* The amplitude range of ECG is 0.1-5 μV, the frequency range of ECG is 0.05-120 Hz.
* Sino-atrial node 🡪 regroup of cells that facilitate the ECG process and act as the pacemaker of the heart. It is located near the top right atrium near venacava (top right corner of the human heart)
* Generates impulses at rate of 72 beats/minute
* It produces the required stimulus for the migration of ions (cations, sodium, na+, potassium, k+, chloride CL-) 🡪 produces electric potential
* In resting place, the cardiac cell 🡪 negative charge along the inner surface + positive along the outer
* Unequal distribution of opposite charged ions 🡪 electric potential called resting potential equal to -90mV🡪 The cell is in a state called polarized state
* Stimulated cell 🡪 outer surface momentarily negative + inner surface momentarily positive 🡪 migration of charge 🡪 gives rise to a potential called action potential equal to 20mV 🡪 Process called depolarization
* Afterwards, the cell returns to idle state 🡪 Called repolarization
* The time required between depolarization and repolarization is called refractory period

**SOURCE:** <https://www.youtube.com/watch?v=1K4ASqq0Rhk&ab_channel=ENGINEERINGTUTORIAL>

*Cancellation of 60/50 Hz Interference in an ECG Signal*

* Main problem of ECG recording 🡪 an interference of 50-60 Hz that is observed in the output 🡪 Need for cancellation
* Adaptive noise cancellation : primary input to filters is from the ECG pre-amplifier, reference (secondary) input is from the wall outlet with AC 60 Hz modulation
* The adaptive filter has 2 weights
  + Original
  + Adapted by noise cancellation   
    Separately weighted 🡪 form the output of the filter, which is subtracted from the primary input
* The weight are varied according to the LMS algorithm
* This enables the reference input to change both in magnitude and phase so that the integrating 60 Hz signal of ECG is effectively cancelled

*Cancellation of ECG Signal from the Electrical Activity of the Chest Muscles*

* By placing surface electrodes on the external inter-costal muscle 🡪 electromyographic (EMG) interference pattern that distinguishes a normal subject and a non-healthy subject, e.g. suffers from COPDS
* The acquisition of a clean (free from interfering cardiac potentials) is difficult because of the generator activity of the heart
* Spectral analysis of cardiac and myoelectric activity 🡪 overlap of spectra between 1-5 Hz 🡪 can’t use linear filter
* Both EMG and ECG signals are sampled at 500 Hz

**SOURCE:** <https://www.youtube.com/watch?v=B5Nc4u9RAXI&ab_channel=CourseonBiomedicalSignalProcessing>