



**B.TECH DEGREE EXAMINATIONS: MAY 2018**

(Regulation 2015)

Fourth Semester

**BIOTECHNOLOGY**

U15BTT402 : Biotechniques

**COURSE OUTCOMES**

- CO1:** Explain the basics of measurements and different extraction methodologies, and their applications in biotechnology
- CO2:** Describe the instrumentation and applications of specialized molecular spectroscopic techniques
- CO3:** Demonstrate the principles and techniques of chromatography, and electro-analytical methods and their applications in biotechnology
- CO4:** Explain the various electrophoretic and thermal techniques and their applications in biotechnology
- CO5:** Distinguish and interpret the various structural elucidation methods
- CO6:** Describe the basics of radiation and radioisotope methods

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**  
**PART A (10 x 1 = 10 Marks)**

1. Match the List I with List II

CO1 [K2]

List I (Detectors)			List II (Principles)
A. Thermal Conductivity Detector (TCD)		I	Thermionic property
B. Flame ionization detector		II	Radioactive decay-based detector
C. Electro capture detector		III	No. of reduced carbon ion
D. Nitrogen-Phosphorus Detector (NPD)		IV	Universal detector

- |    | A   | B   | C   | D  |
|----|-----|-----|-----|----|
| a) | ii  | i   | iii | iv |
| b) | iii | iv  | ii  | i  |
| c) | iv  | iii | i   | iv |
| d) | iii | i   | ii  | iv |

2. Reversed phase HPLC is the technique in which

CO3 [K<sub>2</sub>]

- |   |   |
|---|---|
| a) stationary phase is solid and mobile phase is liquid | b) stationary phase is non polar and the mobile phase is relatively polar |
| c) the stationary phase is made of very fine particles  | d) the stationary phase has been silinized with dimethyldichlorosilane    |

3. Which of the following statement(s) is/are true about spectroscopy? CO2 [K<sub>3</sub>]
- P. In single beam photometer, only one single beam source is available.
- Q. 0 % transmittance must be adjusted in photometer before keeping the samples in cell holder.
- R. Pivot is used to change the light intensity.
- S. Colourless compound can be determined by visible spectroscopy.
- a) P,R b) P,S
- c) P,Q d) Q,R
4. A solution of X of concentration  $0.010 \text{ mol dm}^{-3}$  gives an absorbance of 0.5. What concentration is a solution of X which gives an absorbance reading of 0.25? Assume that the same optical cell is used for both readings. CO1 [K<sub>1</sub>]
- a)  $0.050 \text{ mol dm}^{-3}$  b)  $0.0250 \text{ mol dm}^{-3}$
- c)  $0.0150 \text{ mol dm}^{-3}$  d)  $0.0050 \text{ mol dm}^{-3}$
5. Assertion (A): IN NMR spectroscopy, the nuclei are involved in absorption process. CO4 [K<sub>3</sub>]
- Reason(R): Each nuclei in atom is energetically degenerate
- a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A
- c) A is true but R is false d) A is false but R is true
6. According to Beer's law for a colored solution, which one of the following statements is False? CO2 [K<sub>3</sub>]
- a) The percent transmission is not directly proportional to the concentration b) The absorbance does not change when the cell path length (cell thickness) increases.
- c) The absorbance is directly proportional to the concentration. d) When the concentration of the unknown sample is higher than the highest concentration in the calibration range, the sample should be diluted.
7. During Mass spectroscopy operation, the following steps have been considered for determination of protein molecular weight. CO5 [K<sub>3</sub>]
1. Vapourization
  2. Acceleration
  3. Ionizing
  4. Deflection
- Choose the correct sequencing method adopted in MS- Spec?
- a) 2-3-4-1 b) 1-3-2-4
- c) 3-4-2-1 d) 4-1-3-2

8. The rate at which DNA migrates through the gel is determined by CO4 [K<sub>2</sub>]
- a) Molecular size of the DNA and the agarose gel concentration      b) Conformation of DNA and the applied voltage
- c) The length of the agarose gel and the negative charge of the DNA.      d) Both (a) and (c)
9. **Assertion (A):** In flame photometer, electron jumps to excited state under thermal emission CO2 [K<sub>2</sub>]  
**Reason (R):** The electrostatic force of attraction between the electrons and nucleus of the atom helps them to absorb a particular amount of energy.
- a) Both A and R are Individually true and R is the correct explanation of A      b) Both A and R are Individually true but R is not the correct explanation of A
- c) A is true but R is false      d) A is false but R is true
10. Which of the following detection methods is not commonly used to detect isotopically labelled drug metabolites? CO5 [K<sub>3</sub>]
- a) Infra red spectroscopy      b) NMR
- c) Mass spectroscopy      d) Scintillation counting
- PART B (10 x 2 = 20 Marks)**  
**(Answer not more than 40 words)**
11. What is a transducer in an analytical instruments? CO1 [K<sub>3</sub>]
12. Interpret how the reduction of matrix effect in calibration is done. CO1 [K<sub>2</sub>]
13. A solution tryptophan has an absorbance at 280 nm of 0.54 in a 5 cm length cuvette. Given the molar absorbance coefficient of Trp is  $6.4 \times 10^3$  L/mol/cm. What is the concentration of solution? CO2 [K<sub>4</sub>]
14. Recall the function of monochromator used in spectrophotometer. CO2 [K<sub>1</sub>]
15. Predict the characteristic features of the solvent power of a supercritical fluid. CO3 [K<sub>2</sub>]
16. Justify why the column length in gas chromatography is longer than in HPLC? CO3 [K<sub>2</sub>]
17. Indicate the application of SDS-PAGE. CO4 [K<sub>2</sub>]
18. Draw a TGA Thermal Curve look like. CO4 [K<sub>3</sub>]
19. Write the Bragg's equation and name the parameters are it. CO5 [K<sub>1</sub>]
20. In an initial counting period, the counting rate for a particular radioactive sample was found to be 435 cpm (count per minute). In a second experiment performed 420 min later, the same sample exhibits 285 cpm. What is the half life of that sample? CO6 [K<sub>4</sub>]

**Answer any FIVE Questions:-**  
**PART C (5 x 14 = 70 Marks)**  
**(Answer not more than 300 words)**

**Q.No. 21 is Compulsory**

- |   |                       |
|---|-----------------------|
| 21. Explain in detail about the various calibration methods used in biotechniques.  | CO1 [K <sub>2</sub> ] |
| 22. Outline principle, instrumentation and application of UV visible spectrometer with beam splitting in space.                                 | CO2 [K <sub>3</sub> ] |
| 23. Summarize the principle, instrumentation and applications of FTIR.  | CO2 [K <sub>3</sub> ] |
| 24. How do you separate the protein using size and net charge? Explain in detail about the working principle and application of this technique. | CO4 [K <sub>3</sub> ] |
| 25. Elaborate on the principle, instrumentation and any four using HPLC.  | CO3 [K <sub>3</sub> ] |
| 26. Explain the following   | CO4 [K <sub>2</sub> ] |
| (i) Thermo gravimetric method of analysis and its applications.   | (6)                   |
| (ii) Scintillation counters and its application   | (8)                   |
| 27. Explain in detail about the working principles and applications of mass spectrometry with a neat diagram.                                   | CO5 [K <sub>2</sub> ] |

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