APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Scheme for Valuation/Answer Key

Scheme of evaluation (marks in brackets) and answers of problems/key

EIGHTH SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

Course Code: AE402

Course Name: ANALYTICAL INSTRUMENTATION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) State and derive Beer-Lambert's law from basic principles. Discuss the limitations of it. (5)

Statement- 1 Mark, Derivation- 2 Marks, Limitations- 2 Marks

b) What is the use of filters and monochromators in spectroscopy? With diagrams explain principle of filtering using filters and monochromators. (10)

Uses- 3 Marks, Diagram- 3 Marks, Explanation- 4 Marks

2 a) Draw the electromagnetic spectrum and specify wavelengths of different radiations. (5)

Diagram- 3 Marks, Wavelengths- 2 Marks

b) Differentiate single beam and double beam spectrophotometer with neat diagrams. (7)

Diagram- 4 Marks, Explanation- 3 Marks

c) What are the different types of detectors used in flame photometry? (3)

Types- 3 Marks

3 a) With a block diagram explain the operation of a Single beam photometer. (5)

Block Diagram- 3 Marks. Explanation- 2 Marks

b) Explain the various components in the emission system of flame photometer in detail with neat diagram. (10)

Diagram- 4 Marks, Explanation- 6 Marks

PART B

Answer any two full questions, each carries 15 marks.

4 a) How a single-beam filter fluorimeter and Double beam filter fluorimeter works? Explain in detail with neat sketches (10)

Single beam fluorimeter- 5 Marks (Diagram- 2 Marks, Explanation- 3 Marks)

Double beam fluorimeter- 5 Marks (Diagram- 2 Marks, Explanation- 3 Marks)

b) Describe the principle of ion-beam spectroscopy with a neat sketch. (5)

Diagram- 3 Marks, Explanation- 2 Marks

5 a) Illustrate the working of an Inductively coupled plasma- mass spectrometer. (8)

Diagram- 4 Marks, Explanation- 4 Marks

b) Explain the working of an X-ray absorptiometer. (7)

Diagram- 4 Marks, Explanation- 3 Marks

6 a) Explain the following with neat sketches: (10)

i. Inlet sample system in a Mass spectrometer

ii. Functions of Klystron tube and Microwave cavity in ESR spectrometer

i. Diagram- 2 Marks, Explanation- 3 Marks

ii. *Diagram- 2 Marks, Explanation- 3 Marks*

b) Explain about X-Ray spectrum and indicate it in the electromagnetic spectrum diagram. (5)

X-Ray spectrum diagram- 2 Marks, Indication of X-Ray on it with proper explanation- 3 Marks

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PART C

Answer any two full questions,each carries 20 marks.

7 a) Explain the basic principle of chromatographic process. List the various types. (7)

Diagram- 3 Marks, Explanation- 2 Marks, Types- 2 Marks

b) Define retention time, Dead time, Phase ratio, linear velocity and efficiency in chromatography. (5)

Each carries 1 Mark

c) With neat diagrams explain any two detectors used in Gas chromatography. (8)

Each carries 4 Marks. Each diagram carries 2 Marks.

8 a) How liquid chromatography works? What are the various types of LC and discuss in detail. (10)

Liquid Chromatography: 6 Marks (Diagram- 3 Marks, Explanation- 3 Marks)

Types: 4 Marks

b) Prepare brief notes on (10)

i. pH meter.

ii. Flue gas analysers.

Each part carries 5 Marks

9 a) With necessary theoretical backing, explain how Paramagnetism is employed in the sensing of Oxygen. (10)

Theory of Paramagnetism-3, Construction of sensor-4, Working - 3

b) Explain the following: (10)

i. CO analyser.

ii. DO meter.

Each carries 5 Marks

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