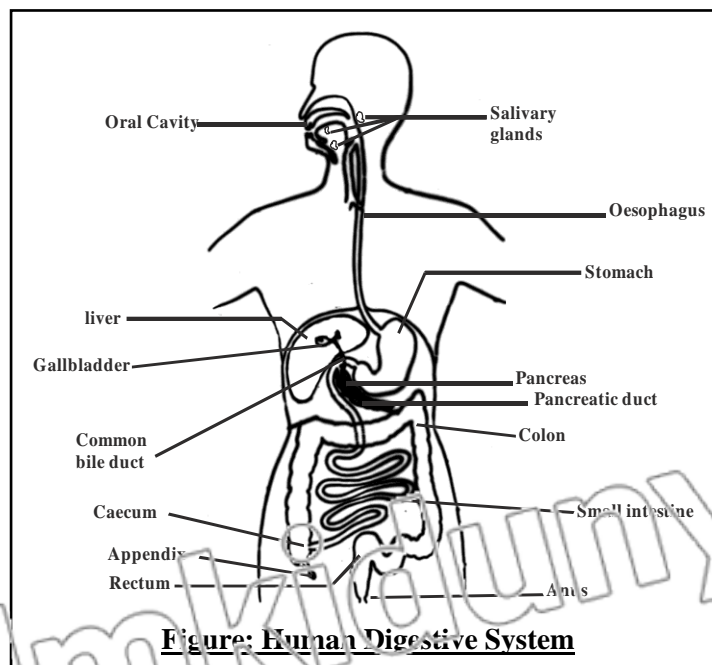


Figure: Human Digestive System

SHORT QUESTIONS (Topic 8.3)

Q.1 Why digestion is required for human beings? (U.B)

Ans: REQUIREMENT OF DIGESTION FOR HUMAN BEINGS

Amino acids, simple sugars and fatty acids are rare in our environment. Such substances are usually parts of larger molecules like proteins, polysaccharides and lipids, which cannot cross the membranes. There is a need of converting such large and non-diffusible molecules into smaller and diffusible molecules (that can cross the membrane). This is achieved through the process of digestion.

Q.2 Write a brief summary of the phases of digestion. (K.B)

Ans: SUMMARY OF PHASES OF DIGESTION

Digestion comprises following phases:

Ingestion:

The process of taking in food.

Digestion:

The process of breaking up complex substances into simpler substances.

Absorption:

Diffusion of digested food into blood and lymph.

Assimilation:

Conversion or incorporation of absorbed simple food into the complex substances constituting the body.

Defecation:

Elimination of undigested food from the body.

Q.3 Define alimentary canal. Write down its parts. (K.B)

(SGD 2015)

Ans: Page no 262.

Q.4 Which glands are associated with alimentary canal? (K.B)

Ans: Page no 262.

Q.5 Differentiate mastication and lubrication?

(GRW-G-14)

Ans: DIFFERENCE

Mastication	Lubrication
The grinding of food by teeth is known as Mastication.	The chewing process stimulate the three pairs of salivary glands to release saliva. Saliva lubricate the food, to ease the chemical digestion.

Q.6 What is bolus? (K.B)

(GRW 2012, RVP 2015)

Ans: Page no 263.

Q.7 Define peristalsis? (K.B)

(GRW 2012)

Ans: Page no 264.

Q.8 Pepsin is a powerful protein digesting enzyme. Why does it not digest stomach walls which are mostly proteins? (U.B)

Ans: PEPSIN AND STOMACH WALLS

Pepsin is not released in its active form. It is secreted as inactive pepsinogen, which requires HCl for activation. The mucous of gastric juice forms a thick coating over the inner walls of stomach and neutralizes the HCl there. It makes pepsinogen difficult to be activated, and to attack stomach walls.

Q.9 Differentiate between two portions of stomach?

Ans: **DIFFERENCE**

Cardiac Portion	Pyloric Portion
It is present immediately after oesophagus	It is located beneath the cardiac portion
It is supplied by cardiac sphincter which is located between	It is supplied by pyloric sphincter which is between stomach and small intestine.

Q.10 What is chyme? (K.B)

(LHR 2015, RWP 2015)

Ans: Page no 266.

Q.11 How gastric juice is secreted? (U.B)

Ans: Page no 265.

Q.12 What is churning?

Ans: **CHURNING**

“It is a process by which food is broken down into small pieces”.

- The walls of stomach contract and relax. This movement help in the mixing of gastric juice and food.
- The churning action also produces heat which melt the lipid content of food.

Q.13 What is gastrin? (U.B)

Ans: Page no 266.

Q.14 What is the role of bile and pancreatic juice in digestion? (A.B)

Ans: Page no 267.

Q.15 What is emulsification?

Ans: **EMULSIFICATION**

“It is the process by which lipid droplets separate from one other”. This is done by the help of liver juice i.e. Bile. It contains salts.

Q.16 What are villi? (K.B)

(GRW 2014)

Ans: Page no 267.

Q.17 What is appendix? (K.B)

(GRW 2014)

Ans: Page no 273.

Q.18 What are the functions of large intestine? (A.B)

(LHR 2013)

Ans: Page no 268.

Q.19 Define Faeces?

Ans: **FAECES:**

“The undigested part of food from which water is re-absorbed is known as faeces.”

Composition:

A long with un-digest part of food faeces contains:

- Large number of bacteria
- Sloughed off cells of alimentary canal
- Bile pigments
- Water (very little)

Q.20 What is appendix?

(GRW-G-14,16)

Ans: **Appendix:**

“A non-functional finger-like process called appendix arises from the blind end of caecum.”

Appendicitis:

Inflammation of appendix due to infection causes severe pain.

Treatment:

The infected appendix must be removed surgically otherwise it may burst and inflammation may spread in abdomen.

Q.21 How vitamin K is produced? (U.B)

Ans: **PRODUCTION OF VITAMIN K**

Many bacteria live in colon. They produce vitamin K, which is necessary for the coagulation of blood.

Q.22 What are bile pigments? (K.B)

Ans: **BILE PIGMENTS**

Bile contains pigments that are byproducts of red blood cell destruction in liver. These bile pigments are eliminated from body with faeces.

Q.23 Write the weight and size of liver in an adult human. (K.B)

(LHR 2016)

Ans: Page no 269.

Q.24 Enlist some functions of liver other than digestion. (A.B)

Ans: Page no 270.

Q.25 What do you know about gallbladder?

Ans: Gallbladder:

Gallbladder is a pear shaped greenish yellow sac.

Location:

Gallbladder lies along the right lobe of liver on ventral side

Storage:

Gallbladder stores bile in it

Function:

Gallbladder contracts to release bile into duodenum through common bile duct.

Q.26 What are the harmful effects of carbonated soft drinks? (A.B)

Ans: **HARMFUL EFFECTS OF CARBONATED SOFT DRINKS**

There is a growing concern about the harmful effects of carbonated soft drinks. They are very acidic and make our body poor in oxygen. They contain phosphoric acid, which dissolves calcium out of the bones. This results in bone weakening. The caffeine present in colas increases the heart rate and raises blood pressure.

MULTIPLE CHOICE QUESTIONS (Topic 8.3)

- The process of taking in food: (K.B)** **(GRW 2015)**
 (A) Ingestion (B) Digestion
 (C) Absorption (D) Defecation
- The elimination of undigested food from the body: (K.B)** **(LHR 2014)**
 (A) Absorption (B) Assimilation
 (C) Defecation (D) Digestion
- The grinding of food by teeth is called. (K.B)** **(SGD 2014)**
 (A) Chewing (B) Mastication
 (C) Lubrication (D) Both A and B
- Which part of food is semi digested in oral cavity? (U.B)**
 (A) Starch (B) Lipids
 (C) Proteins (D) All of these
- In adult human oesophagus is about: (K.B)** **(FSD 2014)**
 (A) 10 cm (B) 15 cm
 (C) 20 cm (D) 25 cm

6. **The wave of contraction and relaxation in the smooth muscles of alimentary canal:** (K.B)(SWI 2016)
 (A) Lubrication (B) Mastication
 (C) Food selection (D) Peristalsis
7. **When the direction of peristalsis reverses, it results:** (U.B)
 (A) Swallowing (B) Vomiting
 (C) Diarrhoea (D) Lubrication
8. **In stomach, pepsinogen is converted into:** (K.B) (FSD 2015, SGD 2015, MTN 2014)
 (A) Pepsin (B) Bicarbonates
 (C) HCl (D) Gastrin
9. **Which acid is present in stomach to activate pepsin?** (U.B) (MTN 2015)
 (A) H_2SO_4 (B) H_2CO_3
 (C) HNO_3 (D) HCl
10. **Gastric juice is composed chiefly of:** (K.B)
 (A) Mucous (B) Hydrochloric Acid
 (C) Pepsinogen (D) All of these
11. **The length of duodenum in adult human:** (K.B)
 (A) 10 cm (B) 15 cm
 (C) 25 cm (D) 35 cm
12. **Which of the following enzyme is present in bile?** (K.B)
 (A) Amylase (B) Lipase
 (C) Pepsin (D) None of these
13. **Pancreatic juice from pancreas contains enzymes:** (K.B)
 (A) Trypsin (B) Pancreatic amylase
 (C) Lipase (D) All of these
14. **The pancreas produces digestive enzymes and releases them into:** (K.B) (GRW 2013)
 (A) Colon (B) Gall bladder
 (C) Liver (D) Duodenum
15. **The length of jejunum in adult human:** (K.B)
 (A) 2.1 meter (B) 2.2 meter
 (C) 2.3 meter (D) 2.4 meter
16. **The length of ileum in adult human:** (K.B) (GRW 2015)
 (A) 1.5 meters (B) 2.5 meters
 (C) 3.5 meters (D) 4.5 meters
17. **The circular folds in the inner wall of ileum have numerous finger-like projections called:** (K.B)
 (A) Villi (B) Lactea
 (C) Blood capillaries (D) Appendix
18. **Where are villi found?** (K.B) (LIT 2015, GRW 2014, BWP, FSD 2015)
 (A) Stomach (B) Small intestine
 (C) Esophagus (D) Large intestine
19. **In which part of the alimentary canal, the maximum absorption of nutrients occur?** (U.B)(MTN 2014)
 (A) Stomach (B) Small intestine
 (C) Large intestine (D) All of these
20. **Which part of gut absorbs water?** (K.B) (GRW 2014)
 (A) Stomach (B) Large intestine
 (C) Rectum (D) Duodenum

21. The part of the large intestine in which maximum absorption of water take place: (U.B)
 (A) Caecum (B) Colon
 (C) Rectum (D) None of these
22. A non-functional finger-like process: (U.B)
 (A) Villus (B) Lacteal
 (C) Caecum (D) Appendix
23. Functions of the large intestine include: (A.B)
 (A) The elimination of faeces (B) Absorption of water
 (C) Absorption of salts (D) All of these
24. Faeces are temporarily stored in: (A.B) (SGD 2014)
 (A) Appendix (B) Rectum
 (C) Gall bladder (D) Pancreas
25. Which vitamin is made by bacteria in colon? (A.B) (RWP 2015)
 (A) Vitamin C (B) Vitamin D
 (C) Vitamin E (D) Vitamin K
26. The largest gland of human's body is: (U.B)
 (A) Liver (B) Pancreas
 (C) Thyroid (D) Parathyroid
27. In an adult human, the weight of liver: (K.B) (DGK 2015)
 (A) 1 kg (B) 1.5 kg
 (C) 2 kg (D) 2.5 kg
28. The function of bile is: (K.B)
 (A) Deamination (B) Emulsification of lipids
 (C) Detoxification (D) All of these

8.4 DISORDERS OF GUT

LONG QUESTIONS

Q.1 Describe disorders of the gut. (K.B) (Ex Q. No 12) (SWL 2014, MTN 2014)

Ans: DISORDERS OF GUT

The most common disorders of the gut that affect a number of people in Pakistan are:

- i. Diarrhoea
- ii. Constipation
- iii. Ulcer

i. Diarrhoea: (MTN 2015)

Introduction:

It is a condition in which the sufferer has frequent watery, loose bowel movements.

Symptoms:

This condition may be accompanied by

- Loose, watery stools
- Abdominal pain
- Nausea
- Vomiting

Causes:

- When required water is not absorbed in blood from colon.
- Lack of adequate safe water.
- Viral or bacterial infections of large intestine.

Recovery:

If sufficient food and water is available, the patient of diarrhoea recovers in a few days. However, for malnourished individuals, diarrhoea can lead to severe dehydration and can become life-threatening.

Treatment:

The treatment of diarrhoea involves

- Consuming adequate amounts of water (to replace the loss), preferably mixed with some amounts of essential salts and nutrients.
- Antibiotics may be required if diarrhoea is due to bacterial infection

Prevention:

Diarrhoea can be prevented by:

- Taking clean water
- Intake of essential salts
- Eating regularly
- Taking hygienic measures

ii. Constipation:**Introduction:**

Constipation is a condition where a person experiences hard faeces that are difficult to eliminate.

Causes:

The main causes of constipation include:

- Excessive absorption of water through colon
- Insufficient intake of dietary fiber
- Dehydration
- Use of medicines (e.g. those containing iron, calcium, aluminium)
- Tumors in rectum or anus

Treatment:

The treatment of constipation includes:

- Changes in dietary and exercise habits
- Use of laxatives (e.g. paraffin)

Prevention:

Constipation is usually easier to prevent than to treat. One should take the required quantities of water and dietary fibres.

iii. Ulcer:**Occurrence:**

An ulcer (peptic ulcer) is a sore in the inner wall of gut, i.e. in:

- Esophagus
- Stomach
- Duodenum

Pathology:

In ulcer, the acidic gastric juice gradually breaks down the tissue of the inner mucosal wall.

Gastric Ulcer:

Ulcer of stomach is called gastric ulcer.

Causes:

The causes of ulcer include:

- **Excess acid**
- **Infection**
- **Long term use of anti-inflammatory medicines (including aspirin)**
- **Smoking**
- **Drinking coffee**
- **Drinking colas**
- **Eating spicy foods**

Signs and Symptoms:

The signs and symptoms of ulcer include:

- **Abdominal burning after meals or at midnight**
- Severe ulcers may **cause abdominal pain**
- **Rush of saliva after an episode of regurgitation**
- **Nausea**
- **Loss of appetite**
- **Weight loss**

Treatment:

Ulcer is treated with medicines which neutralize the acidic effects of gastric juice.

Preventive Measures:

The following things should be avoided as preventive measures:

- **Spicy foods**
- **Acidic foods**
- **Smoking**

SHORT QUESTIONS (Topic 8.4)

Q.1 Discuss treatment of diarrhoea. (A.B)

Ans: Page no 277.

Q.2 What are the preventions of diarrhea?

Ans: PREVENTIONS

Preventions of diarrhea include:-

- Taking clean water
- Essential salts
- Eating regularly
- Taking hygienic measures

Q.3 Define constipation and also tell its main causes. (K.B) (SGD 2015, RWP 2014)

Ans: Page no 277.

Q.4 What are the treatment of constipation?

Ans: PREVENTIONS

One should take following preventions:

- Take required quantities of water
- Take required quantities of dietary fibers

TREATMENT

Treatment of constipation is the use of medicines called laxatives.

Q.5 What is ulcer?

Ans:

ULCER

Ulcer (Peptic Ulcer) is a sore in the inner wall of gut (in oesophagus, duodenum or stomach).

STOMACH ULCER

Ulcer of stomach is called gastric ulcer

Q.6 What are the causes and symptoms of peptic ulcer? (K.B)

(GRW 2012)

Ans: Page no 277.

Q.7 Write the reasons of stomach ulcer? (K.B)

(RWP 2015)

Ans: Page no 277.

Q.8 What treatment would you suggest to a patient of ulcer and constipation if you become doctor in future? (U.B)

Ans: Page no 278.

MULTIPLE CHOICE QUESTIONS (Topic 8.4)

- A disease characterized by less water absorption in blood from colon is named: (A.B)**
 (A) Constipation (B) Diarrhoea
 (C) Ulcer (D) Food poisoning
- Diarrhoea is caused by: (K.B)**
 (A) Viral infections (B) Bacterial infections
 (C) Lack of safe water (D) All of these
- From where the excessive absorption of water causes constipation? (A.B)**
 (A) Caecum (B) Colon
 (C) Rectum (D) Appendix
- The medicines used for treatment of constipation: (K.B)**
 (A) Laxatives (B) Steptomycin
 (C) Aspirin (D) Penicillin
- The causes of ulcer include all, except: (A.B)**
 (A) Colas (B) Bacterial or viral infections
 (C) Smoking (D) Anti-inflammatory medicines
- In which of the following peptic ulcer occur? (K.B)**
 (A) Oesophagus (B) Duodenum
 (C) Stomach (D) All of these

ANSWER KEYS**MULTIPLE CHOICE QUESTIONS****8.1 MINERAL NUTRITION IN PLANTS**

1	A	5	C	9	D	13	C	17	B
2	A	6	D	10	B	14	C	18	C
3	B	7	A	11	C	15	C	19	B
4	B	8	D	12	B	16	D		

8.2 COMPONENTS OF HUMAN FOOD

1	A	11	B	21	B	31	B	41	C	51	B
2	A	12	C	22	A	32	B	42	D	52	A
3	A	13	D	23	D	33	B	43	B	53	C
4	D	14	D	24	B	34	D	44	A	54	B
5	C	15	A	25	B	35	D	45	B	55	D
6	B	16	D	26	B	36	D	46	D	56	D
7	D	17	D	27	A	37	C	47	A	57	D
8	D	18	D	28	A	38	B	48	B		
9	C	19	D	29	A	39	A	49	D		
10	B	20	C	30	D	40	D	50	D		

8.3 DIGESTION IN HUMAN

1	A	8	A	15	D	22	D
2	C	9	D	16	C	23	D
3	D	10	D	17	A	24	B
4	A	11	C	18	B	25	D
5	D	12	D	19	E	26	A
6	D	13	D	20	B	27	B
7	B	14	D	21	B	28	B

8.4 DISORDERS OF GUT

1	B	4	A
2	D	5	D
3	B	6	D

REVIEW QUESTIONS

MULTIPLE CHOICE QUESTIONS

1. **What are the primary nutrients that provide quick useable energy to body? (A.B)**
 (a) Carbohydrates (b) Proteins
 (c) Lipids (d) Nucleic acids
2. **The wave like movement of muscle that pushes food through digestive system is called: (U.P)**
 (a) Churning (b) Emulsification
 (c) Absorption (d) Peristalsis
3. **Micronutrients of plants are: (K.B)**
 (a) Available in the soil in only small amounts (b) Required by plants in small amounts
 (c) Small molecules required by plants (d) Useful, but not required by plants
4. **Which of the following does not occur in the oral cavity? (U.B)**
 (a) Lubrication of food (b) Beginning of protein digestion
 (c) Breaking the food into small fragments (d) All of the above do occur in the oral cavity
5. **Where are villi found? (K.B)**
 (a) Esophagus (b) Stomach
 (c) Small intestine (d) Large intestine
6. **Ulcers occur in: (K.B)**
 (a) Stomach (b) Duodenum
 (c) Esophagus (d) All of these
7. **Which group of enzymes breaks up starches and other carbohydrates? (K.B)**
 (a) Proteases (b) Lipases
 (c) Amylases (d) None of these
8. **Pancreas produces digestive enzymes and releases them into: (K.B)**
 (a) Colon (b) Gall bladder
 (c) Liver (d) Duodenum
9. **In stomach, pepsinogen is converted into: (K.B)**
 (a) Pepsin (b) Bicarbonate
 (c) HCl (d) Gastrin
10. **Hepatic portal vein carries blood from _____ to _____. (K.B)**
 (a) Small intestine, liver (b) Small intestine, heart
 (c) Liver, heart (d) Small intestine, colon
11. **Which of the following is not a function of liver? (A.B)**
 (a) Converts glucose to glycogen (b) Converts glycogen to glucose
 (c) Manufactures fibrinogen (d) Produces digestive enzymes
12. **The diseases of Kwashiorkor and Marasmus may be due to: (K.B)**
 (a) Mineral deficiency (b) Over-intake of nutrients
 (c) Protein-energy malnutrition (d) Ulcer
13. **Which food group is our body's best source of energy? (A.B)**
 (a) Meat group (b) Fats, oils, and sweets
 (c) Breads and cereals (d) Milk and cheese
14. **What may be the reason that children need more calcium and iron? (A.B)**
 (a) Both calcium and iron for bones (b) Both calcium and iron for blood
 (c) Calcium for blood and iron for bones (d) Calcium for bones and iron for blood
15. **The process of breaking down large droplets of fat into small droplets is called: (K.B)**
 (a) Emulsification (b) Absorption
 (c) Peristalsis (d) Digestion

ANSWERS KEY

1	a	2	d	3	b	4	b	5	e
6	d	7	e	8	d	9	a	10	a
11	d	12	e	13	c	14	d	15	a

UNDERSTANDING THE CONCEPTS

1. What are the effects of lack of nitrate and magnesium ions on plant growth? (A.B)

Ans: See the LQ.2 of (Topic 8.1)

2. How are inorganic and organic fertilizers important in agriculture? (A.B)

Ans: See the LQ.3 of (Topic 8.1)

3. Draw a table that can show sources, energy values, and functions of carbohydrates, proteins, and fats. (K.B)

Ans: **COMPARISON OF CARBOHYDRATES, PROTEINS AND FATS**

A comparison among carbohydrates, proteins and fats is as follows:

Nutrient	Sources	Energy Values	Functions
Carbohydrates	<ul style="list-style-type: none"> • Bread • Pasta • Beans • Potatoes • Bran • Rice • Cereals 	4 Kcal / gram	Basic source of energy
Proteins	<ul style="list-style-type: none"> • Meat • Eggs • Grains • Legumes • Dairy products like milk and cheese 	4 Kcal / gram	Essential components of: <ul style="list-style-type: none"> • Cytoplasm • Membranes • Organelles Major components of: <ul style="list-style-type: none"> • Muscles • Ligaments • Tendons Play roles as Enzymes Play role in Growth Energy source
Fats	<ul style="list-style-type: none"> • Milk • Butter • Cheese • Eggs • Mutton • Fish • Mustard seeds • Coconut • Dry fruits 	9 Kcal / gram	Used to form: <ul style="list-style-type: none"> • Membranes • Sheaths around neurons • Certain hormones Energy source

4. **How are vitamins A, C and D important in our diets? (U.B)**
Ans: See the LQ.4, 5 and 6 of (Topic 8.2)
5. **Which foods contain calcium and iron and what roles do these minerals play in our bodies? (A.B)**
Ans: See the LQ.3 of (Topic 8.2)
6. **Why are water and dietary fibres considered important in our diets? (U.B)**
Ans: See the LQ.7 of (Topic 8.2)
7. **Define balanced diet. How would you relate it with age, gender and activity? (U.B)**
Ans: See the LQ.8 of (Topic 8.2)
8. **Describe how protein energy malnutrition, mineral deficiency diseases and over intake of nutrients are the major forms of malnutrition. (K.B)**
Ans: See the LQ.9 of (Topic 8.2)
9. **How would you advocate the unequal distribution of food as the major factor that contributes to famine? (A.B)**
Ans: See the LQ.11 of (Topic 8.2)
10. **Describe structures and functions of the main regions of alimentary canal. (K.B)**
Ans: See the LQ.1, 2, 3, 4 and 5 of (Topic 8.3)
11. **Describe swallowing and peristalsis. (K.B)**
Ans: See the LQ.2 of (Topic 8.3)
12. **Briefly give the signs and symptoms, causes, treatments, and preventions of diarrhea, constipation, and ulcer. (A.B)**
Ans: See the LQ.1 of (Topic 8.4)

SHORT QUESTIONS

1. **What are the health risks if we take more saturated fatty acids in our diet? (A.B)**

Ans: **HEALTH RISKS ASSOCIATED WITH SATURATED FATTY ACIDS**
Saturated fatty acids are a major risk factor for cardiovascular diseases, such as:

- Heart attacks
- Strokes

Increase Level of LDL:

They raise the production of low density lipids (LDL) or 'bad' cholesterol. This causes deposition of cholesterol plaques in arteries, thrombus formation and ultimately blockage. Saturated fatty acids can increase a person's cholesterol level. An increased cholesterol level may eventually result in the clogging of arteries and, ultimately, heart disease.

2. **How can the deficiency of vitamin A cause blindness? (A.B)**

Ans: **DEFICIENCY OF VITAMIN A**
Vitamin A combines with a protein called opsin to form rhodopsin in red-cells of the retina of eye. When vitamin A is inadequate, the lack of rhodopsin makes it difficult to see in dim light. This is called night blindness. It is a temporary condition, but if left untreated, it can cause permanent blindness.

3. How will you differentiate between bolus and chyme? (K.B)

Ans: DIFFERENTIATION

The difference between bolus and chyme is as follows:

Feature	Bolus	Chyme
Definition	A small, slippery mass of chewed food produced in the oral cavity by the action of tongue, teeth and saliva	A soupy mixture of partially-digested food and digestive juices
Nature	More alkaline due to saliva	More acidic due to digestive acids
Location	It is produced in oral cavity	It is produced in stomach
Pathway	It leaves oral cavity to travel down esophagus and enter stomach	It leaves stomach to enter duodenum
Contents	Carbohydrates are in partially digested form	Carbohydrates and proteins are in partially digested form

4. Which sphincters play role in the movement of food in and out of stomach? (K.B)

Ans: SPHINCTERS

Definition:

“Sphincters are the openings which are guarded by muscles.”

Types:

Stomach has two sphincters:

- Cardiac sphincter
- Pyloric sphincter

Cardiac Sphincter:

It is between stomach and oesophagus. Bolus enters stomach through esophagus through this sphincter.

Pyloric Sphincter

It is between stomach and small intestine.

5. Stomach is an organ of the digestive system, but it also secretes a hormone. What hormone is it and what function it performs? (A.B)

Ans: HORMONE SECRETED BY STOMACH

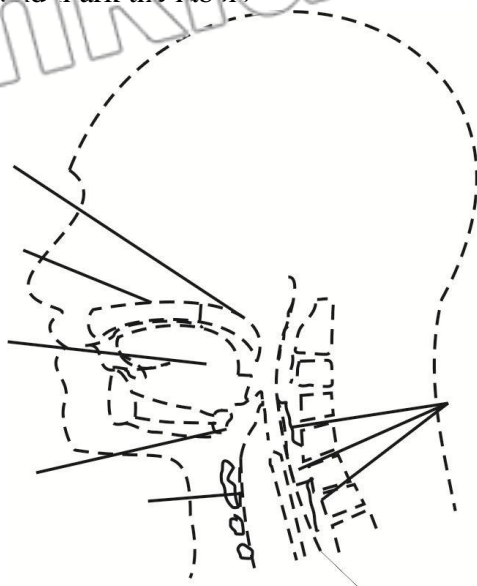
The hormone secreted by stomach walls is gastrin. The presence of proteins in our food causes secretion of abundant amounts of gastric juice which digests these proteins into peptides. These peptides stimulate some cells of stomach walls to gastrin.

Effects of Gastrin:

This hormone enters blood and is distributed to all parts of body. In stomach it has a specific effect and stimulates the gastric glands to secrete more gastric juice.

KIPS ASSIGNMENT**LET'S DRAW & LABEL****(A) Parts of Oral Cavity****Instructions:**

- Trace the patterns and mark the labels

**(B) Peristalsis****Instructions:**

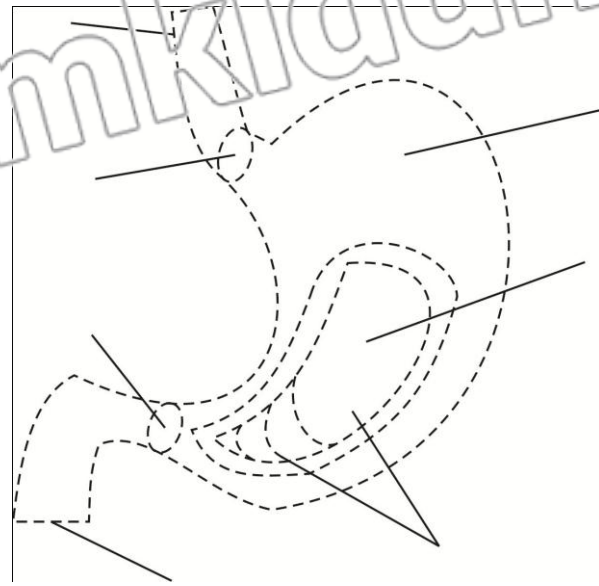
- Trace the patterns and mark the labels



(C) Structure of Stomach

Instructions:

- Trace the patterns and mark the labels



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CUT HERE

SELF TEST

Time: 40 min

Marks: 25

Q.1 Four possible answers A, B, C and D to each question are given, mark the correct answer. (6×1=6)

1. The nutrient involved in osmosis of water:

- (A) Zinc (B) Nickel
(C) Chloride (D) Iron

2. The amount of energy provided by one gram of protein:

- (A) 2000 calories (B) 4000 calories
(C) 5000 calories (D) 7000 calories

3. Night blindness is caused by the deficiency of:

- (A) Vitamin A (B) Vitamin B
(C) Vitamin C (D) Vitamin D

4. Percentage of lipids present in milk:

- (A) 10% (B) 12%
(C) 9% (D) 4%

5. The wave of contraction and relaxation in the smooth muscles of alimentary canal:

- (A) Lubrication (B) Mastication
(C) Food selection (D) Peristalsis

6. The largest gland of human body is:

- (A) Liver (B) Pancreas
(C) Thyroid (D) Parathyroid

Q.2 Give short answers to following questions.

(5×2=10)

1. What is the difference between autotrophic and heterotrophic organisms?
2. Name the components of human food.
3. How can hypertension and kidney stones be prevented?
4. What do you know about goiter? What is its cause?
5. What is the role of pancreatic juice in digestion?

Q.3 Answer the following questions in detail.

(5+4=9)

(a) Write a note on vitamin A and D.

(5)

(b) Describe the role of stomach in digestion.

(4)

Note:

Parents or guardians can conduct this test in their supervision in order to check the skill of students.