



GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

(An Autonomous Institute of Government of Maharashtra)

National Highway No.6, JALGAON – 425 002

Phone No.: 0257-2281522

Website : www.gcoej.ac.in

Fax No.: 0257-2281319

E-mail : princoej@rediffmail.com



Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **IN452U - Analytical Instrumentation**

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Maximum Marks : **60**

Duration : **3 Hrs**

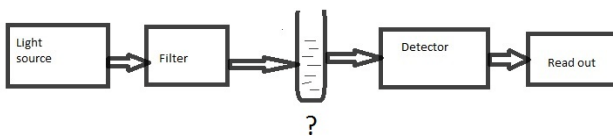
[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. All questions are compulsory.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Use of logarithmic table, drawing instruments and non programmable calculators is allowed.
5. Figures to the right indicate full marks.

1)

- i) NMR is the study of the absorption of _____ by nuclei in a magnetic field. [1]
 - a) Radioactive radiation
 - b) IR radiation
 - c) Radio frequency radiation
 - d) Microwaves
- ii) The procedure for mass spectroscopy starts with which of the following processes? [1]
 - a) The sample is bombarded by electron beam
 - b) The ions are separated by passing them into electric and magnetic field
 - c) The sample is converted into gaseous state
 - d) The ions are detected
- iii) If the number of protons or neutrons is even the spin of the nucleus will be which of the following? [1]
 - a) Integral spin
 - b) Half integral spin
 - c) Zero spin
 - d) Positive spin
- iv) Beer's law states that the intensity of light decreases with respect to _____. [1]
 - a) Concentration
 - b) Distance
 - c) Composition
 - d) Volume
- v) Mass spectrometer separates ions on the basis of which of the following? [1]
 - a) Mass
 - b) Charge
 - c) Molecular weight
 - d) Mass to charge ratio
- vi) In the diagram of single beam photometer given below, identify the component that is not marked. [1]



- a) Monochromator
 - b) Absorption filter
 - c) Sample holder
 - d) Interference filter
- vii) Which of the following is a source used in spectroscopy? [1]
 - a) LASER
 - b) Tube light
 - c) Sodium vapour lamp
 - d) Tungsten lamp
- viii) Lambert's law states that the intensity of light decreases with respect to _____. [1]
 - a) Concentration
 - b) Distance
 - c) Composition
 - d) Volume
- ix) The x-rays generated come out of the Coolidge tube through which of the following? [1]
 - a) Beryllium window
 - b) Tungsten window
 - c) Collimator
 - d) Target material

- x) The value of the magnetic moment is known as which of the following? [1]
a) Thompson magneton
b) Bohr magneton
c) Goldstein magneton
d) Rutherford magneton
- xi) Waveguides look like _____ cross-section pipes with dimensions of the order of the wavelength to be transmitted. [1]
a) Triangular
b) Circular
c) Rectangular
d) Square
- xii) Bolometer, a type of detector, is also known as _____ [1]
a) Resistance temperature detector (RTD)
b) Thermistor
c) Thermocouple
d) Golay cell
- 2) Attempt any two
- A) What do you mean by Qualitative Analysis and Quantitative Analysis? [6]
Explain different components of an analytical instrumentation system.
- B) i. Discuss the variation of transmission and absorbance with respect to concentration in Beer-Lambert Law with neat graphs. [3]
ii. Determine the concentration of glycogen-iodine complex if the transmission of light is 40%. Also, the absorption coefficient is 0.20 at 450 nm. The size of the cuvette is 2 cm. [3]
- C) What is Raman Effect? Explain the LASER Raman spectrophotometer. [6]
- 3) Attempt any two
- A) Discuss the principle of fluorescence and phosphorescence. Explain a single-beam filter fluorimeter. [6]
- B) Explain the principle and instrumentation constructional details of the Flame photometer. [6]
- C) Explain Geiger Muller's counter and its application. [6]
- 4) Attempt any two
- A) Explain the principle and constructional details of Electron Spin Resonance (ESR) Spectrometry. [6]
- B) What is the significance of nuclear spin, nuclear energy levels, and resonance condition in NMR. [6]
- C) Explain the concept and working of the time-of-flight mass spectrometer. [6]
- 5) Next question!
- A) Describe electrophoresis and densitometer. What are their applications? [6]
- B) Explain the environment monitoring system. [6]

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