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Subject : Advancement in Medical Laboratory Technology

Question No1 Ans :

- Liver function test
- Renal functions test
- Lipid profile.
- Cardiac enzyme profile
- Electrolytes.
- Fertility hormones.
- Pancreatic enzyme.
- Thyroid profile.
- Tumor markers.
- **Liver function test:**

Liver function tests (LFTs or LFs), also referred to as a hepatic panel, are groups of blood tests that provide information about the state of a patient's liver. These tests include prothrombin time (PT/INR), activated Partial Thromboplastin Time (aPTT), albumin, bilirubin (direct and indirect), and others.

- **Renal functions test**

Know your kidney numbers! Your kidney numbers include 2 tests: ACR (Albumin to Creatinine Ratio) and GFR (glomerular filtration rate). GFR is a measure of kidney function and is performed through a blood test.

- **Lipid profile.**

complete cholesterol test is also called a lipid panel or lipid profile. Your doctor can use it to measure the amount of "good" and "bad" cholesterol and triglycerides, a type of fat, in your blood. Cholesterol is a soft, waxy fat that your body needs to function properly.

- **Cardiac enzyme profile**

Cardiac enzyme studies measure the levels of the enzymes creatine phosphokinase (CPK) and creatine kinase (CK), and the proteins troponin I (TnI) and troponin T (TnT) in the blood.

- **Electrolytes**

electrolytes

1.a liquid or gel which contains ions and can be decomposed by electrolysis, e.g. that present in a battery.

2.PHYSIOLOGY
other organic matter.

the ionized or ionizable constituents of a living cell, blood, or

- **Fertility hormones**

The Role of Hormones in Fertility. Hormones & infertility at a glance. High levels of follicle-stimulating hormone (FSH) in a woman's blood could reduce chances of getting pregnant. Follicle-stimulating hormone (FSH) Estradiol. Luteinizing hormone. Progesterone

- **Pancreatic enzyme**

Pancreatic enzymes help break down fats, proteins and carbohydrates. A normally functioning pancreas secretes about 8 cups of pancreatic juice into the duodenum, daily. This fluid contains pancreatic enzymes to help with digestion and bicarbonate to neutralize stomach acid as it enters the small intestine.

- **Thyroid profile.**

The thyroid is a small gland located in the lower-front part of your neck. It's responsible for helping to regulate many of the body's processes, such as metabolism, energy generation, and mood. The thyroid produces two major hormones: triiodothyronine (T3) and thyroxine (T4)

- **Tumor markers**

A tumor marker is anything present in or produced by cancer cells or other cells of the body in response to cancer or certain benign (noncancerous) conditions that provides information about a cancer, such as how aggressive it is, whether it can be treated with a targeted therapy, or whether it is responding to treatment.

Question No 2 Ans:

- **PCR (polymerase Chain Reaction):**

PCR (polymerase chain reaction) is a method to analyze a short sequence of DNA (or RNA) even in samples containing only minute quantities of DNA or RNA. PCR is used to reproduce (amplify) selected sections of DNA or RNA. Previously, amplification of DNA involved cloning the segments of interest into vectors for expression in bacteria, and took weeks. But now, with PCR done in test tubes, it takes only a few hours. PCR is highly efficient in that untold numbers of copies can be made of the DNA. Moreover, PCR uses the same molecules that nature uses for copying DNA:

Two "primers", short single-stranded DNA sequences that are synthesized to correspond to the beginning and ending of the DNA stretch to be copied;

An enzyme called polymerase that moves along the segment of DNA, reading its code and assembling a copy; and

A pile of DNA building blocks that the polymerase needs to make that copy

- **What is RT PCR?**

RT-PCR (Reverse transcriptase-polymerase chain reaction) is a highly sensitive technique for the detection and quantitation of mRNA (messenger RNA). The technique consists of two parts:

The synthesis of cDNA (complementary DNA) from RNA by reverse transcription (RT) and

The amplification of a specific cDNA by the polymerase chain reaction (PCR).

RT-PCR has been used to measure viral load with HIV and may also be used with other RNA viruses such as measles and mumps.

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The enzyme-linked immunosorbent assay (ELISA)

is a commonly used analytical biochemistry assay, first described by Engvall and Perlmann in 1971.[1] The assay uses a solid-phase type of enzyme immunoassay (EIA) to detect the presence of a ligand (commonly a protein) in a liquid sample using antibodies directed against the protein to be measured. ELISA has been used as a diagnostic tool in medicine, plant pathology, and biotechnology, as well as a quality control check in various industries.

- **ELISA:**

In the most simple form of an ELISA, antigens from the sample to be tested are attached to a surface. Then, a matching antibody is applied over the surface so it can bind the antigen. This antibody is linked to an enzyme and then any unbound antibodies are removed. In the final step, a substance containing the enzyme's substrate is added. If there was binding the subsequent reaction produces a detectable signal, most commonly a color change.

Performing an ELISA involves at least one antibody with specificity for a particular antigen. The sample with an unknown amount of antigen is immobilized on a solid support (usually a polystyrene microtiter plate) either non-specifically (via adsorption to the surface) or specifically (via capture by another antibody specific to the same antigen, in a "sandwich" ELISA). After the antigen is immobilized, the detection antibody is added, forming a complex with the antigen. The detection antibody can be covalently linked to an enzyme or can itself be detected by a secondary antibody that is linked to an enzyme through bioconjugation. Between each step, the plate is typically washed with a mild detergent solution to remove any proteins or antibodies that are non-specifically bound. After the final wash step, the plate is developed by adding an enzymatic substrate to produce a visible signal, which indicates the quantity of antigen in the sample.

- **Electrophoresis**

Electrophoresis is a technique used to separate macromolecules in a fluid or gel based on their charge, binding affinity, and size under an electric field. In the year 1807, Ferdinand Frederic Reuss was the first person to observe electrophoresis. He was from Moscow State University. Anaphoresis is the electrophoresis of negative charge particles or anions whereas cataphoresis is electrophoresis of positive charge ions or cations. Electrophoresis has a wide application in separating and analyzing biomolecules such as proteins, plasmids, RNA, DNA, nucleic acids

Electrophoresis Principle and its types:

Charged macromolecules are placed in the electric field move towards the negative or positive pole based on their charge. Nucleic acid has a negative charge and therefore it migrates towards the anode.

This technique is divided into two types viz slab electrophoresis and capillary electrophoresis.

Types of Electrophoresis:

- Capillary electrophoresis
- Gel electrophoresis
- Paper electrophoresis
- Slab electrophoresis
- Zone electrophoresis
- Immunoelectrophoresis
- Isoelectrofocusing