Table of contents of EGA I–IV

Chapter 0. Preliminary material

(Volume I)

§1. Rings of fractions

1.0 Rings and algebras
1.1 Radical of an ideal; nilradical and radical of a ring
1.2 Modules and rings of fractions
1.3 Functorial properties
1.4 Change of multiplicative sets
1.5 Change of rings
1.6 M_f as a direct limit
1.7 Support of a module

§2. Irreducible and Noetherian spaces

2.1 Irreducible spaces
2.2 Noetherian spaces

§3. Supplement on sheaves

3.1 Sheaves with values in a category
3.2 Presheaves on a base of open sets
3.3 Gluing sheaves
3.4 Direct images of presheaves
3.5 Inverse images of presheaves
3.6 Constant and locally constant sheaves
3.7 Inverse images of presheaves of groups or rings
3.8 Pseudo-discrete sheaves of spaces

§4. Ringed spaces

4.1 Ringed spaces, sheaves of $\mathcal{A}$-modules, $\mathcal{A}$-algebras
4.2 Direct image of an $\mathcal{A}$-module
4.3 Inverse image of an $\mathcal{A}$-module
4.4 Relation between direct and inverse images

§5. Quasi-coherent and coherent sheaves

5.1 Quasi-coherent sheaves
5.2 Sheaves of finite type
5.3 Coherent sheaves
5.4 Locally free sheaves
5.5 Sheaves on a locally ringed space

§6. Flatness

6.1 Flat modules
6.2 Change of rings
6.3 Local nature of flatness
6.4 Faithfully flat modules

6.5 Restriction of scalars
6.6 Faithfully flat rings
6.7 Flat morphisms of ringed spaces

§7. I-adic rings
7.1 Admissisble rings
7.2 I-adic rings and projective limits
7.3 Pre-I-adic Noetherian rings
7.4 Quasi-finite modules over local rings
7.5 Restricted formal series rings
7.6 Completed rings of fractions
7.7 Completed tensor products
7.8 Topologies on Hom modules

(Volume III)

§8. Representable functors
8.1 Representable functors
8.2 Algebraic structures in categories

§9. Constructible sets
9.1 Constructible sets
9.2 Constructible subsets of Noetherian spaces
9.3 Constructible functions

§10. Supplement on flat modules
10.1 Relations between free and flat modules
10.2 Local flatness criteria
10.3 Existence of flat extensions of local rings

§11. Supplement on homological algebra
11.1 Reminder on spectral sequences
11.2 Spectral sequence of a filtered complex
11.3 Spectral sequences of a double complex
11.4 Hypercohomology of a functor on a complex $K^\bullet$
11.5 Inductive limits in hypercohomology
11.6 Hypercohomology of a functor on a complex $K_\bullet$
11.7 Hypercohomology of a functor on a double complex $K_{\bullet\bullet}$
11.8 Supplement on cohomology of simplicial complexes
11.9 A lemma on complexes of finite type
11.10 Euler-Poincaré characteristic of a complex of finite-length modules

§12. Supplement on sheaf cohomology
12.1 Cohomology of sheaves of modules on a ringed space
12.2 Higher direct images
12.3 Supplement on Ext of sheaves
12.4 Hypercohomology of the direct image functor

§13. Projective limits in homological algebra
13.1 Mittag-Leffler condition
13.2 Mittag-Leffler condition for abelian groups
13.3 Application to cohomology of a projective limit of sheaves
13.4 Mittag-Leffler condition and graded objects associated to projective systems
13.5 Projective limits of spectral sequences of filtered complexes
13.6 Spectral sequence of a functor relative to a finitely filtered object
13.7 Derived functors on projective limits

(Volume IV)

§14. Combinatorial dimension of a topological space
14.1 Combinatorial dimension of a topological space
14.2 Codimension of a closed subset
14.3 Chain condition

§15. M-regular and $\mathcal{F}$-regular sequences
15.1 M-regular and M-quasi-regular sequences
15.2 $\mathcal{F}$-regular sequences

§16. Dimension and depth of Noetherian local rings
16.1 Dimension of a ring
16.2 Dimension of a semi-local Noetherian ring
16.3 Systems of parameters in a Noetherian local ring
16.4 Depth and co-depth
16.5 Cohen-Macaulay modules

§17. Regular rings
17.1 Definition of regular ring
17.2 Reminder on projective and injective dimension
17.3 Cohomological theory of regular rings

§18. Supplement on extension of algebras
18.1 Inverse images of augmented rings
18.2 Extension of ring by a bi-module
18.3 The group of A-extension classes
18.4 Extensions of algebras
18.5 Case of topological rings

§19. Formally smooth algebras and Cohen rings
19.0 Introduction
19.1 Formal epi- and monomorphisms
19.2 Formally projective modules
19.3 Formally smooth algebras
19.4 First criteria for formal smoothness
19.5 Formal smoothness and associated graded rings
19.6 Case of algebras over a field

19.7 Case of local homomorphisms; existence and uniqueness theorems
19.8 Cohen algebras and p-rings; structure of complete local rings
19.9 Relatively formally smooth algebras
19.10 Formally unramified and formally étale algebras

§20. Derivations and differentials
20.1 Derivations and extensions of algebras
20.2 Functorial properties of derivations
20.3 Continuous derivations of topological rings
20.4 Principal and differential subsets
20.5 Basic functorial properties of $\Omega^1_{B/A}$
20.6 Imperfection modules and characteristic homomorphisms
20.7 Generalizations to topological rings

§21. Differentials in rings of characteristic p
21.1 Systems of p-generators and p-bases
21.2 p-bases and formal smoothness
21.3 p-bases and imperfection modules
21.4 Case of a field extension
21.5 Application: separability criteria
21.6 Admissible fields for an extension
21.7 Cartier's identity
21.8 Admissibility criteria
21.9 Completed modules of differentials for formal power series rings

§22. Differential criteria for smoothness and regularity
22.1 Lifting of formal smoothness
22.2 Differential characterization of formally smooth local algebras over a field
22.3 Application to relations between certain local rins and their completions
22.4 Preliminary results on finite extensions of local rings in which $\mathfrak{m}^2 = 0$.
22.5 Geometrically regular and formally smooth algebras
22.6 Zariski's Jacobian criterion
22.7 Nagata's Jacobian criterion

§23. Japanese rings
23.1 Japanese rings
23.2 Integral closure of a Noetherian local domain

Volume I. The language of schemes

§1. Affine schemes
1.1 Prime spectrum (Spec) of a ring
1.2 Functorial properties of Spec
1.3 Sheaf associated to a module
1.4 Quasi-coherent sheaves on Spec
1.5 Coherent sheaves on Spec

1.6 Functorial properties of quasi-coherent sheaves on Spec
1.7 Characterization of morphisms of affine schemes

§2. Preschemes and their morphisms
2.1 Definition of prescheme
2.2 Morphisms of preschemes
2.3 Gluing preschemes
2.4 Local schemes
2.5 Preschemes over a prescheme

§3. Product of preschemes
3.1 Disjoint union of preschemes
3.2 Product of preschemes
3.3 Formal properties of the product; change of base prescheme
3.4 Points of a prescheme with values in a prescheme; geometric points
3.5 Surjections and injections
3.6 Fibers
3.7 Application: reduction of a prescheme mod $\mathcal{I}$

§4. Sub-preschemes and immersions
4.1 Sub-preschemes
4.2 Immersions
4.3 Product of immersions
4.4 Inverse image of a prescheme
4.5 Local immersions and local isomorphisms

§5. Reduced preschemes; separatedness
5.1 Reduced preschemes
5.2 Existence of sub-prescheme with a given underlying space
5.3 Diagonal; graph of a morphism
5.4 Separated morphisms and preschemes
5.5 Criteria for separatedness

§6. Finiteness conditions
6.1 Noetherian and locally Noetherian preschemes
6.2 Artinian preschemes
6.3 Morphisms of finite type
6.4 Algebraic preschemes
6.5 Local determination of a morphism
6.6 Quasi-compact morphisms and morphisms locally of finite type

§7. Rational maps
7.1 Rational maps and rational functions
7.2 Domain of definition of a rational map
7.3 Sheaf of rational functions
7.4 Torsion sheaves and torsion-free sheaves

§8. Chevalley schemes
8.1 Allied local rings
8.2 Local rings of an integral scheme
8.3 Chevalley schemes

§9. Supplement on quasi-coherent sheaves
9.1 Tensor product of quasi-coherent sheaves
9.2 Direct image of a quasi-coherent sheaf
9.3 Extension of sections of quasi-coherent sheaves
9.4 Extension of quasi-coherent sheaves
9.5 Closed image of a prescheme; closure of a sub-prescheme
9.6 Quasi-coherent sheaves of algebras; change of structure sheaf

§10. Formal schemes
10.1 Affine formal schemes
10.2 Morphisms of affine formal schemes
10.3 Ideals of definition of a formal affine scheme
10.4 Formal preschemes and their morphisms
10.5 Ideals of definition of formal preschemes
10.6 Formal preschemes as inductive limits of schemes
10.7 Product of formal schemes
10.8 Formal completion of a prescheme along a closed subset
10.9 Extension of morphisms to completions
10.10 Application to coherent sheaves on formal schemes

Volume II. Basic global properties of some classes of morphisms.

§1. Affine morphisms
1.1 S-preschemes and $\mathcal{O}_S$-algebras
1.2 Preschemes affine over a prescheme
1.3 Affine prescheme over S associated to an $\mathcal{O}_S$-algebra
1.4 Quasi-coherent sheaves on a prescheme affine over S
1.5 Change of base prescheme
1.6 Affine morphisms
1.7 Vector bundle associated a sheaf of modules

§2. Homogeneous prime spectra
2.1 Generalities on graded rings and modules
2.2 Rings of fractions of a graded ring
2.3 Homogeneous prime spectrum of a graded ring
2.4 The scheme structure of $\mathrm{Proj}(S)$
2.5 Sheaf associated to a graded module
2.6 Graded S-module associatedto a sheaf on $\mathrm{Proj}(S)$
2.7 Finiteness conditions
2.8 Functorial behavior

2.9 Closed sub-preschemes of Proj(S)

§3. Homogeneous prime spectrum of a sheaf of graded algebras
3.1 Homogeneous prime spectrum of a graded, quasi-coherent $\mathcal{O}_Y$-algebra
3.2 Sheaf on Proj($\mathcal{S}$) associated to a sheaf of graded $\mathcal{S}$-modules
3.3 Sheaf of graded $\mathcal{S}$-modules associated to a sheaf on Proj($\mathcal{S}$)
3.4 Finiteness conditions
3.5 Functorial behavior
3.6 Closed sub-preschemes of Proj($\mathcal{S}$)
3.7 Morphisms from a prescheme to a Proj
3.8 Criteria for immersion into a Proj

§4. Projective bundles; ample sheaves.
4.1 Definition of projective bundles
4.2 Morphisms from a prescheme to a projective bundle
4.3 The Segre morphism
4.4 Immersions in projective bundles; very ample sheaves
4.5 Ample sheaves
4.6 Relative ample sheaves

§5. Quasi-affine, quasi-projective, proper and projective morphisms
5.1 Quasi-affine morphisms
5.2 Serre's criterion
5.3 Quasi-projective morphisms
5.4 Universally closed and proper morphisms
5.5 Projective morphisms
5.6 Chow's lemma

§6. Integral and finite morphisms
6.1 Preschemes integral over another
6.2 Quasi-finite morphisms
6.3 Integral closure of a prescheme
6.4 Determinant of an endomorphism of a sheaf of $\mathcal{O}_X$-modules
6.5 Norm of an invertible sheaf
6.6 Application: criteria for ampleness
6.7 Chevalley's theorem

§7. Valuative criteria
7.1 Reminder on valuation rings
7.2 Valuative criterion for separatedness
7.3 Valuative criterion for properness
7.4 Algebraic curves and function fields of dimension 1

§8. Blowup schemes; projective cones; projective closure
8.1 Blowup preschemes
8.2 Preliminary results on localization of graded rings

8.3 Projective cones
8.4 Projective closure of a vector bundle
8.5 Functorial behavior
8.6 A canonical isormorphism for pointed cones
8.7 Blowing up projective cones
8.8 Ample sheaves and contractions
8.9 Grauert's ampleness criterion: statement
8.10 Grauert's ampleness criterion: proof
8.11 Uniqueness of contractions
8.12 Quasi-coherent sheaves on projective cones
8.13 Projective closure of sub-sheaves and closed subschemes
8.14 Supplement on sheaves associated to graded $\mathcal{S}$-modules

Volume III. Cohomological study of coherent sheaves

(Part 1)

§1. Cohomology of affine schemes
1.1 Reminder on the exterior algebra complex
1.2 Čech cohomology of an open cover
1.3 Cohomology of an affine scheme
1.4 Application to cohomology of general preschemes

§2. Cohomological study of projective morphisms
2.1 Explicit calculation of some cohomology groups
2.2 Fundamental theorem on projective morphisms
2.3 Application to sheaves of graded algebras and modules
2.4 Generalization of the fundamental theorem
2.5 Euler-Poincaré characteristic and Hilbert polynomial
2.6 Application: criteria for ampleness

§3. Finiteness theorem for proper morphisms
3.1 "Dévissage" lemma
3.2 Finiteness theorem for ordinary schemes
3.3 Generalization of the finiteness theorem
3.4 Finiteness theorem for formal schemes

§4. Fundamental theorem on proper morphisms, and applications
4.1 The fundamental theorem
4.2 Special cases and variations
4.3 Zariski's connectedness theorem
4.4 Zariski's "main theorem"
4.5 Completion of Hom modules
4.6 Relations between ordinary and formal morphisms
4.7 An ampleness criterion
4.8 Finite morphisms of formal preschemes

§5. An existence theorem for coherent sheaves
5.1 Statement of the theorem
5.2 Proof in the projective & quasi-projective case
5.3 Proof in the general case
5.4 Application: comparison between morphism of ordinary and formal schemes; algebraisable formal schemes
5.5 Decomposition of certain schemes

(Part 2)

§6. Local and global Tor, Künneth formula
6.1 Introduction
6.2 Hypercohomology of complexes of sheaves of modules on a prescheme
6.3 Hypertor of two complexes
6.4 Local hypertor for quasi-coherent complexes, affine case
6.5 Local hypertor for quasi-coherent complexes, general case
6.6 Global hypertor for quasi-coherent complexes and Künneth spectral sequence, case of an affine base
6.7 Global hypertor for quasi-coherent complexes and Künneth spectral sequence, general case
6.8 Associativity spectral sequence for global hypertor
6.9 Base-change spectral sequence for global hypertor
6.10 Local nature of certain cohomological functors

§7. Base change for homological functors on sheaves of modules
7.1 Functors on A-modules
7.2 Characterization of the tensor product functor
7.3 Exactness criteria for homological functors on modules
7.4 Exactness criteria for the functors $H_\bullet(P_\bullet \otimes_A M)$
7.5 Case of Noetherian local rings
7.6 Descent of exactness properties; semi-continuity theorem and Grauert's exactness criterion
7.7 Application to proper morphisms: I. Exchange property
7.8 Application to proper morphisms: II. Cohomological flatness criteria
7.9 Application to proper morphisms: III. Invariance of Euler-Poincaré characteristic and Hilbert polynomial

Volume IV. Local study of schemes and morphisms

(Part 1)

§1. Relative finiteness conditions; constructible sets in preschemes
1.1 Quasi-compact morphisms
1.2 Quasi-separted morphisms
1.3 Morphisms locally of finite type
1.4 Locally finitely presented morphisms

1.5 Morphisms of finite type
1.6 Finitely presented morphisms
1.7 Improvements of preceding results
1.8 Finitely presented morphisms and constructible sets
1.9 Pro- and ind-constructible morphisms
1.10 Application to open morphisms

(Part 2)

§2. Base change and flatness
2.1 Flat sheaves of modules on preschemes
2.2 Faithfully flat sheaves on preschemes
2.3 Topological properties of flat morphisms
2.4 Universally open morphisms and flat morphisms
2.5 Persistence of properties of sheaves under faithfully flat descent
2.6 Persistence of set-theoretic and topological properties under faithfully flat descent
2.7 Persistence of various properties of morphisms under faithfully flat descent
2.8 Preschemes over a regular base scheme of dimension 1; closed subschemes in the closure of the generic fiber

§3. Associated prime cycles and primary decomposition
3.1 Associated prime cycles of a sheaf of modules
3.2 Irredundant decompositions
3.3 Relations with flatness
3.4 Properties of sheaves of the form $\mathcal{F}/t\mathcal{F}$

§4. Change of ground field for algebraic preschemes
4.1 Dimension of algebraic preschemes
4.2 Associated prime cycles on algebraic preschemes
4.3 Reminder on tensor products of fields
4.4 Irreducible and connected preschemes over an algebraically closed field
4.5 Geometrically irreducible and connected preschemes
4.6 Geometrically reduced preschemes
4.7 Multiplicities in primary decomposition on an algebraic prescheme
4.8 Fields of definition
4.9 Subsets defined over a field

§5. Dimension, depth, and regularity for locally Noetherian preschemes
5.1 Dimension of preschemes
5.2 Dimension of algebraic preschemes
5.3 Dimension of the support of a sheaf; Hilbert polynomial
5.4 Dimension of the image of a morphism
5.5 Dimension formula for a morphism of finite type
5.6 Dimension formula and universally catenary rings
5.7 Depth and property (S_k)
5.8 Regular preschemes and property (R_k); Serre's criterion for normality

5.9 Z-pure and Z-closed sheaves of modules
5.10 Property (S_2) and Z-closure
5.11 Coherence criteria for sheaves $\mathcal{H}^0_{X/Z}(\mathcal{F})$
5.12 Relations between the properties of a Noetherian local ring A and a quotient A/tA.
5.13 Properties that persist under inductive limits

§6. Flat morphisms of locally Noetherian preschemes
6.1 Flatness and dimension
6.2 Flatness and projective dimension
6.3 Flatness and depth
6.4 Flatness and property (S_k)
6.5 Flatness and property (R_k)
6.6 Transitiviy properties
6.7 Application to change of base for algebraic preschemes
6.8 Regular, normal, reduced and smooth morphisms
6.9 Theorem on generic flatness
6.10 Dimension and depth of a sheaf normally flat along a closed sub-prescheme
6.11 Criteria for $U_{S_n}(\mathcal{F})$ and $U_{C_n}(\mathcal{F})$ to be open
6.12 Nagata's criteria for $\mathrm{Reg}(X)$ to be open
6.13 Criteria for $\mathrm{Nor}(X)$ to be open
6.14 Base change and integral closure
6.15 Geometrically unibranched preschemes

§7. Noetherian local rings and their completions; excellent rings
7.1 Formal equidensionality and formally catenary rings
7.2 Strictly formally catenary rings
7.3 Formal fibers of Noetherian local rings
7.4 Persistence of properties of formal fibers
7.5 A criterion for P-morphisms
7.6 Application I: Locally Japanese rings
7.7 Application II: Universally Japanese rings
7.8 Excellent rings
7.9 Excellent rings and resolution of singularities

(Part 3)

§8. Projective limits of preschemes
8.1 Introduction
8.2 Projective limits of preschemes
8.3 Constructible subsets of a projective limit of preschemes
8.4 Irreducibility and connectedness criteria for projective limits of preschemes
8.5 Finitely presented sheaves of modules on a projective limit of preschemes
8.6 Finitely presented subschemes of a projective limit of preschemes

8.7 Criteria for a projective limits of preschemes to be a reduced (resp. integral) prescheme
8.8 Preschemes finitely presented over a projective limit of preschemes
8.9 Initial applications to elimination of Noetherian hypotheses
8.10 Properties of morphisms persistent under projective limits
8.11 Application to quasi-finite morphisms
8.12 Another proof and generalization of Zariski's "main theorem"
8.13 Translation into the language of pro-objects
8.14 Characterization of a prescheme locally finitely presented over another, in terms of the functor it represents

§9. Constructible properties
9.1 Principle of finite extension
9.2 Constructible and ind-constructible properties
9.3 Constructible properties of morphisms of algebraic preschemes
9.4 Constructibility of certain properties of sheaves of modules
9.5 Constructibility of topological properties
9.6 Constructibility of certain properties of morphisms
9.7 Constructibility of the properties of separability, and geometric irreducibility and connectedness
9.8 Primary decomposition in the neighborhood of a generic fiber
9.9 Constructibility of local properties of fibers

§10. Jacobson preschemes
10.1 Very dense subsets of a topological space
10.2 Quasi-homeomorphisms
10.3 Jacobson spaces
10.4 Jacobson preschemes and rings
10.5 Noetherian Jacobson preschemes
10.6 Dimension of Jacobson preschemes
10.7 Examples and counterexamples
10.8 Rectified depth
10.9 Maximal spectra and ultra-preschemes
10.10 Algebraic spaces in the sense of Serre

§11. Topological properties of finitely presented flat morphisms; flatness criteria.
11.1 Flatness loci (Noetherian case)
11.2 Flatness of a projective limit of preschemes
11.3 Application to elimination of Noetherian hypotheses
11.4 Descent of flatness by arbitrary morphisms: case of a prescheme over an Artinian base
11.5 Descent of flatness by arbitrary morphisms: general case
11.6 Descent of flatness by arbitrary morphisms: case of a prescheme over a unibranched base

11.7 Counterexamples
11.8 Valuative criterion for flatness
11.9 Separated and universally separtated families of homomorphisms of sheaves of modules
11.10 Schematically dominant families of morphisms and schematically dense families of sub-preschemes

§12. Fibers of finitely presented flat morphisms
12.0 Introduction
12.1 Local properties of the fibers of a locally finitely presented flat morphism
12.2 Local and global properties of the fibers of a proper, flat, finitely presented morphism
12.3 Local cohomological properties of the fibers of a locally finitely presented flat morphism

§13. Equidimensional morphisms
13.1 Chevalley's semi-continuity theorem
13.2 Equidimensional morphisms: case of domeinant morphisms of irreducible preschemes
13.3 Equidimensional morphisms: general case

§14. Universally open morphisms
14.1 Open morphisms
14.2 Open morphisms and dimension formula
14.3 Universally open morphisms
14.4 Chevalley's criterion for universally open morphisms
14.5 Universally open morphisms and quasi-sections

§15. Fibers of a universally open morphism
15.1 Multiplicities of fibers of a universally open morphism
15.2 Flatness of universally open morphisms with geometrically reduced fibers
15.3 Application: criteria for reducedness and irreducibility
15.4 Supplement on Cohen-Macaulay morphisms
15.5 Separable rank of the fibers of a quasi-finite and universally open morphism; application to geometrically connected components of the fibers of a proper morphism
15.6 Connected components of fibers along a section
15.7 Appendix: local valuative criteria for properness

(Part 4)

§16. Differential invariants; differentially smooth morphisms
16.1 Normal invariants of an immersion
16.2 Functorial properties of normal invariants
16.3 Basic differential invariants of a morphism of preschemes
16.4 Functorial properties of differential invariants
16.5 Relative tangent sheaves and bundles; derivations
16.6 Sheaves of p-differentials and exterior differentials

16.7 The sheaves $\mathcal{P}^n_{X/S}(\mathcal{F})$
16.8 Differential operators
16.9 Regular and quasi-regular immersions
16.10 Differentially smooth morphisms
16.11 Differential operators on a differentially smooth S-prescheme
16.12 Characteristic 0 case: Jacobian criterion for differentially smooth morphisms

§17. Smooth, unramified and étale morphisms
17.1 Formally smooth, unramified and étale morphisms
17.2 General differential properties
17.3 Smooth, unramified and étale morphisms
17.4 Characterization of unramified morphisms
17.5 Characterization of smooth morphisms
17.6 Characterization of étale morphisms
17.7 Properties of descent and passage to the limit
17.8 Criteria for smoothness and unramification in terms of fibers
17.9 Étale morphisms and open immersions
17.10 Relative dimension of a prescheme smooth over another
17.11 Smooth morphisms of smooth preschemes
17.12 Smooth subschemes of a smooth prescheme; smooth and differentially smooth morphisms
17.13 Transverse morphisms
17.14 Local and infinitesimal characterizations of smooth, unramified and étale morphisms
17.15 Case of preschemes over a field
17.16 Quasi-sections of flat and smooth morphisms

§18. Supplement on étale morphisms; Henselian local rings and strictly local rings
18.1 A remarkable equivalence of categories
18.2 Étale covers
18.3 Finite étale algebras
18.4 Local structure of unramified and étale morphisms
18.5 Henselian local rings
18.6 Henselization
18.7 Henselizatoin and excellent rings
18.8 Strictly local rings and strict Henselization
18.9 Formal fibers of Noetherian Henselian rings
18.10 Preschemes étale over a geometrically unibranched or normal prescheme
18.11 Application to complete Noetherian local algebras over a field
18.12 Applications of étale localization to quasi-finite morphisms (generalizations of preceding results)

§19. Regular immersions and normal flatness
19.1 Properties of regular immersions

19.2 Transversally regular immersions
19.3 Relative complete intersections (flat case)
19.4 Application: criteria for regularity and smoothness of blowups
19.5 Criteria for M-regularity
19.6 Regular sequences relative to a filtered quotient module
19.7 Hironaka's criterion for normal flatness
19.8 Properties of projective limits
19.9 $\mathcal{F}$-regular sequences and depth
§20. Meromorphic functions and pseudo-morphisms
20.0 Introduction
20.1 Meromorphic functions
20.2 Pseudo-morphisms and pseudo-functions
20.3 Composition of pseudo-morphisms
20.4 Properties of domains of definition of rational functions
20.5 Relative pseudo-morphisms
20.6 Relative meromorphic functions
§21. Divisors
21.1 Divisors on a ringed space
21.2 Divisors and invertible fractional ideal sheaves
21.3 Linear equivalence of divisors
21.4 Inverse images of divisors
21.5 Direct images of divisors
21.6 1-codimensional cycle associated to a divisor
21.7 Interpretation of positive 1-codimensional cycles in terms of sub-preschemes
21.8 Divisors and normalization
21.9 Divisors on preschemes of dimension 1
21.10 Inverse and direct images of 1-codimensional cycles
21.11 Factoriality of regular rings
21.12 Van der Waerden's purity theorem for the ramification locus of a birational morphism
21.13 Parafactorial pairs; parafactorial local rings
21.14 The Ramanujan-Samuel theorem
21.15 Relative divisors