



**ST. ANNE'S**  
**COLLEGE OF ENGINEERING AND TECHNOLOGY**  
(Approved by AICTE, New Delhi.)  
Affiliated to Anna University, Chennai)  
(An ISO 9001:2015 Certified Institution)  
ANGUCHE TYPALAYAM, PANRUTI – 607 106.

**QUESTION BANK**

PERIOD: JULY 2021–DEC 2021

BATCH: 2019-2023

BRANCH: ECE

YEAR/SEM: III/V

SUBJECT: EC8073 MEDICAL ELECTRONICS

**UNIT – I – ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING**

**PART – A**

**1. Define Resting Potential and Action Potential.[D][April/May 2015]**

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. What is meant by Skeletal muscle.[D][May/June-2014]**

It is a form of striated muscle tissue which is under the voluntary control of the somatic nervous system. It is one of three major muscle types, the others being cardiac muscle and smooth muscle. Most skeletal muscles are attached to bones by bundles of collagen fibers known as tendons.

**3. Define Electrodes and list its types . [D] [May/June-2013]**

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

**4. Define CMRR. Give its importance in physiological signal amplifiers? .[D] [Nov/Dec-2014]**

CMRR is capability of amplifier to reject common mode interference signals like power line interference.  $CMRR = \frac{\text{Amplitude of common mode signal}}{\text{Amplitude of differential bio signal}}$ .

**5. What are the types of electrodes used in bipolar measurement? .[D]**

The types of electrodes used in bipolar measurement are

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

**6. Name the electrodes used for recording EMG and ECG. . [D] [May/June-2014, 16] [APR/MAY2019]**

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) Paste less electrodes

**7. State the importance of biological amplifiers. [D] [May/June-2013]**

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.

**8. What are the requirements for bio-amplifiers? .[D] [Nov/Dec-013]**

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

**9. Differentiate micropipette and metal microelectrode?[Nov/Dec-2018]**

Metal Microelectrode

The tungsten filament or stainless steel wire made into minute structure forms the tip of the microelectrode. The insulating material covers the entire electrode for safety purpose.

Non - Metal Microelectrode (Micro pipet)

This electrode uses Non - metallic material to measure the potential from a single cell. It consists of glass micropipette of diameter 1 micrometer. Stem of Micro pipet has a thin flexible wire made out of chloride silver, stainless steel or tungsten.

**10. Compare the signal characteristics of ECG and PCG ? (May/June-2013) PCG: Graphical record of sounds produced by heart muscle activities.**

ECG: Graphical record of electrical potential produced by heart muscle activities.

**11. What is PCG? [D] [Nov/Dec-2013]**

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.

**12. List the characteristics needed for bio amplifier? [D] [May/June-2013]**

Voltage gain should be more than 100dB. Gain and frequency response should be uniform throughout required bandwidth. Input impedance should be very high. CMRR should be very high (>80dB)

**13. State the importance of PCG signals. [D] [May/June-2013,16]**

The importance of PCG signals are

- a) Different types of heart sounds are measured.
- b) Additional sounds are heard between normal heart sounds 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.

**14. State all or none law. [D] [Nov/Dec-2016]**

In nerve and muscle cells, depolarization occurs so rapidly following depolarization that the action potential appears as a spike of 1 ms total duration. But for heart, action potential is from 150 to 300 ms and so it re-polarises much more slowly. When a cell is excited, the action potential is always the same for any given cell. This is known as all-or nothing law.

**15. What is meant by conduction velocity? [D] [Nov/Dec-2016]**

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.

**16. List the types of bioelectric potentials. [D] [APR/MAY2019]**

Bio electric potential related to

- Heart – ElectroCardioGram (ECG)
- Brain – ElectroEncephaloGram (EEG)
- Muscle – ElectroMyoGram (EMG)
- Eye (Retina) – ElectroRetinoGram (ERG)
- Eye (Cornea - Retina) – ElectroOculoGram (EOG)

**17. Define electrode and list its types. [D]**

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

**18. What are perfectly polarized and perfectly non polarized electrodes? [D]**

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.

**19. What are the types of electrodes used in bipolar measurement? [D] [May/June- 2017]**

The types of electrodes used in bipolar measurement are

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

**20. What are the requirements for bio-amplifiers? [D]**

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
- f) High CMRR.

**21. What are the basic components of biomedical systems? [D]**

The basic components are

- a) Patient
- b) Transducer
- c) Signal processing equipment
- d) Display
- e) Control unit
- f) Stimulus.

**22. What is PCG? [D] [May/June- 2012], [Nov/Dec -2012]**

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.

**23. State the importance of PCG signals. [D] [May/June 2009]**

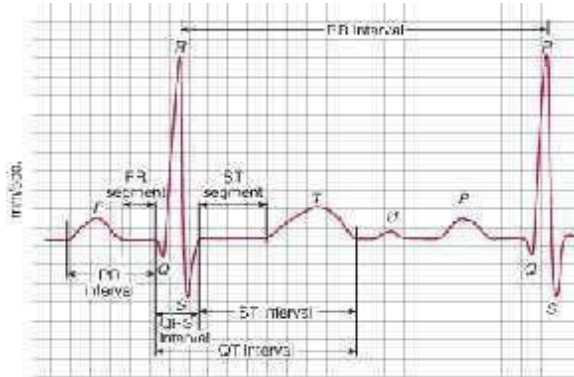
The importance of PCG signals are

- 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 in the phonocardiogram indicates a possible hear disorder such as Aortic stenosis, Mitral regurgitation, mitral stenosis etc.

**25. Define latency as related to EMG. [ID] [Nov/Dec 2008] [Nov/Dec 2019]**

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

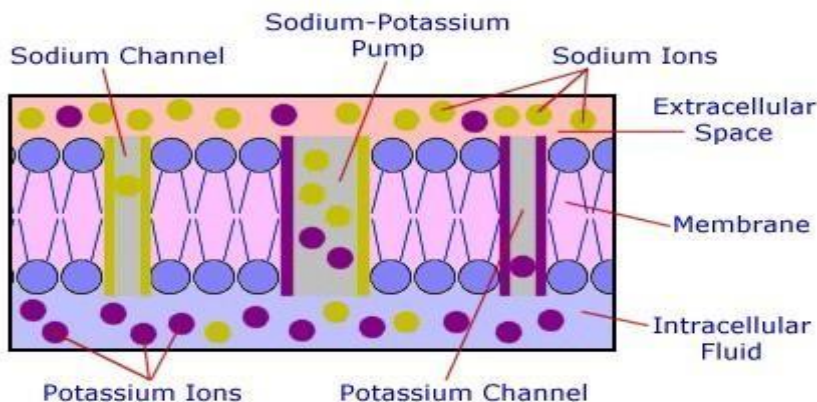
**26 Draw typical ECG waveform. [D] [Nov/Dec 2009][May/June 2007 ]**



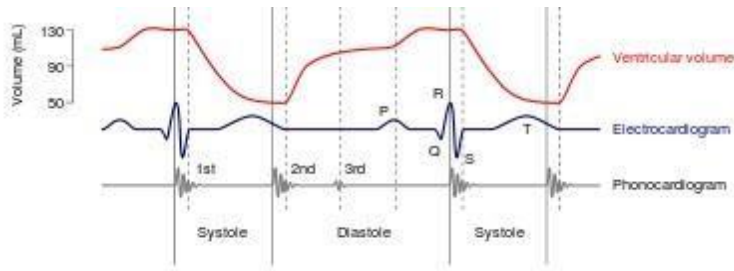
Wave	Amplitude (mV)	Duration (sec)
P	0.25	0.12 – 0.22 (P – R interval)
R	1.06	0.07 – 0.1
T	0.1 – 0.5	0.05 – 0.15 (S – T segment)
QRS Complex	-	0.09

**27. What is meant by sodium pump? [D]**

Sodium pump is an active process in which sodium ions are quickly transported to the outside of the cell and the cell again becomes polarized and assumes its resting potential.



**28. Compare the signal characteristics of ECG and PCG. [D] [Nov/Dec – 2011]**



ECG wave occurrence	PCG wave occurrence
QRS Complex	1st heart sound
End of T wave	2nd heart sound
Beginning of P wave	3rd heart sound

**29. Define latency as related to EMG. [D] [Nov/Dec –2008]**

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

**30. The contraction of skeletal muscle is termed as what? Give its specifications. [ID] [May/June – 2014]**

The contraction of skeletal muscle is termed as Electromyogram.

Specification:

Signal ranges – 0.1 to 0.5 mV

Frequency component – 20 Hz to 10 kHz

The surface electrode picks up many overlapping spikes and produces an average voltage from various muscles and motor units.

**31. Define relative refractory period. [D] [Nov/Dec2018]**

Medical Definition of relative refractory period. : the period shortly after the firing of a nerve fiber when partial repolarization has occurred and a greater than normal stimulus can stimulate a second response — compare absolute refractory period.

**32. What are the important bands of frequencies in EEG and state their importance. [Nov/Dec2019]**

Delta: has a frequency of 3 Hz or below. ...

Theta: has a frequency of 3.5 to 7.5 Hz and is classified as "slow" activity. ...

Alpha: has a frequency between 7.5 and 13 Hz. ...

Beta: beta activity is "fast" activity.

An electroencephalogram (EEG) is a noninvasive test that records electrical patterns in your brain. The test is used to help diagnose conditions such as seizures, epilepsy, head injuries, dizziness, headaches, brain tumors and sleeping problems. It can also be used to confirm brain death.

PART – B  
[First Half]

THE ORIGIN OF BIO-POTENTIALS

1. Discuss in detail about the origin of action potential and resting potential with necessary equations.(13) [D] [Nov/Dec 2013] [May/June 2016] [APR/MAY2019]
2. Discuss in detail about the origin of bio potential and resting potential with necessary equation. (16) [D] [Nov/Dec 2014)] [May/June 2016]

**BIO-POTENTIAL ELECTRODES:**

3. Discuss the different types of surface electrodes and its application.(16) [D] [Nov/Dec2017,18].
4. What is known as biopotential electrodes? Draw its equivalent circuit. Explain various types of biopotential electrodes with suitable diagram. (16) [D] [Nov/Dec 2016] [Nov/Dec 2019]

or

5. Explain in detail about biopotential or bioelectric or physiological electrodes. [D]

**BIOLOGICAL AMPLIFIERS**

6. With a suitable circuit diagram, explain the instrumentation amplifier. (8) [D] [D] [Nov/Dec 2017].
7. List and discuss the important characteristics of bio amplifier.(6) [Apr/May 2017]
8. With circuit diagram explain the differential amplifier?(8) [D]
9. With circuit diagram explain the operational amplifier?(8) [D]
10. With circuit diagram explain the chopper and isolation amplifier?(13) [D] [Nov/Dec 2018].

[Second Half]

**ECG-LEAD SYSTEMS AND RECORDING METHODS, TYPICAL WAVEFORMS AND SIGNAL CHARACTERISTICS**

11. Discuss the genesis of ECG and explain the working of an ECG machine with Suitable block diagram along with its various lead configurations. [D][Nov/Dec 2019]
12. (i) Explain the international standard 12 lead system used to record ECG. [ID] (10)[Apr/May2017]  
(ii) With a neat block diagram, explain the working of ECG recorder (8) [D] [May/June-2013,14][Nov/Dec-2014,16]
13. Describe the standard 12 lead configuration used in ECG and also describe the typical ECG waveform. [ID] [Nov/Dec-2014] [May/June-2016] (8)

OR

14. With the neat diagram explain the formation of various Lead systems used for recording ECG. [D] (16) [May/June-2013,14] [Nov/Dec 2018].

**15.** Draw the circuit diagram of an ECG isolation amplifier and explain its operation. [D] (8)  
(May/June-2014)

**16.** Draw the typical ECG waveform with its characteristics. (13) [APR/MAY 2019]  
EEG-LEAD SYSTEMS AND RECORDING METHODS, TYPICAL  
WAVEFORMS AND SIGNAL CHARACTERISTICS

**16.** Give the origin of brain waves and describe the 10-20 electrode system used in  
EEG. (8) [D] [Nov/Dec 2017]

**17.** Discuss in detail about the 10-20 lead system. (10) [D] [Apr/May 2017]

**18.** List and discuss the characteristics and frequency bands of EEG signal. (6) [D] [Apr/May  
2017]

**19.** Draw the block diagram of an EEG unit and explain the different parts in it. (8) [D]

**20.** Give the origin of brain waves and describe the 10-20 electrode (or) placement  
of electrode. [ID]

(or)

**21.** Discuss the characteristics and frequency bands of EEG  
Signal. (8) [D] (May/June 2016) (Nov/Dec-2013)

EMG-RECORDING METHODS, TYPICAL WAVEFORMS AND SIGNAL  
CHARACTERISTICS

**22.** Describe in typical EMG wave form and its characteristics. (6) [D] [Apr/May 2017]

(Or)

**23.** Explain in detail about EMG. (8) [D] (May/June-2013, (May/June-2016)

PCG-LEAD SYSTEMS AND RECORDING METHODS, TYPICAL WAVEFORMS  
AND SIGNAL CHARACTERISTICS

**26.** Explain in detail about PCG. (May/June-2014) (16) [D]

Explain the origin of different heart sounds. (8) [D]

## UNIT -2 – BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT

### PART – A

**1) What are the typical values of blood pressure and pulse rate of an adult? [ID]**

Systolic (maximum) blood pressure in the normal adult is in the range of 95 to 145 mm Hg, with 120 mm Hg being average. Diastolic (lowest pressure between beats) blood pressure ranges from 60 to 90 mm Hg, 80 mm Hg being average.

**2) What are systolic and diastolic pressures? [D] [Nov/Dec-2013]**

The heart's pumping cycle is divided into two major parts: systole and diastole. Systole is defined as the period of contraction of the heart muscles, specifically the ventricular muscle, at which time blood is pumped into the pulmonary artery and the aorta. Systolic pressure is 120 mm Hg (average value). Diastole is the period of dilation of the heart cavities as they fill with blood. Diastolic pressure is 80 mm Hg (average value).

**3) State Beer's law. [D] [Nov/Dec-2016]**

A law stating that the concentration of an analyte is directly proportional to the amount of light absorbed, inversely proportional to the logarithm of the transmitted light.

Beer's law

$$A = abc = \log(100/\%T) - \log \%T$$

where:

A = absorbance  
a = absorptivity

b = light path of the solution in cm

c = concentration of the substance of interest

%T = per cent transmittance—the ratio of transmitted LIGHT TO INCIDENT

**4) State the principle behind the indicator dilution method. [D]**

The indicator dilution method is based on the principle that a known amount of dye or radio isotope as an indicator is introduced with respect to time at the measurement site, so the volume flow of blood can be estimated.

**5) What is residual volume and Tidal Volume? [D]**

Residual volume is the volume of gas remaining in the lungs at the end of

Maximum expiration. Tidal volume is also called as normal depth volume of breathing or is the volume of gas inspired or expired during each normal quiet respiration cycle.

**6) What is total lung capacity and vital capacity? [D]**

Lung capacity

The total lung capacity is the amount of gas contained in the lungs at the end of maximal inspiration.

Vital Capacity

The vital capacity (VC) is the maximum volume of gas that can be expelled from the lungs after a maximal inspiration.

**7) What are the applications of flame photometer? [D]**

Flame photometer is used to analyze urine or blood in order to determine the concentration of potassium (K), sodium (Na), calcium (Ca) and lithium (Li).



**8) What are the typical values of blood pressure and pulse rate of an adult? [D] [Nov/Dec-12] [APR/MAY2019]**

.Systolic blood pressure in the normal adult is in the range of 95-145mm Hg, with 120mm Hg being average. Diastolic blood pressure ranges from 60-90mm Hg, 80mmHg being average.

**9) Define Flick's Principle? [D] [Nov/Dec-2014]**

The Fick principle states that uptake or release of a substance by any organ is the product of the arteriovenous (A-V) concentration difference of the substance and the bloodflow to that organ.

**10) What are korotkoff sounds? [D]**

In the Blood pressure (BP) measurement, when the systolic pressure exceeds the cuff pressure, then the doctor can hear some crashing, snapping sounds through the stethoscope. These sounds are called as korotkoff sounds.

**11) What is cardiac output? What are the methods of measurement of cardiac output? [D] [Nov/Dec-2014,16][May/June 2015]**

Cardiac output is the amount of blood delivered by the heart to the aorta per minute. For normal adult, the cardiac output is 4- 6 liters /min. The cardiac output is measured by using three methods. They are Fick's Method, Indicator dilution method, Measurement of cardiac output by impedance change.

**12) What are the two methods of pulse measurement? [D]**

The methods used for measuring pulse are transmittance and reflectance methods.

**13) What is cardiac output? What is the value of cardiac output if the stroke volume is 7ml and heart rate is 70 BPM. [D] [May/June 2016]**

Cardiac output (Q) = stroke volume (SV) x heart rate (HR)  
=70 x 70= 4900 ml/minutes.

**14. What is electrophoresis? [D] [April/May2010] [Nov/Dec 2019]**

Electrophoresis is a method for separating and analyzing macromolecular substances such as plasma proteins. The method is based on the fact that, the molecules carry electric charges and therefore migrate in a electric field.

**15. What is the purpose PO2 electrode is used? [D]**

PO2 electrode is used to determine the oxygen tension in the blood. It is a piece of platinum wire embedded in an insulating glass holder with the end of wire exposed to the electrolyte into which the oxygen from the solution under measurement is allowed to diffuse through the membrane.

**16. What are the uses of gas analyzers? [D] [Nov/Dec 2019]**

Gas analyzers are used to determine the quantitative composition of inspired and expired gas to assess the lung function.

**17. What are the applications of flame photometer? [D] [Nov/Dec2009]**

Flame photometer is used to analyze urine or blood in order to determine the concentration of potassium (K), sodium (Na), calcium (Ca) and lithium (Li). Blood flow meters are used to monitor the blood flow in various blood vessels and to measure cardiac output.

**18. Write the principle behind electromagnetic blood flow meters . [ID]**

The principle behind electromagnetic blood flow meter is Faraday's law of induced emf. When a magnetic field is applied to a blood vessel, the blood flow in the vessel causes an electric field to be induced in a direction mutually perpendicular to the direction of the applied magnetic field and the blood velocity.

**19. What is the reason for decrease of cardiac output? [D]**

The reason for decrease of cardiac output may be due to low blood pressure, reduced tissue oxygenation, poor renal function, shock and acidosis.

**20. Define – Cardiac Output . [D]**

Cardiac output is defined as the amount of blood delivered by the heart to the aorta per minute. In case of adults during each beat, the amount of blood pumped ranges from 70 to 100 ml. for normal adults the cardiac output is about 4- 6 liters/ minute.

**21 What is cardiac output? What are the methods of measurement of cardiac output? [D]  
[Nov/Dec2004] [APR/MAY2019]**

Cardiac output is the amount of blood delivered by the heart to the aorta per minute. For normal adult, the cardiac output is 4- 6 litres/min. The cardiac output is measured by using three methods. They are Fick's Method, Indicator dilution method, Measurement of cardiac output by impedance change.

**22. How is cardiac output is used? [D]**

Using implanted electromagnetic fine probe on the aorta, find the cardiac output per minute directly can be found by multiplying the stroke volume with the heart beat rate per minute.

**23. State the principle behind the indicator dilution method. [D]**

The indicator dilution method is based on the principle that a known amount of dye or radio isotope as an indicator is introduced with respect to time at the measurement site, so the volume flow of blood can be estimated.

**24 What is residual volume? [D] [May/June – 2007]**

Residual volume is the volume of gas remaining in the lungs at the end of maximum expiration.

**25 Define – Tidal Volume. [D]**

Tidal volume is also called as normal depth volume of breathing or is the volume of gas inspired or expired during each normal quiet respiration cycle.

**26. What is total lung capacity? [D]**

The total lung capacity is the amount of gas contained in the lungs at the end of maximal inspiration.

**27. Define – Vital Capacity . [D]**

The vital capacity (VC) is the maximum volume of gas that can be expelled from the lungs after a maximal inspiration.

**28. What are the typical values of blood pressure and pulse rate of an adult? [D]  
[Nov/Dec2012]**

Systolic (maximum) blood pressure in the normal adult is in the range of 95 to 145 mm Hg, with 120 mm Hg being average. Diastolic (lowest pressure between beats) blood pressure ranges from 60 to 90 mm Hg, 80 mm Hg being average.

**29. What are systolic and diastolic pressures? [D] [Nov/Dec2011]**

The heart's pumping cycle is divided into two major parts systole and diastole. Systole is defined as the period of contraction of the heart muscles specifically the ventricular muscle at which time blood is pumped into the pulmonary artery and the aorta. Systolic pressure is 120 mm Hg (average value). Diastole is the period of dilation of the heart cavities as they fill with blood. Diastolic pressure is 80 mm Hg (average value).

**31. What are korotk off sounds? [D] [Nov/Dec2008]**

In the Blood pressure (BP) measurement, when the systolic pressure exceeds the cuff pressure, then the doctor can hear some crashing, snapping sounds through the stethoscope. These sounds are called as korotkoff sounds.

**32. What are the two methods of pulse measurement? [D]**

The methods used for measuring pulse are transmittance and reflectance methods.

**34. What are blood cells? [D]**

The blood cells have important functions in our body. The red blood cell is used for the transport of oxygen and carbon dioxide. The white blood cells are part of the body's defense against infections and foreign substances. The platelet is involved in the clotting of blood.

**35. What is the principle of colorimeter? [Nov/Dec 2018]**

A colorimeter is a light-sensitive device used for measuring the transmittance and absorbance of light passing through a liquid sample. The device measures the intensity or concentration of the color that develops upon introducing a specific reagent into a solution.

PART – B  
FIRST HALF

PH, PO<sub>2</sub>, PCO<sub>2</sub>

1. Describe the measurement of PO<sub>2</sub> .(16) [D] [Apr/may 2017],[Nov/Dec 2017]
2. Describe the measurement of pH of blood using pH meter. [D] [May/June-2016] (8)
3. **Explain in detail about chemical electrode.** (12) [D] [Nov/Dec-2013,14]

COLORIMETER, BLOOD FLOW METER, BLOOD PRESSURE

4. Explain the block diagram and working of colorimeter. (8) [D] [April/May 2017]. [APR/MAY2019] [Nov/Dec 2019]
5. Explain the block diagram and working of Auto analyzer (8) [D] [April/May 2017].
6. **Explain the working principle of auto analyzer.** (8) [D] [May/June-2014]
7. From basic principle discuss the working of a pulmonary function analyzer. (16) [D] [May/June-2014]
8. Explain auscultator blood pressure measurement and write its advantages and disadvantages (8) [D] [Nov/Dec 2017]
9. Describe the working principle of electromagnetic blood flow meter (8) [D] [Apr/May 2017] [Nov/Dec 2018] [Nov/Dec 2019]
10. With suitable diagram describe how ultra sound principles are used in measuring the flow of blood. (8) [D] [Apr/May 2017]
11. Define blood pressure. How it can be measured using Sphygmomanometer?(8) [D] [Apr/May2017 ]
12. Explain about blood pressure measurement. (8) [D] [Nov/Dec-2013]
13. What are the different types of ultrasonic blood flow meter? Explain each in detail . (8) [D] [Nov/Dec-2016] [APR/MAY2019]
14. How lung volume can be measured? Explain with necessary diagram (13) [D] [Nov/Dec-2016]

SECOND HALF

CARDIAC OUTPUT

15. Define the term cardiac output? How is cardiac output measured by dilution techniques? explain(8) [D] [Apr /may2017] [Nov/Dec 2018]
16. Discuss about the various methods for determining cardiac output. (16) [D] [May/June-2013]

RESPIRATORY MEASUREMENT

17. Explain the measurement of respiration rate using impedance technique. (8) [D] [May/June2016]
18. Explain how respiration rate can be measured give its normal values.(8) [D] [(Nov/Dec-2014)[May/June-2016]

TEMPERATURE, PULSE, AND BLOOD CELL COUNTERS

- 19.** Briefly describe the working of temperature measurement. **(16) [D]**
- 20.** Explain the working principle of pulse measurement. **(16) [D]**
- 21.** Describe the operation of conductive method blood cell counter with its construction details.**(8) [D] [May/June 16][Nov/Dec-14] [APR/MAY2019]**
- 22.** Explain the principle of operation of Coulter counter. What is its applications.(12)  
**[D] [Nov/Dec-2012]**

UNIT III - ASSIST DEVICES  
PART-A

**1) Give two important factors that demand internal pace maker's usage. [D] [Nov/Dec-2013]**

The two important factors that demand internal pace maker's usage are

- (i). Type and nature of the electrode used
- (ii). Nature of the cardiac problems.
- (iii). Mode of operation of the pacemaker system.

**2) Classify Pacing modes.[D]**

Based on the modes of operation of the pacemakers, they can be classified into five Types. They are:

1. Ventricular asynchronous pacemaker (fixed rate pacemaker)
2. Ventricular synchronous pacemaker.
3. Ventricular defibrillator inhibited pacemaker (demand pacemaker)
4. Atrial synchronous pacemaker.
5. Atrial sequential ventricular inhibited pacemaker.

**3) What is meant by Nitrogen washout? [D] [May/June-2014]**

Nitrogen washout (or Fowler's method) is a test for measuring anatomic dead space in the lung during a respiratory cycle, as well as some parameters related to the closure of airways.

**4) What types of electrodes are used in a defibrillator? [D]**

The electrodes used in a defibrillator are

- (i) Internal electrodes - Spoon shaped
- (ii) External electrodes - Paddle shaped

**5) What is meant by fibrillation? [D]**

The condition at which this necessary synchronism is lost is known as fibrillation.

During fibrillation the normal rhythmic contractions of either atria or the ventricles are replaced by rapid irregular twitching of the muscular wall.

**6) Calculate the energy stored in 16 $\mu$ F capacitor of a DC defibrillator that is charged to a potential of 5000 Vdc. [D]**

Given Data:

$$C = 16\mu\text{F}$$

$$V = 5000$$

$$E = (1/2) CV^2$$

$$= (1/2) 16 \times 10^{-6} \times 25 \times 10^6$$

$$= 200 \text{ Joules}$$

**7) What is meant by Dialyzer? [D]**

Hemodialysis is a method for removing waste products such as creatinine and urea, as well as free water from the blood when the kidneys are in kidney failure. The mechanical device used to clean the patient's blood is called a dialyser, also known as an artificial kidney.

**8) What is meant by AV fistula and AV graft? [D]**

An AV fistula is a direct connection between the patient's artery and one of their nearby veins. This is the absolute BEST access a patient can have because it is all their own tissue. The fistula resists clotting and infection.

An AV graft (sometimes called a bridge graft) is an indirect connection between the artery and vein, most commonly a plastic tube is used, but donated cadaver arteries or veins can also be used.

**9) What is arterio venous (AV) graft surgery? [D]**

Arterio venous (AV) graft surgery creates a synthetic access point into the body's circulatory system to perform dialysis. Dialysis removes wastes and extra fluid from your blood when the kidneys can no longer perform this function. This is known as kidney failure. AV graft surgery allows blood to flow from your body to the dialysis machine and back into your body after filtering.

**10) Define MRI Machine? or What is the need for MRI Machine? [D]**

Cardiopulmonary bypass (CPB) is a technique that temporarily takes over

The function of the heart and lungs during surgery, maintaining the circulation of blood and the oxygen content of the body. The CPB pump itself is often referred to as a heart-lung MACHINE

**11) Draw a diagram of DC defibrillator? [D] [May/June-2014]**

**12) Mention two difference between internal and external defibrillator. [D] [Nov/Dec-2016] [Nov/Dec 2019]**

Internal Defibrillator	External defibrillator
Internal Defibrillator is used when the chest is opened	External defibrillator is used on the chest
It uses large spoon shaped electrodes with insulated handle	It uses paddle shaped electrodes
Contact impedance of electrode is about 50Ω.	Contact impedance of electrode gel is about 100Ω
The current passes through the heart is of 1 to 20A.	The current flowing through the chest is about 10 to 60A

**13. Why asynchronous pacemakers (Fixed rate pacemakers) no longer used? [D] (Nov/Dec-2016)**

- Using fixed rate pacemaker the heart rate cannot be increased
- Simulation with a fixed impulse frequency results in the ventricles and atria beating at different rates. This varies the stroke volume of heart and causes some loss in cardiac output.
- Possibility of ventricular fibrillation will be more.
- There may be competition between the natural heart beats and pacemaker beats.

**14. Give two important factors that demand internal pace maker's usage. [ID] [April/May2005]**

The two important factors that demand internal pace maker's usage are

- (i) Type and nature of the electrode used
- (ii) Nature of the cardiac problems.
- (iii) Mode of operation of the pacemaker system.

**15. Distinguish between Internal and External pacemakers. [D] [Nov/Dec 2019][May/June2007][Nov/Dec2008]**

S.No	Internal Pacemakers	External Pacemakers
1.	The pacemaker is surgically implanted when if the skin near the chest or abdomen, with its output's leads is connected directly to the heart muscle.	The pacemaker is placed outside the body. It may be in the form of wrist watch or in the pocket, from that one terminal will go in the heart through the vein
2.	It requires open chest minor surgery to place the pacemaker	It does not require open chest surgery
3.	It is used for temporary heart regularity	It is used for permanent heart regularity
4.	There is no safety for the pacemaker, particularly in case of child carrying the pacemaker	There is 100% safety for circuit from the external disturbances.

**16. Classify Pacing modes. [D] [Nov/Dec2007]**

Based on the modes of operation of the pacemakers, they can be classified into five types. They are:

- i) Ventricular asynchronous pacemaker(fixed rate pacemaker)
- ii) Ventricular synchronous pacemaker
- iii) Ventri defibrillator inhibited pacemaker (demand pacemaker)
- iv) Atrial synchronous pacemaker
- v) Atrial sequential ventricular inhibited pacemaker.

**17. What are the batteries used for implantable pacemaker? [D] [Nov/Dec2012]**

The batteries used for implantable pacemakers are  
(i)Mercury cell (ii) Lithium cells (iii) Nuclear cell

**18. What is ventilator?[D]**

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 such as controlled mode and assist mode.

**19. What are the types of ventilator?[D]**

Based on the clinical usage ventilators are categorized into two types.

1. Pressure-cycled (positive-pressure assistor) controller
2. Volume-cycled ventilator (volume respirator)

**20. What is the need for ventilator? [D]**

- It is used to provide artificial respiration
- Artificial respiration should be applied to the patient, whenever respiration is suspended due to reasons like gas poisoning, electric shock etc.

**21. What types of electrodes are used in a defibrillator? [D] [April/May2005] [Nov/Dec 2019]**

The electrodes used in a defibrillator are

- (i)Internal electrodes - Spoon shaped
- (ii)External electrodes -Paddle shaped



**22. What is meant by fibrillation? [D] [May/June2009][April/May2010]**

The condition at which the necessary synchronizing action of the heart is lost is known as fibrillation. During fibrillation the normal rhythmic contractions of either atria or the ventricles are replaced by rapid irregular twitching of the muscular wall.

**23. Calculate the energy stored in 16μF capacitor of a DC defibrillator that is charged to a potential of 5000 Vdc. D]**

Given Data:

$$C = 16\mu\text{F}$$

$$V = 5000$$

$$E = (1/2) CV^2$$

$$= (1/2) 16 \times 10^{-6} \times 25 \times 10^6$$

$$= 200 \text{ Joules}$$

**24. What is meant by dialysis? [D]**

Dialysis is a process by which impurities in the blood are removed. The machine used to artificially remove impurities is called kidney machine or hemodialysis machine.

**25. What are the classifications of defibrillator? [D]**

Based on the nature of voltage applied, the defibrillator can be classified into six types.

They are

AC defibrillator

DC defibrillator

Synchronized dc defibrillator

Square pulse defibrillator

Double square pulse defibrillator

Bi-phasic DC defibrillator

**26. List out the methods of dialysis. [D]**

Haemo dialysis and peritoneal dialysis.

**27. Compare hemodialysis and peritoneal dialysis. [D]**

Hemodialysis	Peritoneal dialysis	Hemodialysis
In this method, blood is taken out from the body and the metabolic waste products are removed by using a semi-permeable membrane which is continuously rinsed by a dialyzing liquid or dialysate.	In this method, blood is not taken out from the body; the peritoneal cavity in the human body is used as semi-permeable membrane. A dialysate is passed into peritoneal cavity and metabolic waste products are removed by diffusion.	In this method, blood is taken out from the body and the metabolic waste products are removed by using a semi-permeable membrane which is continuously rinsed by a dialyzing liquid or dialysate.

The process takes 3-6 hours	Peritoneal dialysis takes 9-12 hours or longer.	The process takes 3-6 hours
A technically complex and risky process since the blood is taken out from the body.	Simple method and less risk.	A technically complex and risky process since the blood is taken out from the body.
Effective method.	Less effective when compared to hemodialysis.	Effective method.

**28. Write the advantage of dc defibrillator over ac defibrillator?[Nov/Dec2018]**

AC defibrillator is the oldest and simplest type. The construction of AC defibrillator is such that appropriate values are available for internal and external defibrillation.

DC defibrillator does not produce side effects and produces normal heartbeat. Ventricular fibrillation is avoided when high-energy shock is passed through discharging capacitor that is exposed to heart or chest of the patient.

**29. Mention the important process of diffusion.[May/June 2007]**

The important processes of diffusion are

- a. Diffusion
- b. Osmosis
- c. Ultra filtration.

**30. What are the important parameters of MRI? [D]**

There are three principal MRI parameters. They are,

Spin density

Spin-lattice (Longitudinal) relaxation time,  $T_1$

Spin-spin (or) transverse relaxation time,  $T_2$

**31. What is dialysate? Mention its composition? [Nov/Dec2018]**

Dialysate is one of the two fluids used in dialysis. The other fluid being blood. The term dialysate is borrowed from physical chemistry and refers to fluids and solutes which have crossed a membrane .... This is the general composition of dialysate, but other compounds such as glucose may also be included.

PART – B  
FIRST HALF

**CARDIAC PACEMAKER**

1. Distinguish between Internal and External Pacemaker.(8) [D]
2. Discuss with suitable diagram the various modes of operation of cardiac pacemaker. [D] (16)[May/June 2014] [April/May 2011]
3. Explain the function and characteristics of on various types of demand Pacemaker. [D] [May/June 2014] [Nov/Dec 2012]
4. Explain the working principle of atrial synchronous pacemaker. (or) R-wave inhibited pacemaker (8) [D] [April/may 2017]

5. How pacemakers are classified based on the modes of operation? Draw the block diagram of stand by and demand pacemakers and explain its working principle (16) . [ID] [April/may 2016]
6. Explain briefly on ultrasonic imaging systems [D]
7. Define the term "Cardiac Output". How is cardiac Output measured by dye dilution technique? Explain [D]
8. With a neat diagram explain the block diagram of arterial and ventricular triggered pacemaker. [D]
9. What is pacemaker? Discuss the different modes of operation of cardiac pacemaker in detail. [D] (16)

### **DEFIBRILLATORS**

10. Distinguish between Internal and External Defibrillation. (8) [D] [April/May 2015]
11. Explain DC defibrillators with its types with neat sketch.(13) [D] [April/may 2011, 15, 17][Nov/Dec 2012,14,18][May/June 2012,13]
12. (i)Explain the function of DC synchronized Defibrillator with neat block diagram.(8) [D] [April/May 2011]  
(ii)Explain AC defibrillators with its types with neat sketch.(8) [D]

### **SECOND HALF**

### **VENTILATORS, MAGNETIC RESONANCE IMAGING SYSTEMS, ULTRASONIC IMAGING SYSTEMS.**

13. Explain the principle and working of ventilators (16) [D]
  - 14 Explain briefly on ultrasonic imaging systems [D].(16)
  15. Explain MRI systems in detail.16) [D]
  16. Discuss in detail about Modern ventilators. (8) [D]
- ### **DIALYSIS**
17. Explain in detail the principle block diagram and working of Hemodialysis with neat sketch.(8)[May/June 2016] [Nov/Dec 2018] [D]
  18. Discuss in detail about peritoneal dialysis. (8) [D] [Nov/Dec 2016]
  19. Explain in detail about Dialyser with neat diagram? (or) Explain the working principle of hemodialyser with suitable diagram.(16) [ID] [May/June-2016]
  20. Explain the working principle of peritoneal dialysis.(8) [D] [April/May 2017]
  21. Write short notes on peritoneal dialysis. (8)[D]

UNIT- 4 PHYSICAL MEDICINE AND BIOTELEMETRY  
PART-A

**1. What are the advantages of biotelemetry system? [D]**

The advantages of biotelemetry systems are

- (i). It is used to record the bio signals over long periods and while the Patient is engaged in his normal activities.
- (ii). The medical attendant or computer can easily diagnose the nature of Disease by seeing the telemeter bio signals without attending patient Room
- (iii). Patient is not disturbed during recording.
- (iv). For recording on animals, particularly for research, the biotelemetry is Greatly Used.

**2. What is meant by Demand Pacemaker? [D] [Nov/Dec-2013]**

It is a form of artificial pacemaker usually implanted into cardiac tissue because its output of electrical stimuli can be inhibited by endogenous cardiac electrical activity.

**3. What is a radio-pill? Mention the application. [D] (May/June-2016)**

The radio pill is capable of measuring various parameters. With the help of radio pill type devices, it is possible for use to measure or sense temperature, pH, enzyme activity, and oxygen tension values. These measurements can be made in associated with transducers. Pressure can be sensed by using variable inductance, temperature can be measured by using temperature-sensitive transducer.

**4. What is principle of tele stimulation? [D]. [Nov/Dec 2014]**

Telestimulation is the measurement of biological signals over long distance.

**5. Define Let-go current. [D] [Nov/Dec 2016]**

Let – go current is the minimum current to produce muscular contraction.

For men—about 16mA

For Women—about 10.5 Ma

**6. Define – Micro Shock . [D] [Nov/Dec 2013]**

A physiological response to a current allied to the surface of the heart that results in unnecessary stimulation like muscle contractions or tissue injury is called as micro shock.

**7. Define – Macro Shock. [D] [Nov/Dec 2014]**

A physiological response to a current applied to the surface of the body that produces unwanted stimulation like tissue injury or muscle contractions is called as macro shock.

**8. What is meant by diathermy? [D] [Nov/Dec 2014]**

Diathermy is the treatment process by which, cutting coagulation of tissues are obtained.

**9. List the types of diathermy. [D]**

The types of diathermy are

- i) Short wave diathermy
- ii) Microwave diathermy
- iii) Ultrasonic diathermy
- iv) Surgical diathermy

**10. What are the different types of current that are used for medical applications? [D]  
[Nov/Dec 2019]**

The different types of current are Threshold current, pain current, let-go current, paralysis current, fibrillation and defibrillation current.

**11. What are the devices used to protect against electrical hazards? [D] [May/June 2014,16]**

- i). Ground fault interrupt
- ii). Isolation transformer

**12. What are the application of Bio-Telemetry? [D] [May/June 2013]**

The most common usage for biotelemetry is in dedicated cardiac care telemetry units or step-down units in hospitals. Although virtually any physiological signal could be transmitted, application is typically limited to cardiac monitoring.

**13. What are the choices of radio carrier frequency for medical telemetry purpose? [ID]  
[Nov/Dec-2016]**

The biosignals are amplified to radio frequency range of few hundred KHz to about 300 KHz and then they are transmitted by transmitter antenna's.

**14. What is the modulation techniques used for biotelemetry? Mention the reason for adopting that modulation scheme. [ID] [Nov/Dec 2016] [Nov/Dec 2019]**

The two different modulation techniques used for biotelemetry are

- i) Double Modulation
- ii) Pulse Width Modulation

The reason for adopting such a scheme

- i) Double modulation

The purpose behind this double modulation, it gives better interference free performance in transmission, and this enables the reception of low frequency biological signals. The sub modulators can be a FM (frequency modulation) system, or a PWM (pulse width modulation) system or a final modulator is practically always an FM system.

**15. What are the advantages of biotelemetry system? [D] [May/June2007]  
[May/June2009]**

The advantages of biotelemetry systems are

- (i) It is used to record the biosignals over long periods and while the Patient is engaged in his normal activities
- (ii) The medical attendant or computer can easily diagnose the nature of Disease by seeing the telemeter biosignals without attending patient Room
- (iii) Patient is not disturbed during recording
- (iv) For recording on animals, particularly for research, the biotelemetry is greatly used

**16. Specify the frequencies used for biotelemetry. [D] [Nov/Dec2012]**

Wireless telemetry system uses modulating systems for transmitting biomedical signals. Two modulators are used here. A lower frequency sub-carrier is employed in addition to very- high frequency (VHF). This transmits the signal from the transmitter.

**17. What are the essential requirements of the FM telemetry system? [ID] [May/June2014]**

The essential requirements of the FM telemetry system are

- i. The telemetry system should be selected to transmit the bio-electric signals with maximum fidelity and simplicity
- ii. There would not be any constraint for living system due to these telemetry systems and there would not be any reaction or interference with the living system.
- iii. The power consumption should be very small to extend the source life time in the case of implanted units.
- iv. The miniature radio telemetering system should be used to reduce noises.

**18. What is a radio-pill? [D] [Nov/Dec2009][April/May2010][May/June2012]**

The radio pill is capable of measuring various parameters that are available in the tract. With the help of radio pill type devices, it is possible for us to measure or sense temperature, pH, enzyme activity and oxygen tension values. These measurements can be made in association with transducers. Pressure can be sensed by using variable inductance and temperature can be measured by using temperature-sensitive transducer.

**19. What is the principle of tele stimulation? [D] [April/May2008]**

Tele stimulation is the measurement of biological signals over long distance.

**20. What is meant by diathermy? [D] [April/May2010]**

Diathermy is the treatment process by which, cutting coagulation of tissues are obtained.

**22. List the types of diathermy. [D]**

The types of diathermy are

- i. Short wave diathermy
- ii. Microwave diathermy
- iii. Ultrasonic diathermy
- iv. Surgical diathermy

**22. What are the two methods of shortwave diathermy? [D]**

The two methods of shortwave diathermy are

- i. Capacitive method
- ii. Inductive method

**23. What is meant by fulguration? [D]**

Fulguration is a process to destroy the unwanted tissue like tumor using surgical diathermy.

**24. Can pain be relieved through electrical stimulation? What is the equipment used for it? [ID] [May/June – 2014]**

Yes pain can be relieved through electrical stimulation. Electrical stimulator is the equipment used to relieve the pain. This technique is called electrotherapy which uses low volt, low frequency impulse currents. There are different types of stimulators like

- i. Nerve stimulators
- ii. Muscle stimulators
- iii. Implanted prosthetic stimulators

**25. . What are the different types of current that are used for medical applications? [D]**

The different types of current are Threshold current, pain current, let-go current, paralysis current, fibrillation and defibrillation current.

**26. What is ultrasonic wave? [Nov/Dec 2018]**

Ultrasound is acoustic (sound) energy in the form of waves having a frequency above the human hearing range. The highest frequency that the human ear can detect is approximately 20 thousand cycles per second (20,000 Hz). This is where the sonic range ends, and where the ultrasonic range begins.

**27. List the classifications of blood pumps. [D]**

The blood pumps available can be classified into two types. They are:

- Pulsatile pumps
- Non-pulsatile(peristaltic) pumps

**28. What is the purpose of using resuscitation unit? [D] [Nov/Dec 2019]**

Resuscitation unit is generally used in intensive care unit (ICU). In modern hospitals the resuscitation units are in the form of a mobile trolley.

**29. What is heat exchanger? [D]**

Heat exchanger is used to regulate the blood temperature during oxygenation. Secondly it is used to reduce the blood temperature in preparation for a surgical procedure. Thirdly it is used to reheat the blood after doing surgery under hypothermic.

**30. What is oxygenator? [D]**

Oxygenators are to oxygenate the blood similar to the function of the lungs.

List out the types of oxygenators.

- Film oxygenators
- Bubble oxygenators
- Membrane oxygenators
- Liquid- liquid oxygenators.

**PART –B**

**DIATHERMIES- SHORTWAVE ULTRASONIC AND MICROWAVE TYPE AND THEIR APPLICATIONS.**

1. Explain different methods of applying electrodes used in shortwave diathermy.(16). [D] [April /May 2017],[Nov/Dec 2016]
2. Draw the block diagram of short wave diathermy unit and explain it. (8) [ID] [Nov/Dec 2017]
3. Write a brief note on the functioning of Microwave Diathermy unit. (13) [May/June2014],[April/May 2017]
4. Write short notes on Ultrasonic diathermy. [D]

5. Explain the working principle of a diathermy unit with a neat neat block diagram.(13) [Nov/Dec 2016][April/May 2016][May/June 2006][April/May 2008][Nov/Dec 2016]
6. Draw the block diagram of short wave and microwave diathermy and explain in detail.( 13) [April/May 2019][May/June 2016][April/May 2018][Nov/Dec 2017][April/May 2017][Nov/Dec 2016]

### **SURGICAL DIATHERMY**

7. Explain the function of surgical diathermy and various mode of operations. ( 8 ) [D] [April /May 2011 [May/June 2013]
8. Write short notes on Surgical Diathermy,(8)[D].[May/June 2016]
9. Explain the working principle of surgical diathermy unit with a neat block diagram(8)[[D].[Nov/Dec 2018]
10. Explain working principle of a surgical diathermy unit with a neat block diagram. (8) [D] [May/June-2014] [Nov/Dec 2018]
- ### **BIO TELEMETRY,**
11. With a neat block diagram combined single channel telemetry for the measurement for ECG and respiration rate.(8) [ID] [Nov/Dec2013,16]
12. Explain multichannel Bio telemetry system with neat diagram. (12) [D]
13. Discuss about the element of Bio telemetry system. (12) [May/June-2013,14][Nov/Dec-2013,14]
14. With suitable diagram explain how ECG signal can be transmitted using single channel telemetry system.(8) [ID] [Nov/Dec-2016]
15. What are the applications and working of Biotelemetry (13) [Nov/Dec 2018]
16. With suitable diagram, explain how the ECG signal can be transmitted using single channel telemetry systems.(8)[D] [Nov/Dec 2016][April/May 2017][April/May 2018]
17. Explain the working of a biotelemetry system with sub-carrier. (8)[Nov/Dec 2017] [Nov/Dec 2019]
18. Write short notes on frequency selection for telemetry applications. (8)[D][April/May 2016]
19. What is telemetry? Mention the application of telemetry. (8)[D [Apr/May 2007, Apr/May 2008, Nov/Dec 2006]
- 20 What is the application of diathermy? (8)[D]

## **UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION**

### **PART-A**

#### **1. What is telemedicine?**

- Telemedicine is the application of telecommunications and computer technology to deliver health care from one location to another.
- Telemedicine technology includes hardware, software, medical equipment and communication links.

#### **2. List the types of lasers used in medical field. [D]**

The types of lasers used in medical fields are

- i). Pulsed Nd-YaG laser
- ii). Continuous laser. Co2 laser
- iii). Continuous wave organ ion laser.

#### **3.What are the advantages of performing surgery using LASER? [D] [Nov/Dec 2019]**

The advantages of performing surgery using LASER are

- Highly sterile
- Non-contact surgery
- Highly localized and precise
- Prompt surgery



Short period of surgical time

**4. Mention the blocks in BMI.[D]**

- Signal acquisition
- Signal preprocessing
- Feature extraction
- Classification (Detection)
- Application interface

**5. What are the types of LOC based on a moving fluid?[D]**

The types of LOC based on a moving fluid are,

- Single phase flow through micro channels.
- Multiphase flow of droplets through micro channels or on a surface.

**6. Mention the classification of lab on chip.[D]**

The classification of lab on chip is,

- Bio-micro electromechanical systems (bio MEMS)
- Micro-total analysis system ( $\mu$  TAS)

**7. Define - Endoscopes and mention some of its types. [D] [May/June-2014]**

Endoscope is a tubular optical instrument to inspect or view the body cavities which are not visible to the naked eye normally. Types of endoscopes are cardio scope, bronchoscope, laparoscope, horoscope, gastro scope etc.

**8. What is lab on chip?[D]**

A lab on chip is a miniaturized device that integrates onto a single chip one or several analyses, which are usually done in a laboratory, analyses such as DNA sequencing or biochemical detection.

**9. What is the use of laparoscope? [D]**

The laparoscope is used for analyzing abdominal related diseases and to perform operations in the abdominal region.

**10. What is meant by telemedicine? [D]**

Telemedicine is the remote diagnosis and treatment of patients by means of telecommunications technology.

**11. State the applications of telemedicine. [D] [May/June 2016] Tele**

radiology  
Tele pathology  
Tele cardiology  
Tele education  
Tele consultation

**12. What is brain machine interface?[D]**

- A brain-machine interface (BMI) is a device that translates neuronal information into commands capable of controlling external software or hardware such as a computer or robotic arm.
- A brain computer interface (BCI), also referred to as a brain machine interface (BMI), is a hardware and software communications system.

**13. Mention few applications of laser in medicine. [D] [Nov/Dec 2016]**

Gynecology  
Gastroenterology  
Orthopedics

**14. Define the physical factors which affect the amount of infrared radiation from the human body. [ID] [Nov/Dec 2016]**

Emissivity  
Reflection  
Transmittance and absorption

**15. What is medical thermography? [D] [Nov/Dec 2004,2005]**

Thermography is the process of recording true thermal image of the surfaces of objects under study. It displays images representing the thermal radiation of skin areas. Thermogram contain both qualitative and quantitative information relevant to the image itself and to temperature.

**16. Mention the types of endomicroscopy. [D]**

Some of the types of endomicroscopes are

- Single Fibre Endomicroscopes
- Fibre Bundle Endomicroscopes
- Distal Scanning Endomicroscopes
- Non-Confocal Endomicroscopes

**17. What are the types of thermography? [D]**

The types of thermography are i. Infrared thermography  
ii. Liquid crystal thermography iii. Microwave thermography.

**18. What is endomicroscopy? [D]**

- Endomicroscopy is a technique for obtaining histology-like images from inside the human body in real-time, a process known as 'optical biopsy'.
- It generally refers to fluorescence confocal microscopy

**19 Give the principle of endomicroscopy. [D]**

- Conventional, wide field microscopy is generally unsuitable for imaging thick tissue because the images are corrupted by a blurred, out-of-focus background signal.
- Endomicroscopes achieve optical sectioning (removal of the background intensity) using the confocal principle - each image frame is assembled in a point-by-point fashion by scanning a laser spot rapidly over the tissue.

**20. What is the use of laparoscope? [D]**

The laparoscope is used for analyzing abdominal related diseases and to perform operations in the abdominal region.

**21 List the types of lasers used in medical field. [D] [Nov/Dec2004]** The types of lasers used in medical fields are

Pulsed Nd-YaG laser  
Continuous laser. Co2 laser  
Continuous wave organ ion laser

**22. What is Insulin? [D]**

- ❖ Insulin is a hormone produced in the pancreas that regulates blood glucose levels.
- ❖ Insulin enables the body to use Glucose.
- ❖ First discovered in 1921.
- ❖ Before the discovery children with diabetes were expected to live for under a year.
- ❖ Diabetics can't produce insulin so it must be given to their body.

**21. Mention the types of Insulin delivery. .[D]**

Some of the types of insulin delivery are:

- ❖ Insulin pens
- ❖ Inhaled insulin
- ❖ Insulin pumps

**24. What is the 3-electrode electrochemical cell? [D]**

- ❖ The 3-electrode electrochemical cell is used to detect the level of dissolved oxygen in solution.
- ❖ The oxygen sensor measures the oxygen gradient from the proximal to the distal GI tract.
- ❖ This enables a variety of syndromes to be investigated including the growth of aerobic bacteria or bacterial infection.

**25. What is biotelemetry? [D]**

It is the measurement of biological parameters over a distance.

**26. List out the applications of biotelemetry. [D]**

The applications of biotelemetry are

Astronauts' physiological parameters have to be monitored through RF transmission

For exercise ECG, wireless remote data logging is simple and safe.

Collection of patients' parameters from unrestrained and anaesthetized animals for research.

Remote sensing of pH and pressure in the gastrointestinal tract.

To protect patient from power line when susceptible is essential one.

**27. What are the advantages of AM transmission? [D]**

The advantages of amplitude modulation are:

Easy transmission and reception

Lesser bandwidth requirements

Low cost

**28. What are the limitations of AM transmission? [D]**

The limitations of AM transmissions are Noisy reception, low efficiency and small operating range.

**29. What are the advantages of FM transmission? [D]**

The advantages of frequency modulation are:

FM has high immunity to noise. Noise in the modulated signal will be in the form of amplitude.

Hence FM receiver will reject the noise signals in the modulated signal.

The efficiency of transmission is very high. The operating range is very large.

**30. What are the disadvantages of FM transmission? [D]**

The disadvantages of FM transmission are as follows: A wide range is required for each channel

FM transmission requires complex equipment.

**34. What are the applications of cryogenics? [Nov/Dec 18]**

Biological and medical uses for cryogenics are extensive. In these applications the goal is to store, modify, or destroy a biological structure by reducing its temperature. Storage of cellular structures in liquid nitrogen is a common practice, the largest of these being the storage of blood plasma

**PART-B**

**TELEMEDICINE, INSULIN PUMPS RADIO PILL,**

1. Explain in detail on telemedicine.(8)[D]
2. Briefly discuss the operation of insulin pumps.(8)[D]
3. Discuss about the working principle of insulin pumps . (8)[D]
4. What are the different types of insulin pumps & Mention application of insulin pumps. (16) [ID]
3. Write short notes on Telemedicine. [D] [May/June 2016]
5. Draw the block diagram of a typical telemedicine system .[D] (8) [Nov/Dec 2016] [May/June 2016] [Nov/Dec 2014]
6. Give the detail description of Parts of an Insulin Pump?? .[D] (13) [Nov/Dec 2018]
7. What are the different types of laser used in Radio Pill .(8)[D] [Nov/Dec 2019]
8. Draw the detail block diagram of Radio Pill. .(8)[D]
9. What are the applications of Telemedicine . .(8)[D]
10. What is Radio pill? Explain with the help of an example. .(8)[D] [Nov/Dec 2012][April/May 2011]
11. Discuss in detail about Radio-Pill.(8) [D] (Nov/Dec 2014)

**SECOND HALF**

**ENDO MICROSCOPY, BRAIN MACHINE INTERFACE, LAB ON A CHIP.**

12. Write short notes on Brain machine interface.. (8)[D]
13. Explain with neat Schematic diagram of EEG based BCI .(8)[D]
14. Explain briefly on Lab on a chip.(8)[D]
15. What are the Advantages and Disadvantages of Lab on a chip .(8)[D]
16. What is an endomicroscopy? Discuss the working of an endoscopic unit.(8)[D]
17. Explain the principle & application of Lab on a chip.[D] (12)
18. Explain briefly on Chip materials and fabrication technologies on Lab on a chip,(8)[D]
19. Describe the working principle and Block diagram of endomicroscopy interfaced with a FPGA? (8)[D]
20. Explain image acquisition using thermography? [Nov/Dec 2019]

