

2. (a) Find the effective number of Bohr magneton in case of wide multiplets of a paramagnetic material. (5)
- (b) What is Weiss molecular field theory? (2)
- (c) Calculate the molar diamagnetic susceptibility of atomic hydrogen. Assume the first Bohr radius 0.529 \AA . (3)
3. (a) What is meant by direct exchange interaction? (2)
- (b) Derive the expression of exchange integral in a ferromagnetic solid on the basis of Heitler-London scheme. (8)
4. (a) What is meant by Cooper pairs? (2)
- (b) Prove that electron-phonon-electron interaction in a superconductor is attractive. Derive the necessary expression. (8)
5. (a) Derive the expression for susceptibility of an anti-ferromagnetic solid for $T > T_N$. (7)
- (b) What is Ferrite? Write two technological application of Ferrite. (1+2)
6. (a) Explain what is meant by “isotope effect”. What is the physical significance of isotope effect? What is the origin of energy gap in a superconductor? (2+2+2)
- (b) What are mixed ferrites? Write their characteristic features and important uses. (2+2)

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(Internal Assessment – 10)

2019**M.Sc.****4th Semester Examination****PHYSICS****PAPER – PHS-404****Full Marks : 50****Time : 2 Hours**

*The figures in the right hand margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.*

(Solid State Physics-Spl-II)**Answer Q1 and any three from the rest**

1. Answer any five bits: 5 X 2 = 10
- (a) Explain what do you meant by Quenching of orbital angular momentum.
- (b) What is the origin of negative surface energy in a superconductor?
- (c) Find the Hund's ground state and effective number of Bohr magneton for Mn^{+2} having $3d^5$ electron configuration.
- (d) What is the full form of SQUID and what is flux quantisation?
- (e) What is persistent current in superconductor?
- (f) Explain what is meant by Magnon.
- (g) Evaluate the intrinsic coherence length of aluminium assuming energy gap 0.00032 eV and Fermi velocity $2 \times 10^6 \text{ m/s}$.
- (h) Write the principle of ESR.

(Turn Over)