Reg. No.															

Question Paper Code	13618

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Fifth Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20EIPC501 - ANALYTICAL INSTRUMENTATION

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	In Atomic Absorption Spectroscopy, which of the following is the generally used radiation source? (a) Tungsten lamp (b) Xenon mercury arc lamp (c) Hydrogen or deuterium discharge lamp (d) Hollow cathode lamp	1	K1	CO1
2.	Spectroscopy deals with interaction of electromagnetic radiation with matter. What is the speed of this radiation in vacuum in m/s? (a) 6×10^8 (b) 5×10^8 (c) 7×10^8 (d) 3×10^8	1	K1	CO1
3.	Chromatography is a physical method that is used to separate and analyse _____ (a) Simple mixtures (b) Complex mixtures (c) Viscous mixtures (d) Metals	1	K1	CO2
4.	In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure? (a) Column chromatography (b) Planar chromatography (c) Liquid chromatography (d) Gas chromatography	1	K1	CO2
5.	Which among the following gases have diamagnetic property? (a) Oxygen (b) Nitrogen (c) Nitrogen dioxide (d) Nitric oxide	1	K1	CO3
6.	Which of the following gases have paramagnetic property ? (a) Nitric oxide (b) Hydrogen (c) Helium (d) Nitrogen	1	K1	CO3
7.	Which of the following is the formula for pH calculation? (a) $\log_{10}[H+]$ (b) $-\log_{10}[H+]$ (c) $\log_2[H+]$ (d) $-\log_2[H+]$	1	K1	CO4
8.	Pure water is known to be which of the following? (a) Weak electrolyte (b) Strong electrolyte (c) Neither weak nor strong (d) Not an electrolyte	1	K1	CO4
9.	NMR spectroscopy is used for determining structure in which of the following materials? (a) Radioactive materials (b) Insoluble chemical compounds (c) Liquids (d) Gases	1	K1	CO5
10.	If the number of protons or neutrons is even the spin of the nucleus will be which of the following? (a) Integral spin (b) Half integral spin (c) Zero spin (d) Positive spin	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	State beer-Lambert law.	2	K1	CO1
12.	List four different techniques used for sampling of solids.	2	K1	CO1
13.	Name few IR radiation sources.	2	K1	CO1
14.	Write the features of thermal conductivity detector.	2	K2	CO2
15.	Classify the various types of Chromatography.	2	K2	CO2
16.	Define the terms retention volume and dead volume.	2	K1	CO2
17.	What is the principle of Chemiluminiscence?	2	K1	CO3

18.	What is the purpose of using gold films in H_2S analyzer?		*2*	*K1*	*CO3*
19.	List the different types of Ion selective electrodes.		*2*	*K1*	*CO4*
20.	What is the use of buffer solution in pH measurement?		*2*	*K1*	*CO4*
21.	What are the types of Mass Spectrometers?		*2*	*K1*	*CO5*
22.	List the application of NMR.		*2*	*K1*	*CO5*

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	Construct the block diagram of IR Spectrometer and also explain its working with neat diagram.	*11*	*K2*	*CO1*
		OR			
	b)	Construct the block diagram of UV Spectrometer and also explain its working with neat diagram.	*11*	*K2*	*CO1*
24.	a)	Draw the schematic diagram of gas chromatography and explain the components in detail.	*11*	*K2*	*CO2*
		OR			
	b)	Explain in detail about Paper Chromatography.	*11*	*K2*	*CO2*
25.	a)	Discuss about dust and smoke measurement with neat sketch.	*11*	*K2*	*CO3*
		OR			
	b)	Explain in detail about paramagnetic oxygen analyzer based on magnetic susceptibility.	*11*	*K2*	*CO3*
26.	a)	List the types of electrode used for pH measurement and explain the principle of pH measurement.	*11*	*K2*	*CO4*
		OR			
	b)	Demonstrate the principle of conductivity measurement by using the conductivity meters in detail.	*11*	*K2*	*CO4*
27.	a)	Explain the working principle of NMR spectrometer in detail.	*11*	*K2*	*CO5*
		OR			
	b)	With neat sketch explain various components of mass spectrometer.	*11*	*K2*	*CO5*
28.	a) (i)	Explain the principle of silica analyzer in detail.	*6*	*K2*	*CO4*
	(ii)	Explain Scanning Electron microscope in detail with neat diagram.	*5*	*K2*	*CO5*
		OR			
	b) (i)	With neat diagram, describe the working principle of a H_2S analyzer.	*6*	*K2*	*CO4*
	(ii)	Explain about time of flight Mass analyzer in detail.	*5*	*K2*	*CO5*