Topics for the Ph.D.-Level Examination in Algebra.

This examination will cover the topics listed in the following three categories:

I. Group Theory.
   (a) Solvable Groups; applications from Galois Theory of Equations.
   (b) Nilpotent Groups; the structure of finite nilpotent groups.
   (c) The Linear Groups, especially over finite fields.
   (d) Semi-direct Products.

II. Homological Algebra.
   (a) Universal concepts defined by diagrams.
      (i) Free Modules; Projective and Injective Modules.
      (ii) Tensor Products.
   (b) The Hom-Functor; Exact Sequences.
   (c) Artinian Rings; the Wedderburn-Artin Theorem.

III. Commutative Algebra.
   (a) Rings of Fractions; Localization.
   (b) Rings of Polynomials.
   (c) Integral and Algebraic Closure.
   (d) Noetherian Rings; the Hilbert-Basis Theorem.
   (e) Affine Varieties; the Nullstellensatz.
Suggested Bibliography.

1. Atiyah & MacDonald, Introduction to Commutative Algebra; Addison-Wesley (1969)
4. Kaplansky, Fields and Rings; University of Chicago.
5. Lang, Algebra; Addison-Wesley (1967).
6. Van der Waerden; Algebra I, Ungar.