



## GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

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

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

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Maximum Marks : **60**

Duration : **3 Hrs**

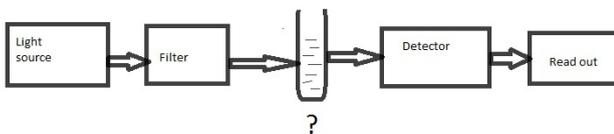
[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

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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