QP CODE: 24803636

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, JUNE 2024

Fifth Semester

INTEGRATED MSC BASIC SCIENCE-PHYSICS

CORE - IPH5CR02 - ATOMIC AND MOLECULAR PHYSICS - I

2021 Admission Onwards

45693521

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What is the direction of spin magnetic moment of an electron with respect to spin angular momentum?
2. Explain spin quantisation.
3. Differente LS coupling and jj coupling.
4. What is Zeeman effect ?
5. The wavelength of mercury green light is 546.1nm. Calculate the frequency in Hz and the wavenumber in cm-1and m-1
6. What is Phosphorescence?
7. Draw the block diagram of a Raman spectrometer.
8. What is ESR?
9. What is hyperfine structure?
10. What is NMR? What are the parts of NMR spectrometer?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Show that the velocity of the electron in the first bohr orbit is (1/137)c, where c is the velocity of light
12. Explain fine structure of hydrogen line of hydrogen spectra on the basis of vector atom model.
13. How strong is LS coupling in Paschen back effect?

14. The moment of inertia of the CO molecules is 1.46×10-46 kgm2. Calculate the energy in electron volts in the lowest rotational energy level of CO molecule.

15. Irradiation of Carbon tetrachloride by 4358 A0 radiation gives Raman lines at 4400 A0, 4419 A0 and 4447 A0. Calculate the Raman shift for each of these lines in cm-1.

16. What is Microwave Spectrometer? Explain its basic functions with schematic representation.

17. What is ESR? Explain the resonance condition by drawing the Zeeman splitting of unpaired electron in a magnetic field.

18. What is meant by NMR? What is the basic principle and explain the resonance condition.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. On the basis of Bohr theory deduce the expression for the radius velocity and energy of an orbit of hydrogen atom

20. What is anomalous Zeeman effect ? Explain it using vector atom model.

21. What is vibrational spectrum? Considering the molecule as a harmonic oscillator, obtain and expression for energies of various vibrational levels.

22. Explain about the basic principles and instrumentation of NMR Spectroscopy. Discuss the medical applications of NMR.

(2×5=10 weightage)