

UNIT -I

1. Define Absolute Refractory Period (ARP).

During the initial portion of the action potential, the membrane cannot respond to any stimulus, no matter how intense the stimulus is. This interval is called ARP.

2. Define Relative refractory period (RRP).

ARP is followed by relative refractory period. During this period, action potential can be elicited by a super threshold stimulus.

3. What are sensory nerves, motor nerves and mixed nerves?

The nerves that carry the information gathered by the sensory organs to the brain are called sensory nerves. They serve as message carriers for the brain. Motor nerves carry back the orders from the brain to the muscles and glands. Mixed nerves perform the function of the both sensory and motor nerves.

4. What are resting potential?

The membrane potential measured when an equilibrium is reached with a potential difference across the cell membrane negative on the inside and positive on the outside is called resting potential.

5. What is action potential?

When a stimulus is applied to a cell at the resting stage, there will be a high concentration of the positive ions inside the cell. So there will be slightly high potential on the inside of the cell due to imbalance of potassium ions. This is called action potential. Range: 20Mv.

6. What is bio electric potential?

Certain systems of the body generate their own monitoring signals conveying useful information about the functions they represent. Such signals are bio electric potentials and are related to nerve conduction, brain activity, heart beat etc.

7. State all or nothing law.

Regardless the method of excitation of cells or the intensity of the stimulus, which is assumed to be greater than the threshold of stimulus, the action potential is always the same for any given cell. This is known as the all or nothing law.

8. Define systolic and diastolic pressure.

Systole is the period of contraction of the ventricular muscles during that time blood is pumped into the pulmonary artery and the aorta. Diastole is the period of dilation of the heart chambers as the blood fills the heart. For normal adult the systolic pressure is around 140 mm of Hg and diastolic pressure is around 80 mm of Hg. It is measured using noninvasive blood pressure measuring device called as Sphygmomanometer.

9. Define perfectly polarized electrodes & perfectly non polarized electrodes.

Electrodes in which no net transfer of charge takes place across the metal electrolyte is called perfectly polarized electrodes. An electrode in which unhindered exchange of charge takes place across the metal electrolyte is called perfectly non polarized electrodes.

10. Define transducers.

Transducers are defined as a device which when actuated, transforms energy from one form to another. Generally, any physical parameters are converted into electrical form.

UNIT – II

1, What are the requirements of amplifiers used in biomedical recorders?

- High power gain to activate the pen motor in the display.
- An ideal non inverting amplifier to avoid cross over distortion.
- Excellent frequency response in the sub audio frequency range
- To avoid noise, limited high frequency noise is used.

2. Give some of the amplifiers used with recorders.

- Differential amplifier
- AC coupled amplifiers
- Carrier amplifiers

3. What are the electrodes used for ECG?

- Limb electrodes
- Floating electrodes
- Paste less electrodes

4. What are the different types of electrodes?

Surface Electrodes: These are used to measure Potentials from the surface of skin and to sense potentials from heart, brain and nerve. Internal electrodes: These are used to measure the bioelectric potentials of highly localized extra cellular regions in brain or Potentials from a specific group of muscles. Micro electrodes: These are used to measure the bioelectric potentials near or within a single cell. These are also called as intracellular electrodes

5. Define Electrocardiograph and Electroencephalograph.

The electrocardiograph (ECG) is an instrument which records the electrical activity of the heart. It is the instrument used for recording electrical activity of the brain by suitably placing electrodes on the scalp.

6. What are the characteristics of a DC amplifier?

It may need balanced differential inputs giving a high Common Mode Rejection Ratio (CMRR). It should have extremely good thermal and long term stability.

7. List the brainwaves and their frequency.

- Alpha 8 t-13 Hz
- Beta 13 - 30 Hz
- Theta 4-8 Hz and Delta 0.5-4 Hz

8. Define the term latency in EMG.

Electromyography (EMG) is a medical technique for evaluating and recording physiologic properties of muscles at rest and while contracting. For nerve conduction studies (NCS) studies, a noninvasive stimulator applies brief electrical impulses to a peripheral nerve transcutaneous, the nerve then transmits the impulse and a response is recorded by electrodes at some distance away. The time it takes for the stimulus to reach the recording electrodes is called as latency. It can be accurately measured and a velocity of transmission calculated. Healthy nerves will transmit the electrical impulse faster than diseased ones.

9. List the different types of Micro electrodes.

- Metal microelectrodes • Supported metal micro electrodes and Micropipette electrodes

10. List the different types of internal electrodes.

- Wire loop electrode • Silver sphere cortical electrode and Multi element depth electrode

UNIT – III

1. What is korotkoff sound?

When cuff is inflated to a pressure that only partially occludes the brachial artery turbulence is generated in the blood as it spurts through the tiny arterial opening during each systole. The sounds generated by this turbulence are called korotkoff sounds.

2. What are the methods used to measure blood pressure directly?

Catheterization method involving the sensing of blood pressure through a liquid column. In this method the transducers is external to the body and blood pressure is transmitted through a saline solution column in a catheter to this transducers. This method also involves the placement of transducers through a catheter at the actual site of measurement in the blood stream. Percutaneous methods in which the blood pressure is sensed in the vessel just under the skin by the use of a needle or catheter. Implantation technique in which the transducer is more permanently placed in the blood vessel.

3. What is the principle of Plethysmograph?

Principle of operation of plethysmograph depends on Boyle's law. Boyle's law states that at a given Kelvin temperature the pressure of given mass of the gas is inversely proportional to its volume. ($P \cdot Vol = K \cdot \text{temp}$).

4. What is the principle of electromagnetic flow meter?

Electromagnetic blood flow meter is based on the principle of magnetic induction. A permanent magnet or electromagnet positioned around the blood vessel generates magnetic field perpendicular to the direction of blood flow

5. Discuss about the origin of heart sounds.

With each heart beat the normal heart produces two distinct sounds described as “Lub-Dub”. The lub is caused by the closure of the atrioventricular valves, which permits flow of blood from the atria into the ventricles .this is called the first heart sound, it occurs approximately at the time of the QRS complex of the electrocardiogram. The dub part of the heart sounds is called the second heart sound and is caused by the closing of the semilunar valves, occurs about the time of the end of the T wave of the cardiogram. A third heart sound is heard especially in young adults. Atrial heart sound is not audible and it occurs when the atria do not contract.

6. What is Fluorescence?

Certain chemicals when illuminated by light with a short wavelength in the ultraviolet (UV) range emit light with a longer wavelength. This phenomenon is called fluorescence

7. Give the methods for measuring blood flow.

• Indirect method – sphygmomanometer. • Direct method • Percutaneous insertion • Catheterization (vessel cut down) • Implantation of a transducer in a vessel or in the heart.

8. What is cardiac output and its normal rate?

Blood flow is highest in the pulmonary artery and the aorta, where the blood vessels leave the heart. The flow at these points is called cardiac output, is between 3.5 and 5liters/min in a normal adult at rest.

9. What are the methods involved in direct blood pressure measurement?

• Auscultator method • Palpatory method

10. Give the principle of transduction of heart sounds.

The sounds and murmurs which originate from the heart can be picked up from the chest using stethoscope or by transduction of heart sounds in to electrical signal.

UNIT – IV

1. Define nuclear magnetic resonance signal.

A patient in an external magnetic field causes the magnetization of protons of hydrogen atoms in his body. Due to magnetization, these protons align and precess about the external magnetic field, now a radiofrequency pulse at resonance frequency is transmitted into the patient under controlled condition. The resonance condition proton responds by emitting radiofrequency signal. This is called nuclear magnetic resonance signal.

2. What is Biotelemetry?

Bio-telemetry is the electrical technique which permits examination of the physiological data of man or animal under normal conditions and in natural surroundings without discomfort to the patient under investigation.

3. What is a single channel radio telemetry system?

In single channel telemetry a miniature battery operated radio transmitter is connected to the electrodes of the patients. This transmitter broadcasts the bio potential to a remotely located receiver, which detects and recovers the radio signals for further processing. FM or AM transmission is used.

4. Define – radio pill.

It is a pill that contains a sensor plus a miniature transmitter is swallowed and the data are picked up by a receiver and recorded. Such radio pills are used to monitor stomach pressure or pH.

5. What is micro shock?

A physiological response to a current applied to the surface of the heart that results in unwanted stimulations like muscle contractions or tissue injury is called micro shock. It is caused when currents greater than $10\mu\text{A}$ flow through an insulated catheter to the heart. Proper protection circuits should be used to overcome the micro shocks.

6. What is macro shock?

A physiological response to a current applied to the surface of the body that produces unwanted stimulation like muscle contraction or tissue injury is called macro shock. Taking the least body resistance to be 1K ohms the inter electrode voltage on the order of 75-120V could be dangerous

7. What is a Defibrillator?

A defibrillator is an electronic device that creates a sustained myocardial depolarization of a patient's heart in order to stop ventricular fibrillation or atrial fibrillation.

8.. What is thermograph?

The human skin is almost a perfect emitter of infrared radiation proportional to the surface temperature at any location of the body. Thermograph is an infrared thermometer incorporated into a scanner so that the entire surface of a body or some portion of the body is scanned and the infrared energy is measured and used to modulate the intensity of a light beam that produces a map of the infrared energy on photographic paper.

9. What is endoscopy?

It is a tubular optical instrument to inspect or view the body cavities, which are not visible to the naked eye normally. Gastro-intestinal, fiberoscope (intestinas), Broncho fiberoscope (trachea), Laparoscope (abdomen), Sigmoidoscope (rectum), Cystoscope (urinary bladder) etc.

10. What is desiccation?

The needlepoint electrode are struck into the tissue and kept steady while passing electric current. This creates a high local increase in heat and drying of tissues. This is called desiccation which produces dehydration in the tissues.

UNIT – V

1. What is the cardiac pacemaker and why is it used?

It is an electrical stimulator that produces periodic electric pulses that are conducted to electrodes located on the surface of the heart (Epicardium), within the muscle (myocardium) or within the cavity or the lining of the heart (Endocardium).

2. What is meant by Atrial Synchronous Pacemaker?

It detects the electrical signal corresponding to the contraction of atria and uses appropriate delays to activate a stimulus pulse to the ventricles. 6. What is cardiac fibrillation? It is a condition wherein the individual myocardial cells contract asynchronously with only very local

3. What is ventilator?

Ventilator is a device used in intensive care unit to provide oxygen enriched, medicated air to a patient at a controlled temperature. Ventilators can operate in different modes: Controlled mode and assist mode.

4. Define Dialysis.

It is used in the treatment of acute or chronic renal (kidney) failure. It is a process which involves removal of waste products from blood and obtaining normal pH.

5. Define the term Electrotherapy.

Simulators are used for treatment of paralysis with totally or partially denervated muscles, for the treatment of pain, muscular spasm and peripheral circulatory disturbances. This technique is called Electrotherapy which uses low volt, low frequency impulse currents.

6. Define Hemodialysis.

It is the removal of chemical substances form the blood by passing it through tubes made of semipermeable membrane.

7. What is Diathermy?

The term Diathermy means „through heating“ or producing deep heating directly in the tissues of the body. In the practice of physiotherapy, diathermy is used for producing heat stimulus by application of high frequency energy.

8. What are the advantages diathermies?

- The subject's body becomes a part of the electrical circuit and heat is produced within the body and not transferred through the skin.
- The treatment can be controlled precisely. Careful placement of the electrodes permits localization of the heat to the region to be treated

9. What is microwave diathermy?

Microwave diathermy involves the process of irradiating tissues of the patient's body with very short wireless waves having frequency in the microwave region. Typically, the frequency used is 2450 MHz corresponding to a wavelength of 12.25 cm. Heating effect is produced by the absorption of the microwaves in the region of the body under treatment.

10. What is the principle of ultrasonic diathermy?

In this method, the heating effect is produced because of the ultrasonic energy absorption property of the tissues. The amount of energy absorbed by the tissues is depending upon the frequency of ultrasonic waves from a conventional crystal oscillator.

11. What are cerebellar stimulators?

In case of epilepsy, chronic stimulation to the cerebellum is provoked by transcutaneous inductive coupling, through an antenna fixed subcutaneously on the chest. The electrodes are placed on anterior or posterior lobe of cerebellum. Such stimulators are called cerebellar stimulators