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Reg.No :

Name :

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS) REGULAR EXAMINATION March 2026
Fourth SEMESTER
Discipline Specific Core Course (DSC) - MG4DSCICH200 -
INSTRUMENTATION TECHNIQUES IN CHEMISTRY
(2024 ADMISSION ONWARDS)

Duration: 1 hour 30 minutes

Maximum Marks: 50

Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S), Interest(I) and Appreciation(Ap)

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Multiple choice questions

Answer all questions

Each question carries **1** marks

1. The time constant of an instrument indicates [A] / [CO1]
 - a). Sensitivity
 - b). Speed of response
 - c). Accuracy
 - d). Linearity
2. Float type level indicators operate based on [U] / [CO1]
 - a). Capacitance
 - b). Buoyancy
 - c). Voltage
 - d). Radiation
3. Which of the following is an example of chemical noise? [U] / [CO1]
 - a). Thermal noise
 - b). Shot noise
 - c). Reagent impurities
 - d). Electronic drift
4. Which type of spectroscopy involves transitions between electronic energy levels? [K] / [CO2, CO3]

- a). Microwave spectroscopy b). Infrared spectroscopy
- c). UV–Visible spectroscopy d). NMR spectroscopy
5. Which device disperses light into its component wavelengths and allows selection of a narrow wavelength band? [K] / [CO2]
- a). Detector b). Monochromator
- c). Amplifier d). Cuvette
6. The signal produced by a detector is usually proportional to: [U] / [CO2]
- a). Sample weight b). Light intensity
- c). Sample concentration d). Temperature
7. What is the unit of specific rotation in polarimetry? [U] / [CO4]
- a). Gram/milliliter b). Degrees Celsius
- c). Gram/cm³ d). Degrees/(g/mL)
8. In a polarimeter, what is the primary function of a polarizer? [A] / [CO4]
- a). To detect the interference patterns of light passing through a sample.
- b). To convert polarized light into unpolarized light.
- c). To analyze the color changes in the sample.
- d). To select and transmit light of a specific polarization.
9. While measuring the refractive index of a volatile liquid, the reading fluctuates continuously. Which instrument component should be checked first? [A] / [CO4]
- a). Eyepiece b). Water circulation system
- c). Mirror d). Scale
10. Beer–Lambert law is applied in UV–Visible spectroscopy to determine: [U] / [CO3]
- a). Molecular weight b). Concentration of solution
- c). pH of solution d). Boiling point

Part B

Short Answer Questions

Answer any **4** questions

Each question carries **3** marks

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| 11. Explain how automatic instruments reduce human error. | [A] / [CO1] |
| 12. What is time constant? Explain its importance in first-order instruments. | [A] / [CO1] |
| 13. Calculate the energy of radiation having wavelength 400 nm. ($h = 6.626 \times 10^{-34}$ J·s, $c = 3 \times 10^8$ m/s). | [A] / [CO2, CO3] |
| 14. How is IR spectroscopy used to identify functional groups? | [U] / [CO3] |
| 15. State Snell's law and write its mathematical expression. | [U] / [CO4] |
| 16. What is the function of the reference material holder? | [U] / [CO4] |

[3x4 = 12]

Part C

Short Essay Questions

Answer any **4** questions

Each question carries **7** marks

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| 17. Discuss the significance of S/N ratio in analytical techniques such as spectroscopy and chromatography. | [U] / [CO1] |
| 18. What is a flicker noise? What are its characteristics? What are the methods to reduce it? | [U] / [CO1] |
| 19. Write short notes on: (a) Nernst Glower (b) Globar Source. | [U] / [CO2] |
| 20. Derive and explain the Beer–Lambert law. | [U] / [CO3] |
| 21. Define Thermal Gravimetric Analysis (TGA). Explain its principle, instrumentation and working in detail. | [E] / [CO4] |
| 22. Write a note on different sampling methods. | [U] / [CO3] |

[7x4 = 28]