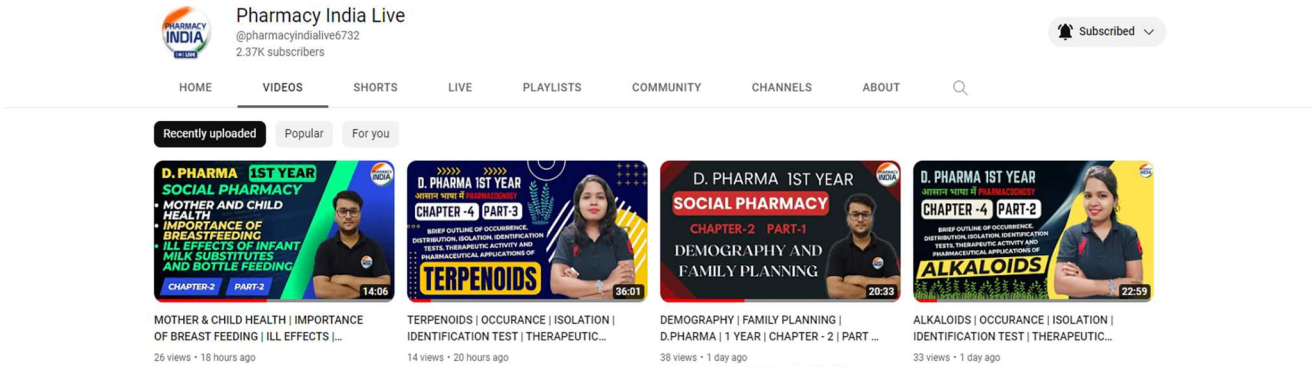
BIOCHEMISTRY AND CLINICAL PATHOLOGY

MODEL PAPER – 3

Syllabus to be covered in this module are-

- ❖Chapter- 9 Minerals
- ❖Chapter- 10 Water and Electrolytes
- ❖Chapter- 11 Introduction to Biotechnology
- ❖Chapter- 12 Organ Function Tests
- ❖Chapter- 13 Introduction to Pathology of Blood and Urine



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Questions

Long Questions-

Ques.1 Discuss in detailed about minerals.

Ques.2 Differentiate between cations and anions.

Ques.3 Explain in detailed about biotechnology.

Ques.4 Write in detailed about urine.

Short Questions

Ques.1 Write a short note on zinc.

Ques.2 Mention the functions of the following minerals-

(a) Magnesium
(b) Potassium
(c) Sodium
(d) Cobalt
(e) Silicon
(f) Molybdenum
(g) Iodine
(h) Copper

Ques.3 What are the functions of water in the body?

Ques.4 Give the regulation of water balance in the body.

Ques.5 Write a short note on electrolysis.

Ques.6 Give the various fields of biotechnology.

Ques.7 What are the impacts of biotechnology?

Ques.8 What is pharmaceutical biotechnology?

Ques.9 Write a short note on common liver function tests.

Ques.10 What are lipid profile tests?

Ques.11 What are the properties and functions of blood tests.

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Ques.12 What is B and T cell screen?

Ques.13 What are the causes of anemia?

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Long Answers

Ques.1 Discuss in detailed about minerals.

Ans- INTRODUCTION

- Minerals are essential nutrients found in many different types of plant and animal bad foods.
- Minerals are basically the spark plugs of life, or keystones to our health.
- Minerals compose about 4% of the human body. We cannot produce minerals within e bodies, so we must obtain them through our food.
- There are 103 known minerals, at least 18 of these are necessary for good health.
- Mineral imbalance is epidemic.
- Zine deficiency is very common, evidenced by such health issues as, prostate cancer, brea cancer, hormonal imbalances, hydrochloric acid deficiency, skin cancer.
- Magnesium is a key element to keeping the cells metabolizing, involved in at least 30 functions in the body. It is particularly sensitive to stress, and can easily be lost. Mos everyone is deficient in magnesium any more, along with all of the main minerals of the body.
- It can take several years to re-mineralize the body. It can take 12 months to replace one mineral such as iron, so to replace more can take awhile,

ROLE OF MINERALS IN THE BODY

- Minerals act as co-factors for enzyme reactions.
- Enzymes don't work without minerals. All cells require enzymes to work & function.
- They give us our vitality. They maintain the pH balance within the body.
- Minerals actually facilitate the transfer of nutrients across cell membranes.
- They maintain proper nerve conduction.
- Minerals help to contract and relax muscles.
- They help to regulate our bodies tissue growth.
- Minerals provide structural and functional support for the body.

There are two categories of minerals essential within the body, macro-minerals & micro minerals.

(a) Macro-minerals, that are required in greater amounts, include calcium, potassium, sodium, phosphorus, magnesium, chloride, and sulfur.

(b) Trace minerals, that are required in smaller amounts, include iron, zinc, selenium, manganese, copper, iodine, cobalt, and fluoride.

Both types of minerals support a wide variety of bodily functions, ranging from building and maintaining healthy bones and teeth to keeping your muscles, heart and brain working properly.

Calcium

Calcium is a mineral found in many foods

Sources: Calcium is found in many foods. It present in the body in the largest amount of all the minerals present in the body. Calcium comprises 2% of the body weight.

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- Milk, yogurt, and cheese are the main food sources of calcium for the majority of people inthe United States.
- Kale, broccoli, and Chinese cabbage are fine vegetable sources of calcium.
- Fish with soft bones that you cat, such as canned sardines and salmon, are fine animal sources of calcium.
- Most grains (such as breads, pastas, and unfortified cereals), while not rich in calcium, add significant amounts of calcium to the diet because people eat them often or in large amounts
- Calcium is added to some breakfast cereals, fruit juices, soy and rice beverages, and tofu. To find out whether these foods have calcium, check the product labels

Functions:

- The body needs calcium to maintain strong bones and to carry out many important functions. Almost all calcium is stored in bones and teeth, where it supports their structure and hardness
- The body also needs calcium for muscles to move and for nerves to carry messages between the brain and every body part.
- In addition, calcium is used to help blood vessels move blood throughout the body and to help release hormones and enzymes that affect almost every function in the human body.

Hypercalcemia: It is due to following reasons:

(i) Increased intake |Absorption of calcium

(ii) Increased plasma albumin

(iii) Increased calcium reabsorption

(iv) Increased renal reabsorption

Hypocalcemia: It is due to following reasons:

(i) Deficiency of vitamin D

(ii) Decreased sun light

(iii) Kidney disease

(iv) Decreased in plasma albumin

Deficiency Diseases:

Bone health (osteoporosis), arthritis, dental care, insomnia, menopause, premenstrual syndrome, cramps, weight loss, colon cancer, acidity, heart diseases, high blood pressure

Phosphorus

Sources:

- Dairy foods, cereal products, meat, and fish are particularly rich sources of phosphorus
- Phosphorus is also a component of many food additives that are used in food processing and is present in cola soft drinks as phosphonic acid

Functions:

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- Phosphorus is a major structural component of bone in the form of a calcium phosphate salt called hydroxyapatite.
- Phospholipids membranes (e.g, phosphatidylcholine) are major structural components of cell membranes.
- All energy production and storage are dependent on phosphorylated compounds, such adenosine triphosphate (ATP) and creatine phosphate,
- Nucleic acids (DNA and RNA), which are responsible for the storage and transmission of genetic information, are long chains of phosphate-containing molecules.
- A number of enzymes, hormones, and cell-signaling molecules depend on phosphorylation
- for their activation.
- Phosphorus also helps maintain normal acid-base balance (pH) by acting as one of the
- body's most important buffers.
- Additionally, the phosphorus-containing molecule 2,3-diphosphoglycerate (2,3-DPG) binds to hemoglobin in red blood cells and regulates oxygen delivery to the tissues of the body,

Hyperphosphatemia: Its causes are:

Chronic kidney disease

HypoparathyroidismMetabolic or respiration acidosis

Hypophosphatemia: The main reasons for hypophosphatemia are;

(i) Severe malnutrition such as from anorexia or starvation

(ii) Alcoholism

(iii) Severe burns

(iv) Vitamin D deficiency

Deficiency Diseases: Weakness, bone health, brain function, sexual weakness, dental care, body metabolism.

Iron

- Iron is an essential bioelement for most forms of life, from bacteria to mammals.
- Its importance lies in its ability to mediate electron transfer. In the ferrous state, iron acts as an electron donor, while in the ferric state it acts as an acceptor.
- Thus, iron plays a vital role in the catalysis of enzymatic reactions that involve electron transfer (reduction and oxidation, redox). Proteins can contain iron as part of different cofactors, such as iron-sulfur clusters (Fe-S) and heme groups, both of which are assembled in mitochondria.

Sources: The best sources of iron include:

- Dried beans
- Oysters
- Dried fruits
- Egg yolks
- Poultry, dark red meat
- SalmonIron-fortified cereals

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- Tuna
- Whole grains
- Liver
- Lean red meat (beef)

Reasonable amounts of iron are also found in lamb, pork, and shellfish.

lodine

lodine is a trace element that is naturally present in some foods, added to others and available as a dietary supplement. Todine is an essential component of the thyroid hormones thyroxine (T4) and triiodothyronine (T-3).

Sources:

- Seaweed (such as kelp, nori, kombu, and wakame) is one of the best food sources of iodine
- Other good sources include seafood, dairy products, grain products, and eggs.
- Dairy products, especially milk, and grain products are the major contributors of iodine
- lodine is also present in human breast milk and infant formulas.
- Fruits and vegetables contain iodine, but the amount varies depending on the iodine content of the soil, fertilizer use and irrigation practice.

Functions:

- lodine is an essential component of the thyroid hormones thyroxine (T-4) and triiodothyronine (T-3). Thyroid hormones regulate many important biochemical reactions. including protein synthesis and enzymatic activity, and are critical determinants of metabolic activity.
- They are also required for proper skeletal and central nervous system development in fetuses and infants.
- Thyroid function is primarily regulated by thyroid-stimulating hormone (TSH), also known as thyrotropin.
- It is secreted by the pituitary gland to control thyroid hormone production and secretion. thereby protecting the body from hypothyroidism and hyperthyroidism.
- TSH secretion increases thyroidal uptake of iodine and stimulates the synthesis and release of T-3 and T-4.
- In the absence of sufficient iodine, TSH levels remain elevated, leading to goiter, an enlargement of the thyroid gland that reflects the body's attempt to trap more jodine from the circulation and produce thyroid hormones.
- lodine plays a role in immune response and might have a beneficial effect on mammary dysplasia and fibrocystic breast disease.

Deficiency Diseases:

lodine deficiency has multiple adverse effects on growth and development, and is the most common cause of preventable mental retardation in the world.

- Hypothyroidism is, a condition that is frequently accompanied by goiter.
- In pregnant women, iodine deficiency of this magnitude can cause major neuron developmental deficits and growth retardation in the fetus, as well as miscarriage and stillbirth.

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- Chronic, severe iodine deficiency in utero causes cretinism, a condition characterized by mental retardation. deaf mutism, motor spasticity, stunted growth, delayed sexual maturation, and other physical and neurological abnormalities.
- In infants and children, less severe iodine deficiency can also cause neurodevelopmental deficits such as somewhat lower-than-average intelligence as measured by 1Q.
- Mild to moderate maternal iodine deficiency has also been associated with an increased risk for attention deficit hyperactivity disorder in children.
- In adults, mild-to-moderate iodine deficiency can cause goiter as well as impaired mental function and work productivity secondary to hypothyroidism.
- Chronic iodine deficiency may be associated with an increased risk of the follicular form of thyroid cancer.

Ques.2 Differentiate between cations and anions.

Ans- Cations.

1. Sodium ions (Na^+)-

- It is a principal cation of extracellular fluid.
- This cation of all extracellular fluid supplying more than 90% of cation present on an equivalent basis. Normally about 142 meq/L are extra cellularly fluid present in blood Plasma.
- Na^+ maintain hydration and osmotic pressure.
- Our daily diet contains more than enough sodium. Which is most absorbed from the intestinal tract. Excess of sodium is eliminated through the kidneys by glomerular filtration.

Functions:

1. Sodium ion regulates fluid distribution throughout the body.

2. It preserves the normal irritability of muscle and permeability of the cell.

2. Potassium ions [K^+]: It is principal cation of intracellular fluid associated with cell function and metabolism.

K^+has nearly 23 times higher concentration as intracellularly then the concentration of K^+ ion as extracellular.

The difference of concentration is maintained by active transport mechanism. Potassium in the diet is rapidly absorbed. An excess of potassium is rapidly excreted by the kidneys.

Functions:

1. It is essential for carbohydrates metabolism of glycogen storage and protein synthesis.

2. It controls acid-base balance

3. It also controls osmotic pressure and water retention.

Calcium Ion (C a $^{2+}$) :About half of the calcium exists as calcium ions in plasma, the remaining curs in the form of non-ski fusible complex with protein. Only diffusible ca^{2+} take part in the regulation of the physiological balance

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Functions:

1. Calcium ions have important regulatory actions on a number of vital processes.
2. The calcium content of the plasma regulates the secretion of PTI

Magnesium (Mg^{2+}) ions

It is present in the intracellular fluid.

Functions

- As activator of some enzymes of carbohydrate metabolism.
- It inhibits ATPase activity,

Anions

Chloride ions (CI^-)

- It is a principal anion of all body fluids with extracellular fluid.
- 2/3rd of this anion is present in plasma
- It is absorbed through intestinal tract and excreted through urine, skin.

Functions

1. It is responsible for maintaining hydration

2. Osmotic pressure.

- **Bi-Carbonate ion ($CO^{2\backslash 3}$)**
- This is the second most abundant anion of extracellular fluid.
- It is useful in the transportation of $CO_2$from tissues to lungs.
- It forms most important buffer system of all body fluids.

Phosphate in ($PO^{4\backslash 3-}$)

- Present in intra-cellular fluid compartment.
- It acts as buffer system.

Sulphate ion ($SO^{4\backslash 2-}$)

- Present in the plasma and interstitial fluid in negligible amount.
- Ingested through the consumption of plant or animal protein,
- Play important part in detoxification mechanism.
- Its deficiency causes cystinuria.

Dietary Sources of Electrolytes

The main food sources of electrolytes are fruits and vegetables. Some foods that provide electrolytes are as follows:

- **Sodium:** Pickled foods, cheese and table salt.
- **Chloride:** Table Salt.
- **Potassium**: Fruits and vegetables like bananas, avocado and sweat
- **Magnesium:** Seeds and nuts.

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- **Calcium**: Dairy products, green leafy vegetables. potato.

Ques.3 Explain in detailed about biotechnology.

Ans- Introduction to Biotechnology

- Biotechnology as the word suggests, is combination of biology and technology
- Biotechnology is the use of technology to use, modify or upgrade the part or whole of the biological system for industrial and human welfare.

DEFINITION

1. Biotechnology is the application of biological organisms, system or process to manufacturing and service industries.

2. Biotechnology is the integrated use of biochemistry, microbiology and engineering sciences in order to attain technological application of the capabilities of microorganisms (cultured tissue cells).

3. Biotechnology is the controlled use of biological agents such as microorganisms or cellular components.

- Biotechnology is the use of living things especially cells and bacteria for production of various products for benefitting human beings.
- It is a combination of various technologies, applied together to living cells, including not only biology, but also subjects like mathematics, physics, chemistry and engineering
- Its application ranges from agriculture to industry, medicine, nutrition, environmental conservation, cell biology making it one of the fastest growing fields
- Biotechnology is to modify genetic structure in animals and plants to improve them in desired way for getting beneficial products.

HISTORY

- The name biotechnology was given by hungarian Engineer **Karoly Ereky in 1919.**
- The ancient Egyptians made wine using fermentation techniques. Egyptions also used fermentation technologies to make dough rise during bread making
- People have used selective breeding to improve production of crops and livestock to use them for food

This technique was used with corn to produce the largest and sweetest crops.

Based on the field of application biotechnology can be classified into:

1. **Red Biotechnology** or **Medical Biotechnology** is biotechnology applied to manufacture pharmaceuticals live enzymes, antibiotics and vaccines and its use for molecular diagnostic.

2. White Biotechnology or Industrial Biotechnology is biotechnology applied to industrial and other production processes. is Biotechnology applied to

3. Green Biotechnology or **Agricultural Biotechnology** agricultural processes and products.

4. Blue Biotechnology or **Marine Biotechnology** is marine and aquatic applications of biotechnology.

FIELDS IN BIOTECHNOLOGY

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1. Genetic Engineering (Genetic Modification): It is the direct manipulatioin of an organism's genome using biotechnology. Through genetic engineering, organisms can be given targeted combinations of new genes, and therefore new combinations of traits that do not occur in nature and indeed cannot be developed by natural means.

2. Tissue Culture: It is a method of biological research in which fragments of tissue from an animal or plant are transferred to an artificial environment in which they can continue to survive and function.

3. Cloning: It describes the processes used to create an exact genetic replica of another cell, tissue or organism. The copied material, which has the same genetic makeup as the original; is referred to as a clone.

Cloning is of 3 types:

- Gene cloning
- Reproductive cloning
- Therapeutic cloning

IMPACT OF BIOTECHNOLOGY

Biotechnology improves crop insect resistance, enhances crop herbicide tolerance and facilities the use of more environmentally sustainable farming practices.

Biotechnology is:

- reducing rates of infectious disease
- tailoring treatments to individuals to minimize health risks and side creating more precise tools for disease detection. effects.
- improving manufacturing process efficiency. reducing use of and reliance on petrochemicals.
- using biofuels to cut greenhouse gas emissions, decreasing water usage and waste generation.
- generating higher crop yields with fewer inputs.
- lowering volumes of agricultural chemicals. using crops that need fewer applications of pesticides.
- producing foods free of allergens and toxins.
- improving food and crop oil content. work with chemical processes, genetic engineering, textile development, etc.,
- final new ways to design and use antibiotics and pesticides.
- use genetic modification to improve crop productive or crop resistance to pests and diseases.
- combating environmental pollution by developing the use of biosensors for early detection
- of pollutants.
- help professionals in improving in the methods of diagnosis, medicines, and vaccinations for diseases.

PHARMACEUTICAL BIOTECHNOLOGY

- Pharmaceutical biotechnology is a relatively new and growing field in which, the principles of biotechnology are applied to the development of drugs.
- Most therapeutic drugs in the current market are bioformulations, such as antibodies, nucleic acid products and vaccines.

Applications

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- Biotechnological methods have become an important tool in pharmaceutical drug research and development.
- The most relevant indications are oncology, metabolic disorders and disorders of the musculoskeletal system.

Examples

1. Insulin: A hormone used in diabetes mellitus.

2. Gene Therapy: The common function of gene therapy involves the use of functional DNA to replace muted DNA.

3. Clotting Factors: Use in treatment of haemophilia where there is absence of clotting factors patient's body.

4. Human Serum Albumin: One of the most blood protein use in the treatment of burns.

5. Engineered Enzyme: Used to treat variety of conditions that is due to enzyme deficiency.

Ques.4 Write in detailed about urine.

Ans- URINE

Urine is a liquid by-product of metabolism in humans and in many animals. Urine flows from the kidneys through the ureters to the urinary bladder.

Urination results in urine being excreted from the body through the urethra. The cellular metabolism generates many by-products which are rich in nitrogen and must be cleared from the bloodstream, such as urea, uric acid, and creatinine.

A urinalysis can detect nitrogenous of the mammalian body.

Normal Urine Characteristics

Characteristic	**Normal values**
Colour	Pale yellow to deep amber
Odour	Odourless
Volume	750-2000 ml/24 hour
pH	4.5-8.0
Specific gravity	1.003-1.032
Osmolarity	40-1350 mOsmol/kg
Urobilinogen	0.2-1.0 mg/100 ml.
White blood cells	0-2 HPF (per high-power field of microscope)
Leukocyte esterase	None
Protein	None or trace
Bilirubin	<0.3 mg/100 mL
Ketones	None
Nitrites	None
Blood	None
Glucose	None

- Urine volume varies considerably.
- The normal range is one to two litres per day.

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- The kidneys must produce a minimum urine volume of about 500 mL/day to rid the body of wastes.
- Output below this level may be caused by severe dehydration or renal disease and is termed **oliguria.**
- The virtual absence of urine production is termed anuria. Excessive urine production is **polyuria**, which may be due to diabetes mellitus or diabetes insipidus.

Urine Color

- Normal urine has a colour yellow-amber and it looks clear, limpid
- Urine colour depends on your daily diet, that you eat and drink all day.
- Much water intake makes urine color lighter and reduces its concentration. If you have a dark urine color there can be some reasons,
- Taking less liquid or some medicines may be the reason but sometimes a bleeding in your urethra can change your urine color to pink or red.
- An infection may cause turbidity and your urine looks cloudy. This cloudy view is remarkable in urinalysis.

Urine Smell

People may think that the smell of urine is insignificant, but sometimes even smell of urine can give an idea about your health.

You can pay attention to your urine smell sometimes by yourself like you are doing your own urinalysis.

If you have diabetes your urine may have a fruity sweet odour because of ketones in your urine,

Normal urine has a light odour but if urine aged in your body for exp. night long sleeping, has a stronger odour like ammonia because of concentration.

Cloudy Urine

Normal urine looks clear and bright but some reasons cause turbidity of urine and there is blurred, cloudy, opaque view occurs

Common reasons of cloudy urine can be crystals, infection (and so bacterise), increasing of cells (red and white blood cells), lipids, semen, or contamination of faeces.

These particles can be determined easily by microscopic urinalysis.

Acidity of Urine (pH)

Acidity degree of a solution is called pH, this pH degree has a range between 0 to 14. Pure water's degree is 7 and it is called neutral; means it is not acid or alkali.

Acid degree range is from 7 to strong "0"; it is strong acid.

Alkali range is from 7 to 14 degree is called "base", ph of urine changes between 45-1 usually it is 6 or 6.5. High protein nutrition on diet cause acidic urine or vegetarian food diet usually causes alkaline urine,

Long-time uncontrolled diabetes causes acidic urine too. Urine is usually found alkaline in urinalysis if there is an infection.

Specific Gravity

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Specific gravity is a measure of the quantity of solutes per unit volume of a solution and is traditionally easier to measure than osmolarity.

Urine will always have a specific gravity greater than pure water (water = 1.0) due to the presence of solutes.

Laboratories can now measure urine osmolarity directly, which is a more accurate indicator of urinary solutes than specific gravity. Remember that osmolarity is the number of osmoles or milliosmoles per litre of fluid

(mOsmol/L).

Urine osmolarity ranges from a low of 50-100 mOsmol/L to as high as 1200 mOsmol/L H_2O.

Specific Gravity may change in urinalysis with these conditions:

- Diabetes
- Shock
- Dehydration
- Heart problems
- Kidney diseases
- Urinary system infection

(A) Normal constituents of Urine

Urine is mainly composed of water, urea, and sodium chloride. In an adult taking about 100 g protein in 24 hours, the composition of urine is likely to be as follows:

(i) Water: Near about 96%

(ii) Solids: About 4% (urea 2% and other metabolic products 2% Other metabolic products

include: uric acid, creatinine, electrolytes, or salts such as sodium chloride, potassium chloride and bicarbonate).

- **Urea** is one of the end products of protein metabolism. It is prepared from the deaminated amino-acid in the liver and reach the kidneys through blood circulation (The normal blood urea level is 20-40 mg/dl) About 30-gram urea is excreted by the kidneys daily
- **Uric Acid**: The normal level of uric acid in blood is 2 to 6 mg/dl and about 1.5 to 2 gram is excreted daily in urine.
- **Creatinine**: Creatinine is the metabolic waste of creatine in muscle Purine bodies, oxalates. phosphates, sulphates, and urates are the other metabolic products Electrolytes or salts such as sodium chloride and potassium chloride are also excreted in the urine to maintain the normal level in blood. These are the salts which are the part of our daily diet and are always taken in excess and need to be excreted to maintain normal physiological balance.

(B) Abnormal Constituents of Urine

Normally, urine contains water and wastes, such as urea, unc acid, creatinine, and some tons. However, some of these substances may be abnormally elevated, which usually indicates that something is wrong with the body

The following are some of the abnormal constituents of urine and some possible causes

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Albumin: Albumin is a type of protein, which is a normal component of plasma-the fluid component of blood.

- When albumin is found to be excessive in the urine, it may indicate that the tiny filtering units in the kidney, called nephrons, are damaged or destroyed
- Elevated albumin in the urine is termed albuminuria.

Bilirubin: Bilirubin, when modified by the kidneys, contributes to the classical yellow colour of urine It is a by-product that results from the breakdown of hemoglobin-the red pigment in red blood cells

- When levels of bilirubin in urine is above normal, the condition is called bilirubinuria. This

may indicate liver disease or obstructive biliary disease Glucose: The presence of glucose or blood sugar in urine is called glucosuria It may indicate that the person has diabetes

Ketone bodies: The presence of ketone bodies in the urine may indicate diabetes or anorexia It may also be elevated during fasting and starvation.

Microbes: The presence of microorganisms, such as bacteria or fungus may indicate urinary tract infection

Blood: The red blood cells in blood should not be found in urine because they are too large to pass through the nephrons Haematuria is the clinical term used when red blood cells are present in the urine. It may indicate damage to the kidney, such as in renal or kidney disease. Sometimes, blood may be present because of the presence of kidney stones

White blood cells: When white blood cells are present in the urine, it may indicate infections in the kidney or other organs of the urinary tract.

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Short Answers

Ques.1 Write a short note on zinc.

Ans- Zinc

Zine is an important trace mineral that people need to stay healthy. Of the trace minerals, this element is second only to iron in its concentration in the body.

Sources:

- Animal proteins are a good source of zinc. Beef, pork, and lamb contain more zine than fo The dark meat of a chicken has more zine than the light meat.
- Other good sources of zine are nuts, whole grains, legumes, and yeast.
- Zinc is in most multivitamin and mineral supplements. These supplements may contain z gluconate, zinc sulphate, or zinc acetate. It is not clear whether one form is better than the others.

Functions:

- Zine is needed for the body's defensive (immune) system to properly work.
- It plays a role in cell division, cell growth, wound healing, and the breakdown of carbohydrates.
- Zinc is also needed for the senses of smell and taste.
- During pregnancy, infancy, and childhood the body needs zinc to grow and develop properly.
- Zinc also enhances the action of insulin.
- Recent information suggest that zinc may reduce your risk of becoming sick with the common cold.

Deficiency Diseases: Skin care, eczema, acne, healing of wounds, prostate disorders, cold. weight loss, pregnancy, reproduction, hair care, appetite loss, eye care, night blindness.

Ques.2 Mention the functions of the following minerals-

(a) Magnesium
(b) Potassium
(c) Sodium
(d) Cobalt
(e) Silicon
(f) Molybdenum
(g) Iodine
(h) Copper

Ans-

(a) Magnesium
Functions:

- Magnesium is needed for more than 300 biochemical reactions in the body. of in
- It helps to maintain normal nerve and muscle function, supports a healthy immune system
- keeps the heart beat steady, and helps bones remain strong.

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(b) Potassium

Functions:

- It regulates the water balance and the acid-base balance in the blood and tissues.
- In the nerve cells, this sodium-potassium flux generates the electrical potential that aids the conduction of nerve impulses.
- The electrical potential gradient, created by the "sodium-potassium pump." helps generate muscle contractions and regulates the heartbeat.
- Another of the pump's most important functions is preventing the swelling of cells
- Potassium is very important in cellular biochemical reactions and energy metabolism; it participates in the synthesis of protein from amino acids in the cell.
- Potassium also functions in carbohydrate metabolism, it is active in glycogen and glucose metabolism, converting glucose to glycogen that can be stored in the liver for future energy.
- Potassium is important for normal growth and for building muscle.

(c) Sodium

Functions:

- Essential for regulating muscle contractions and nerve transmissions.
- Helps maintain proper balance of water and body fluids.
- Important for maintaining the proper blood Ph.
- Plays a crucial role in regulating blood pressure and volume.
- Needed for stomach function.
- Deficiency Diseases: Water balance, sunstroke, brain function, muscle cramps, anti-aging.

(d) Cobalt

Functions:

- It is an essential element required for the normal functioning of the pancreas.
- It is also essential for hemoglobin formation.
- It may be necessary for the first stage of hormone production i.e., capture of iodine by the gland.
- Aids in normal growth and appetite.
- It is indicated that cobalt helps with repair of the myelin sheath, increases the effectiveness of glucose transport from the blood into body cells, and the building of red blood cells.
- Cobalt, together with other elements, can play a role in the body's absorption of iron.

(e) Silicon

Functions:

- Silicon have effect on weak bones (osteoporosis), heart disease and stroke (cardiovascular disease), Alzheimer's disease, hair loss, and improving hair and nail quality.
- It is also used for skin healing and for treating sprains and strains, as well as digestive system disorders.

(f) Molybdenum

Functions: Molybdenum acts as a cofactor for 4 enzymes. These enzymes are involved in processing sulfites and breaking down waste products and toxins in the body.

1. Sulfite Oxidase converts sulfite to sulfate, preventing the dangerous build-up of sulfites in the body.

2. Aldehyde Oxidase breaks down aldehydes, which can be toxic to the body.

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3. Xanthine Oxidase converts Xanthine to uric acid. This reaction helps breaks down nucleotides, the building blocks of DNA, when they were no longer needed.

4. Mitochondrial amidoxine reducing component (MARC): It is thought to remove toxic by-products of metabolism.

(g) Iodine
Functions:

- lodine is an essential component of the thyroid hormones thyroxine (T-4) and triiodothyronine (T-3). Thyroid hormones regulate many important biochemical reactions. including protein synthesis and enzymatic activity, and are critical determinants of metabolic activity.
- They are also required for proper skeletal and central nervous system development in foetuses and infants.
- Thyroid function is primarily regulated by thyroid-stimulating hormone (TSH), also known as thyrotropin.
- It is secreted by the pituitary gland to control thyroid hormone production and secretion. thereby protecting the body from hypothyroidism and hyperthyroidism.
- TSH secretion increases thyroidal uptake of iodine and stimulates the synthesis and release of T-3 and T-4.
- In the absence of sufficient iodine, TSH levels remain elevated, leading to goitre, an enlargement of the thyroid gland that reflects the body's attempt to trap more iodine from the circulation and produce thyroid hormones.
- lodine plays a role in immune response and might have a beneficial effect on mammary dysplasia and fibrocystic breast disease.

(h) Copper
Functions: Brain function, immunity, skin care,

- It is found in all body tissues and plays a role in making red blood cells and maintaining
- nerve cells and the immune system. It also helps the body form collagen and absorb iron, and plays a role in energy production.
- It helps maintain healthy bones, blood vessels, nerves, and immune function, and contributes to iron absorption
- Most copper in the body is found in the liver, brain, heart, kidneys, and skeletal muscle
- Both too much and too little copper can affect how the brain works.

Ques.3 What are the functions of water in the body?

Ans- FUNCTIONS OF WATER IN THE BODY

Water is the most critical of all the nutrients, as its absence proves lethal within a few days. Its

1. Transportation: Water is called the "Universal Solvent because more substances dissolve in mam functions are: if than any other fluid. The solvent action of water allows for substances to be more readily transported.

2. Chemical reaction: Water is an ideal medium for chemical reactions.

3. Lubrication and Shock Absorption:

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- Water is the main component of the lubricating fluid between joints and eases the movement of bones.
- Watery fluids surrounding organs provide both chemical and mechanical protection.
- Nasal mucus (Snot) is also a front-line defence against injury and foreign invaders. It is composed of nearly 90% water and helps discharge nasal irritants, lubricate cells in the lungs to enable you to breathe, transport nutrients along the gastro intestinal tract and aids in eliminating waste materials through the rectum.

4. Temperature Regulation: Water is good at storing heat which means that it helps the body maintain temperature despite changes in the surrounding environment.

Ques.4 Give the regulation of water balance in the body.

Ans- Regulation of Water Balance in the Body

The amount of fluid inside the human body must be regulated and balanced in order to maintain homeostasis. The water balance in the body is maintained by following factors

1. By **thirst centre** present in **hypothalamus.**
2. **By Antidiuretic Hormone (A.D.H) or Vasopressin**: This Hormone water in Distal tubule and collecting ducts of kidney.
3. **By Aldosterone**: This hormone increases the absorption of Na and water by kidney a increases the excretion of K.
4. **Electrolytes** increases the amount of body water and helps in its distribution,

Dehydration

Dehydration occurs when more water and fluids leave the body than enter it.

Causes of Dehydration

(i) Diarrhoea
(ii) Vomiting
(iii) Sweating
(iv) Diabetes
(v) Frequent urination
(vi) Burns
(vii) Fasting

Ques.5 Write a short note on electrolysis.

Ans- ELECTROLYTE

An electrolyte is a substance that dissociates in water into positively (cation) and negatively (anion) charged particles.

Electrolytes are found in the human body, and the electrolyte balance in our bodies is necessary for our cells and our organs to function normally.

Electrolytes in living systems include sodium, potassium, chloride, bicarbonate, calcium, phosphate, magnesium, copper, zinc, iron, manganese, molybdenum, and chromium.

- **Composition of Body Fluids**
- Water is the main component of all body fluids making up 45-75% of the total body weight.
- Sources of water include

- Ingested foods and liquids (performed water) Metabolic water produced during dehydration synthesis of anabolism.
- Solutes are broadly classified into
- Electrolytes
- Non-electrolytes
- Electrolytes have greater osmotic power than non-electrolytes,
- Water moves according to osmotic gradients.
- Electrolyte Composition of Body Fluids
- Each fluid compartment of the body has a distinctive pattern to electrolytes.

Extracellular Fluids

- ECFs are similar except for the high protein content of plasma.
- Sodium
- (Na^+) is the major cation.
- Chloride (CI) is the major anion

Intracellular Fluids

- Have low sodium and chloride ions.
- Potassium (K) is the main cation.
- Phosphate (PO) is the main anion.
- The fluid compartments (ICF and ECF) are separated from each by membranes which are permeable to water and many organic and inorganic solutes

Ques.6 Give the various fields of biotechnology.

Ans- FIELDS IN BIOTECHNOLOGY

1. Genetic Engineering (Genetic Modification): It is the direct manipulation of an organism's genome using biotechnology. Through genetic engineering, organisms can be given targeted combinations of new genes, and therefore new combinations of traits that do not occur in nature and indeed cannot be developed by natural means.

2. Tissue Culture: It is a method of biological research in which fragments of tissue from an animal or plant are transferred to an artificial environment in which they can continue to survive and function.

3. Cloning: It describes the processes used to create an exact genetic replica of another cell, tissue or organism. The copied material, which has the same genetic makeup as the original; is referred to as a clone.

Cloning is of 3 types:

- Gene cloning
- Reproductive cloning
- Therapeutic cloning

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Ques.7 What are the impacts of biotechnology?

11.5 Ans- IMPACT OF BIOTECHNOLOGY

Biotechnology improves crop insect resistance, enhances crop herbicide tolerance and facilities the use of more environmentally sustainable farming practices.

Biotechnology is:

- reducing rates of infectious disease
- tailoring treatments to individuals to minimize health risks and side creating more precise tools for disease detection. effects.
- improving manufacturing process efficiency. reducing use of and reliance on petrochemicals.
- using biofuels to cut greenhouse gas emissions, decreasing water usage and waste generation.
- generating higher crop yields with fewer inputs.
- lowering volumes of agricultural chemicals. using crops that need fewer applications of pesticides.
- producing foods free of allergens and toxins.
- improving food and crop oil content. work with chemical processes, genetic engineering, textile development, etc.,
- final new ways to design and use antibiotics and pesticides.
- use genetic modification to improve crop productive or crop resistance to pests and diseases.
- combating environmental pollution by developing the use of biosensors for early detection
- of pollutants.
- help professionals in improving in the methods of diagnosis, medicines, and vaccinations for diseases.

Ques.8 What is pharmaceutical biotechnology?

Ans- PHARMACEUTICAL BIOTECHNOLOGY

- Pharmaceutical biotechnology is a relatively new and growing field in which the principles of biotechnology are applied to the development of drugs.
- Most therapeutic drugs in the current market are bioformulations, such as antibodies, nucleic acid products and vaccines.

Applications

- Biotechnological methods have become an important tool in pharmaceutical drug research and development.
- The most relevant indications are oncology, metabolic disorders and disorders of the musculoskeletal system.

Examples

1. Insulin: A hormone used in diabetes mellitus.

2. Gene Therapy: The common function of gene therapy involves the use of functional DNA to replace muted DNA.

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3. Clotting Factors: Use in treatment of haemophilia where there is absence of clotting factors patient's body.

4. Human Serum Albumin: One of the most blood protein use in the treatment of burns.

5. Engineered Enzyme: Used to treat variety of conditions that is due to enzyme deficiency.

Ques.9 Write a short note on common liver function tests.

Ans- Common Liver Function Tests

1.Alanine transaminase (ALT)

- ALT is an enzyme found in liver that helps convert proteins into energy for the liver cells.
- When the liver is damaged, ALT is released into the blood stream and levels increase

2. Aspartate Transaminase (AST)

AST is an enzyme that helps metabolize amino acids. AST is normally present in blood at low levels. An increase in AST levels may indicate liver damage, disease or muscle damage.

3. Alkaline Phosphatase (ALP)

- ALP is important for breaking down proteins.
- Higher than normal levels of ALP may indicate liver damage or disease, such as blocked bile duct or certain bone diseases.

4. Albumin and Total Protein

Albumin is made in liver and body needs these proteins to fight infections and to perform other functions.

Lower than normal levels of albumin and total protein may indicate liver damage or disease.

5. Bilirubin

Bilirubin is produced during the normal breakdown of red blood cells.

Bilirubin passes through the liver and is excreted in stool. Elevated levels of bilirubin (jaundice) might indicate liver damage or disease or certain types of anemia.

6. Gamma-glutamyl transferase

- (GGT) GGT is an enzyme in the blood.
- Higher than normal levels may indicate liver or bile duct damage.

7. L-lactate dehydrogenase (LD)

- LD is an enzyme found in the liver.
- Elevated levels may indicate liver damage but can be elevated in many other disorders.

8. Prothrombin time (PT)

- PT is the time it takes your blood to clot.
- Increase PT may indicate liver damage (but can also be elevated on using blood-thinning such as warfarin.

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Ques.10 What are lipid profile tests?

Ans- LIPID PROFILE TESTS

The lipid profile test is a combination of tests conducted together to check for any risks of coronary heart disease or as a preventive measure to check any risks depending on factors like eating habits, diet, stress, exercise and life style related.

A typical lipid profile includes the following tests:

- High density lipoprotein cholesterol (HDL-C)-**'good cholesterol'.**
- Low density lipoprotein cholesterol (LDL-C)-'bad
- LDL/HDL ratio (calculated value).
- Triglycerides
- Very low-density lipoprotein cholesterol (VLDL-C). Total Cholesterol
- Total cholesterol/HDL Ratio (Calculated Values)

Lipids are the fats and fatty substances that are stored in blood and tissues and are used by the body as a source of energy. While lipids help keep the body functioning normally, lipid disorders, like high cholesterol, might lead to life-threatening conditions like heart attacks, strokes, or coronary artery disease.

A lipid profile test is performed to measure:

Total cholesterol level

HDL cholesterol (good cholesterol)

LDL cholesterol (Bad cholesterol) Triglyceride levels,

Lipid profile tests are done on a blood sample withdrawn from a vein of a patient.

Typically, a fasting of 8 to 12 hours is required before the test.

Usually, the laboratory measures only **Total cholesterol**; HDL; Triglycerides.

Ques.11 What are the properties and functions of blood tests.

Ans- Properties of Blood

- **Amount:** 7-9% of total body weight; 79 m/kg.
- **Blood volume:** 5-6 litres. Viscosity (3.5-5.5) times more than water.
- **Specific Gravity:** 045-1,065.
- **pH:** 3-7.4 (slightly alkaline).
- Venous blood has low pH than the arterial blood as venous blood has more CO.
- **Temperature:** 380°C (100.4°F).
- **Osmotic pressure:** 25 mm Hg.
- **Color**: red. due to haemoglobin.

Functions of Blood

(1) Transportation:

- Transport of $O_2$from lungs to body tissue and CO_2 from tissue to lungs.

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- Transport of wastes of cellular metabolism from body tissue to kidney, liver gland and eventually removal out of body.
- Transport of hormones, enzymes, other chemicals throughout the body.
- Nutrients absorbed in the digestive tract, such as glucose, amino acids, vitamins, minerals ete and are circulated to all body tissues.
- Waste products of the tissues, such as urea and creatinine, circulate through the kidneys and are excreted in urine.

(ii)Regulation (Homeostasis):

- Regulate body temperature.
- Distribution of heat throughout the body.

(iii) Balance:

- Maintaining electrolyte balance
- Maintain acid base balance.

(iv) Protection:

- Protect body from harmful microorganisms, by WBCs, protein, and antibody.
- Develop immune response (plasma protein).

Ques.12 What is B and T cell screen?

Ans- A blood test that counts how many lymphocytes are in a person's blood is called a 1 and T cell screen. In this test, the levels of the main types of white blood cells in the body are measured.

Lymphocyte count is one part of a larger whole blood test called a complete blood count (CBC). A CDC can be requested by doctors if they suspect that a disease or infection is present.

A sample of the bone marrow can also be used instead of blood in some cases

T cell counts above the normal range can indicate any of the following conditions:

- Sexually transmitted disease, such as syphilis.
- Viral infection, such as infectious mononucleosis.
- Infection caused by a parasite, such as toxoplasmosis.
- Tuberculosis, a disease that affects the lungs and other organs.
- Cancer of the white blood cells.
- Cancer of the blood, starting in the bone marrow.

B cell counts above the normal range can indicate:

- Chronic lymphocytic leukaemia.
- Multiple myeloma.
- A genetic disease known as DiGeorge syndrome.
- A type of cancer called Wald Enstrom macroglobulinemia,

T cell counts below the normal range can indicate:

- A disease present from birth

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- An acquired T cell deficiency disease, such as HIV, which can progress to AIDS or HTLV-1
- A type of cancer.

B cell counts below the normal range can indicate:

- Acute lymphoblastic leukaemia.
- HIV or another disease that weakens the immune system.

Ques.13 What are the causes of anemia?

Ans- Causes of Anaemia

Any process that can disrupt the normal life span of a red blood cell may cause anaemia. Normal life span of a red blood cell is typically around 120 days. Red blood cells are made in the bone marrow

Anaemia is caused essentially through two basic pathways. Anaemia is caused by either:

1. A decrease in production of red blood cells or hemoglobin, or

2. An increase in loss or destruction of red blood cells.

Conditions associated with these causes of anemia include the following:

- Sickle cell anemia
- Iron-deficiency anemia
- Vitamin deficiency
- Bone marrow and stem cell problems
- Other health conditions

Sickle cell anaemia is an inherited disorder that, in the US, affects mainly African-Americans and Hispanic Americans. Red blood cells become crescent-shaped because of a genetic defect. They break down rapidly, so oxygen does not get to the body's organs, causing anaemia. The crescent-shaped red blood cells can also get stuck in tiny blood vessels, causing pain.

Iron deficiency is a very common cause of anaemia. This is because iron is major component of hemoglobin and essential for its proper function. Chronic blood loss due to any reason is the main cause of low iron level in the body as it depletes the body's iron stores to compensate for the ongoing loss of iron. Anaemia that is due to low iron levels is called iron deficiency anaemia.

Young women are likely to have low grade iron deficiency anaemia because of the loss of blood each month through normal menstruation. This is generally without any major symptoms as the blood loss is relatively small and temporary.

Vitamin-deficiency anaemia may occur when vitamin B12 and folate are deficient. These two vitamins are needed to make red blood cells. Conditions leading to anaemia caused by vitamin deficiency include:

- **Megaloblastic Aplastic anaemia:** Vitamin B12 or folate or both are deficient.
- **Pernicious anaemia:** Poor vitamin B12 absorption.
- **Dietary deficiency**: Eating little or no meat may cause a lack of vitamin B12, while overcooking of eating too few vegetables may cause a folate deficiency.

Aplastic Anaemia

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Aplastic anaemia is a life-threatening form of complete bone marrow failure. As a result, the blood contains inadequate numbers of red blood cells (anaemia) as well as insufficient white blood cells (leukopenia) and platelets (thrombocytopenia).

Complete bone marrow failure causes all three cell lines produced in the bone marrow to be inadequate, a condition referred to as pancytopenia. Aplastic anaemia can occur at nearly any age. Its onset can be sudden or gradual.

Symptoms: The symptoms of this anaemia are similar to the symptoms of all anaemias above) as well as recurrent infections and abnormal bleeding.

Causes: Causes of aplastic anaemia include:

- Chronic exposure to toxic chemicals;
- Cancer treatments (radiation therapy: chemotherapy);
- Infections (certain viral infections).
- Medications (for examples, chloramphenicol, carbamazepine, and phenytoin).
- Myelodysplastic syndromes, and
- Genetic abnormalities.

Thalassemia occurs when the red cells cannot mature and grow properly. Thalassemia is inherited condition that typically affects people of Mediterranean, African, Middle Eastern, and Southeast Asian descent. This condition can range in severity from mild to life-threatening. the mo severe form is called Cooley's anaemia.

Anaemia associated with other conditions usually occurs when there are too few hormones necessary for red blood cell production. Conditions causing this type of anaemia include the following:

- Advanced kidney disease.
- Hypothyroidism
- Other chronic diseases, such as cancer, infection, lupus, diabetes, and rheumatoid arthritis.

Pernicious Anaemia

Pernicious anaemia occurs when your body lacks vitamin B12, which is needed to make healthy red blood cells and to keep the nervous system working properly.

If you have pernicious anaemia, your body cannot absorb enough vitamin B12 from food because it lacks a protein in the stomach called intrinsic factor. If you lack intrinsic factor, there is nothing you can do to prevent pernicious anaemia caused by this.

B12 deficiency can also be caused by other factors and conditions, such as infections, surgery, medicines, and diet, and in these cases, it may also be referred to as pernicious anemia.

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Very Short Answers

1. Which of the following minerals controls growth and body weight?
(a) Calcium
(b) Iodine
(c) Phosphorus
(d) None of these

2..... helps in the regulation of blood volume and blood pressure.
(a) Iron
(b) Iodine
(c) Sodium
(d) Phosphorus

3. Which of the following are examples of macro minerals:
(a) Calcium
(b) Sodium
(c) Chloride
(d) All of these

4. Excessive intake of calcium in our diet results in:
(a) diarrhoea
(b) stroke
(c) constipation
(d) kidney stones

5. Onions, broccoli, fresh fruits, milk, eggs, iodized salt are good sources of:
(a) sodium
(b) Iodine
(c) phosphorus
(d) Both (a) and (b)

6. Passion fruit and pomegranate are rich source of:
(a) phosphorus
(b) calcium
(c) manganese
(d) None of these

7. Sources of copper are:
(a) cashews
(b) oysters
(c) whole grains
(d) All of these

8. Iodine is a.....that is naturally present is some foods.
(a) trace elements
(b) major element
(c) metal
(d) transition metal

9. Manganese is a cofactor for enzymes involved in:
(a) hydrolysis

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(b) phosphorylation
(c) decarboxylation
(d) All of these

10. Deficiency of cobalt is equivalent to the deficiency of:
(a) vitamin B_{12}
(b) Vitamin B_1
(c) Vitamin B_2
(d) Vitamin B_6

11.All the following are important electrolytes in the body except:
(a)K^+ ions
(b) Na^+ ions
(c) CI ions
(d) Carbon ions

12. The intracellular fluid compartment refers to all the water found in:
(a) Bones of the body
(b) Areas outside the body cells
(c) Areas within the gastrointestinal tract
(d) All the cells of the body

13.Nearly 1/3rd of the body water exists in
(a) Kidneys and Urinary bladder
(b) Extracellular fluid compartment.
(c) Blood
(d) Transcellular fluid compartment

14. The plasma is generally rich while the interstitial fluid is generally poor
(a) H' ions
(b) Na^+ and Cl-
(c) Protein
(d) Carbohydrates

15.Water leaves the body by all the following mechanism except:
(a) Through air expired from the lungs
(b) Through metabolic reaction taking place in the cells
(c) From faeces eliminated from the intestine
(d) Through sweating

16.The hormones aldosterone and ADH both have an important function in :
(a) Fluid balance in the body
(b) The regulation of acid concentration in the body
(c) Stimulation of a conscious desire for water
(d) The activity of buffer systems.

17. 90% of the cations in the extracellular fluids consists of:
(a) OH^-
(b) Ca^{2+}
(c) Na^+
(d) HCO^-_3

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18. A low concentration of sodium in the blood stimulates the production of:
(a) K^+ from KOH
(b) H^+ from strong acid
(c) Renin from the nephron of kidney
(d) Lymph from the lymphatic channels

19. Gastric juice contains:
(a) Calcium
(b) Albumin Protein
(c) Angiotensin
(d) Chloride ions

20. Water balance in the body is regulated by:
(a) Thirst centre present in hypothalamus
(b) Antidiuretic Hormone (ADH)
(c) Aldosterone
(d) All of these

21. Causes of dehydration are:
(a) Diarrhoea
(b) Vomiting
(c) Sweating
(d) All of these

22. The name biotechnology was given by:
(a) Karoly Ereky
(b) Alexander Fleming
(c) Smith and Nathans
(d) Berg

23. Based on the field of application biotechnology is classified into..... types:
(a) 4
(b) 3
(c) 2
(d) None of these

24. Medical biotechnology is also called as.
(a) White biotechnology
(b) Blue biotechnology
(c) Red biotechnology
(d) Green biotechnology

25. Which one of the following are field of biotechnology?
(a) Genetic engineering
(b) Tissue culture
(c) Cloning
(d) All of these

26. Excision and insertion of a gene is called:
(a) Biotechnology
(b) Genetic engineering
(c) Cytogenetics

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(d) Gene Therapy

27. Which bacterium is used in the production of insulin by genetic engineering?
(a) Saccharonyces
(b) Rhizobium
(c) Escherichia
(d) Mycobacterium

28. The first transgenic plant to be produced is:
(a) Brinjal
(b) Tobacco
(c) Rice
(d) Cotton

29. Which is a genetically modified crop?
(a) Bt-cotton
(b) Bt-brinjal
(c) Golden rice
(d) All of these

30. The antiviral protein produced by virus infected cells is called:
(a) Insulin
(b) Auxin
(c) Vaccine
(d) Interferon

31.Which medical term refers to the kidney function?
(a) Hepatic
(b) Renal
(c) Dialysis
(d) Urinary

32. Which kidney disease is known to be inherited?
(a) End stage renal disease
(b) Protein disease
(c) Autoimmune kidney disease
(d) Polycystic kidney disease

33. There are..... stages of kidney disease.
(a) 3
(b) 5
(c) 6
(d) 7

34. What is glomerular filtration rate (GFR):
(a) The concentration of metabolites that are filtered by one kidney/unit time.
(b) The volume of water reabsorbed by the kidneys/unit time.
(c) The total volume of filtrate formed by all nephrons in both kidneys/unit time.
(d) The volume of filtrate that is reabsorbed by the kidneys/unit time.

35. How is GFR altered by acute kidney injury?
(a) Increased

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(b) Decreased
(c) Remains unchanged
(d) Only reabsorption is altered

36. How is GFR calculated?
(a) GFR C(UX)
(b) GFR = Kfx NFP
(c) GFRPG-PB-G+B
(d) GFR = UER Filtration rate + secretion rate-Reabsorption rate

37. Which of the following is the function of the human liver?
(a) Production of bile
(b) Metabolization of fats
(c) Metabolization of Carbohydrates
(d) All of these

38. Albumin is the most important protein in blood serum. It is produced by
(a) Heart
(b) Lungs
(c) Liver
(d) Endocrine glands

39. Cirrhosis (a liver disease) is mainly diagnosed by:
(a) Blood test
(b) Liver biopsy
(c) Physical examination
(d) All of these

40. Which of the following samples is usually takes for the liver function test?
(a) Blood sample
(b) Urine sample
(c) Intestine biopsy sample
(d) Sputum sample

41. Prothrombin is synthesized by:
(a) Liver
(b) Kidney
(c) Intestine
(d) Stomach

42. A complete lipid screening test done after you fast for 9 to 12 hours measures:
(a) LDL cholesterol
(b) HDL cholesterol
(c) Triglycerides
(d) All of these

43. LDL cholesterol is called bad cholesterol because:
(a) It causes low blood counts
(b) It can cause blockage in the arteries
(c) It changes heart rhythm
(d) None of these

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44. HDL is called good cholesterol because:
(a) It keeps cholesterol from building up in the lining of the arteries
(b) Your body makes more of it as you get older
(c) It helps keep your blood from clotting
(d) None of the above

45. The scientific study of disease which deals with causes, effects, mechanism and nature of the disease is:
(a) Oceanology
(b) Physiology
(c) Biology
(d) Pathology

46. Functions of blood include:
(a) Transport of hormones and
(b) Transport of oxygen and nutrients
(c) Maintenance of osmotic pressure and body temperature.
(d) All of the above

47. The composition of Blood is.
(a) Plasma and blood cells
(b) RBCs and Plasma
(c) Plasma and WBCs
(d) Respiratory gases and blood cells.

48. Blood plasma contains
(a) Organic substances
(b)inorganic substances
(c) Respiratory gases
(d) All of them

49. Which is involved in antibodies formation?
(a) RBCs
(b)WBCs
(c) Platelets
(d) None of these

50. Blood cells fraction is composed of
(a) Wacs/leukocytes
(b) RBCs/Erthrocytes
(c) Platelets/Thrombocytes
(d) All of these

51. In case of immunodeficiency diseases, no, of WBCs will
(a) Decrease
(b) Increase
(c) Remains same
(d) None of these

52. Erythrocytes are called.....
(a) RBCs
(b) WBCS

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(c) Platelets
(d) None of these

53. Thrombocytes are called
(a) RBCs
(b) WBCs
(c) Platelets
(d). None of these

54. Decrease in platelet count is called:
(a) Thrombocytopenia
(b) Thrombocytosis
(c) Erythrocytosis
(d) None of these

55. Increase in Platelet count is called.....
(a) Thrombocytosis
(b) Thrombosis
(c) Thrombocytopenia
(d) None of these

56. Which blood cells secrets antibody?
(a) Ecounophilis
(b) Monocytes
(c) Lymphocytes
(d) Neutrophils

57. Which leucocytes release heparin and histamine in blood:
(a) Neutrophil
(b) Basophil
(c) Eosinophil
(d) Monocytes

58. The blood corpuscles are of..... kinds.
(a) 4
(b) 5
(c) 2
(d) 3

59. Process of formation of blood corpuscles is called.
(a) Haemolysis
(b) Haemozoin
(c) Haemopoesis
(d) Haemoter

60. Which prevents the clotting of blood inside blood vessels ?
(a) Heparin
(b) Serotonin
(c) Fibrinogen
(d) Fibrin

61. Excretion from the kidney which is stored in the bladder and excreted through urethra is

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(a) Urine
(b) Blood
(c) Glucose
(d) None of them.

62. Waste products from urine include:
(a) Urea
(b) Ammonia
(c) Uric acid
(d) All of them

63. The urine which does not contain any substance which is required by the body is called:
(a) Normal urine
(b) Physiological urine
(c) Both of them
(d) None of them

64. The urine which contains necessary substance which are required by the body is called:
(a) Normal urine
(b) Physiological urine
(c) Abnormal urine
(d) None of these

65.The substances required by the boy but excreted in the urine are:
(a)Sugar
(b) Proteins
(c) Blood
(d) All of these

66.Composition of urine is
(a) Water
(b) Inorganic substances
(c) Organic substances
(d) All of them

67. Inorganic substances of urine include.
(a) Sodium, potassium
(b) Calcium, magnesium
(c) Lead, iodine
(d) All of these

68. Organic substances from urine include:
(a) Urea creatinine
(b) Urea, uric acid
(c) Amino acid, nitrogen
(d) All of these

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