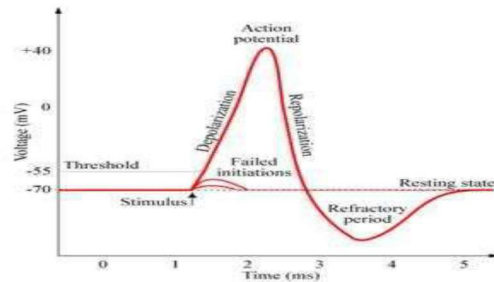


TWO MARKS

1. Define Resting Potential and Action Potential

Resting potential is defined as the electrical potential of an excitable cell relative to its surroundings when not stimulated or involved in passage of an impulse. It ranges from -60mV to -100mV

Action potential is defined as the change in electrical potential associated with the passage of an impulse along the membrane of a cell.



2. Define – Conduction Velocity

Conduction velocity is defined as the rate at which an action potential moves down a fiber or is propagated from cell to cell. It is also called as Nerve conduction rate.

3. Write down the Nernst equation of action potential.

An equation relating the potential across the membrane and the two concentrations of the ion is called Nernst equation.

$$E_{hc} = -\frac{RT}{nF} \ln \frac{C_1 \cdot f_1}{C_2 \cdot f_2}$$

Where,

R – gas constant (8.315 x 10⁷ ergs/mole/degree Kelvin)

T – absolute Temperature, degrees Kelvin

n – valence of the ion (the number of electrons added or removed to ionize the atom)

F – Faraday constant (96,500 coulombs)

C₁, C₂ – two concentrations of the ion on the two sides of the membrane

f₁, f₂ – respective activity coefficients of the ion on the two sides of the membrane

4. State all or none law in respect of cell bio potential.

Regardless of the method by which a cell is excited or the intensity of the stimulus, the action potential is always the same for any given cell.

5. List the types of bioelectric potentials.

Bio electric potential related to

Heart – ElectroCardioGram (ECG)

Brain – ElectroEncephaloGram (EEG)

Muscle – ElectroMyoGram (EMG)

Eye (Retina) – ElectroRetinoGram (ERG)

Eye (Cornea - Retina) – ElectroOculoGram (EOG)

6. Define electrode and list its types.

The devices that convert ionic potential into electronic potential are called as electrode.

The types of electrode are

- a) Micro electrode
- b) Depth and needle electrode
- c) Surface electrode

7. What are perfectly polarized and perfectly non polarized electrodes?

Electrodes in which no net transfer of charge occurs across the metal electrolyte interface is called perfectly polarized electrode.

Electrodes in which unhindered exchange of charge occurs across the metal electrolyte interface is called perfectly non polarized electrode.

8. What are the types of electrodes used in bipolar measurement?

The types of electrodes used in bipolar measurement are

- a) Limb electrodes
- b) Floating Electrodes
- c) Skin electrodes

9. Name the electrodes used for recording EMG and ECG.

Electrodes used for recording EMG are:

- a) Needle electrodes
- b) Surface electrodes

Electrodes used for recording ECG are:

- a) Limb electrodes
- b) Floating Electrodes
- c) Pregelled disposable electrodes
- d) Pasteless electrodes

10. State the importance of biological amplifiers.

Bio signals such as ECG, EMG, EEG, EOG have low amplitude and low frequency. So, amplifier is used to boost the amplitude level of bio signals.

11. What are the requirements for bio-amplifiers?

Bio amplifiers must have

- a) High input impedance
- b) Isolation and protection circuit
- c) High voltage gain
- d) Constant gain throughout required bandwidth
- e) Low output impedance and High CMRR

12. List the lead systems used in ECG recording.

The lead systems used in ECG recording are

- a) Bipolar Limb leads or Standard leads
- b) Augmented unipolar limb leads
- c) Chest leads or precordial leads

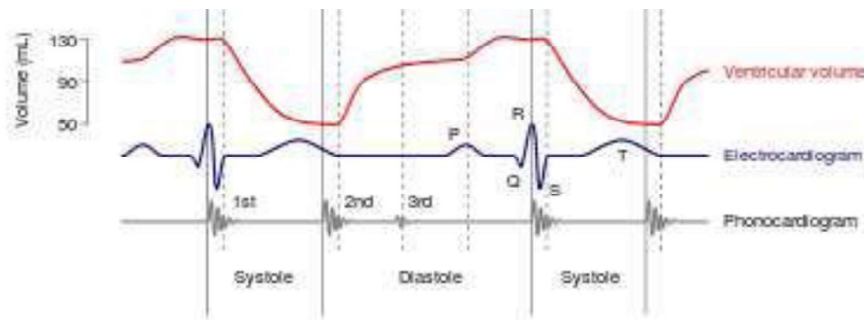
13. What is evoked potential?

The external stimuli are detected by the sense organs which cause changes in the electrical activity of the brain. Due to this, potential is developed in the brain as the response to external stimuli like light, sound etc. It is called as evoked potential.

14. What is PCG?

A Phonocardiogram or PCG is a graphic display of the sounds generated by the heart and picked up by a microphone at the surface of the body. Frequency response required is 5 to 2000 Hz. It is measured by special transducer or microphone.

15. Compare the signal characteristics of ECG and PCG.



ECG wave occurrence

- QRS Complex
- End of T wave
- Beginning of P wave

PCG wave occurrence

- 1st heart sound
- 2nd heart sound
- 3rd heart sound

16. What is EOG?

Electrooculogram is the measure of the variations in the corneal – retinal potential as affected by the position and movement of eye. The EOG potentials are picked up by small surface electrodes placed on the skin near the eye.

17. State the importance of PCG signals.

The importance of PCG signals are

- a) Different types of heart sounds are measured.
- b) Additional sounds are heard between normal heart sound due to vibration setup in the blood inside the heart by sudden closure of valves.
- c) The presence of higher frequencies (murmurs) in the phonocardiogram indicates a possible hear disorder such as Aortic stenosis, Mitral regurgitation, mitral stenosis

18. Define latency as related to EMG.

Latency is defined as the elapsed time between the stimulating impulse and the muscle action potential. In other words it is the time delay between stimulus and response

19. What are the peak amplitude and frequency response for ECG, EEG and EMG.

Bioelectric potential	Function	Peak amplitude	Frequency response	Observation
ElectroCardioGram (ECG)	Records electrical activity of heart	0.1 to 4mV	0.05 to 120 Hz	Used to measure heart rate, arrhythmia and abnormalities
ElectroEncephaloGram (EEG)	Records electrical activity of brain	2 to 200 μ V	0.1 to 100 Hz	Used to analysis evoked potential, certain patterns, frequency response
ElectroMyoGram (EMG)	Records muscle potential	50 μ V to 1mV	5 to 2000 Hz	Used as indicator of muscle action for measuring fatigue

16 MARKS

1. Explain the factors that influence the design and application of a medical instruction system / Discuss the different characteristics of a medical instrument system. (8)
2. Explain with a block diagram the components of the bio-medical instrument system(8)
3. Explain in detail about EMG.(8)
4. With a neat block diagram, explain the working of ECG recorder(8)
5. Discuss the different lead configuration used in ECG(12)
6. Draw the block diagram of an EEG unit and explain the different parts in it(8)
7. Give the origin of brain waves and describe the 10-20 electrode (or) placement of electrode(8)
8. Explain the origin of different heart sounds(6)
9. Draw the circuit diagram of an ECG isolation amplifier and explain its operation(8)
10. Explain in detail about biopotential or bioelectric or physiological electrodes.(16)
11. Explain in detail about origin or sources of biopotential.(8)
12. Explain in detail about PCG.(16)
13. Discuss the different types of biological amplifier.(16)