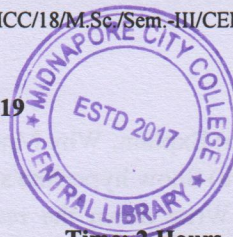


PG (NEW) CBCS  
M.Sc. Semester-III Examination, 2019  
CHEMISTRY  
PAPER: CEM-301  
(COMMON PAPER)



Full Marks: 40

Time: 2 Hours

GROUP- A

Answer any four of the following questions:

2×4=8

- 1) What is LASER?
- 2) "Water and alcohol are not suitable solvents for ESR studies"-Explain.
- 3) The benzene radical anion has  $g=2.0025$ . At which field should you search resonance in a spectrometer operating at 9.302GHz.
- 4) How many ESR lines can be expected for  $^{33}\text{S}^{19}\text{F}_6$  radical anion and radical cation.  $I=3/2$  for  $^{33}\text{S}$  and  $I= 1/2$  for  $^{19}\text{F}$ .
- 5)  $[\text{Mo}(\text{CN})_8]^{3-}$  complex shows single line in ESR spectrum but when C-atom is replaced by  $^{13}\text{C}$  isotope we get nine lines. Explain.
- 6) How is the fluorescence of pyrene influenced by polarity of the medium?
- 7) Which of the following exhibit excimer emission?  
Pyrene, Naphthalene, Anthracene, 9-methyl anthracene and 9,10-diphenyl anthracene.
- 8) How would you know that a fluorescence quenching process in dynamic and static in nature?

GROUP-B

Answer any four of the following questions:

4×4=16

- 9) Show all the possible transitions predict the intensity distribution in the hyperfine lines of the ESR spectrum of radical  $\cdot\text{CD}_3$  ( $I$  for  $D= 1$ ).
- 10) The ESR Spectrum of  $[(\text{NH}_3)_5\text{Co}-\text{O}_2-\text{Co}(\text{NH}_3)_5]^{5+}$  shows fifteen lines. Derive structural information for this complex ion from this data.
- 11) Using energy level diagram explain the ESR spectrum of TEMPOL free radical.

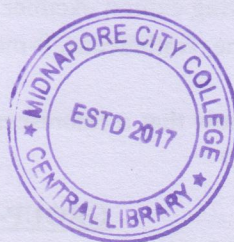
(P.T.O)

(2)

- 12) a) Explain, Why Mn(II) is EPR active but Cr(II) is EPR inactive.  
b) Show hyperfine splitting pattern of  $\cdot\text{H}$ .
- 13) Write down the reaction between excited state life time and the rate constant involving IC, ISC.
- 14) Schematically show the potential energy curves of iodine molecule in its ground and higher energy state.
- 15) Discuss the characteristics of LASER .
- 16) What is population inversion? Write a note on Ruby LASER.

**GROUP-C****Answer any four of the following questions:****8×2=16**

- 17) Using energy level diagram predict all possible transition in the hyperfine line of  $\cdot\text{CH}_3$  radical and draw the spectrum.
- 18) a) Explain the Jablonki diagram and obtain the stern Valmer equation.  
b) Explain the ESR spectrum of  $\cdot\text{CH}_2\text{OH}$  radical. Give  $a(\text{CH}_2)=1.738\text{mT}$  and  $a(\text{OH})=0.115\text{mT}$ .
19. Write a note on photo electric. Describe the principle of XPS Spectroscopy.
20. Write note on photo electric effect. Describe its Principle. Write a note on NDYAG –LASER.



\*\*\*\*\*