



## Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category 'A' by MHRD (now MoE)

Re-accredited with 'A++' Grade by NAAC. CGPA 3.65/4, Category I by UGC

Coimbatore - 641 043, Tamil Nadu, India

### Bachelor's Degree Examination – May 2025 IV Semester

Class : II UG  
Major : Physician Assistant

Time: 3 Hours  
Max. Marks: 100

#### 22BPAD04 DSE IV : Biomedical Instrumentation and Scientific Measurements

##### Course Outcome:

Upon completion of the course, the student will be able to

- CO1 Gain knowledge on the scope of medical instrumentation and bio-sensors.
- CO2 Describe the principle behind Electro-physiological Equipment.
- CO3 Discuss the devices used for measurements of blood flow & gas flow.
- CO4 Describe the working of Clinical and Medical Imaging Equipment.
- CO5 Discuss the working of therapeutic equipment and the importance of electrical safety.

#### Part A

10 x 1 = 10

#### Choose the Correct Answer

1. Which of the following is an example of a static characteristic of a medical instrument?  
a. Frequency response      b. Precision      c. Settling time      d. Bandwidth      CO1 K1
2. Which of the following sensors is primarily used for measuring temperature in biomedical applications?  
a. Thermistor      b. Photodiode      c. Strain gauge      d. Piezoelectric sensor      CO1 K1
3. Which biopotential is used to measure the electrical activity of the heart?  
a. EOG      b. EMG      c. ECG      d. ERG      CO2 K1
4. Which type of electrode is most commonly used for recording biopotentials from the skin?  
a. Needle electrode      b. Surface electrode  
c. Microelectrode      d. Indwelling electrode      CO2 K1
5. Which of the following methods is used to measure cardiac output?  
a. Pulse oximetry      b. Thermodilution      c. ECG      d. CT Scan      CO3 K1
6. Which of the following is an ultrasonic method used for measuring blood flow?  
a. Electromagnetic flow meter      b. Doppler ultrasound  
c. Strain gauge      d. Thermistor      CO3 K1
7. Which medical imaging technique uses magnetic fields and radio waves to create detailed images of soft tissues?  
a. X-Ray      b. MRI      c. CT Scan      d. Ultrasound      CO4 K1
8. What type of medical device is used to deliver controlled doses of drugs into the body?  
a. Electrolyte analyzer      b. Drug delivery device  
c. Hemodialysis machine      d. Defibrillator      CO4 K1
9. Which of the following devices is used to restore normal heart rhythm in patients with arrhythmias?  
a. Cardiac Pacemaker      b. Hemodialysis machine  
c. Defibrillator      d. Ventilator      CO5 K1
10. What is the primary function of a ventilator in a medical setting?  
a. To monitor heart rate      b. To support breathing  
c. To filter blood      d. To regulate blood pressure      CO5 K1

**Part B**  
**Answer ALL questions**  
**Each answer should not exceed 400 words or two pages**

**5 x 6 = 30**

- 11.a. Discuss the static and dynamic characteristics of biomedical instruments with examples .  
CO1 K2  
(or)
- 11.b. Explain the basic principles of operation for pressure sensors used in medical devices.  
How do they function in the measurement of blood pressure? CO1 K2
- 12.a. Describe the electrical activity of excitable cells and how it relates to the generation of  
biopotentials. Provide examples of different biopotentials. CO2 K2  
(or)
- 12.b. Explain the working principle of an electrocardiogram (ECG) and the types of electrodes  
used for recording the heart's electrical signals. CO2 K2
- 13.a. Discuss the oscillometric and auscultatory methods for measuring blood pressure.  
Compare their advantages and disadvantages. CO3 K2  
(or)
- 13.b. Describe the principle of operation of an ultrasonic flow meter and how it is applied in  
blood flow measurements. CO3 K2
- 14.a. Explain the working principle of X-ray imaging. Discuss its role and limitations in clinical  
diagnostics. CO4 K2  
(or)
- 14.b. Describe the operation of a blood gas analyzer and its importance in assessing  
respiratory and metabolic functions. CO4 K2
- 15.a. Describe the working principle of a cardiac pacemaker and discuss its role in regulating  
the heart rhythm. CO5 K2  
(or)
- 15.b. Explain the function of surgical diathermy and its application in surgical procedures.  
How does it differ from other cutting tools? CO5 K2

**Part C**  
**Answer ALL questions**  
**Each answer should not exceed 800 words or four pages**

**5 x 12 = 60**

- 16.a. Classify biomedical instruments based on their functions. Discuss the operating principles  
of one of these categories, focusing on sensors and amplifiers used. CO1 K2  
(or)
- 16.b. Explain the role of signal processing in biomedical instrumentation. Discuss how  
amplifiers are used to enhance weak biological signals for processing. CO1 K2
- 17.a. Discuss on the origin, significance, and the role of ECG,EMG & EOG . CO2 K2  
(or)
- 17.b. Explain the principles of bio-telemetry in medical applications. How are these systems  
used to monitor patient data remotely? CO2 K2
- 18.a. Explain the different techniques used for the measurement of blood pressure, including  
both invasive and non-invasive methods. Discuss their applications in clinical practice. CO3 K2  
(or)
- 18.b. Describe the various methods used for measuring cardiac output. Focus on the principle of  
electromagnetic and ultrasonic flow meters and their clinical relevance. CO3 K2
- 19.a. Explain different types of medical imaging technologies and outline how each is  
applied in clinical diagnostics. CO4 K2  
(or)
- 19.b. Explain the principles of chromatography and electrophoresis. How are these techniques  
applied in clinical laboratories for diagnosing diseases or conditions? CO4 K2
- 20.a. Discuss the principles and applications of hemodialysis. How does the machine filter  
blood, and why is it important for patients with kidney failure? CO5 K2  
(or)
- 20.b. Explain the concept of electrical safety in medical devices. Discuss the key safety  
protocols, including grounding and isolation transformers, used to prevent electrical  
shocks during medical procedures. CO5 K2

\*\*\*\*\*