# Question Paper

Exam Date & Time: 26-Apr-2018 (09:30 AM - 12:30 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**INTERNATIONAL CENTRE FOR APPLIED SCIENCES**
**IV SEMESTER B.S. (ENGG)**
**END-SEMESTER THEORY EXAMINATION- APRIL 2018**
**DATE:26.04.2018**
**TIME:9.30AM TO 12.30PM**
**Technical Chemistry III [CH 242]**

**Marks: 100** **Duration: 180 mins.**

## Answer 5 out of 8 questions.

1) Explain the following terms: (8)

A) i) Electromagnetic Radiation
ii) Band spectrum
iii) Wavelength
iv) Wave number

B) Give an account of the following: (8)
i) Modes of vibrations in water and carbon dioxide molecules
ii)Any four difference between IR and Raman spectroscopy

C) Give reasons: (4)
i) Ethylene is IR inactive whereas bromoethylene is IR active
ii)Sample holder made up of glass/quartz cannot be used in IR spectrophotometer

2) Derive the following mathematical expressions: (8)

A) i) $I = Âμr^2$
ii) A= 2-log%T

B) Describe the following (8)
i) TGA apparatus
ii) Electron capture detector

C) Write a note sources of IR radiation (4)

3) Explain the following (8)

A) i) Hypsochromic shift
ii) Distribution constant
iii) Resolution of the chromatographic column
iv) $R_f$ value

B) Give an account of the following (8)
i) Applications of microwave spectroscopy
ii) Real limitations of Beer's law

C) Give reasons: (4)
i) All mode of vibrations of $CO_2$ molecule are not Raman active
ii) Absorption band corresponding to n → Π*transition in the UV spectrum of Pyridine is not found in its acidic solution.

4) What is Raman shift? Explain the Quantum theory of Raman effect (8)

A)

| | | | |
|---|---|---|---|
| | B) | Discuss the Instrumental factors affecting TGA curve. | (8) |
| | C) | Give an account of applications of Gas-liquid chromatography | (4) |
| 5) | | Discuss the various factors affecting the conductivity of electrolytes. | (8) |
| | A) | | |
| | B) | Explain the following:<br>i) Methods of detection of end point in potentiometric titrations.<br>ii) Advantages of Glass electrode | (8) |
| | C) | With a schematic diagram explain the working of double beam IR spectrophotometer. | (4) |
| 6) | | Derive the expression for the frequencies of different transitions for anharmonically vibrating diatomic molecule | (8) |
| | A) | | |
| | B) | Discuss the following components of a gas chromatograph:<br>i) Carrier gas ii) Sample introduction system | (8) |
| | C) | Explain any two factors affecting the column efficiency of liquid chromatography | (4) |
| 7) | | Briefly explain i) Column packing in HPLC and ii) Any two Detectors used in HPLC. | (8) |
| | A) | | |
| | B) | Derive the expression for the relation between<br>i) Retention time ($t_r$) of a solute and capacity factor (k) of the solute.<br>ii) Electrode potential of glass electrode and $P^H$ of a solution. | (8) |
| | C) | Discuss the characteristics of Raman lines | (4) |
| 8) | | Derive the expression for the frequency of transition between the energy levels of a rotating non-rigid diatomic molecule. | (8) |
| | A) | | |
| | B) | Explain the following:<br>i) TGA & DTA curves of $CaC_2O_4 .H_2O$<br>ii) Applications of DTA in glass and polymer industry. | (8) |
| | C) | Discuss the following:<br>i) Conductometric titration of ($HCl$+ $CH_3COOH$) Vs. NaOH<br>ii) Advantages of conductometric titrations. | (4) |

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