

**B. Sc. DEGREE END SEMESTER EXAMINATION – OCT. 2020: JANUARY 2021****SEMESTER –5: CHEMISTRY (CORE COURSE)****COURSE: 15U5CRCHE08: PHYSICAL CHEMISTRY - II**

*(Common for Regular 2018 admission & Improvement 2017/Supplementary 2017/2016/2015 admissions)*

Time: Three Hours

Max. Marks: 60

**SECTION A*****Answer all the questions. Each question carries 1 mark***

1. The energy of Avogadro number of quanta is called an .....
2. The compound among CO, NO, HCl and CO<sub>2</sub> which will not give a microwave spectrum is .....
3. Shift of absorption maximum to shorter wavelength is called .....
4. The SI unit of force constant of a bond is .....
5. The number of signals obtained in the proton NMR of TMS is .....
6. The intensity of base peak in mass spectrometry is taken as .....
7. The region 700-1400 cm<sup>-1</sup> of the infra red spectrum is called .....
8. The selection rule for the vibrational Raman spectrum of a diatomic molecule is .....

(1 x 8 = 8)

**SECTION B*****Answer any six questions. Each question carries 2 marks***

9. Explain quantum yield
10. State Born-Oppenheimer approximation.
11. Calculate the reduced mass of CO.
12. Explain auxochromes with examples.
13. How many signals will be present in the proton NMR spectrum of dimethyl ether? Explain.
14. What are Stokes and anti Stokes lines?
15. What is Chemical shift?
16. Write a short note on chemiluminescence.

(2 x 6 = 12)

**SECTION C*****Answer any four questions. Each question carries 5 marks***

17. Write a note on Franck-Condon principle.
18. An aqueous solution of an organic dye absorbs 20% of the incident light. What percentage of the same incident light will be absorbed by the same solution if it was taken in a cell twice longer than the first?
19. How force constant of a diatomic molecule can be calculated with the help of IR spectroscopy?
20. Discuss the PMR spectrum of acetaldehyde and acetophenone.
21. Explain the complementary character of IR and Raman spectroscopy techniques.

22. Write a note on the various types of electronic transitions in a molecule and arrange them in the increasing order of energy. (5 x 4 = 20)

#### SECTION D

**Answer any two questions. Each question carries 10 marks**

23. Explain all photophysical processes using Jablonski diagram. (6 marks)
24. (a) Write a note on applications of electronic spectroscopy (6 marks)  
(b) The bond length in HBr molecule is 141 pm. Calculate the moment of inertia and rotational constant [Atomic mass: H =  $1.008 \times 10^{-3} \text{ kgmol}^{-1}$  and Br =  $79.909 \times 10^{-3} \text{ kgmol}^{-1}$ ] (4 marks)
25. (a) Explain the theory of NMR spectroscopy (6 marks)  
(b) Write a note on hyperchromic and hypochromic shifts (4 marks)
26. (a) How molecular formula of a compound is determined by using mass spectrometry (5 marks)  
(b) Define Beer-Lambert's law. Derive its mathematical form. (5 marks)
- (10 x 2 = 20)

\*\*\*\*\*