(6 pages) Reg. No. : .....

Code No. : 6403 **Sub. Code : HCHM 43**

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2016.

Fourth Semester

Chemistry

PHYSICAL CHEMISTRY–IV

(For those who joined in July 2012 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Microwave region has ———— frequency

(a) 3×10^{6} to 3×10^{10} (b) 3×10^{12} to 3×10^{14}

(c) 3×10^{10} to 3×10^{12} (d) 3×10^{14} to 3×10^{16}

2. Which one is not used as radioactive isotopes for mossbauer effect?

(a) Fe^{57} (b) P^{31}

(c) sn^{119} (d) zn^{67}

3. Carbondioxide molecule and acetylene molecule have fundamental vibrational frequency of ————

(a) 4,7 (b) 3,7

(c) 4,6 (d) 4,4

4. Raman shifts fall in the range of 100–4000cm^{-1}. This energy values are smaller for ———— energy changes.

(a) vibrational (b) rotational

(c) translational (d) ultraviolet

5. Which one is acidic auxochromic group?

(a) $-OH$ (b) $-NO_2$

(c) $-OR$ (d) $-NH_2$

6. In ESCA, the sample is freed from moisture and oxygen and it is cleaned by ———— sputtering.

(a) Ar (b) Kr

(c) Xe (d) Rn

7. Naphthalene has ESR spectrum of ———— lines.

(a) 25 (b) 75

(c) 15 (d) 85

Number of NMR signals for p–xylene is _____

(a) 3 (b) 4

(c) 2 (d) 1

Selection rule for NQR transition is _____.

(a) $\Delta M_I = \pm 2$ (b) $\Delta M_I = \pm 1$

(c) $\Delta M_I = \pm 1$ and 2 (d) ΔM_I = zero and ± 1

). Spectroscopy concerned with the phenomenon of resonance fluorescence of gamma rays.

(a) NQR (b) Mossbauer

(c) ESR (d) Auger

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

1. (a) Write notes on regions of spectrum of electromagnetic radiation.

Or

(b) Discuss about effect of isotopic substituent.

12. (a) Taking HCI molecule discuss about the simple harmonic oscillator.

Or

(b) Write notes on vibrational Raman spectroscopy.

13. (a) Briefly write about Birje Sponer extrapolation.

Or

(b) Write any five applications of ESCA.

14. (a) Predict the ESR spectrum of benzene radical anion.

Or

(b) Discuss about the spin labeling studies of some important biomolecules.

15. (a) Discuss about the application of NOR on hydrogen bonding and substituent effect.

Or

(b) Write notes on magnetic hyperfine interaction

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Discuss about the rotational spectra of rigid diatomic molecules.

Or

(b) (i) Write about relative intensities of rotational spectral lines.

(ii) Discuss briefly on application of microwave for the determination of bond distances in polyatornic molecules.

17. (a) By taking suitable examples discuss the structural determination using Raman and Infrared spectroscopies.

Or

(b) Briefly write notes on

(i) Overtone and combination frequencies

(ii) Fermi resonance and group frequencies.

18. (a) Write the Principle, Instrumentation and application of UV-PES.

Or

(b) Discuss the dissociation energy and dissociation products of electronic spectroscopy.

19. (a) How will calculate the density of electron by Mc connel equation?

Or

(b) Write some important application and principle of C^{13}, F^{19}, P^{31} NMR spectra.

20. (a) Write the application of Mossbaure in

(i) Covelently bonded compounds.

(ii) Oxidation states of metal ions in compounds.

Or

(b) How will you split the energy levels in NQR? Explain it taking any two suitable examples.

———————